SANBI
Biodiversity for Life
South African National Biodiversity Institute

SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE

Contract No: SANBI G464/2023

REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE

PROCUREMENT DOCUMENT

May 2023

Issued by:

South African National Biodiversity Institute
Private Bag X101
Silverton
0184
Gauteng

Contact:

Supply Chain Management

E-mail: sanbi.tenders@sanbi.org.za

Prepared by:

Delta Built Environment Consultants (Pty) Ltd
P.O. Box 35703
Menlo Park
0102
Gauteng

Contact:

Mr M. Grift

Tel: 012 368 1850

E-mail: malcolm.grift@deltabec.com

Name of tenderer: .....

Address: .....

Tel no.: ..... **Fax no.:** .....

Email: .....

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PART T: THE TENDER

Part T1: Tendering Procedures

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE.**
CONTRACT NO:	**SANBI G464/2023**

Advertising date:	**5 May 2023**	**Closing date:**	**26 May 2023**
Closing time:	**11:00**	**Validity period:**	**90 days**

T1.1 Tender Notice and Invitation to Tender

THE SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE INVITES TENDERERS FOR THE PROVISION OF:
The appointment of a contractor for the remedial electrical work to various infrastructure for the SANBI at the Free State National Botanical Garden, Free State. It is estimated that tenderers should have a CIDB contractor grading of **4EB or higher**.

Tender documents will be available as from **5 May 2023** and will be available **ONLINE ONLY** on the SANBI website www.sanbi.org (click on "Opportunities").

A compulsory site briefing session will take place on site on **15 May 2023** at 10h00 at the Free State National Botanical Garden. Only one representative per service provider will be allowed to attend the scheduled compulsory site briefing session. Bidders are encouraged to direct all technical and bidding procedure enquiries to the email addresses below.

Bidders are encouraged to direct all technical and bidding procedure enquiries to the email address below.

Department:	Supply Chain Management
Email:	Sanbi.Tenders@sanbi.org.za
Cc:	malcolm.grift@deltabec.com
Cut-off date for enquiries:	**17 May 2023 at 12:00**

Any queries regarding the tender document or any related matter prior to submission of tenders must be directed to:

SANBI Representative (Technical Queries Only)	Delta Built Environment Consultants (Pty) Ltd 021 368 1850 malcolm.grift@deltabec.com
SANBI SCM Representative	sanbi.tenders@sanbi.org.za

The closing time and date for the receipt of tenders is **11:00** on **26 May 2023.**
The tenders will **NOT** be opened in public (please note that the two-envelope system is being followed). Requirements for sealing, addressing, delivery, opening and assessment of tenders are stated in the Tender Data.

PART T: THE TENDER

Part T1: Tendering Procedures

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T1.2 Tender Data

The conditions of tender are the Standard Conditions of Tender as contained in Annex C of the CIDB Standard for Uniformity in Engineering and Construction Works Contracts – August 2019. (See www.cidb.org.za).

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.

Clause number	Tender Data
C.1.1.1	The Employer is: South African National Biodiversity Institute (SANBI): The Employer's domicilium citandi et executandi (permanent physical business address) is: Pretoria National Botanical Garden 2 Cussonia Avenue, Biodiversity Centre Brummeria, Pretoria The Employer's address for communication relating to this project is: Private Bag X101 Silverton 0184
C.1.2	The Tender Documents issued by the Employer comprise the following documents: **PART T: 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 documents/schedules **PART C: THE CONTRACT** **Part C1: Agreements and Contract data** C1.1 - Form of offer and acceptance C1.2 - Contract data C1.3 - Construction guarantee C1.4 - Occupational Health & Safety Agreement 37(2) **Part C2: Pricing Data** C2.1 - Pricing Instructions C2.2 - Bill of Quantities

Clause number	Tender Data
	Part C3: Scope of Works C3.1 - Description of the works C3.2 - Construction **Part C4: Site Information** C4.1 - Site location **Annexures** Annexure A - Specifications Annexure B - Drawings
C.1.4	The employer's agent is: Delta Built Environment Consultants (Pty) Ltd **Contact Person:** Mr Malcolm Grift **Tel:** 021 368 1850 **E-mail:** malcolm.grift@deltebec.com
C.2.1	Only those tenderers who satisfy the following eligibility criteria are eligible to submit tenders Only those tenderers who score the minimum score in respect of the quality criteria stated in C.3.11.1 of this Tender Data shall be considered responsive and have their tenders evaluated further. (a) CIDB registration Only those tenderers who are registered with the CIDB or are capable of being so prior to the evaluation of submissions, 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 **4 EB** class of construction work, are eligible to have their tenders evaluated. 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 **4 EB** class of construction work; and 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 **4 EB** class of construction work or a value determined in accordance with Regulation 25 (1B) or 25(7A) of the Construction Industry Development Regulations.
C.2.6	Failure to apply instructions contained in addenda may render a tenderer's offer non-responsive in terms of clause C.3.8.
C.2.7	The arrangements for a compulsory clarification meeting are as stated in the Tender Notice and Invitation to Tender. Tenderers must sign the attendance list in the name of the tendering entity. Addenda will be issued to and tenders will be received only from those tendering entities appearing on the attendance list
C.2.8	Request clarifications at least 7 working days before the closing time.
C.2.12	Main tender offers are required to be submitted together with alternative tenders. If a tenderer wishes to submit an alternative tender offer, the only criteria permitted for such alternative tender offer is that it demonstrably satisfies the Employer's standards and requirements, the details of which may be obtained from the Employer's Agent.

Clause number	Tender Data
	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 amount tendered for the alternative offer to cover the Employer's costs in confirming the acceptability of the detailed design.
C.2.13.6	A two-envelope procedure will be followed as described in clause C.2.13.7.
C.2.13.7	Tenderers shall note the specific requirements for packaging of their tender documents and include only the following: • Financial: one (1) original document marked "Original" **including** Form of Offer and Acceptance, Estimated monthly expenditure and Priced Bills of Quantities; and • Technical: one (1) document pack **without any** pricing (files in PDF format) on a **memory stick** Financial or pricing details should **ONLY** be included in the printed document pack marked '**ORIGINAL**', and not in the PDF file(s) of the document(s) on the memory stick. **NB:** Failure to submit one printed document pack with pricing in one envelope, and a document pack without pricing on a memory stick will lead to your bid being **disqualified**. INCLUSION OF ANY PRICING INFORMATION ANYWHERE ON THE MEMORY STICK WILL LEAD TO THE BID BEING DISQUALIFIED. The original document will be placed in one envelope and the memory stick will be placed in another envelope. The two envelopes shall be placed together in an outer envelope sealed and bearing the following: • The address as stated in C.2.15.1 below • The identification details as stated in C.2.15.1 below • Name of the Tenderer • The words "Not be opened before the Tender opening" The Technical and Financial envelopes should also contain the details of the last three bullets on them. The financial envelope must contain the words NOT TO BE OPENED WITH THE TECHNICAL ENVELOPE
C.2.13.9	Telephonic, telegraphic, telex, facsimile or e-mailed tender offers will not be accepted.

Clause number	Tender Data
C.2.15.1	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:** Biodiversity Centre **Physical address:** Pretoria National Botanical Garden 2 Cussonia Avenue Brummeria Pretoria **Identification details:** **Tender number: SANBI G464/2023** **Title of Tender:** **REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
C.2.15.2	The closing time for submission of tender offers is as stated in the Tender Notice and Invitation to Tender.
C.2.16.1	The tender offer validity period is 90 days.
C.2.16.3	Where a tenderer, at any time after the opening of his tender offer but prior to entering into a contract based on his tender offer: (1) withdraws his tender; (2) gives notice of his inability to execute the contract in terms of his tender; or (3) fails to comply with a request made in terms of C.2.17, C.2.18 or C.3.9 such tenderer shall be barred from tendering on any of the Employer's future tenders for a period to be determined by the Employer, but not less than six (6) months, from the date of tender closure. The Employer may fully or partly exempt a tenderer from the provisions of this condition if he is of the opinion that the circumstances justify the exemption
C.2.18	The tenderer shall, when requested by the Employer to do so, submit the names of all management and supervisory staff that will be employed to supervise the Labour-Intensive portion of the works together with satisfactory evidence that such staff members satisfy the eligibility requirements.
C.2.22	Tender Documents will **not be returned** to bidders
C.2.23	The tenderer is required to submit with his/her tender, the following **(failure to provide below documentation will result in the tender being rejected)**: 1) A copy of the Central Suppliers Database (CSD) registration report. 2) A printed copy of the Active Contractor's Listing off the CIDB website (www.cidb.org.za) 3) Letter of Good Standing from the office of the Compensation Commissioner as required by the Compensation for Occupational Injuries and Diseases Act (COIDA). The letter should be issued by the Department of Labour. 4) In the case of a Joint Venture/Consortium the tax Compliance status Pin or Compliant tax status on CSD report must be submitted for each member of the Joint Venture/Consortium."
C.3.1.1	The Employer shall respond to clarifications received up to 7 working days before the tender closing time.
C.3.2	The Employer shall issue addenda until 5 working days before the tender closing time.
C.3.4.1	The tenders will not be opened in public.
C.3.5.1	The two-envelope system will be followed for this Tender.
C.3.7	In the event of disqualification, the Employer may, at his sole discretion, impose a specified period during which tender offers will not be accepted from the offending tenderer and report same to the CIDB and National Treasury.
C.3.11.1	The procedure for the evaluation of responsive tenders is stated in **Annexure A**.

Clause number	Tender Data
C.3.13	In addition to the requirements of the Condition of Tender, offers will only be accepted if: a) the Tenderer submits **a copy of the CSD registration report or registration number** (refer to T2.2.13); b) the Tenderer is registered with the Construction Industry Development Board in an appropriate Contractor grading designation (refer to T2.2.12); c) the Tenderer or any of its directors/shareholders is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector; 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 and persons in the employ of the state are permitted to submit Tenders or participate in the contract (refer to T2.2.16); e) the Tenderer is registered and in good standing with the compensation fund issued by the Department of Labour (Letter of Good Standing from the Office of the Compensation Commissioner (COIDA)); f) the Employer is reasonably satisfied that the Tenderer has in terms of the Construction Regulations, 2014, issued in terms of the Occupational Health and Safety Act, 1993, the necessary competencies and resources to carry out the work safely. g) A copy of Tax Compliance Status Pin or CSD report

Annexure A

This annexure contains all the criteria that the Employer shall use to evaluate tenders. In accordance with clause C.3.11 of the Standard conditions of tender. No other factors, methods or criteria shall be used. The tenderer shall provide all the information requested in the forms included in Part T2.2 – Returnable schedules.

Tenders shall be evaluated in three stages as follows

- Stage 1 – Evaluation of Eligibility and Administrative compliance
- Stage 2 – Evaluation of Functionality
- Stage 3 – Evaluation of Tender Price and Preference

1 Stage 1: Eligibility and Administrative compliance

The first stage will determine whether bids are compliant with all mandatory and disqualifiable submission requirements. Bidders that are deemed compliant will be eligible for further evaluation.

The criteria as identified in Clauses C.2.23 and C.3.13 in the Tender Data will be used to determine the tenders eligibility.

For administrative compliance the tenderers must complete all the returnable forms in Part T2.2, the Bill of Quantities and the Offer section in Part C1.1.

2 Stage 2: Functionality

The tenderers who complied with the eligibility and administrative criteria in stage 1 are considered for further evaluation on their capability to execute the project.

In this stage tenders will be evaluated on functionality according to the criteria listed below. Tenderers who fail to score a minimum of 70 points out of a possible 100 points on functionality criteria will not be eligible for further consideration.

Scoring quality

The functionality (quality) evaluation criteria are listed below. Maximum points for each criterion are in bold while points for each sub-criterion are indicated in brackets.

<table>
<tr><th colspan="3">FUNCTIONALITY CRITERIA</th></tr>
<tr><th>ID</th><th>CRITERIA</th><th>POINTS</th></tr>
<tr><td>1</td><td>Implementation method and project plan or programme
• Method to be followed in delivering this project
• Weekly plan/programme with milestones</td><td>25
(15)
(10)</td></tr>
<tr><td>2</td><td>Contractor’s Experience
• Three reference letters regarding work of similar scope and scale completed in last five years
<table>
<tr><th>Sub-Criteria</th><th>Points</th></tr>
<tr><td>One reference letter</td><td>5</td></tr>
<tr><td>Two reference letters</td><td>10</td></tr>
<tr><td>Three reference letters or more</td><td>15</td></tr>
</table>
• List of at least five other similar projects with appointment letters, completion certificates and telephonic references indicating work of similar value completed in the last ten years
<table>
<tr><th>Sub-Criteria</th><th>Points</th></tr>
<tr><td>One Project</td><td>5</td></tr>
<tr><td>Two Projects</td><td>10</td></tr>
<tr><td>Three Projects</td><td>15</td></tr>
<tr><td>Four Projects</td><td>20</td></tr>
<tr><td>Five Projects</td><td>25</td></tr>
</table>
Notes:
Supporting documents required to support the claims above, (Corresponding orders/appointment letters, completion certificates and reference letters for projects must be submitted as proof). Bidders must submit all the requested documents as proof in order to be awarded the points.
• Both appointment letters and reference letters must be on the employer’s letterhead, dated and signed by the employer.
• Failure to complete and sign schedule of the tenderer`s experience will result in the bidder forfeiting these points.</td><td>40
(15)
(25)</td></tr>
<tr><td>3</td><td>Contractor's Resources – Personnel and Plant
Proposed personnel:
• CVs for proposed key personnel (At least 3 – Contracts Manager, Site Agent & OHS Officer) indicating:
o Previous work experience of similar projects
o Total number of years’ working experience in construction
o Individual experience on similar work in last five years
o Certified copies of Qualifications or artisan’s certification or other recognised training courses completed
o Valid Professional Registration for Contracts Manager (ECSA or SACPCMP) and OHS Agent (SACPCMP)
<table>
<tr><th>Sub-Criteria</th><th>Points</th></tr>
<tr><td>Combined CV experience of less than 5 years</td><td>6</td></tr>
<tr><td>Combined CV experience of more than 5 years</td><td>12</td></tr>
<tr><td>Combined CV experience of more than 10 years</td><td>18</td></tr>
</table></td><td>35
(30)</td></tr>
</table>

	Combined CV experience of more than 15 years: 24 Combined CV experience of more than 20 years: 30 Note: Each CV with 10 years or more experience will receive a maximum of 10 points. Plant: • Equipment owned by Contractor – registration documents • Equipment to be rented (if any) – with preferred rental companies – letter of intent to hire	(5)
TOTAL		**100**

Functionality shall be scored by not less than three evaluators in accordance with the following schedules:

Each evaluation criterion will be assessed in terms of five indicators – no response, poor, satisfactory, acceptable, good and very good. Scores ranging from of 0 to 5 will be allocated to no response, very poor, poor, acceptable, good and very good responses, respectively. The scores submitted by each of the evaluators will be averaged, weighted and then totalled to obtain the final score for functionality. The prompts for judgment and the associated scores used in the evaluation of quality shall be as follows:

Score	Prompt for judgement
0	Failed to address the question / issue
1	Very poor response: - response / answer / solution lacks convincing evidence of skill / experience sought or medium risk that relevant skills will not be available.
2	Poor response – some elements of the response / answer / solution are present but documentary evidence is mostly lacking in respect of the required information
3	Acceptable response / answer / solution to the particular aspect of the requirements and evidence given of skill / experience sought
4	Above acceptable - response / answer / solution demonstrating real understanding of requirements and evidence of ability to meet it.
5	Excellent - response / answer / solution provides confidence that the tenderer will add real value to the project.

The minimum number of evaluation points for functionality proposal is **70 points** in order to progress to stage 3 of the evaluation

The stage three will evaluate the price and specific goals of those bids that meet the minimum threshold for functionality. In accordance with the Preferential Procurement Regulations, 2022 pertaining to the Preferential Procurement Policy Framework Act (No. 5 of 2000), the 80/20-point system will be applied in evaluating proposals that qualify for further consideration, where price constitutes 80 points and a maximum of 20 points will be awarded based on the bidder's specific goals.

3 Stage 3: Tender Price and Preference

The tenderers who complied with the functionality criteria in stage 2 are considered for further evaluation in terms of their Tender Price and Preference points.

3.1 Correction of arithmetical errors

Pursuant to clause C.3.9 of the standard conditions of tender as amended in the Tender Data, correction of arithmetical errors shall be undertaken.

3.2 Calculation of score for Tender Price

The score for Tender Price shall be calculated using the following formula:

$$N_F = W_f \times \left[1 - \left(\frac{P_t - P_{min}}{P_{min}}\right)\right]$$

Where:

N_F = the score for Tender Price awarded for the tender under consideration

W_f = the weighting given to financial offer, determined as follows:

- 90 where the Tender Price, inclusive of VAT, of all responsive tender offers received has a value in excess of R50 000 000,00; or
- 80 where the Tender Price, inclusive of VAT, of one or more responsive tender offers has a value that equals or is less than R50 000 000,00.

P_t = Tender Price of the tender under consideration

P_{min} = Tender Price of the lowest responsive tender

In the event that the calculated value of N_F is negative, the allocated score shall be 0

3.3 Financial and Preference

After calculation of the scores for Tender Price and for Preference, a combined score will be calculated as follows:

NT = NF + NP

Where:

NT = Total score for tender under consideration

NF = Score for Tender Price

NP = Score for Preference

The tender with the highest score should be recommended for appointment.

Annexure C

Standard Conditions of Tender

C.1 General

C.1.1 Actions

C.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 C.2 and C.3, timeously and with integrity, and behave equitably, honestly and transparently, comply with all legal obligations and not engage in anticompetitive practices.

C.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.*

C.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.

C.1.2 Tender Documents

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

C.1.3 Interpretation

C.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.

C.1.3.2 These conditions of tender, the tender data and tender schedules which are required for tender evaluation purposes, shall form part of any contract arising from the invitation to tender.

C.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 tenderer 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 tenderer who employs that employee.

b) **comparative offer** means the price after the factors of a non-firm price and all unconditional discounts it can be utilised to have been taken into consideration;

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;

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;

C.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. Communications 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.

C.1.5 Cancellation and Re-Invitation of Tenders

C.1.5.1 An employer may, prior to the award of the tender, cancel a tender if-

a) due to changed circumstances, there is no longer a need for the engineering and construction works specified in the invitation;

b) funds are no longer available to cover the total envisaged expenditure; or

c) no acceptable tenders are received.

d) there is a material irregularity in the tender process.

C.1.5.2 The decision to cancel a tender invitation must be published in the same manner in which the original tender invitation was advertised

C.1.5.3 An employer may only with the prior approval of the relevant treasury cancel a tender invitation for the second time.

C.1.6 Procurement procedures

C.1.6.1 General

Unless otherwise stated in the tender data, a contract will, subject to C.3.13, be concluded with the tenderer who in terms of C.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.

C.1.6.2 Competitive negotiation procedure

C.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 C.3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of C.3.8 relating to the material deviations or qualifications which affect the competitive position of tenderers shall not apply.

C.1.6.2.2 All responsive tenderers or at least a minimum of not less than three responsive tenderers that are highest ranked in terms of the evaluation criteria stated in the tender data shall be invited to enter into competitive negotiations based on the principle of equal treatment, keeping confidential the proposed solutions and associated information.

Notwithstanding the provisions of C.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.

C.1.6.2.3 At the conclusion of each round of negotiations, tenderers shall be invited by the employer to revise their 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.

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

C.1.6.3 Proposal procedure using the two stage-system

C.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.

C.1.6.3.2 Option 2

C.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.

C.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.

C.2 Tenderer's obligations

C.2.1 Eligibility

C.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.

C.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.

C.2.2 Cost of tendering

C.2.2.1 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 complies with requirements.

C.2.2.2 The cost of the tender documents charged by the employer shall be limited to the actual cost incurred by the employer for printing the documents. Employers must attempt to make available the tender documents on its website so as not to incur any costs pertaining to the printing of the tender documents.

C.2.3 Check documents

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

C.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.

C.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.

C.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.

C.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.

C.2.8 Seek clarification

Request clarification of the tender documents, if necessary, by notifying the employer at least five (5) working days before the closing time stated in the tender data.

C.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.

C.2.10 Pricing the tender offer

C.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 fourteen (14) days before the closing time stated in the tender data.

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

C.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.

C.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.

C.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.

C.2.12 Alternative tender offers

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

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

C.2.12.3 An alternative tender offer must only be considered if the main tender offer is the winning tender.

C.2.13 Submitting a tender offer

C.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 identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.

C.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.

C.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.

C.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.

C.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.

C.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.

C.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.

C.2.13.8 Accept that the employer will 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.

C.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.

C.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.

C.2.15 Closing time

C.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.

C.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.

C.2.16 Tender offer validity

C.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.

C.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.

C.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. If the validity period stated in C.2.16 lapses before the employer evaluating tender, the contractor reserves the right to review the price based on Consumer Price Index (CPI).

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

C.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 C.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.*

C.2.18 Provide other material

C.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.

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

C.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.

C.2.20 Submit securities, bonds and policies

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.

C.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.

C.2.22 Return of other tender documents

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

C.2.23 Certificates

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

C.3 The employer's undertakings

C.3.1 Respond to requests from the tenderer

C.3.1.1 Unless otherwise stated in the tender Data, respond to a request for clarification received up to five (5) working days before the tender closing time stated in the Tender Data and notify all tenderers who collected tender documents.

C.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.

C.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 that tender documents are available until three (3) 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 collected tender documents.

C.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.

C.3.4 Opening of tender submissions

C.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.

C.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, number of points claimed for its specific goals and time for completion for the main tender offer only.

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

C.3.5 Two-envelope system

C.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.

C.3.5.2 Evaluate functionality 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 functionality evaluation more than the minimum number of points for functionality stated in the tender data, and announce the score obtained for the technical proposals and the total price and any points claimed on specific goals. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for functionality.

C.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.

C.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.

C.3.8 Test for responsiveness

C.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.

C.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.

C.3.9 Arithmetical errors, omissions and discrepancies

C.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.

C.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 C.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.

C.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.

C.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.

C.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.

C.3.11 Evaluation of tender offers

The Standard Conditions of Tender standardize the procurement processes, methods and procedures from the time that tenders are invited to the time that a contract is awarded. They are generic in nature and are made project specific through choices that are made in developing the Tender Data associated with a specific project.

Conditions of tender are by definition the document that establishes a tenderer's obligations in submitting a tender and the employer's undertakings in soliciting and evaluating tender offers. Such conditions establish the rules from the time a tender is advertised to the time that a contract is awarded and require employers to conduct the process of offer and acceptance in terms of a set of standard procedures.

The CIDB Standard Conditions of Tender are based on a procurement system that satisfies the following system requirements:	
Requirement	**Qualitative interpretation of goal**
Fair	The process of offer and acceptance is conducted impartially without bias, providing simultaneous and timely access to participating parties to the same information.
Equitable	Terms and conditions for performing the work do not unfairly prejudice the interests of the parties.
Transparent	The only grounds for not awarding a contract to a tenderer who satisfies all requirements are restrictions from doing business with the employer, lack of capability or capacity, legal impediments and conflicts of interest.
Competitive	The system provides for appropriate levels of competition to ensure cost effective and best value outcomes.
Cost effective	Cost effective

The activities associated with evaluating tender offers are as follows:

a) Open and record tender offers received

b) Determine whether or not tender offers are complete

c) Determine whether or not tender offers are responsive

d) Evaluate tender offers

e) Determine if there are any grounds for disqualification

f) Determine acceptability of preferred tenderer

g) Prepare a tender evaluation report

h) Confirm the recommendation contained in the tender evaluation report

C.3.11.1 General

The employer must appoint an evaluation panel of not less than three persons conversant with the proposed scope of works to evaluate each responsive tender offer using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the tender data.

C.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.

C.3.13 Acceptance of tender offer

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

a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement;

b) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract;

c) has the legal capacity to enter into the contract;

d) is not; insolvent, in receivership, under Business Rescue as provided for in chapter 6 of the Companies Act No. 2008, bankrupt or being wound up, has his/her affairs administered by a court or a judicial officer, has suspended his/her business activities or is subject to legal proceedings in respect of any of the foregoing;

e) complies with the legal requirements, if any, stated in the tender data; and

f) is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

C.3.14 Prepare contract documents

C.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 and

c) other revisions agreed between the employer and the successful tenderer.

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

C.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.

C.3.16 Registration of the award

An employer must, within twenty-one (21) working days from the date on which a contractor's offer to perform a construction works contract is accepted in writing by the employer, register and publish the award on the CIDB Register of Projects.

C.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.

C.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.

PART T: THE TENDER

Part T2: Returnable Documents

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE.**
CONTRACT NO:	**SANBI G464/2023**

T2.1 List of Returnable Documents

1. RETURNABLE SCHEDULES REQUIRED FOR TENDER EVALUATION PURPOSES

Tender document name	Number of pages issued	Returnable document
Resolution of Board of Directors (T2.1.01)	1 Page	■ Yes □ No
Resolution of Board of Directors to enter into consortia or JV's (T2.1.02) (If Applicable)	2 Pages	■ Yes □ No
Special Resolution of Consortia or JV's (T2.1.03) (If Applicable)	3 Pages	■ Yes □ No
Schedule of proposed sub-contractors (T2.1.04)	1 Page	■ Yes □ No
Capacity of Tenderer (T2.1.05)	3 Pages	■ Yes □ No
Preference Point System (T2.1.06)	6 Pages	■ Yes □ No
Resources to be employed in terms of organization and staffing (T2.1.07)	2 Pages	■ Yes □ No
Estimated Monthly Expenditure (T2.1.08)	1 Page	■ Yes □ No
Compensation of Occupational Injuries and Disease Act (COIDA) (T2.1.18)	1 Page	■ Yes □ No

2. OTHER DOCUMENTS REQUIRED FOR TENDER EVALUATION PURPOSES

Tender document name	Number of pages issued	Returnable document
Declaration of Interest (T2.1.10)	2 Pages	■ Yes □ No
Medical Certificate for the confirmation of permanent disabled status (T2.1.11)	1 Page	■ Yes □ No
Proof of registration with Construction Industry Development Board (T2.1.12)	1 Page	■ Yes □ No
Copy of CSD Registration Certificate (T2.1.14)	1 Page	■ Yes □ No
Financial Reference (T2.1.15)	1 Page	■ Yes □ No

Equipment Datasheets (T2.1.20)	1 Page	■ Yes □ No
Proof of Liability Insurance (T2.1.22)	1 Page	■ Yes □ No

3. RETURNABLE SCHEDULES THAT WILL BE INCORPORATED INTO THE CONTRACT

Tender document name	Number of pages issued	Returnable document
Record of Addenda to Tender Documents (T2.1.16)	1 Page	■ Yes □ No
Compulsory Enterprise Questionnaire (T2.1.17)	3 Pages	■ Yes □ No

4. OTHER DOCUMENTS THAT WILL BE INCORPORATED INTO THE CONTRACT

Tender document name	Number of pages issued	Returnable document
Applicable Form of Guarantee	3 Pages	■ Yes □ No
Priced Bill of Quantities	82 Pages	■ Yes □ No

C1.1 Offer portion of Form of Offer and Acceptance
C1.2 Contract Data (Part 2)
C1.3 Form of Guarantee

RETURNABLE DOCUMENT CHECKLIST

This form has been created as an aid to ensure a tenderer's compliance with the completion of the returnable schedules and subsequent placement in the correct **Technical** and **Financial** envelopes.

A TECHNICAL ENVELOPE (1 COPY)

Reference No	Document Description	Tick if completed
T2.1.01	Resolution of Board of Directors	
T2.1.02	Resolution of Board of Directors to enter into consortia or JV's (If Applicable)	
T2.1.03	Special Resolution of Consortia or JV's (If Applicable)	
T2.1.04	Schedule of proposed sub-contractors	

T2.1.05	Capacity of Tenderer	
T2.1.06	Preference Point System	
T2.1.07	Resources to be employed in terms of organization and staffing	
T2.1.08	Estimated Monthly Expenditure	
T2.1.09	Declaration of Interest	
T2.1.10	Medical Certificate for the confirmation of permanent disabled status	
T2.1.11	Proof of registration with Construction Industry Development Board (	
T2.1.12	CSD Registration Certificate	
T2.1.13	Financial Reference	
T2.1.14	Record of Addenda to Tender Documents	
T2.1.15	Compulsory Enterprise Questionnaire	
T2.1.16	Compensation of Occupational Injuries and Disease Act (COIDA)	
T2.1.17	Proof of Liability Insurance	

B FINANCIAL ENVELOPE (ORIGINAL DOCUMENT)

The entire original tender document must be submitted in this envelope including the forms as listed below:

Reference No	Document Description	Tick if completed
Form C1.1	Form of Offer and Acceptance	
Form C1.2	Contract Data – Part 1	
Form C2.2	Priced Bill of Quantities	
Form T2.1.08	Estimated Monthly Expenditure	

T2.1.01: RESOLUTION OF BOARD OF DIRECTORS

RESOLUTION of a meeting of the Board of *Directors / Members / Partners of:

.....

.....
(*legally correct full name and registration number, if applicable, of the Enterprise)*

Held at ..... (place)

On ..... (date)

RESOLVED that:

1. The Enterprise submits a Bid / Tender to the South African National Biodiversity Institute in respect of the following project:

   .....

   .....
   (*project description as per Bid / Tender Document)*

   Bid / Tender Number: ..... *(Bid / Tender Number as per Bid / Tender Document)*

2. *Mr/Mrs/Ms: .....

   in *his/her Capacity as: ..... *(Position in the Enterprise)*

   and who will sign as follows: .....

   be, and is hereby, authorised to sign the Bid / Tender, and any and all other documents and/or correspondence in connection with and relating to the Bid / Tender, as well as to sign any Contract, and any and all documentation, resulting from the award of the Bid / Tender to the Enterprise mentioned above.

	Name	Capacity	Signature
1			
2			
3			
4			

Note:

1. ** Delete which is not applicable*
2. ***NB**. This resolution must be signed by all the Directors / Members / Partners of the Bidding Enterprise.*
3. *Should the number of Directors / Members/Partners exceed the space available above, additional names and signatures must be supplied on a separate page.*

ENTERPRISE STAMP

T2.1.02: RESOLUTION OF BOARD OF DIRECTORS TO ENTER INTO CONSORTIA OR JOINT VENTURES

RESOLUTION of a meeting of the Board of *Directors / Members / Partners of:

.....

.....
(*Legally correct full name and registration number, if applicable, of the Enterprise)*

Held at ..... (place)

On ..... (date)

RESOLVED that:

1. The Enterprise submits a Bid /Tender, in consortium/Joint Venture with the following Enterprises:

   .....

   .....
   (List all the legally correct full names and registration numbers, if applicable, of the Enterprises forming the Consortium/Joint Venture)

   to the South African National Biodiversity Institute in respect of the following project:

   .....

   .....
   (*Project description as per Bid /Tender Document)*

   Bid / Tender Number: ..... *(Bid / Tender Number as per Bid / Tender Document)*

2. *Mr/Mrs/Ms: .....

   in *his/her Capacity as: ..... *(Position in the Enterprise)*

   and who will sign as follows: .....

   be, and is hereby, authorised to sign a consortium/joint venture agreement with the parties listed under item 1 above, and any and all Other documents and/or correspondence in connection with and relating to the consortium/joint venture, in respect of the project described under item 1 above.

3. The Joint Venture formation/arrangement will be in the following proportions:

Name of Contractor	Proportion (%)

4. The Enterprise accepts joint and several liability with the parties listed under item 1 above for the due fulfilment of the obligations of the joint venture deriving from, and in any way connected with, the Contract to be entered into with the Employer in respect of the project described under item 1 above.

5. The Enterprise chooses as its *domicilium citandi et executandi* for all purposes arising from this joint venture agreement and the Contract with the Employer in respect of the project under item 1 above:

   Physical address:.....

   .....

   ..... (code)

   Postal address: .....

   .....

   ..... (code)

   Telephone number: ..... (code)

   Fax number: ..... (code)

	Name	Capacity	Signature
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Note:

1. ** Delete which is not applicable.*
2. ***NB**. This resolution must be signed by all the Directors / Members / Partners of the Bidding Enterprise.*
3. *Should the number of Directors / Members / Partners exceed the space available above, additional names and signatures must be supplied on a separate page.*

ENTERPRISE STAMP

T2.1.03: SPECIAL RESOLUTION OF CONSORTIA OR JOINT VENTURES

RESOLUTION of a meeting of the duly authorised representatives of the following legal entities who have entered into a consortium/joint venture to jointly bid for the project mentioned below: (*legally correct full names and registration numbers, if applicable, of the Enterprises forming a Consortium/Joint Venture)*

1. .....

   .....

2. .....

   .....

3. .....

   .....

4. .....

   .....

5. .....

   .....

6. .....

   .....

7. .....

   .....

8. .....

   .....

Held at ..... (place)

On ..... (date)

RESOLVED that:

A. The above-mentioned Enterprises submit a Bid in Consortium/Joint Venture to the South African National Biodiversity Institute in respect of the following project:

   .....

   .....
   (*Project description as per Bid /Tender Document)*

   Bid / Tender Number: ..... *(Bid / Tender Number as per Bid / Tender Document)*

   *Mr/Mrs/Ms: .....

   in *his/her Capacity as: ..... *(Position in the Enterprise)*

   and who will sign as follows: .....

be, and is hereby, authorised to sign the Bid, and any and all other documents and/or correspondence in connection with and relating to the Bid, as well as to sign any Contract, and any and all documentation, resulting from the award of the Bid to the Enterprises in Consortium/Joint Venture mentioned above.

B. The Enterprises constituting the Consortium/Joint Venture, notwithstanding its composition, shall conduct all business under the name and style of: .....

C. The Enterprises to the Consortium/Joint Venture accept joint and several liabilities for the due fulfilment of the obligations of the Consortium/Joint Venture deriving from, and in any way connected with, the Contract entered into with the Employer in respect of the project described under item A above.

D. Any of the Enterprises to the Consortium/Joint Venture intending to terminate the consortium/joint venture agreement, for whatever reason, shall give the Employer 30 day's written notice of such intention. Notwithstanding such decision to terminate, the Enterprises shall remain jointly and severally liable to the Employer for the due fulfilment of the obligations of the Consortium/Joint Venture as mentioned under item D above.

E. No Enterprise to the Consortium/Joint Venture shall, without the prior written consent of the other Enterprises to the Consortium/Joint Venture and of the Employer, cede any of its rights or assign any of its obligations under the consortium/joint venture agreement in relation to the Contract with the Employer referred to herein.

F. The Enterprises choose as the *domicilium citandi et executandi* of the Consortium/Joint Venture for all purposes arising from the consortium/joint venture agreement and the Contract with the Employer in respect of the project under item A above:

Physical address:.....

.....

..... (code)

Postal address: .....

.....

..... (code)

Telephone number: ..... (code)

Fax number: ..... (code)

	Name	Capacity	Signature
1			
2			
3			
4			
5			

	Name	Capacity	Signature
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Note:

1. ** Delete which is not applicable.*
2. ***NB**. This resolution must be signed by all the Duly Authorised Representatives of the Legal Entities to the Consortium Joint Venture submitting this Bid.*
3. *Should the number of Duly Authorised Representatives of the Legal Entities joining forces in this Bid exceed the space available above, additional names and signatures must be supplied on a separate page.*
4. *Resolutions, duly completed and signed, from the separate Enterprises who participate in this Consortium/Joint Venture must be attached to the Special Resolution.*

T2.1.04: SCHEDULE OF PROPOSED SUBCONTRACTORS

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

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

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

Name of representative	**Signature**	**Capacity**	**Date**
Name of organisation:			

T2.1.05: CAPACITY OF TENDERER

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

1. WORK CAPACITY: *(The Tenderer is requested to furnish the following particulars, attach additional pages if more space is required. Failure to furnish the particulars may result in the Tender being disregarded.)*

Skilled technicians employed		**Unskilled employees employed**	
Categories of technicians	**Number**	**Categories of employees**	**Number**

1.1. Provide full particulars of:

Machinery	**Equipment**	**Workshops**

2. PARTICULARS OF COMMITMENTS WHICH THE TENDERER HAS PREVIOUSLY COMPLETED AND PRESENTLY ENGAGED WITH:

2.1. Current projects:

	Project	Place (town)	Reference / Contact person	Contact Tel. No.	Contract amount	Contract period	Date of commencement	Scheduled date of completion
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

Any reference to words “Bid” or Bidder” herein and/or in any other documentation shall be construed to have the same meaning as the words “Tender” or “Tenderer”.

2.2. Previous projects:

	Project	Place (town)	Reference / Contact person	Contact Tel. No.	Contract amount	Contract period	Date of commencement	Scheduled date of completion	Actual date of completion
1									
2									
3									
4									
5									
6									
7									
8									
9									

Name of Tenderer	**Signature**	**Date**

Any reference to words “Bid” or Bidder” herein and/or in any other documentation shall be construed to have the same meaning as the words “Tender” or “Tenderer”.

T2.1.06: PREFERENCE POINT SYSTEM

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

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

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

---

1. GENERAL CONDITIONS

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

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

1.2 To be completed by the organ of state

a) The applicable preference point system for this tender is the 80/20 preference point system.

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

(a) Price; and

(b) Specific Goals.

1.4 To be completed by the organ of state:

The maximum points for this tender are allocated as follows:

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

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

1.6 The organ of state reserves the right to require of a tenderer, either before a tender is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the organ of state.

2. DEFINITIONS

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

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

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

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

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

3. FORMULAE FOR PROCUREMENT OF GOODS AND SERVICES

3.1. POINTS AWARDED FOR PRICE

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

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

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

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

Where

Ps = Points scored for price of tender under consideration

Pt = Price of tender under consideration

Pmin = Price of lowest acceptable tender

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

3.2.1. POINTS AWARDED FOR PRICE

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

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

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

Where

Ps = Points scored for price of tender under consideration

Pt = Price of tender under consideration

Pmax = Price of highest acceptable tender

4. POINTS AWARDED FOR SPECIFIC GOALS

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

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

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

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

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

Table 1: Specific goals for the tender and points claimed are indicated per the table below.

(Note to organs of state: Where either the 90/10 or 80/20 preference point system is applicable, corresponding points must also be indicated as such.

Note to tenderers: The tenderer must indicate how they claim points for each preference point

***system.*)**

The specific goals allocated points in terms of this tender	Number of points allocated (90/10 system) (To be completed by the organ of state)	Number of points allocated (80/20 system) (To be completed by the organ of state)	Number of points claimed (90/10 system) (To be completed by the tenderer)	Number of points claimed (80/20 system) (To be completed by the tenderer)
Categories of persons historically disadvantaged by unfair discrimination on the basis of race Information will be verified on CSD report. Points will be allocated based on the percentage of ownership per goal - 100% black ownership = 10 points		10		
Categories of persons historically disadvantaged by unfair discrimination on the basis of gender. Information will be verified on CSD report. Points will be allocated based on the percentage of ownership per goal - 100% female ownership = 10 points		10		

DECLARATION WITH REGARD TO COMPANY/FIRM

4.3. Name of company/firm…….

4.4. Company registration number: ……...

4.5. TYPE OF COMPANY/ FIRM

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

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

i) The information furnished is true and correct;

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

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

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

(a) disqualify the person from the tendering process;

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

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

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

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

……
SIGNATURE(S) OF TENDERER(S)

SURNAME AND NAME: ……..
DATE: ……

ADDRESS: ……

……

……
……

T2.1.07: RESOURCES TO BE EMPLOYED IN TERMS OF ORGANIZATION AND STAFFING

The Tenderer shall list below the key personnel (including first nominee and the second choice alternate), whom he proposes to employ on the Contract should his tender be accepted, both at his headquarters and on the Site, to direct and for the execution of the work, together with their qualifications, experience, positions held and their nationalities.

DESIGNATION	NAME AND NATIONALITY OF: (i) NOMINEE (ii) ALTERNATE	SUMMARY OF QUALIFICATIONS, EXPERIENCE AND PRESENT OCCUPATION
<u>HEADQUARTERS</u> Partner/Director Project manager Other key staff (give designation)		

DESIGNATION	NAME AND NATIONALITY OF: (i) NOMINEE (ii) ALTERNATE	SUMMARY OF QUALIFICATIONS, EXPERIENCE AND PRESENT OCCUPATION
SITE OFFICE Site Agent Site Engineer/Technician Construction supervisor (give designation) Other key staff (give designation)		

T2.1.08: ESTIMATED MONTHLY EXPENDITURE

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

The amounts for contingencies and Contract Price Adjustment must not be included ***OR** the amount for contingencies must not be included.

MONTH	VALUE
1	R .....
2	R .....
3	R .....
4	R .....
5	R .....
6	R .....
7	R .....
8	R .....
9	R .....
10	R .....
	COMPLETION OF CONTRACT
TOTAL	R .....

T2.1.09: DECLARATION OF INTEREST

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

Any person, including persons in the employ of the South African National Biodiversity Institute ; or persons acting on behalf of the South African National Biodiversity Institute performing business as a sole proprietor or in partnership; or persons acting in the capacity of a trustee/s of a trust; or any legal entity, including legal entities and trusts, of which the members, directors, shareholders, trustees and/or beneficiaries are in the employ of the South African National Biodiversity Institute or act on behalf of the South African National Biodiversity Institute, may make an offer or offers in terms of this tender invitation.

In view of the possible allegations of favouritism, should the resulting tender, or part thereof, be awarded to persons employed by the South African National Biodiversity Institute; or to persons who act on behalf of the South African National Biodiversity; or to persons connected or related to them, the bidder / tenderer or the bidder / tenderer's duly authorized representative shall disclose herein any relationship and/or kinship, including blood relation, which he/she; his/her employer; the bidder / tenderer's management; members; directors; partners; shareholders; trustees; and/or beneficiaries may have with any person or persons in the employ of the South African National Biodiversity Institute and/or with any person or persons acting on behalf of the South African National Biodiversity Institute and who may directly or indirectly be involved in, and/or may be in a position to influence the adjudication and/or evaluation and/or award of this bid / tender.

In order to give effect to the above, the following questionnaire shall be completed and submitted with the tender. Failure to furnish the information requested in the questionnaire below may render the tender submission not to be considered at all.

(In answering the questions below, indicate the applicable answer with a ✓ and cross the other out)

1. Is the bidder / tenderer and/or the duly authorized representative in the employ of the South African National Biodiversity Institute?

   ☐ YES ☐ NO

   If yes, State the full particulars of such person/s, together with their current position held as an employee of the South African National Biodiversity Institute.

   _____

   _____

2. Is the bidder / tenderer and/or the duly authorized representative in the employ of the person/s or legal entity acting on behalf of the South African National Biodiversity Institute, and who may directly or indirectly be involved in, and/or may be in a position to influence, the adjudication and/or evaluation and/or award of this tender?

   ☐ YES ☐ NO
   If yes, State the full particulars of such person/s, together with their current position held as an employee of such person/s or legal entity acting on behalf of the South African National Biodiversity Institute.

   _____

   _____

3. Does the bidder / tenderer, the bidder's / tenderer's duly authorised representative, and/or any of the bidder's / tenderer's employees, management, partners, members, directors, shareholders, trustees and/or beneficiaries have any relationship (family, friend, business- or financial interest) with a person, or persons in the employ of the South African National Biodiversity Institute and/or in the employ of the person/s or legal entity acting on behalf of the South African National Biodiversity Institute, and who may directly or indirectly be involved in, and/or may be in a position to influence, the adjudication and/or evaluation and/or award of this tender?

   ☐ YES ☐ NO

   If yes, State the full particulars of the persons between whom the relationship exists, the nature of the relationship and the current position/status of such employee/s of the South African National Biodiversity Institute and/or of the person/s and/or legal entity acting on behalf of the South African National Biodiversity Institute herein.

   _____

   _____

   I, the undersigned, _____
   (name of the person duly authorised to sign the bid / tender documents on behalf of the bidder / tenderer) hereby certify that the information, furnished above, is correct in all respects. I accept and understand that the South African National Biodiversity Institute, may act against me and the bidder / tenderer, jointly and severally, should this declaration prove to be false.

   Duly signed at ..... on this .....day of..... (month) of ..... (year)

.....	.....
Full name of signatory	Name of Bidder / Tenderer
.....	.....
Capacity of Signatory	Signature

COMMISSIONER OF OATHS

T2.1.10: MEDICAL CERTIFICATE FOR THE CONFIRMATION OF PERMANENT DISABLED STATUS

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

I, ... (*surname and name*), Identity number,

.....do hereby declare that I am a registered medical practitioner, with my

practice number being....., practicing at .....

.....(Physical and postal addresses) declare that I have examined Mr/Mrs

....., identity number of .....

and have found the said person to be permanently disabled
or having a recurring disability.

"Disability" means, in respect of a person, a permanent impairment of a physical, intellectual, or sensory function, which results in restricted, or lack of, ability to perform an activity in the manner, or within the range, considered normal for a human being." – As per Preferential Procurement Policy Framework Act: No 5 of 2000 (PPPFA)

The nature of the disability is as follows:

.....

.....

.....

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

OFFICIAL STAMP OF
MEDICAL PRACTITIONER

.....
Signature

.....
Date

T2.1.11: PROOF OF REGISTRATION WITH CONSTRUCTION INDUSTRY DEVELOPMENT BOARD

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

The Tenderer shall provide a printed copy of the Active Contractor's Listing off the CIDB website. (www.cidb.org.za). In the case of a joint venture, a printed copy of the Active Contractor's listing must be provided for each member of the joint venture.

Name of Contractor: .....

Contractor Grading Designation: .....

CIDB Contractor Registration Number: .....

T2.1.12: COPY OF CSD REGISTRATION CERTIFICATE

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

A copy of Central Suppliers Database (CSD) Registration Certificate must be included for evaluation purposes.

T2.1.13: FINANCIAL REFERENCES

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

Notes to tenderer:

1. The tenderer shall attach to this form a letter from the bank in which it is declared how he conducts his account. The contents of the bank's letter must state the credit rating that the bank, in addition to the information required below, accords to the tenderer for the business envisaged by this tender. Failure to provide the required letter with the tender submission may render the tenderer's offer unresponsive in terms of tender condition C3.8.

2. The tenderer's banking details as they appear below shall be completed.

3. In the event that the tenderer is a joint venture enterprise, details of all the members of the joint venture shall be similarly provided and attached to this form.

Details of Company's Bank

DESCRIPTION OF BANK DETAIL	BANK DETAILS APPLICABLE TO TENDERER'S HEAD OFFICE
Name of bank	
Branch name	
Branch code	
Street address	
Postal address	
Name of manager	
Telephone number	
Fax number	
Account number	

T2.1.14: RECORD OF ADDENDA TO TENDER DOCUMENTS

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

I / We confirm that the following communications received from the South African National Biodiversity Institute before the submission of this tender offer, amending the tender documents, have been taken into account in this tender offer: *(Attach additional pages if more space is required)*

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

Name of Tenderer	Signature	Date

I / We confirm that no communications were received from the South African National Biodiversity Institute before the submission of this tender offer, amending the tender documents.

Name of Tenderer	Signature	Date

T2.1.15: COMPULSORY ENTERPRISE QUESTIONNAIRE

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

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

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

Section 3: SAQCC Fire 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 in the service of the state

Indicate by marking the relevant boxes with a cross, if any 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, in the service of any of the following:

- □ a member of any municipal council
- □ a member of any provincial legislature
- □ a member of the National Assembly or the National Council of Province
- □ a member of the board of directors of any municipal entity
- □ an official of any municipality or municipal entity
- □ 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 No 1 of 1999)
- □ a member of an accounting authority of any national or provincial public entity
- □ an employee of Parliament or a provincial legislature

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 or 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, in the service of any of the following:

- □ a member of any municipal council
- □ a member of any provincial legislature
- □ a member of the National Assembly or the National Council of Province
- □ a member of the board of directors of any municipal entity
- □ an official of any municipality or municipal entity
- □ 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 No 1 of 1999)
- □ a member of an accounting authority of any national or provincial public entity
- □ an employee of Parliament or a provincial legislature

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) authorises 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, 2004;

(iii) confirms that no partner, member, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise, has within the last five years been convicted of fraud or corruption;

(iv) confirms that I/we are not associated, linked or involved with any other tendering entities submitting tender offers and have no other relationship with any of the Tenderers or those responsible for compiling the Scope of Work that could cause or be interpreted as a conflict of interest; and

(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: ..... Date: .....

Name: ..... Position: .....

Enterprise name: .....

T2.1.16: COMPENSATION OF OCCUPATIONAL INJURIES AND DISEASE ACT (COIDA)

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

Letter of Good Standing from the office of the Compensation Commissioner as required by the Compensation for Occupational Injuries and Diseases Act (COIDA) must be included for evaluation purposes. The letter should be issued by the Department of Labour.

T2.1.17: PROOF OF LIABILITY INSURANCE

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

The tender shall append their Proof of Liability Insurance behind this page.

PART C: THE CONTRACT

Part C1: Agreement and Contract Data

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

C1.1 Form of Offer and Acceptance

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

REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE RENOVATION WORK TO THE GOLDFIELDS EDUCATION CENTRE FOR THE SANBI AT THE KIRSTENBOSCH NATIONAL BOTANICAL GARDEN, CAPE TOWN

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.

The tenderer, identified in the Offer signature block, has examined the draft contract as listed in the Acceptance section and agreed to provide this Offer.

By the representative of the tenderer, deemed to be duly authorised, signing this part of this Form of Offer and Acceptance the tenderer offers to perform all of the obligations and liabilities of the **Contractor** under the contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the conditions of contract identified in the Contract Data.

THE OFFERED TOTAL OF THE PRICES INCLUSIVE OF VAT IS:

(in words) ..... Rand;

R ..... (in figures)

THE OFFERED PRICES ARE AS STATED IN THE PRICING SCHEDULE

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 including the Schedule of Deviations (if any) to the tenderer before the end of the period of validity stated in the Tender Data, or other period as agreed, 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: .....

.....
(Insert name and address of organisation)

Name & signature of witness ..... Date .....

.....

[Failure of a Tenderer to complete and sign this form will invalidate the tender]

Acceptance

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

The terms of the Contract are contained in

Part C1	Agreements and Contract Data *[which includes this Agreement]*
Part C2	Pricing Data
Part C3	Scope of Work
Part C4	Site Information
APPENDIX A	Project Electrical Specifications
APPENDIX B	Standard Electrical Specifications
APPENDIX C	Earthing and Lightning Protection Specifications

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

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

The Tenderer shall within the time required to submit documentation in accordance with clause 5.3.2 of the Contract Data (C1.2) after receiving a completed copy of this Agreement, including the Schedule of Deviations (if any), contact the Employer's agent (whose details are given in the Contract Data) to arrange the delivery of any bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the Conditions of Contract identified in the Contract Data at, or just after, the date this Agreement comes into effect. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this Agreement.

Notwithstanding anything contained herein, this Agreement comes into effect on the date when the Tenderer receives one fully completed original copy of this document, including the Schedule of Deviations (if any). Unless the Tenderer (now Contractor) within five 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: .....

.....

.....
(Insert name and address of organisation)

Name & signature of witness ..... Date .....

.....

Schedule of Deviations

1 Subject .....

Details .....

.....

.....

.....

2 Subject .....

Details .....

.....

.....

.....

3 Subject .....

Details .....

.....

.....

.....

4 Subject .....

Details .....

.....

.....

.....

5 Subject .....

Details .....

.....

.....

.....

By the duly authorised representatives signing this Schedule of Deviations, the Employer and the Tenderer agree to and accept the foregoing Schedule of Deviations as the only deviations from and amendments to the documents listed in the Tender Data and Addenda thereto as listed in the Tender Schedules, as well as any confirmation, clarification or change 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 organisation]

Name and signature of witness ..... Date .....

FOR THE EMPLOYER:

Signature(s) ....

Name(s) ....

Capacity ....

.....
[Name and address of organisation]

Name and signature of witness ..... Date .....

CONFIRMATION OF RECEIPT

The Tenderer (now Contractor), identified in the Offer part of this Agreement, hereby confirms receipt from the Employer, identified in the Acceptance part of this Agreement, of one fully completed original copy of this Agreement, including the Schedule of Deviations (if any) today:

The..... *[day]*

of ..... *[month]*

20.....*[year]*

at ..... *[place]*

For the Contractor: .....
Signature

.....
Name

.....
Capacity

Signature and name of witness: .....
Signature

.....
Name

PART C: THE CONTRACT

Part C1: Agreement and Contract Data

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**G464/2023**

C1.2 Contract Data

The Conditions of Contract are the **JBCC Series 2000 Principal Building Agreement (July 2007 Edition 5.0 - Reprint 1)** published by the Joint Building Contract Committee. Copies of these documents may be obtained from the **Association of South African Quantity Surveyors** (011-315 4140), the **Master Builders Association** (011-205 9000), the **South African Association of Consulting Engineers** (011-463 2022) or the **South African Institute of Architects** (011-486 0684).

The JBCC Principal Building Agreement Contract Data EC and the JBCC Principal Building Agreement Contract Data CE form an integral part of this agreement.

The **ASAQS Preliminaries (November 2007 Edition)** published by the Association of South African Quantity Surveyors for use with the said JBCC Principal Building Agreement shall be deemed to be incorporated in the bills of quantities.

The **Model Preambles for Trades (2008 Edition)** as published by the Association of South African Quantity Surveyors shall be deemed to be incorporated in the bills of quantities and no claims arising from brevity of description of items fully described in the said Model Preambles will be entertained.

Section C1.2.1: Contract Data: Employer to Contractor (EC)

Employer Addendum Code 2101-EC

For information purposes only. To be signed on appointment.

Introduction

This addendum contains all variables referred to in the **Principal Building Agreement** that are the responsibility of the Contractor to provide the appropriate information that is necessary for the Contractor to complete his tender. The Addendum must be completed in full and included in the tender documents. The Addendums "Contract Data – EC", "Contract Data – CE", "Contract Data – ES" and "Contract Data – SE" form part of the contract between the parties.

Definitions

The definitions used in this document and the interpretation thereof are as listed in the Principal Building Agreement. The work or phrase of a definition is in bold text and shall bear the meaning assigned to it in the Principal Building Agreement. Where such word or phrase is not highlighted it shall bear the meaning consistent with the context of its use. The listed defined word or phrase does not quality as a definition where information required to be stated in the contract data has not been provided.

Provision of Contract Data

Spaces requiring information must be filled in, shown as "not applicable" or deleted and not left blank. Where choices are offered, the non-applicable items are to be clearly struck out. Where insufficient space is provided the additional information should be annexed hereto and cross referenced to the applicable clause of the contract data.

Reference Clauses

Where relevant the Principal Building Agreement clause applicable to the required information is printed in italics under the Contract Data clause number i.e. [27.4.2]

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CONTRACT DATA – EMPLOYER

1.0 CONTRACTING AND OTHER PARTIES

1.1 *[1.2]*	**Employer:**	South African National Biodiversity Institute		
	Postal Address:	Private Bag X101, Silverton, Gauteng	**Code:**	0184
	Physical Address:	Pretoria National Botanical Garden 2 Cussonia Avenue, Brummeria, Gauteng	**Code:**	0184
	Tel no.:	012 843 5000	**Fax no.:**	012 843 5205
	VAT no.			
	E-mail:			
1.2 *[5.1]*	**Principal Agent:**	Delta Built Environment Consultants (Pty) Ltd	**Person:**	Mr. Malcolm Grift
	Postal Address:	P.O. Box 37503, Menlo Park	**Code:**	0102
	Tel no.:	012 368 1850	**Fax no.:**	012 348 4738
	E-mail:	malcolm.grift@deltabec.com		
1.2 *[5.2]*	**Agent (1):**		**Person:**	
	Agent's Service:			
	Postal Address:		**Code:**	
	Tel no.:		**Fax no.:**	
	E-mail:			
1.3 *[5.2]*	**Agent (2):**			
	Agent's Service:			
	Postal Address:		**Code:**	
	Tel no.:		**Fax no.:**	
	E-mail:			
1.4 *[5.2]*	**Agent (3):**		**Person:**	
	Agent's Service:			
	Postal Address:		**Code:**	
	Tel no.:		**Fax no.:**	
	E-mail:			
1.5 *[5.2]*	**Agent (4):**		**Person:**	
	Agent's Service:			
	Postal Address:		**Code:**	

	Tel no.:		**Fax no.:**	
	E-mail:			
1.6 *[5.2]*	**Agent (5):**		**Person:**	
	Agent's Service:			
	Postal Address:		**Code:**	
	Tel no.:		**Fax no.:**	
	E-mail:			
1.7 *[5.2]*	**Agent (6):**		**Person:**	
	Agent's Service:			
	Postal Address:		**Code:**	
	Tel no.:		**Fax no.:**	
	E-mail:			
1.8 *[5.2]*	**Agent (7):**		**Person:**	
	Agent's Service:			
	Postal Address:		**Code:**	
	Tel no.:		**Fax no.:**	
	E-mail:			

1.9 *[5.5]* **Interest of principal agent or other agent in the project.** (Yes / No) **No**

Details where "yes": **N/A**

2.0 CONTRACT AND SITE INFORMATION

2.1 *[1.7]* The **law** applicable to this **agreement**: (Country / State) **RSA**

2.2 *[1.1]* **Works** identification: **REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**

2.3 *[1.1]* Site description: **Free State National Botanical Garden**

2.4 *[15.2.1]* Possession of the **site** is to be given on: (Date)

Within 5 (five) working days after receipt of documentary evidence that:
- **Insurances have been effected *[12.2];***
- **Security has been provided to the Employer *[14.1];***
- **Contractor's Lien has been signed;**
- **Safety Plan has been approved by the Employer.**

2.5 *[15.3]*	Period for the commencement of the **works** after the contractor takes possession of the **site:**				(Working days)	**5 (Five)**
2.6 *[15.4], [28.0]*	Completion of the works in **sections** is required.	(Yes / No)	**YES**	(No. of sections)		**24**
2.7 *[3.3], [31.16.2]*	Waiver of the **contractor's** lien or right of continuing possession is required.				(Yes / No)	**Yes**
2.8 *[16.1]*	Defined restrictions to the **site** area. Where "yes" the specific requirements are described below or detailed in the **contract documents**.				(Yes / No)	**No**
2.9 *[16.4]*	Geotechnical investigation of the **site** has been undertaken. Where "yes" the results are included in the **contract documents.**				(Yes / No)	**N/A**
2.10 *[16.6]*	Existing premises will be occupied. Where "yes" the specific requirements are described below or detailed in the **contract documents.**				(Yes / No)	**Yes**
2.11 *[16.7]*	Provision of temporary services is required. Where "yes" the specific requirements are described below or detailed in the **contract documents.**				(Yes / No)	**Yes**
2.11.1	**Water**	Option A Option B Option C	Contractor – his cost Employer – free of charge Contractor – metered (contractor cost)		(A, B or C)	**B**
2.11.2	**Electricity**	Option A Option B Option C	Contractor – his cost Employer – free of charge Contractor – metered (contractor cost)		(A, B or C)	**B**
2.11.3	**Telecom**	Option A Option B Option C	Contractor – his cost Employer – free of charge Contractor – metered (contractor cost)		(A, B or C)	**A**
2.11.4	**Ablutions**	Option A Option B Option C	Contractor – his cost Employer – free of charge Contractor – metered (contractor cost)		(A, B or C)	**A**
2.12 *[16.8]*	Protection of existing trees and shrubs is required. Where "yes" the specific requirements are described below or detailed in the **contract documents.**				(Yes / No)	**Yes**

3.0 INSURANCE AND SECURITIES

3.1	Contract works insurance to be effected by:	(Employer / Contractor)	**Contractor**

[10.1.1], [12.6]			
	For the sum of:	(Amount)	**Contract Sum Plus 20%**
	With a deductible of:	(Amount)	**R20 000**
3.2 *[10.1.2], [11.1-3], [12.6]*	Supplementary / Special insurance to be effected by:	(Employer / Contractor)	**N/A**
	For the sum of:	(Amount)	**N/A**
	With a deductible of:	(Amount)	**N/A**
3.3 *[10.1.3], [12.6]*	Public liability insurance to be effected by:	(Employer / Contractor)	**Contractor**
	For the sum of:	(Amount)	**R3 000 000 per claim**
	With a deductible of:	(Amount)	**R20 000**
3.4 *[11.1.1]*	Support insurance to be effected by:	(Employer / Contractor)	**N/A**
	For the sum of:	(Amount)	**N/A**
	With a deductible of:	(Amount)	**N/A**
3.5 *[11.1.2-3], [12.1]*	Special insurance to be effected by:	(Employer / Contractor)	**N/A**
	Type:	**N/A**	
	For the sum of:	(Amount)	**N/A**
	With a deductible of:	(Amount)	**N/A**

4.0 PRACTICAL COMPLETION DATES AND PENALTIES

	Date	**Penalty Amount**

4.1 *[24.3.1], [30.1-36]*	For the **works** as a whole: The date for **practical completion** and the **penalty** per **calendar day** is:	**10 months (incl Builders Holiday) after date of site handover**	**R2 000-00 per calendar day (Excl. VAT)**

Or

4.2 *[24.3.1], [28.1]* For the **works** in **sections**: The date for **practical completion** and the **penalty** per **calendar day** is:

	Date	**Penalty Amount**
Section 1	**N/A**	**R**
Section 2	**N/A**	**R**
Section 3	**N/A**	**R**
Section 4	**N/A**	**R**

5.0 DOCUMENTS AND GENERAL

5.1 *[3.7]*	Construction document copies to be supplied to the **contractor** free of charge.	(No. of copies)	**3**		
5.2 *[3.9]*	The **priced document** may be used as a specification of **materials and goods** and work methods.	(Yes / No)	**Yes**		
5.3 *[3.10]*	The **contractor** shall provide a schedule of rates.	(Yes / No)	**No**	(Addendum No.)	**Refer to Bill of Quantities**
5.4 *[3.11]*	Changes made to **JBCC** standard documents.	(Yes / No)	**Yes**	(Addendum No.)	**Refer to Point 6 below**
5.5 *[15.1.1]*	On acceptance of the tender the **priced document** is to be submitted within the stated **working days.**	(No. of days)	**Priced document to be submitted with Tender**		
5.6 *[22.2]*	Work to be undertaken by **direct contractors.**	(Yes / No)	**No**	(Addendum No.)	**N/A**
5.7 *[24.9]*	On achievement of practical completion the **contractor** is to hand over all certificates and manuals etc. related to the works.				
5.8 *[31.1]*	Interim **payment certificate** to be issued by:	(Date of Month)	**25th**		

5.8 *[4.1]* The following items of works shall be designed by the Contractor:

(1) _____ (2) _____

(3) _____ (4) _____

(5) _____ _____

6.0 STATE PROVISIONS AND SUBSTITUTIONS

6.1 *Replace the following definitions with:*

"CONSTRUCTION PERIOD" means the period commencing on the date of acceptance of the bid as stated in [15.2.1] And ending on the date of **practical completion**

"**INTEREST"** means the interest rate as determined by the Minister of Finance, from time to time, in terms of section 80(1)(b) of the Public Finance Management Act, 1999 (Act No. 1 of 1999).

6.2 *Replace the last sentence with the following:*
[3.6]

The original signed set of contract documents shall be held by the **Employer**.

6.3 *Replace the clause with the following:*
[5.1]

In terms of the clauses listed hereunder the **Employer** has retained its authority and has not given a mandate to the **Principal Agent**. The **Employer** shall sign all documents in relation to the following clauses:

20.1, 20.7, 26.2.1, 26.3.1, 29.1, 29.2, 29.4.1, 29.4.3, 29.7, 29.8, 32.1, 32.6.2, 32.15, 34.3

Copies of the signed documents shall be provided to the **Principal Agent**.

6.4 *Replace the clause with the following:*
[8.4]

The **Contractor** shall bear the full risk of damage to and/or destruction of the **works** by whatever cause during construction of the **works** and hereby indemnifies and holds harmless the **Employer** against any such damage. The **Contractor** shall take such precautions and security measures and other steps for the protection and security of the **works** as the **Contractor** may deem necessary.

6.6 *Add the following clause:*
[9.3]

The **Employer's** rights to claim damages for the **Contractor's** omissions and actions will not be affected.

6.7 *Replace the clause with the following:*
[10.1]

The **Contractor** shall effect contract works insurances and, where available, supplementary insurance in respect of civil commotion, riot and strike shall be effected for the **works** for the Contractor's all risk and, in addition, covering the **Contractor's** subcontractors. Such insured amounts shall include the full value of materials and goods supplied by the **Employer** to the Contractor. Supplementary insurance shall not be effected where the **Employer** makes such an election as stated in [11.1.2 – 3]

6.8 *Add the following clause:*
[11.2]

The **Contractor** shall effect public liability insurance for not less than the amount and the deductible as stated in [10.1.3]. In addition the **Contractor** shall affect any relevant workmen's compensation or similar insurances as are required by **law**. The **Contractor** shall ensure that his sub-contractors effect their own similar insurances.

6.9 *Add the following clause:*
[11.3]

Should the **Employer** decide that the execution of the works could cause the weakening or interference with the support of the land adjacent to the **site**, the **Employer** shall state in [11.1.1] That the **Contractor** shall effect support insurance

6.12 *Replace the clause with the following:*
[12.3]

Where the **Contractor** fails to effect any of the required insurances or to keep them in force, the **Employer** may cancel this agreement in terms of clause [36.0]

6.13 *Replace the clause with the following:*
[12.4]

Before effecting support insurance in terms of [11.2] the **Contractor** shall engage an engineer or technologist to design and inspect the provision of the necessary support.

6.14 *Replace the clause with the following:*
[14.1]

Security:

The securities to be provided by the **Contractor** are:

(1) Variable construction guarantee
(2) Fixed construction guarantee
(3) Advance payment guarantee

6.14 *Replace the clause with the following:*
[15.2.1]

Give the **Contractor** possession of site within ten (10) **working days** of the commencement of the **construction period** provided that the **Contractor** has complied with the terms of [15.1.1] and [15.1.2]

6.15 *Replace the clause with the following:*
[25.3]

Should the **Principal Agent** not issue a **works completion** list, in terms of [25.1] or [25.2.2], within seven (7) **calendar days** from the end of the inspection period, the **Contractor** shall notify the **Employer** and **Principal Agent**. Should the **Principal Agent** not issue such **works completion** list within seven (7) **calendar days** of such notice, the **Employer** may within seven (7) **calendar days** issue to the **Contractor** a **works completion** list. Should the **Employer**:

6.16 *Replace the clause with the following:*
[25.3.1]

Not issue such **works completion** list within seven (7) **calendar days**, then the **certificate of works completion** shall be deemed to have been issued on the date of expiry of the initial notice period and **works completion** shall be deemed to have been achieved on such date.

6.17 *Replace the clause with the following:*
[25.3.2]

Issue a **works completion** list and the work on the **works completion** list have not been completed or where further **defects** have become apparent, the **Employer** shall forthwith identify such items on the updated **works completion** list and notify the **Contractor**. The **Contractor** shall repeat the procedure in terms of [25.2.2] until such items have been completed to the satisfaction of the **Employer**.

6.18 *Replace the clause with the following:*
[26.1]

The defects liability period for the works shall commence on the date of works completion and end after three hundred and sixty-five (365) **calendar days** for items stated in the **bills of quantities**.

6.19 *Replace the clause with the following:*
[26.4]

Should the **Principal Agent** not issue a **defects** list in terms of [26.2.2 or 26.3.2], within seven (7) **calendar days** from the end of the **defects** liability period, the **Contractor** shall notify the **Employer** and **Principal Agent**. Should the **Principal Agent** not issue such **defects** list within seven (7) **calendar days** of receipt of such notice, the **Employer** may within seven (7) **calendar days** issue to the **Contractor** a **defects** list. Should the **Employer**:

6.20 *Replace the clause with the following:*
[26.4.1]

Not issue such **defects** list within seven (7) **calendar days**, then the **certificate of final completion** shall be deemed to have been issued on the date of expiry of the initial notice period and **final completion** shall be deemed to have been achieved on such date.

6.21 *Replace the clause with the following:*
[26.4.2]

Issue a **defects** list and the work on the **defects** list has not been completed or where further **defects** have become apparent, the **Employer** shall forthwith identify such items on the updated **defects** list and notify the **Contractor**. The **Contractor** shall repeat the procedure in terms of [26.3.2] until such items have been completed to the satisfaction of the **Employer**

6.22 *Replace the clause with the following:*
[26.6]

A **certificate of final completion** issued in terms of [26.0] shall be *prima facie* evidence as to the sufficiency of the **works** and that the Contractor's obligations in terms of [2.0] and [15.0] have been fulfilled other than for **latent defects**.

6.23 *Replace the clause with the following:*
[27.1]

The **latent defects** liability period shall commence at the start of the **construction period** and end ten (10) years from the date of **final completion** where **final completion** in terms of [26.0] is achieved.

6.24 *Replace the clause with the following:*
[27.2]

Where cancellation of this **agreement** occurs before the achievement of **final completion** the **latent defects** liability period shall end ten (10) years from the date of cancellation.

6.27 *Replace the clause with the following:*
[31.4.2]

A reasonable estimate of the value of **materials and goods** in terms of [31.6] unless the **Employer** elects not to pay for such.

6.29 *Replace the clause with the following:*
[31.9]

The **Employer** shall pay the **Contractor** the amount certified within thirty (30) **calendar days** of the date for issue of the **payment certificate**. Payment shall be subject to the **Contractor** giving the **Employer** a **tax** invoice for the amount due.

6.30 *Replace the last sentence with the following:*
[31.11.2]

The principle agent shall calculate such default interest at the rate as determined by the Minister of Finance, from time to time, in terms of section 80(1)(b) of the Public Finance Management Act, 1999 (Act No. 1 of 1999).

6.31 *Replace the clause with the following:*
[31.12]

Where a **payment certificate** reflects an amount in favour of the **Employer**, the **Contractor** shall pay the amount certified within twenty-one (21) **calendar days** of the date of issue of the **payment certificate**. Where such an amount has not been paid, the **Contractor** shall be liable for default interest and the **Principal Agent** shall include such an amount in the **recovery statement** in terms of [33.0]. Payment shall be subject to the **Employer** giving the **Contractor** a **tax** invoice for the amount due. The **Principal Agent** shall calculate such interest at the rate as determined by the Minister of Finance, from time to time, in terms of section 80(1)(b) of the Public Finance Management Act, 1999 (Act No. 1 of 1999).

6.32 *Replace the clause with the following:*
[34.1]

The **Contractor** shall cooperate with and assist the **Principal Agent** in the preparation of the **final account** by timeously providing all relevant documents on request. The **Principal Agent** shall issue the final account to the **Contractor** within one hundred and twenty (120) **working days**.

6.33 *Add the following clause:*
[34.2]

The **Principal Agent** shall allow the **Employer** twenty (20) **working days**, within the period provided in [34.1] to accept the **final account** before presentation to the **Contractor** in terms of [34.3]

6.34 *Add the following:*
[34.5]

The final payment certificate shall be issued by the **Employer**.

6.35 *Replace the clause with the following:*
[34.9]

The **Employer** shall concurrently with the issue of the final **payment certificate** issue a statement to the **Contractor** showing the total amount of **tax** certified.

6.36 *[34.10]* The **Employer** shall pay to the **Contractor** the amount certified for payment in the final **payment certificate** within thirty (30) **calendar days** of the date of issue of the final **payment certificate** subject to the **Contractor** giving the **Employer** a **tax** invoice for the amount due.

6.37 *Replace the last sentence with:*
[34.12]

Such interest shall be calculated at the rate as determined by the Minister of Finance, from time to time, in terms of section 80(1)(b) of the Public Finance Management Act, 1999 (Act No. 1 of 1999).

6.38 *Replace the clause with the following:*
[36.1]

The **Employer** may, without prejudice of any other rights available to him, cancel this **agreement** where the **Contractor:**

6.39 *Replace the clause with the following:*
[36.2]

Where the **Contractor** is in default, the **Employer** may notify the **Contractor**, either directly or through the **Principal Agent**, of his default and of the **Employer's** intention to cancel this **agreement** in terms of [36.1], should the default not be remedied.

6.40 *Replace the clause with the following:*
[37.2]

Where the **Employer** considers cancelling this **agreement** in terms of [37.1] the **Employer** shall notify the **Contractor** of the **Employer's** intention to cancel this **agreement**.

6.41 *Add the following clause:*
[39.2]

The **Employer** shall be entitled at any time to unilaterally terminate or cancel this **agreement** or any part thereof. Save for the following the **Contractor** shall not be entitled to claim any other amounts whatsoever in respect of such termination or cancellation of this **agreement**. The **Employer** shall be obliged to pay the **Contractor** as damages and/or loss of profit the lesser of:

6.42 *Add the following clause:*
[39.2.1]

An amount not exceeding ten per cent (10%) of the **contract sum.**

6.43 *Add the following clause:*
[39.2.2]

Ten per cent (10%) of the value of incomplete work.

6.43 *Add the following clause:*
[39.2.3]

The **Contractor's** actual damage or loss as determined by the **Employer** after receipt of evidence substantiating any such damage or loss.

6.44 *Replace the clause with the following:*
[40.2.2]

Litigation where the **Employer** so elects. Institution of the action shall be commenced and process served with one (1) year from the date of existence of the dispute, failing which the dispute shall lapse.

7.0 CHANGES MADE TO THE STANDARD JBCC DOCUMENT

Changes made to the standard JBCC document are listed in section 6 above.

8.0 DECLARATION BY THE PRINCIPAL AGENT

I, the Principal Agent named in 1.2 above, declare that the information provided above is complete and accurate at the time of calling for tenders. Where necessary, should any of the above information need to be varied, tenderers will be forthwith informed thereof in writing,

……
Principal Agent

……
Date

Section C1.2.2: Contract Data: Contractor to Employer (CE)

Contractor Addendum Code 2101-CE

Introduction

This addendum contains all variables referred to in the Principal Building Agreement that are the responsibility of the Contractor to provide the appropriate information that is necessary for the Contractor to complete his tender. The Addendum must be completed in full and included in the tender documents. The Addendums "Contract Data – EC", "Contract Data – CE", "Contract Data – ES" and "Contract Data – SE" form part of the contract between the parties.

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Provision of Contract Data

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Reference Clauses

Where relevant the Principal Building Agreement clause applicable to the required information is printed in italics under the Contract Data clause number i.e. *[27.4.2]*

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CONTRACT DATA – CONTRACTOR

1.0 CONTRACTING PARTY

1.1 *[1.2]* **Contractor:** _____

Postal Address: _____ **Code:** _____

Physical Address: _____ **Code:** _____

E-mail: _____

Tel no.: _____ **Fax no.:** _____

VAT no.: _____

2.0 SECURITIES

2.1 The security provisions selected are:

2.1.1 *[14.3]*	Variable Construction Guarantee	(Yes / No)	
2.1.2 *[14.4]*	Fixed Construction Guarantee and Payment Reduction	(Yes / No)	
2.1.3 *[14.5]*	Advanced Payment is required. Where "Yes"	Amount	**N/A**
2.1.4 *[14.5]*	An Advance Payment Guarantee to be provided	(Yes / No)	**No**

3.0 PAYMENT AND ADJUSTMENT OF PRELIMINARIES

3.1 **Payment of preliminaries**

The payment of preliminaries shall be according to the option selected by the **contractor**. The amount included in each monthly **payment certificate** in respect of preliminaries as stated in the **contract data** shall be:

3.1.1 **Option A**

Assessed by the **principal agent** as an amount prorated to the value of the work duly executed in the same ratio as the preliminaries bears to the **contract sum** excluding:

- The amount for preliminaries
- Any contingency sum
- Any amount in respect of **CPAP**

All inclusive of **tax.**

3.1.2 **Option B**

Calculated from the priced items in the **bills of quantities** / **lump sum document**. The **contractor** and the **principal agent** shall agree on a division of the priced preliminaries items into:

- An initial or establishment charge
- A monthly charge
- A final or disestablishment charge

All inclusive of **tax.**

In arriving at such a division cognizance shall be taken of such factors as:

- Premiums for annually renewable insurance policies.
- Plant, scaffolding and the like remaining the property of the **contractor** or the hiring company and the capital costs thereof not treated as part of the initial charge.

Where the initial **construction period** is extended the monthly charge shall be recalculated on the same basis as was originally applied but taking into account the revised **construction period** and the amounts already paid to the **contractor.**

Should the **contractor** and the **principal agent** be unable to agree such division then the **principal agent** shall make a division of the amount of preliminaries to be incorporated in the valuations of each monthly **payment certificate.**

3.2 **Adjustment of preliminaries**

The amount of items of preliminaries shall be adjusted to take account of the theoretical financial effect which changes in time and/or value have on preliminaries. Such ad adjustment shall be based on the particulars provided by the **contractor** for this purpose in terms of Option A or B and shall preclude any further adjustment of preliminaries.

Adjustment of preliminaries in terms of Options A or B shall apply notwithstanding the actual employment of resources by the **contractor** in the execution of the **works**. The adjustment of preliminaries shall be based on the options as selected in the **contractor's tender.**

For the adjustment of the preliminaries both the **contract sum** and the **contract value** shall exclude:

- The amount of preliminaries
- Any contingency sum
- Any amount in respect of **CPAP**

All inclusive of **tax.**

3.2.1 **Option A**

The amount of preliminaries shall be adjusted in the following categories:

- An amount which shall not be varied.
- An amount which shall be varied in proportion to the **contract value** as compared with the **contract sum.**
- An amount which shall be varied in proportion to the **construction period** as compared to the initial **construction period** excluding revisions to the **construction period** for which the **contractor** is not entitled to adjustment of the **contract value** in terms of the **agreement.**

The **contractor** shall, within fifteen (15) working days of taking possession of the **site**, give the **principal agent** a breakdown, subdivided into the above categories, of the amount for preliminaries in tabulated form, all to the satisfaction of the **principal agent.**

Should the **contractor** fail to provide such information within the period stipulated then the amount for preliminaries shall be deemed to be subdivided into the following proportions:

- 10% (ten percent) which amount shall not be varied.
- 15% (fifteen percent) which amount shall be varied in proportion to the **contract value** as compared with the **contract sum.**
- 75% (seventy-five percent) which amount shall be varied in proportion to the **construction period** as compared with the initial **construction period.**

For a lump sum document, should the contractor fail to identify the amount for preliminaries, then such an amount shall be deemed to be 7,5% (seven and a half percent) of the contract sum excluding:

- Any contingency sum
- Any amount in respect of **CPAP**

All inclusive of **tax.**

Where sectional completion is required in terms of the agreement, the contractor shall provide the **principal agent** with the division of the above categorised amounts into sections. Should the **contractor** fail to provide such information within the period stipulated the categorised amounts shall be prorated to the value of each section.

3.2.2 **Option B**

The **contractor** shall, within fifteen (15) **working days** of taking possession of the site, provide the **principal agent** with a detailed breakdown of the amount for preliminaries. This breakdown shall set out, among others, full particulars of administrative, supervisory and other personnel, plant, transport and other resources and charges included in the amount for preliminaries. The **contractor** shall show the periods to which the individual items related with the charge rate for such items by means of a **programme** all to the satisfaction of the **principal agent.**

Where sectional completion is required in terms of the **agreement,** the **contractor** shall provide the **principal agent** with details of the resources required for each section and those that are common to sections. Should the **contractor** fail to provide such information within the period stipulated, Option A shall apply.

3.2.3 **Payment certificate cash flow**

The **contractor** shall provide all reasonable assistance to the **principal agent** in the preparation of cash flow projections of claims for **payment certificates** where required by the **employer**. The projections shall be based on the **programme** and shall be updated as and when the **programme** requires updating. The cooperation of the **contractor** in terms of this item shall not prejudice his right to receive payment in terms of the **agreement.**

3.2.4	The **contract value** shall be adjusted according **CPAP** [3.1]	(Yes / No)	**No**
3.2.5	Payment of preliminaries [3.1.1-2]	(A or B)	
3.2.6	Adjustment of preliminaries [3.2.1-2]	(A or B)	

4.0 EMPLOYER CHANGES TO JBCC STANDARD DOCUMENTS

4.1	Changes (if any) in terms of the Employer's Contract Data are accepted [3.11]. Where "no" an addendum referenced to this clause is to be attached.	(Yes / No)	**Yes. Refer to EC 6**

5.0 THE TENDER

5.1 This tender is to be submitted to the employers at the street address provided in the invitation to tender before the tender closing date and time stated herein.

5.2 By the submission of this tender to the **employer** the tenderer offers and agrees to contract for, execute and complete the **works** for the tender sum as stated below.

5.3 Tenders will be opened in public directly after the stated closing time. Only the total tender sum as stated in each tender will be announced.

5.4 The lowest or any tender will not necessarily be accepted.

5.5 This tender shall remain in full legal force for **one hundred and twenty (120) calendar days**. The tenderer accepts liability for damages as may be suffered by the **employer** should the tender validity period not be honoured.

5.6 This tender takes into account all listed items [4.0] for the purpose of preparing and submitting this tender.

5.7 The successful tenderer will be appointed in terms of the JBCC Principal Building Agreement.

5.8 **TENDER SUM COMPILATION**	**Amount**
5.8.1 Tenderer's work including **prime cost amounts**	R
5.8.2 **Employer allowances** stated by the **principal agent**	R
5.8.3 **SUB TOTAL**	R
5.8.4 *Add* **tax** on 5.8.3	R
5.8.5 **TOTAL TENDER SUM inclusive of tax**	R
5.8.6 Tender Sum in words	

Thus done and signed at ..... on .....

.....	.....
Name of Signatory	Capacity of Authorised Signatory
.....	.....
As witness	for and on behalf of the Tenderer who warrants authorisation hereto

PART C: THE CONTRACT
Part C1: Agreement and Contract Data

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

C1.3 Form of Construction Guarantee (Pro Forma)

C1.3.1 FIXED CONSTRUCTION GUARANTEE - JBCC 2000 PRINCIPAL BUILDING AGREEMENT (Edition 5.0 of July 2007)

To:
South African National Biodiversity Institute
Private Bag X101
Silveron
0184

Sir,

FIXED CONSTRUCTION GUARANTEE FOR THE EXECUTION OF A CONTRACT IN TERMS OF JBCC 2000 (5.0 EDITION JULY 2007)

1. With reference to the contract between ……(hereinafter referred to as the "**Contractor**") and the **South African National Biodiversity Institute** (hereinafter referred to as the "**Employer**"), **Contract/Tender No: SANBI G464/2023** for **REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE** (hereinafter referred to as the "contract") in the amount of

   R ……..(insert amount), ….....

   .....(insert amount in words), (hereinafter referred to as the contract sum),

   I / We, ...

   in my/our Capacity as ..... and hereby

   representing .....

   (hereinafter referred to as the "**Guarantor**") advise that the **Guarantor** holds at the **Employer's** disposal the sum of R....., (insert amount in figures)

   .....(insert amount in words) being 5% of the contract sum (excluding VAT), for the due fulfilment of the contract.

2. The **Guarantor** hereby renounces the benefits of the exceptions *non numeratae punia; non causa debiti; excussionis et divisionis;* and *de duobus vel pluribus reis debendi* which could be pleaded against the enforcement of this guarantee, with the meaning and effect whereof I/we declare myself/ourselves to be conversant, and undertake to the **Employer** the amount guaranteed, on receipt of a written demand from the **Employer** to do so, stating that the **Employer** has a right of recovery against the **Contractor** in terms of 33.0 of the contract.

3. Subject to the above, but without in any way detracting from the **Employer's** rights to adopt any of the procedures provided for in the contract, the said demand can be made by the **Employer**, at any stage prior to the expiry of this guarantee.

4. The amount id by the **Guarantor** in terms of this guarantee may be retained by the **Employer** on condition that upon the issue of the last final **payment certificate**, the **Employer** shall account to the **Guarantor** showing how this amount has been expended and refund any balance due to the **Guarantor**.

5. The **Employer** shall have the absolute right to arrange his affairs with the **Contractor** in any manner which the **Employer** deems fit and the **Guarantor** shall not have the right to claim his release on account of any conduct alleged to be prejudicial to the **Guarantor**. Without derogating from the aforegoing, any compromise, extension of the **construction period**, indulgence, release or variation of the **Contractor's** obligation shall not affect the validity of this guarantee.

6. The **Guarantor** reserves the right to withdraw from this guarantee at any time by depositing the guaranteed amount with the **Employer**, whereupon the Guarantor's liability seizes.

7. This guarantee is neither negotiable nor transferable, and

   (a) must be surrendered to the **Guarantor** at the time when the **Employer** accounts to the **Guarantor** in terms of clause 4 above, or
   (b) shall lapse on the date of the last **certificate of practical completion**.

8. This guarantee shall not be interpreted as extending the **Guarantor's** liability to anything more than payment of the amount guaranteed.

Signed at ..... on this ..... day of ..... 20.....

AS WITNESS

1. .....

2. .....

.....
By and on behalf of

.....

.....

(insert the name and physical address of the Guarantor)

Name: .....

Capacity: .....
(Duly authorised thereto by resolution attached marked Annexure A)

Date: .....

A. No alterations and/or additions of the wording of this form will be accepted.
B. The physical address of the Guarantor must be clearly indicated and will be regarded as the Guarantor's *domicilium citandi et executandi*, for all purposes arising from this guarantee.
C. This GUARANTEE must be returned to: .....
.....

C1.3.2: VARIABLE CONSTRUCTION GUARANTEE - JBCC 2000 PRINCIPAL BUILDING AGREEMENT (Edition 5.0 of July 2007)

To:
South African National Biodiversity Institute
Private Bag X101
Silverton
0184

Sir,

VARIABLE CONSTRUCTION GUARANTEE FOR THE EXECUTION OF A CONTRACT IN TERMS OF JBCC 2000 (5.0 EDITION JULY 2007)

5. With reference to the contract between ……(hereinafter referred to as the "**Contractor**") and the **South African National Biodiversity Institute** (hereinafter referred to as the "**Employer**"), **Contract/Tender No: SANBI G464/2023** for **REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**

(hereinafter referred to as the "contract") in the amount of

R ……..(insert amount), ….....

.....(insert amount in words),
(hereinafter referred to as the contract sum),
I / We, ...

in my/our Capacity as ..... and hereby

representing .....

(hereinafter referred to as the "**Guarantor**") advise that the **Guarantor** holds at the **Employer's** disposal

the sum of R....., (insert amount in figures)

.....(insert amount in words)
being 10% of the contract sum (excluding VAT), for the due fulfilment of the contract.

1. I / We advise that the **Guarantor's** liability in terms of this guarantee shall be as follows:

   (a) From and including the date on which this guarantee is issued and up to and including the date of payment of the amount in the last final **payment certificate**, the **Guarantor** will be liable in terms of this guarantee to the maximum amount of 10% of the **contract sum** (excluding VAT);

   (b) The **Guarantor's** liability shall reduce to 3 % of the **contract value** (excluding VAT) as determined at the date of the last **certificate of practical completion**, subject to such amount not exceeding 10% of the **contract sum** (excluding VAT).

   (c) The **Guarantor's** liability shall reduce to 1 % of the **contract value** (excluding VAT) as determined at the date of the last **certificate of final completion**, subject to such amount not exceeding 10 % of the **contract sum** (excluding VAT).

   (d) This guarantee shall expire on the date of the last **final payment certificate**.

   (e) The **practical completion certificate** and the **final completion certificate** referred to in this guarantee shall mean the certificates issued in terms of the contract.

2. The **Guarantor** hereby renounces the benefits of the exceptions *non numeratae punia; non causa debiti; excussionis et divisionis;* and *de duobus vel pluribus reis debendi* which could be pleaded against the enforcement of this guarantee, with the meaning and effect whereof I/we declare myself/ourselves to be conversant, and undertake to y the **Employer** the amount guaranteed on receipt of a written demand from the **Employer** to do so, stating that the **Employer** has a right of recovery against the **Contractor** in terms of 33.0 of the contract.

4. Subject to the above, but without in any way detracting from the **Employer's** rights to adopt any of the procedures provided for in the contract, the said demand can be made by the **Employer** at any stage prior to the expiry of this guarantee.

5. The amount id by the **Guarantor** in terms of this guarantee may be retained by the **Employer** on condition that upon the issue of the last **final payment certificate**, the **Employer** shall account to the **Guarantor** showing how this amount has been expended and refund any balance due to the **Guarantor**.

6. The **Employer** shall have the absolute right to arrange his affairs with the **Contractor** in any manner which the **Employer** deems fit and the **Guarantor** shall not have the right to claim his release on account of any conduct alleged to be prejudicial to the **Guarantor**. Without derogating from the aforegoing, any compromise, extension of the construction period, indulgence, release or variation of the **Contractor's** obligation shall not affect the validity of this guarantee.

7. The **Guarantor** reserves the right to withdraw from this guarantee at any time by depositing the amount guaranteed with the **Employer**, whereupon the **Guarantor's** liability ceases.

8. This guarantee is neither negotiable nor transferable, and

   (a) must be surrendered to the **Guarantor** at the time when the **Employer** accounts to the **Guarantor** in terms of clause 5 above, or
   (b) shall lapse in accordance with clause 2(d) above.

9. This guarantee shall not be interpreted as extending the **Guarantor's** liability to anything more than the payment of the amount guaranteed.

Signed at ..... on this ..... day of ..... 20.....

AS WITNESS

1. .....

2. .....

.....
By and on behalf of

.....

.....

(insert the name and physical address of the Guarantor)

Name: .....

Capacity: .....
(Duly authorised thereto by resolution attached marked Annexure A)

Date: .....

A. No alterations and/or additions of the wording of this form will be accepted.

B. The physical address of the Guarantor must be clearly indicated and will be regarded as the Guarantor's *domicilium citandi et executandi*, for all purposes arising from this guarantee.

C. This GUARANTEE must be returned to: .....

.....

PART C: THE CONTRACT

Part C1: Agreement and Contract Data

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

C1.4 Occupational Health and Safety Agreement 37(2)

AGREEMENT MADE AND ENTERED INTO BETWEEN THE

SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE (SANBI)

(Hereinafter called the **"EMPLOYER"**)

.....

(Contractor / Mandatary / 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 there under.

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 Sub-contractors employed by me will enter into an Occupational Health and Safety Agreement separately, and that such Sub-contractors 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 at ..... this ..... day of..... 20.....

....
WITNESS MANDATARY

Signed at ..... this ..... day of..... 20.....

....
WITNESS FOR AND ON BEHALF OF THE EMPLOYER

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 C: THE CONTRACT

Part C2: Pricing Data and Bill of Quantities

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

PART C: THE CONTRACT

Part C2: Pricing Instruction and Bill of Quantities

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

C2.1 Pricing Instructions

1. GENERAL INFORMATION

a. Bills of Quantities
The **bills of quantities** forms part of and must be read and priced in conjunction with all the other documents forming part of the **contract documents**, the Standard Conditions of Tender, Conditions of Contract, Specifications, Drawings and all other relevant documentation.

b. Value Added Tax
The **contract sum** must include for Value Added Tax (VAT). All rates, provisional sums, etc. in the **bills of quantities** must however be net (exclusive of VAT) with VAT calculated and added to the total value thereof in the Final Summary.

c. Fixed Price Contract
Tenderers are to take note that contract price adjustments are not applicable to this contract. Tenderers should therefore make provision in the **contract sum**, schedule of rates, etc., for possible price increases during the contract period, as no claims in this regard shall be entertained.

2. PRICING INFORMATION

1. These schedules of quantities contain sequentially numbered pages as indicated in the contents list. Tenderers are required to check that the pages in their schedules of quantities are complete. If any pages are duplicated or omitted, or if any quantity or typing is unclear or if the schedules of quantities contain any obvious errors, the tenderer shall immediately notify the engineer so that the problem may be rectified. No responsibility for any errors arising from any of the above shall be accepted by the engineer.

2. The schedules of quantities form part of and shall be read in conjunction with the specification, which contains full description of the work required to be performed and the materials and equipment to be supplied and used in the execution of the works. Tenderers shall refer to the specification for the full meaning and description of work to be executed and materials and equipment to be supplied or used in the execution of the work.

3. Tenders shall be submitted with schedules of quantities completed in full. Non or partial completion of the schedules of quantities shall render tenders liable for disqualification.

4. The total tender price as carried forward to the tender form, after correction for arithmetic extension errors, etc. shall be the contract price as awarded to the successful tenderer. Tenderers are requested to check multiplication and addition of the schedules of quantities. The rate submitted shall be regarded as the price offered per item.

5. No changes, additions or omissions to the contents of the schedules of quantities shall be permitted. If any changes, additions or omissions are made these shall not be recognised and the original wording of the schedules of quantities shall apply.
6. The priced schedules of quantities of tender shall be checked by the principal agent. The principal agent reserves the right to request adjustments to one or more individual tender prices and to

rectify contradictions and thereby alter the total tender price as submitted. The acceptance of this tender does not preclude the principal agent from querying or requesting of the contractor to adjust the rates at any stage during the contract period or any extension thereto.

7. The responsibility of the accuracy of the quantities included in the schedules, remains with the person who prepared the schedules. The tenderer is relieved from the responsibility of the measurement of quantities at tender stage and the tender amounts shall be for the quantities as listed in the schedules. It is however expected from the tenderer to include for minor construction items such as would be required for the complete execution of works in accordance with the specification.

8. The quantities in these schedules of quantities shall not be used for the ordering of materials.

9. Changes in the scope of works included in the schedule of quantities shall be permitted and shall be measured and priced at the tariffs as included in the schedules of quantities and shall form an addition to or omission from the total of the schedule of quantities. Any changes not covered by any rates in the schedules of quantities shall be agreed and priced as non-schedule items in accordance with the conditions of contract.

10. The extent and value of variations shall be in accordance with the conditions of contract. Variations to the works prior to the execution thereof shall be priced as above. Variations to work already executed shall not necessarily be priced in accordance with the schedule of quantities and shall be judged individually on merit.

11. Except where the separate rate for the material and labour components of any item is specifically called for, the unit price of such item shall be deemed to include the supply and installation of that item.

    The description of any items shall, except where otherwise specified, allow for the purchase, delivery, off-loading, storage, packing, lifting, placing, positioning and fixing in position, cutting and wastage, dies and patterns, models and equipment, temporary work, return of packing material, fixing costs, profit or other obligations of the contract arising out of the conditions of contract. All items prices shall exclude VAT but include any other tax or levy as applicable.

    All items are measured to the net final quantity as indicated on the drawings with the completed work in the position as indicated on the drawing. All prices and rates shall allow for wastage for whatever reason, irrespective of any other standard measurement which may be currently used elsewhere.

12. Should the contractor identify any additional issues or items which in his opinion are necessary for the complete and proper execution of the works, he shall identify such items in a covering letter attached to his tender and submit rates for these items. Mistakes in the physical measurement of items in the schedules of quantities shall be rectified but no claim shall be considered for the non-measurement of doubtful or minor items or claims resulting of criticism of method of measurement used or descriptions given. The priced schedule of quantities shall not be adjusted on the grounds of the items which in the opinion of the tenderer should have been brought into account unless so detailed in the accompanying letter.

13. The schedule of quantities shall be adjusted to reflect the quantities of materials used on completion of whole or part of the works as a result of remeasurement, qualification or variations. The remeasured quantities shall form the basis for the calculation of payment certificates. The schedules of quantities are not intended for the ordering of materials, etc. and the contractor is advised to extract the quantities for the ordering of materials directly from the drawings and specification. Any order placed directly from the schedules of quantities shall be solely at the contractor's risk.

14. The unit rates as entered in the schedule of quantities with the exclusion of dayworks items shall in all cases include any present and applicable sales tax or similar statutory duties.

PART C: THE CONTRACT

Part C2: Pricing Data and Bill of Quantities

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

C2.2 Bill of Quantities

SANBI G464/2023

Provisional Bills of Quantities

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SECTION 1				
	BILL NO 1				
	PRELIMINARIES				
	BUILDING AGREEMENT AND PRELIMINARIES				
	The JBCC Series 2000 Principal Building Agreement (July 2007 edition) prepared by the Joint Building Contract Committee shall be the applicable building agreement, amended as hereinafter described				
	The ASAQS Preliminaries (November 2007 edition) published by the Association of South African Quantity Surveyors for use with the said JBCC Principal Building Agreement shall be deemed to be incorporated in these bills of quantities				
	Contractors are referred to the abovementioned documents for the full intent and meaning of each clause thereof				
	These clauses are hereinafter referred to by clause number and heading only. Where standard clauses or alternatives are not entirely applicable to this contract such modifications, corrections or supplements as will apply are given under each relevant clause heading and such modifications, corrections or supplements shall take precedence notwithstanding anything contrary contained in the abovementioned documents				
	Where any item is not relevant to this specific contract such item is marked N/A, signifying "not applicable"				
	PREAMBLES FOR TRADES				
	The Model Preambles for Trades (1999 edition) as published by the Association of South African Quantity Surveyors shall be deemed to be incorporated in these bills of quantities and no claims arising from brevity of description of items fully described in the said Model Preambles will be entertained				
	Supplementary preambles are incorporated in these bills of quantities to satisfy the requirements of this project. Such supplementary preambles shall take precedence over the provisions of the said Model Preambles				
	The contractor's prices for all items throughout these bills of quantities must take account of and include for all of the obligations, requirements and specifications given in the said Model Preambles and in any supplementary preambles				
	PRICING OF PRELIMINARIES				
	Should the contractor select Option A in terms of subclause 3.2.1 in the Contract Data - Contractor to Employer (CE) for the purpose of adjustment of these preliminaries, the amount entered into the amount column in these preliminaries is to be divided into one or more of the three categories provided namely Fixed (F), Value Related (V) and Time Related (T)				
	SECTION A - PRINCIPAL BUILDING AGREEMENT				
	Definitions				
1	Clause 1.0 - Definitions and interpretationF:..... V:..... T:.....	Item			
	Objective and preparations				
2	Clause 2.0 - Offer acceptance and performance obligations F:..... V:..... T:.....	Item			
3	Clause 3.0 - Documents F:..... V:..... T:.....	Item			

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
4	Clause 4.0 - Design responsibility F:..... V:..... T:.....	Item			
5	Clause 5.0 - Employer's agentsF:..... V:..... T:.....	Item			
6	Clause 6.0 - Contractor's site representative F:..... V:..... T:.....	Item			
7	Clause 7.0 - Compliance with laws and regulations F:..... V:..... T:.....	Item			
	Execution				
8	Clause 15.0 - Preparation for and execution of the works F:..... V:..... T:.....	Item			
9	Clause 17.0 - Contract instructionsF:..... V:..... T:.....	Item			
10	Clause 18.0 - Setting out of the works The contractor shall notify the principal agent if any encroachments of adjoining foundations, buildings, structures, pavements, boundaries, etc. exist in order that the necessary arrangements may be made for the rectification of any such encroachments.F: ..... V:.....T:.....	Item			
11	Clause 20.0 - Nominated subcontractors F:..... V:..... T:.....	Item			
12	Clause 21.0 - Selected subcontractors F:..... V:..... T:.....	Item			
13	Clause 22.0 - Employer's direct contractorsF:..... V:..... T:.....	Item			
14	Clause 23.0 - Contractor's domestic subcontractorsF:..... V:..... T:.....	Item			
	Completion				
15	Clause 25.0 - Works completion F:..... V:..... T:.....	Item			
16	Clause 26.0 - Final completion F:..... V:..... T:.....	Item			
17	Clause 27.0 - Latent defects liability period F:..... V:..... T:.....	Item			
18	Clause 28.0 - Sectional completion F:..... V:..... T:.....	Item			
19	Clause 29.0 - Revision of date for practical completion The removal and replacement of materials and/or workmanship which do not conform to specification or drawing shall not constitute grounds for the extension of the construction period nor for the adjustment of the contract value (Clause 29.3)F:..... V:..... T:.....	Item			
20	Clause 30.0 - Penalty for late or non-completion F:..... V:..... T:.....	Item			

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	Payment				
21	Clause 31.0 - Interim payment ?The inclusion of materials and goods stored off site in the amount authorised for payment in terms of clause 31.4 shall be at the sole discretion of the principal agent and such inclusion shall only be considered upon the provision, by the contractor, of an approved guarantee issued by a registered commercial bank. Clause 31.6.5 is therefore not applicable??Materials and goods stored off site shall not be included in the amount authorised for payment?F:..... V:..... T:.....	Item			
22	Clause 32.0 - Adjustment to the contract value ?All fluctuations in costs, with the exception of fluctuations in the rate of Value Added Tax, shall be for the account of the contractor??Where prices are submitted by the contractor or n/s subcontractor during the progress of the works in respect of contract instructions or in regard to a claim under the terms of the contract and notwithstanding the fact that such prices may be used in an interim payment certificate, there is to be no presumption of acceptance. Should the principal agent wish to accept any such prices prior to the issue of the final payment certificate, it shall be in writing?F:..... V:..... T:.....	Item			
23	Clause 33.0 - Recovery of expense and loss F:..... V:..... T:.....	Item			
24	Clause 34.0 - Final account and final paymentF:..... V:..... T:.....	Item			
25	Clause 35.0 - Payment to other partiesF:..... V:..... T:.....	Item			
	Termination				
26	Clause 36.0 - Termination by employer - contractor's default F:..... V:..... T:.....	Item			
27	Clause 37.0 - Termination by employer - loss and damage F:..... V:..... T:.....	Item			
28	Clause 38.0 - Termination by contractor - employer's default F:..... V:..... T:.....	Item			
29	Clause 39.0 - Termination - cessation of the works F:..... V:..... T:.....	Item			
	Dispute				
30	Clause 40.0 - Settlement of disputesF:..... V:..... T:.....	Item			
	Contract agreement				
31	Clause 41.0 - Post tender provisions	Item			
	The required post tender information shall be inserted in the post tender provisions after consultation with the contractor				
32	Clause 42.0 - Contractual agreement	Item			
	The required information of the contracting parties and the amount of the accepted contract sum shall be inserted in the contractual agreement for signature of the agreement by the contracting parties				

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SECTION B - PRELIMINARIES				
	Definitions and interpretation				
33	Clause 1.0 - Definitions and interpretation F:..... V:..... T:.....	Item			
	Documents				
34	Clause 2.1 - Checking of documents F:..... V:..... T:.....	Item			
35	Clause 2.3 - Availability of construction documentation ?The budgetary allowances and ?selected? (nominated?) subcontract amounts allocated for subsequent trades included in this document will be separately procured, based on multiple procurement of ?selected? (nominated?) subcontractors during the construction period?F:..... V:..... T:.....	Item			
	Previous work and adjoining properties				
36	Clause 3.1 - Previous work - dimensional accuracy F:..... V:..... T:.....	Item			
37	Clause 3.2 - Previous work - defects F:..... V:..... T:.....	Item			
38	Clause 3.3 - Inspection of adjoining propertiesF:..... V:..... T:.....	Item			
	Samples, shop drawings and manufacturer's instructions				
39	Clause 4.1 - Samples of materials F:..... V:..... T:.....	Item			
40	Clause 4.2 - Workmanship samples F:..... V:..... T:.....	Item			
41	Clause 4.3 - Shop drawingsF:..... V:..... T:.....	Item			
42	Clause 4.4 - Compliance with manufacturer's instructionsF:..... V:..... T:.....	Item			
	Deposits and fees				
43	Clause 5.1 - Deposits and fees F:..... V:..... T:.....	Item			
	Temporary services				
44	Clause 6.1 - WaterF:..... V:..... T:.....	Item			
45	Clause 6.2 - ElectricityF:..... V:..... T:.....	Item			
46	Clause 6.3 - Telecommunication facilitiesF:..... V:..... T:.....	Item			
47	Clause 6.4 - Ablution facilitiesF:..... V:..... T:.....	Item			
	Prime cost amounts				
48	Clause 7.1 - Responsibility for prime cost amountsF:..... V:..... T:.....	Item			

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	Special attendance on n/s subcontractors				
	General				
49	Clause 9.1 - Protection of the worksF:..... V:..... T:.....	Item			
50	Clause 9.2 - Protection/isolation of existing/sectionally occupied works F:..... V:..... T:.....	Item			
51	Clause 9.3 - Security of the worksF:..... V:..... T:.....	Item			
52	Clause 9.4 - Notice before covering work F:..... V:..... T:.....	Item			
53	Clause 9.5 - Disturbance F:..... V:..... T:.....	Item			
54	Clause 9.6 - Environmental disturbance ?The employer has prepared an environmental management plan (refer to Annexure ? for a copy of the relevant plan). The contractor shall price opposite this item for compliance with all the requirements of such environmental management plan?F:..... V:..... T:.....	Item			
55	Clause 9.7 - Works cleaning and clearingF:..... V:..... T:.....	Item			
56	Clause 9.8 - VerminF:..... V:..... T:.....	Item			
57	Clause 9.9 - Overhand workF:..... V:..... T:.....	Item			
	Schedule of variables				
	Information necessary for elections and completion of those clauses contained in the schedule which are necessary for tender purposes is given hereunder. Where no information is given it shall mean that no specific requirements are expected or that the clause is not relevant to this specific contract				
	10.1 - Provisional bills of quantities [clause 2.2] The quantities are provisional ? Yes/No ?				
	10.2 - Availability of construction documentation [clause 2.3]Construction documentation is complete ? Yes/No ?				
	10.3 - Previous work - dimensional accuracy [clause 3.1]				
	10.4 - Previous work - defects [clause 3.2]				
	10.5 - Inspection of adjoining properties [clause 3.3]				
	10.6 - Water [clause 7.2]Option A (by contractor) ? yes/no ?Option B (by employer - free of charge) ? yes/no ?Option C (by employer - metered) ? yes/no ?				
	10.7 - Electricity [clause 7.3]Option A (by contractor) ? yes/no ?Option B (by employer - free of charge) ? yes/no ?Option C (by employer - metered) ? yes/no ?				
	10.8 - Telecommunications [clause 7.4] Telephone ? yes/no ? Facsimile ? yes/no ? E-mail ? yes/no ?				
	10.9 - Ablution facilities [clause 7.5]Option A (by contractor) ? yes/no ?Option B (by employer) ? yes/no ?				

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	10.10 - Protection of the works [clause 9.1]				
	10.11 - Protection/isolation of existing/sectionally occupied works [clause 9.2] Protection/isolation is required ? Yes/No ?				
	10.12 - Disturbance [clause 9.5]				
	10.13 - Environmental disturbance [clause 9.6]				
	SECTION C - SPECIFIC PRELIMINARIES				
58	Site instructions Instructions issued on site are to be recorded in triplicate in a site instruction book which is to be maintained on site by the contractor F:..... V:..... T:.....	Item			
59	Warranties for material and workmanship Where warranties for materials and/or workmanship are called for, the contractor shall obtain a written warranty, addressed to the employer, from the firm supplying the materials and/or doing the work and shall deliver same to the principal agent on the certified completion of the contract. The warranty shall state that workmanship, materials and installation are warranteed for a specified period from the date of final completion and that any defects that may arise during the specified period shall be made good at the expense of the firm supplying the materials and/or doing the work, upon written notice to do so. The warranty will not be enforced if the work is damaged by defects in the construction of the building in which case the responsibility for replacement shall rest entirely with the contractor F:.....V:.....T:.....	Item			
60	Co-operation of contractor for cost management It is specifically agreed that the contractor accepts the obligation of assisting the principal agent in implementing proper cost management. The contractor will be advised by the principal agent of all cost management procedures which will be implemented to ensure that the final building cost does not exceed the budget. The principal agent undertakes to make available to the contractor all budgetary allowances and cost assessments/reports to enable the proper procedure to be implemented and the contractor shall attend all cost plan review and cost management meetings. The contractor undertakes to extend these procedures, as necessary, to all subcontractors F:.....V:.....T:.....	Item			
	SUMMARY OF CATEGORIES				
	Category : Fixed R..... Category : Value R..... Category : Time R.....				
	Sub Total Preliminaries and General carried to summary				

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SECTION NO 2				
	BILL NO 1				
	SITE WORKS				
	EXCAVATIONS, ETC.				
	Excavate in earth and set excavated material aside for re-use				
	as filling for:				
61	Excavations in 'earth' for cable/sleeve trenches (450x700mm)	m3	100		
62	Extra over excavations in 'earth' for cable or sleeve trenches in	m3	5		
	soft rock'				
63	Imported river sand for bedding above/below electrical cables	m3	25		
64	Selected and approved material from the excavations, in	m3	75		
	backfilling in trenches, to specified density				
65	Surplus material from the excavations spread and levelled over	m3	35		
	the site as directed				
66	Cable warning tape placed 150mm above cables in excavations	m	250		
	CABLES				
	600/1000V PVC/SWA/PVC copper cable laid in trenches (trenching and				
	backfilling measured elsewhere)				
67	4mm² 3-core	m	100		
68	6mm² 3-core	m	150		
69	10mm² 3-core	m	200		
70	6mm² 4-core	m	50		
71	10mm² 4-core	m	80		
72	16mm² 3-core	m	150		
72	16mm² 4-core	m	200		
73	25mm² 4-core	m	125		
74	35mm² 4-core	m	150		
75	95mm² 4-core	m	80		
	CABLE TERMINATIONS				
	Termination for 600/1000V (PVC/PVC/SWA/PVC) copper cables				
76	4mm² 3-core	No	20		
77	6mm² 3-core	No	10		
78	10mm² 3-core	No	4		
79	6mm² 4-core	No	2		
80	10mm² 4-core	No	4		
81	16mm² 3-core	No	4		
81	16mm² 4-core	No	4		

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
82	25mm² 4-core	No	2		
83	35mm² 4-core	No	6		
84	95mm² 4-core	No	6		
	EARTHING				
	Bare copper earth conductor installed with cable (cable measured elsewhere)				
85	4mm² conductor	m	50		
86	6mm² conductor	m	80		
87	16mm² conductor	m	325		
88	25mm² conductor	m	150		
89	70mm² conductor	m	80		
	EARTH CONDUCTOR TERMINATION				
	Termination for bare and insulated copper conductors including lugs and connections				
90	4mm² conductor	No	2		
91	6mm² conductor	No	4		
92	16mm² conductor	No	2		
93	25mm² conductor	No	6		
94	70mm² conductor	No	6		
	LUMINAIRES AND EQUIPMENT				
	Supply and install luminaires complete with lamps, connections, etc. mounted in position				
95	Decorative LED Post Top light fitting with minimum 6000 lumen, 4000K, mounted on a 4m reinforced fibreglass pole buried dirctly in ground including 25 Mpa concrete support. Regent Lighting Columbia or similar approved	No	18		
96	IP66 LED Flood light mounted on a wall or existing poles with minimum 10000 lumen, 4000K. Regent Lighting Lumina Roto	No	17		
	Sub Total Site works				

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	SECTION NO 2				
	BILL NO.2				
	LOW TENSION DISTRIBUTION				
	DIESEL STANDBY GENERATORS				
	Once-off Servicing of the existing 80 kVA Standby Generator				
97	Allow for the servicing of the existing 80 kVA - Three Phase Diesel Generator (Lovol, 84,3kW, 6 cylinder, turbo charged, diesel engine)	No	1		
98	Allow for the re-commissioning of the existing 80 kVA Standby Generator	No	1		
	Supply and installation of new Standby Generator				
99	Supply and installation of 150 kVA - prime rated three phase diesel generator with complete weatherproof, silent canopy, changeover switch, controller.	No	1		
	Concrete Plinth suitable for above generator	No	1		
	Diesel fuel	Ltr	400		
	UNITERUPTABLE POWER SUPPLY				
	Supply and installation of new UPS				
100	Supply and installation of 5 kVA - single phase, double conversion, online UPS with 15 minute LiFePO4 battery back up including bypas switch complete as per specification	No	1		
	DISTRIBUTION KIOSKS				
	Replacement of low voltage distribution kiosks, corrosion resistant 3CR12 ,complete with sheet metal tray, frames, sub-frames, busbars, energy meters, circuit breakers, legend cards, earth leakage units, timer switches, day/night photocells etc. as per specifications				
101	Distribution Kiosk S2 MF	No	1		
101	Distribution Kiosk S1 F1	No	1		
102	Distribution Kiosk S1 F2	No	1		
102	Distribution Kiosk S1 F3	No	1		
103	Distribution Kiosk S1 F4	No	1		
103	Distribution Kiosk S2 F7	No	1		
104	Distribution Kiosk S2 F8	No	1		
105	Distribution Kiosk S3 F10	No	1		
106	Distribution Kiosk S3 F12	No	1		
107	Distribution Kiosk S3 F13	No	1		
108	Distribution Kiosk S3 F15	No	1		
109	Distribution Kiosk S4 F5	No	1		
110	Distribution Kiosk S4 F6	No	1		
111	Distribution Kiosk S4 F11	No	1		
112	Distribution Kiosk S4 F16	No	1		

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	DISTRIBUTION BOARDS				
	Replacement or repair of low voltage distribution boards, complete with sheet metal tray, frames, sub-frames, busbars, energy meters, circuit breakers, legend cards, earth leakage units, timer switches, day/night photocells etc. as per specifications				
113	Garage House/Main gate DB S2 F9 - Inspect and clean	No	1		
114	Workshop/Store DB S1 I1	No	1		
115	Potting Shed DB S1 I3	No	1		
116	Chief Horticulturist House DB S1 I9	No	1		
117	Chief Horticulturist Garage DB S1 I8	No	1		
118	Staff Kitchen DB S1 I15	No	1		
119	Male and Female Changeroom DB S1 I16	No	2		
120	Admin Office DB S1 I4	No	1		
114	Curator's residence DB S1 I10	No	1		
115	Curator's residence Garage DB S1 I12	No	1		
116	Marketing Office DB S2 I13	No	1		
117	Visitor Centre/Main Kiosk and Nursery Sales DB S2 I15	No	1		
118	Education Centre DB S3 I17	No	1		
119	Lapa DB S3 I18	No	1		
120	Restaurant DB	No	1		
121	Soil Sterilization and Seeds Store DB - new surface mounted DB	No	2		
122	Wendy House 1 DB - new surface mounted DB	No	1		
122	Wendy House 2 DB - new surface mounted DB	No	1		
	TESTING, COMMISSIONING AND CERTIFICATION				
123	Test and commission, balancing, labelling and provision of CoC	No	38		
	for each complete electrical installation				
124	Allowance for insulation tests of all LV cables and conductors	Sum	1		
	Sub Total Low Tension Distribution				

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SECTION NO 2				
	BILL NO.3				
	LIGHTING				
	WIRING CHANNELS				
	Note: The rates for wiring channels shall include for hangers, splices, jointing, drilling etc.				
	Hot dipped galvanised steel channel complete with galvanised cover fixed/suspended from steel trusses or concrete slab with and including hangers, etc. exceeding 3000 mm above floor level				
125	P8300 Channel (0,8 mm thick)	m	180		
	GALVANISED CONDUIT				
	Note: Conduit includes all bends, tee-pieces, joints, locknuts, etc.				
	Surface mounted to brickwork, concrete, steel, wood, roof members, etc. not exceeding 3000mm above floor level				
126	20mm Diameter	No	Rate Only		
	RIGID PVC CONDUIT				
	Note: Conduit includes all bends, tee-pieces, joints, locknuts, etc.				
	Chased and/or fixed in brickwork not exceeding 3000mm above floor level (making good of chase by others)				
127	20mm Diameter	m	500		
	CONDUCTORS				
	PVC insulated stranded copper conductor drawn into wire ways				
128	2,5 mm²	No	3480		
129	4 mm²	No	Rate Only		
	EARTHING				
	Bare copper earth conductor installed with cable (cable measured elsewhere)				
130	2,5 mm²	No	1740		
	LIGHT SWITCHES AND SOCKET OUTLETS				
	Light switches installed in brickwork complete with white steel cover plate, chrome screws, and flush galvanised wall box				
131	16A One-lever one-way switch	No	20		
132	16A One-lever two-way switch	No	20		
133	16A Three-lever two-way switch	No	Rate Only		
134	1000VA, 360 deg, recess/surface mounted vacancy/ Infrared occupancy sensor switch	No	10		
135	1000VA, 360 deg, recess/surface mounted vacancy microwave occupancy sensor switch	No	10		
136	600VA Day-night sensor	No	34		
137	1000VA, rotary dimmer switch 100x50	No	6		

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	Socket outlets installed in galvanised trunking				
138	5A Round three-pin unswitched socket outlet, Installed in P8300 trunking	No	232		
	LUMINAIRES AND EQUIPMENT				
	Supply and install luminaires complete with lamps, connections, etc. mounted in position				
	Type D1				
139	LED Downlight, decorative recessed light fitting with minimum 1300 lumen, 4000K, dimmable. Regent Lighting Elux 70 or similar approved	No	35		
	Type D2				
140	LED Downlight, decorative recessed light fitting with minimum 2800 lumen, 4000K, dimmable. Regent Lighting Elux 115 or similar approved	No	20		
	Type B1				
141	IP66 LED Bulkhead, decorative round wall mount light fitting with minimum 3000 lumen, 4000K. Regent Lighting Solo or similar approved	No	56		
	Type B2				
142	IP65 LED Up/Down, wall mount Light fitting with minimum 3000 lumen, 4000K. Regent Lighting Cubica or similar approved	No	15		
	Type F1				
143	LED Panel, recessed light fitting (600x600mm) with minimum 4500 lumen, 4000K, complete with flexible cable and 5A unswitched plug top. Regent Lighting Luxon Prism or similar approved	No	10		
	Type F2				
144	LED surface mount, vapour proof, IP66 light fitting with minimum 4500 lumen, 4000K. Regent Lighting Nimbus or similar approved	No	57		
	Type P1				
145	Decorative suspended IP54 LED pendant fitting with minimum 8000 lumen, 4000K suspended at 1.5m from roof trusses. Regent Lighting Malta Pendant or similar approved	No	19		
	Type P2				
146	Decorative suspended IP54 LED pendant fitting with minimum 1400 lumen, 4000K suspended at 1.5m from roof trusses or ceilings. Regent Lighting Sky Pendant or similar approved	No	20		
	Type P3				
147	Outdoor bollard IP67 LED fitting with minimum 1800 lumen, 4000K, buried directly in the ground including foot plate and 25 MPa concrete support. Regent Lighting Iris or similar approved	No	20		
	Sub Total Lighting				

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	SECTION NO 2				
	BILL NO.4				
	POWER POINTS				
	WIRING CHANNELS				
	Note: The rates for wiring channels shall include for hangers, splices, jointing, drilling etc				
	Hot dipped galvanised steel channel complete with galvanised cover suspended from steel trusses or concrete slab with and including hangers, etc. exceeding 3000 mm above floor level				
148	P9000 Channel (1 mm thick)	m	Rate Only		
	CABLE TRAYS				
	Note: Conduit includes all bends, tee-pieces, joints, locknuts, jointing, drilling etc.				
	Hot dipped galvanised steel cable tray suspended from steel trusses or concrete slab, including hangers, etc., not exceeding 3000 mm above floor level				
149	150 mm medium duty cable tray	m	Rate Only		
150	150 mm Heavy duty cable basket	m	Rate Only		
	GALVANISED CONDUIT				
	Note: Conduit includes all bends, tee-pieces, joints, locknuts etc				
	Surface mounted to brickwork, concrete, steel, wood, roof members, etc. not exceeding 3000mm above floor level				
151	25mm Diameter	m	Rate Only		
	RIGID PVC CONDUIT				
	Note: Conduit includes all bends, tee-pieces, joints, locknuts etc				
	Chased and/or fixed in brickwork/drywall or cast in concrete not exceeding 3000mm above floor level (making good of chase by others)				
152	20mm Diameter	m	1667		
	POWER SKIRTING				
	Note: The rates for power skirting shall include for splices, joining, drilling, and cut openings etc.				
	Galvanised, two tier power skirting installed on wall, including bends, joints covers etc. Socket outlets measure elsewhere.				
153	165 x 55 mm power skirting (hammertone grey)	m	50		
	Switches, etc. complete with cover plate as required, fixed to				
	power skirting				
154	16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	No	54		
155	16A Three-pin dedicated switched socket outlet (colour red), SANS 164-1	No	25		
156	Cover complete with IT point outlet	No	23		
	SWITCHED SOCKET OUTLETS, ISOLATORS ETC				

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	Socket outlets and isolators installed in brickwork complete with cover plate and flush galvanised wall box				
157	16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2 galvanised wall box	No	10		
158	16A Double Three-pin switched socket outlet in 100x100x50mm galvanised wall box, SANS 164-1	No	30		
159	32A 2-pole switched isolator	No	10		
160	63A 2-pole switched isolator	No	10		
	Socket outlets and isolators with cover plate and box surface mounted to brickwork				
161	16A Three-pin switched socket outlet with plastic cover plate installed in weatherproof PVC box, SANS 164-1	No	10		
162	32A Single phase 3-pin industrial socket outlet (colour blue)	No	1		
162	63A Three phase 5-pin industrial socket outlet (colour red)	No	4		
163	32A 2-pole weatherproof IP65 lockable rotary isolator	No	10		
164	63A 4-pole weatherproof IP65 lockable rotary isolator	No	12		
	CONDUCTORS				
	PVC insulated stranded copper conductor drawn into wire ways				
165	4mm²	m	1635		
166	6mm²	m	250		
	EARTHING				
	Bare copper earth conductor installed with cable (cable measured elsewhere)				
167	2,5 mm²	m	818		
168	4 mm²	m	250		
	CABLES				
	Cable installed in conduits				
169	4 mm² 4-core	m	Rate Only		
170	16 mm² 4-core	m	210		
	CABLE TERMINATIONS				
	Termination for cables				
171	4 mm² 4-core	No	Rate Only		
172	16 mm² 4-core	No	24		
	Sub Total Power Points				

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	SECTION NO 2				
	BILL NO 5				
	PROVISIONAL SUMS				
	SOLAR PV ALTERATIONS AND REPAIRS				
173	Allow the sum of R65 000.00 for replacement of invertors and PV modules and the rewiring of the AC distribution	Item	1	R 65 000,00	
	BUILDERS WORKS				
174	Allow the sum of R50 000.00 for builders works such as chasing of walls, plaster and paint works.	Item	1	R 50 000,00	
	DESIGN, SUPPLY AND INSTALLATION OF LIGHTNING PROTECTION SYSTEM				
175	Allow the sum of R125 000.00 for lightning protection systems to all buildings	Item	1	R 125 000,00	
	Sub Total Provisional Sums				

SANBI G464/2023					
Provisional Bills of Quantities					
ITEM NO	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	SUMMARY				
S1 B1	PRELIMINARIES				
S2 B1	SITE WORKS				
S2 B2	LOW TENSION DISTRIBUTION				
S2 B3	LIGHTING				
S2 B4	POWER POINTS				
S2 B5	PROVISIONAL SUMS				
	SUB TOTAL				
	CONTINGENCIES @ 10%				
	SUB TOTAL				
	VALUE ADDED TAX (15%)				
	CONTRACT PRICE CARRIED FORWARD TO FORM OF TENDER				

PART C: THE CONTRACT

Part C3: Scope of Work

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

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C3.1. Description of the Works

C3.1.1 Employer's Objectives

The employer's objective is to deliver improved electrical infrastructure in the Free State National Botanical Garden.

C3.1.2 Overview of the Works

The project entails the remedial electrical work to various infrastructure for the SANBI at the Free State National Botanical Garden, Free State.

C3.1.3 Extent of the Works

The Contractor will be required to construct the works in conformity with design criteria specified in the project's scope of work, part C3 of the tender document The scope of works includes but is not limited to the following pertaining to the electrical installations:

- Replace low voltage distribution kiosks and distribution boards where required.
- Repair, service and clean low voltage distribution kiosks and distribution boards where required.
- Insulation testing of all low voltage cabling and conductors.
- Replace low voltage cabling and conductors where necessary.
- Trenching in ground, backfilling, compacting, and making good for new/replaced low voltage cabling.
- Supply, install and commissioning of a new 150kVA standby diesel generator (Specifications can be found in Appendix A).
- Supply, install and commissioning of a new uninterruptable power supply (Specifications can be found in Appendix A).
- Service and commission existing 80 kVA standby diesel generator.
- Replace all internal light fittings with energy efficient LED light fittings.
- Replace all external light fittings with energy efficient LED light fittings.
- Replace antiquated or damaged light switches, occupancy sensors, timers, and day/night photo cells.
- Supply and install additional internal and external light fittings where required.
- Replace antiquated or damaged socket outlets.
- Replace antiquated or damaged isolators.
- Replace antiquated or damaged wireways such as conduit, power skirting and trunking
- Install new electrical infrastructure and equipment where required.
- Install lightning protection to all structures and issue final test certificates.
- Replace damaged Solar PV modules where required.
- Replace/upgrade Solar PV inverters and rewire the AC system for integration into the LV network.
- Issue a certificate of compliance for each installation per distribution kiosk and distribution board.

The table below presents the detailed scope of work per area/building:

ITEM NO.	DESCRIPTION	QUANTITY
	General Notes: **All distribution boards shall comply with the latest edition of SANS 1973 and SANS 61439.** All indoor replacement distribution boards to have a PSCC rating of 3kA or 6kA as indicated and be IP21 minimum rated. The structure is to be mild steel powder coated white and are to be surface or recessed mounted as required. All internal cover plates to be powder coated red The existing labelling convention is to be retained through new labels permanently fixed to the distribution board. **All installations shall comply with the latest edition of SANS 10142.** **All circuit breakers to be ABB or similar approved**	
1	**SOIL STERILIZATION AND SEEDS STORE**	
	No lighting is installed in the Shower and Storeroom	
	Install LED surface mount vapour proof light fitting and light switch	2
	Install new 6 way 3kA surface mounted DB complete with surge protection, 20A 2P main switch, 20A earth leakage unit, 1 x 10A 1p and 2 x 20A 1p	1
	Install surface mounted conduit and wiring	
2	**WENDY HOUSE 1**	
	Potential office area (4 work station)	
	Has no electricity	
	Install 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	8
	Install LED surface mount vapour proof light fitting and light switch	4
	Install new 18 way 3kA surface mounted DB complete with Surge protection,60A 2P main switch, 60A earth leakage unit, 1 x 10A 1p and 2 x 20A 1p	1
	Install surface mounted conduit and wiring	
	Install new 16mm² PVC/SWA/PVC cu cable and earth wire including trenching and backfilling. Fed from distribution kiosk S1 F1	
3	**WENDY HOUSE 2**	
	Change room for EPWP, possible office space	
	Has no electricity	
	Install 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	4
	Install LED surface mount vapour proof light fitting and light switch	4
	Install new 18 way 3kA surface mounted DB complete with Surge protection,60A 2P main switch, 60A earth leakage unit, 1 x 10A 1p and 2 x 20A 1p	1
	Install surface mounted conduit and wiring	

ITEM NO.	DESCRIPTION	QUANTITY
	Install new 16mm² PVC/SWA/PVC cu cable and earth wire including trenching and backfilling. Fed from distribution kiosk S1 F1	
4	**GUARD ROOM AND MAIN GATE**	
	Inspect and test Guardhouse Distribution board	1
	Replace all light fitting with LED Bulkhead, decorative round wall mount light fitting and light switch	5
	Install LED flood lights	4
	Replace socket outlets with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	2
	Repair vehicle barrier	
	Test installation	1
5	**WORK SHOP**	
	Distribution Board (S1 I1)	
	Replace Distribution board - 18 way 6kA Surface mounted with: Surge protection devices 60A 2p main switch 60A Earth Leakage 2 x 20A 1p 2 x 10A 1p	1
	Parking	
	Replace light fittings with LED surface mount vapour proof light fitting and light switch	4
	Working area	
	Replace and add sockets with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	2
	Replace light fittings with LED surface mount vapour proof light fitting and light switch	4
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	1
	Garage 1	
	Replace sockets with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	2
	Replace light fittings with LED surface mount vapour proof light fitting and light switch	2
	Workshop office	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	1
	Double Garage	
	Replace light fittings with LED surface mount vapour proof light fitting and light switch	2

ITEM NO.	DESCRIPTION	QUANTITY
6	**POTTING SHED**	
	Replace Distribution board (S1 I3) - 18 way 6kA Surface mounted with: Surge protection devices 40A 2p main switch 60A Earth Leakage 2 x 20A 1p 2 x 10A 1p	1
	Replace light fittings with LED surface mount vapour proof light fitting and light switches	8
7	**GLASS HOUSE**	
	Electrical installation to be disconnected and made safe. (S1 I12)	
8	**HOUSE 1 (Chief Horticulturist)**	
	Bedroom	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	4
	Passage	2
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	2
	Bedroom 1	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	1
	Bedroom 2	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	1
	Garage	
	Replace light fittings with LED surface mount vapour proof light fitting and light switches	1
	Distribution Boards	
	House DB (S1 I9) Powder coat the cover plate red Inspect, service and clean DB and add the following: 1x 20A 1p to feed garage DB Install surge protection devices	1

ITEM NO.	DESCRIPTION	QUANTITY
	Garage DB (S1 I8) Replace DB with recessed 6 way 3kA DB including: 1 x 40A 2p main switch 1 x Earth Leakage 1 x 20A 1p 1x 10A 1p	
9	**STAFF KITCHEN**	
	Kitchen DB (S1 I5) Replace DB with Surface Mounted 18 way 3kA DB including: Surge Protection Devices 1 x 60A 2p main switch 1 x Earth Leakage 1 x 45A 1p 1 x 40A 1p 4 x 20A 1p 1x 10A 1p	1
	Replace light fittings with LED surface mount vapour proof light fitting and light switches	4
	16A One-lever one-way switch	1
	Replace/Add sockets with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	6
10	**MALE CHANGE ROOM**	
	TOILETS	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	2
	SHOWER 1	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	3
	ABOVE URINAL	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	1
	SHOWER 2	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	3
	CHANGE ROOM	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	4
	16A One-lever one-way switch	2
11	**FLAMMABLE AREA/LIQUID STORE& SEED STORE**	
	Install explosion proof Zone 2 T8 light fittings	3
	Install 16A One-lever one-way switch	3

ITEM NO.	DESCRIPTION	QUANTITY
	Install new 6 way 3kA surface mounted DB complete with surge protection, 20A 2P main switch, 20A earth leakage unit, 1 x 10A 1p and 2 x 20A 1p	1
	Install surface mounted conduit and wiring	
12	**FEMALE CHANGE ROOM**	
	TOILETS	
	LED Bulkhead, decorative round wall mount light fitting	2
	CHANGE ROOM	
	LED Bulkhead, decorative round wall mount light fitting	2
	DB-S1 I6 - Replace Circuit Breakers Install surge protection devices 1 x 60A 2p main switch 1 x Earth Leakage 1 x 20A 2p 1 x 30A 1p 3 x 15A 1p 1 x 10A 1p	1
13	**MALE CHANGE ROOM**	
	TOILETS	
	LED Bulkhead, decorative round wall mount light fitting	2
	CHANGE ROOM	
	LED Bulkhead, decorative round wall mount light fitting	2
14	**ADMINISTRATION BUILDING**	
	Office 1	
	Replace light fitting with LED surface mount linear light fitting	2
	Office 2	2
	Replace light fitting with LED surface mount linear light fitting	
	Office 3	
	Replace light fitting with LED surface mount linear light fitting	2
	Office 4	
	Replace light fitting with LED surface mount linear light fitting	2
	Passage	
	LED Bulkhead, decorative round wall mount light fitting	1
	Power skirting	8
	16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	8
	Reception	
	Replace light fitting with LED surface mount linear light fitting	2
	Install new power skirting and neaten cabling	4
	Boardroom	
	Replace light fitting with LED surface mount linear light fitting	2
	Office 7	
	16A One-lever one-way switch	1

ITEM NO.	DESCRIPTION	QUANTITY
	Replace light fitting with LED surface mount linear light fitting	2
	Install new power skirting and neaten cabling	9
	16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	6
	Office 8	
	Replace light fitting with LED surface mount linear light fitting	1
	Kitchen	
	LED surface mount linear light fitting	2
	Admin DB (S1 I4)	
	Supply and install 5 kVA UPS including the following equipment and rewiring of existing UPS sockets to these circuits: 1 x DIN rail LED power indicator 1 x 20A 2 p dedicated power main switch 1 x 20A 2 p feed to UPS 4 x 15A 1 p socket outlet feeds 1 x 3-way bypass switch	
	Replace missing door ± 350mm x 500mm powder coated white	1
15	**CURATOR GARAGE**	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting and light switch	4
	16A One-lever one-way switch	1
	Garage DB (S1 I12) Replace DB with recessed 6 way 3kA DB including: 1 x 60A 2p main switch 1 x Earth Leakage 1 x 20A 1p 1x 10A 1p	1
16	**CURATOR HOUSE INTERNAL**	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting	2
	16A One-lever one-way switch	1
	House DB (S1 I10) Powder coat the cover plate red Inspect, service and clean DB and add the following: Install stainless steel screws for cover plate Install surge protection devices	1
	Replace Ceiling Fan	1
	Repair and neaten wiring to geyser	1
	Storage	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting	1
	16A One-lever one-way switch	1
	Entrance passage	1

ITEM NO.	DESCRIPTION	QUANTITY
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting	1
	16A One-lever one-way switch	1
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting	2
	Living room	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting	1
	Bedroom passage	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting	1
	Bedroom 1	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting	1
	Bedroom 2	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting	1
	Bathroom	
	Replace light fittings LED Bulkhead, decorative round wall mount light fitting	4
17	**CURATOR HOUSE EXTERNAL**	
	Replace post top light fitting with LED Post top light fitting	3
	Replace light fittings LED Bulkhead, decorative round wall mounted light fitting	3
	Replace day/night photo cell	1
18	**MARKETING OFFICE**	
	Replace light fitting with LED surface mount linear light fitting	2
	Replace/Add sockets with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	2
	Kitchen	1
	Replace light fitting with LED surface mount linear light fitting	1
	Toilet	
	Replace light fitting with LED surface mount linear light fitting	1
	DB (S2 I13) Replace 6kA Circuit Breakers: Add surge protection 1 x 60A 2p main switch 1 x Earth Leakage 4 x 20A 1p 2 x 10A 1p	1
19	**STUDENT OFFICE**	
	Office 1	
	Replace light fitting with LED surface mount linear light fitting	4

ITEM NO.	DESCRIPTION	QUANTITY
	16A One-lever one-way switch	2
	Replace/Add sockets with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	2
20	**VISITORS MAIN KIOSK**	
	Replace existing pendants with Decorative suspended LED pendant fitting with minimum 1600 lumen, 3000K	9
	Replace/neaten wiring to lighting and socket outlets	
	Visitor Centre's DB (S2 I15) Powder coat the cover plate red Inspect, service and clean DB and add the following: Install stainless steel screws for cover plate Install surge protection devices	1
	Replace/Add sockets with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	4
21	**NURSERY**	
	Replace existing pendants with Decorative suspended LED pendant fitting with minimum 1600 lumen, 3000K	8
	Nursery office1	
	Replace light fitting with LED surface mount linear light fitting	1
	Replace/Add sockets with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	2
	Nursery office2	
	Replace light fitting with LED surface mount linear light fitting	1
	Replace/Add sockets with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	2
22	**PUBLIC TOILET**	
	Replace existing pendants with Decorative suspended LED pendant fitting with minimum 1600 lumen, 3000K	4
	Install Occupancy sensors	2
23	**EDUCATIONAL CENTRE**	
	Replace existing pendants with Decorative suspended LED pendant fitting with minimum 1600 lumen, 3000K	12
	Confirm power to air conditioning is in order.	4
	Office 1	
	Replace existing down lights with LED Downlight, decorative recessed light fitting	4
	Kitchen	
	Replace existing down lights with LED Downlight, decorative recessed light fitting	3
	Office 2	
	Replace existing down lights with LED Downlight, decorative recessed light fitting	4

ITEM NO.	DESCRIPTION	QUANTITY
	Education Centre's DB (S3 I17) Powder coat the cover plate red Inspect, service and clean DB and add the following: Install surge protection devices	1
24	**Lapa and Event Area**	
	Replace/Add sockets in power skirting with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	10
	Replace/Add sockets on wall with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	4
	Replace stove isolator	1
	Replace existing pendants with Decorative suspended LED pendant fitting with minimum 1600 lumen, 3000K	4
	Install Occupancy sensors in store room	1
	Replace kitchen and storeroom lighting and light switch with LED surface mount linear light fitting	3
	Lapa DB (S3 I18) Powder coat the cover plate red Inspect, service and clean DB and add the following: Install surge protection devices 2 x blanks	1
25	**RESTAURANT**	
	Replace/Add sockets in power skirting with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	10
	Replace/Add sockets on wall with 16A Combined Three-pin switched socket outlet, SANS 164-1 & 164-2	15
	Replace stove/equipment isolators	8
	Replace damaged power skirting	6
	Clean power skirting and electrical equipment	
	Replace existing pendants with Decorative suspended LED pendant fitting with minimum 1600 lumen, 3000K	4
	Install Occupancy sensors in store rooms	4
	Replace kitchen and storeroom lighting and light switch with LED surface mount linear light fitting	12
	Replace external lighting with LED Bulkhead, decorative round wall mount light fitting	8

ITEM NO.	DESCRIPTION	QUANTITY
	Restaurant DB (S3 I18) Inspect, service and clean DB and add/replace the following: Cover plate to be powder coated red Allow for cover plate screws and refitment of door Allow for new labelling Install surge protection devices Replace Circuit Breakers: 1 x 80A 3p main switch 2 x 60A earth leakages 3 x 30A 3p 1 x 40A 1p 1 x 30A 1p 1 x 25A 1p 10 x 20A 1p 6 x 10A 1p 2 x blanks	1
26	**SOLAR PV PLANT (near main office)**	
	Install LED Flood lights for area illumination including cabling	4
	Replace damaged PV module (	1
27	**SOLAR PV PLANT (near reservoir)**	
	Install LED Flood lights for area illumination including cabling	4
	Replace invertor with grid-tie invertor and rewire the AC installation	
28	**EXTERNAL INFRASTRUCTURE**	
	External Lighting	
	Replace all day/night photo cells	18
	Replace all bollards and inspect wiring	20
	Install LED flood lights	10
	Install LED Post Top Light fittings	6
	Install LED vapour proof Light fittings to car ports	12
	External Socket Outlets	
	Replace all socket outlets	10
	Distribution Kiosks	
	General Notes: **All distribution boards shall comply with SANS 1973 and SANS 61439.** All outdoor replacement distribution kiosk to have a PSCC rating of at least 10kA and be IP54 minimum rated. The structure is to be 3CR12 stainless steel powder coated Avocado Green and are to be plinth mounted or wall mounted as required. All internal cover plates to be powder coated red. The existing labelling convention is to be retained through new labels permanently fixed to the distribution kiosk. **All circuit breakers to be ABB or similar approved.**	

ITEM NO.	DESCRIPTION	QUANTITY
	S2 MF (Main Kiosk)	
	Complete replacement required: Plinth mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 250A 3p main switch 1 x 250A 3p feed to Standby Generator 1 x 250A 3p return feed from Standby Generator 1 x 250A 3p Standby Generator Bypass Switch 1 x 100A 3p 1 x 60A 3p 1 x 70A 3p 2 x 40A 3p 1 x 25A 3p 1x 20A 3p 1 x 60A 2p 7 x 100A 1p 1 x 80A 1p 4 x 60A 1p 1 x 50A 1p 1 x 35A 1p	
	S1 F1	
	Complete replacement required. Wall mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 125A 3p main switch 1 x 60A 3p 1 x 20 3p 2 x 60A 2p 2 x 60A 1p 2 x 50A 1p 1 x 25A 1p 2 x 20A 1p	

ITEM NO.	DESCRIPTION	QUANTITY
	S1 F2	
	Complete replacement required. Wall mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B21 112-100 with suitable CTs. 1 x 35A 2p main switch 2 x 10A 1p 1 x 32A 3p AC3 contactor incl 5A control circuit 1 x 7 day timer switch	
	S1 F3	
	Complete replacement required Wall mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 60A 3p main switch 1 x 35A 3p 1 x 32A 3p AC3 contactor incl 5A control circuit 1 x 20A 1p 2 x 10A 1p 1 x day/night photocell	
	S1 F4	
	Complete replacement required Wall mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 30A 3p main switch 1 x 3p AC3 32A contactor incl 5A control circuit 3 x 20A 1p 3 x 10A 1p 1 x 20A 3p 1 x day/night photocell	
	S2 F7	
	Inspect, service and clean. Powder coat the cover plate red	
	S2 F8	

ITEM NO.	DESCRIPTION	QUANTITY
	Complete replacement required Plinth mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 100A 3p main switch 1 x 100A 3p Standby Generator feed 1 x 100A 3p Restaurant 1 x 80A 3p Spare 1 x 60A Visitors Kiosk 1 x 60A 3p Lapa 1 x 40A 3p Toilets 3 x 60A earth leakages 1 x 32A 3p AC3 contactor incl 5A control circuit 1 x 20A 3p 3 x 10A 1p 1 x day/night photocell	
	S3 F10	
	Complete replacement required Plinth mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 100A 3p main switch 4 x 80A 3p 1 x 60A 3p 2 x 50A 3p Re-use existing electricity meters	

ITEM NO.	DESCRIPTION	QUANTITY
	S3 F12	
	Complete replacement required Plinth mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 60A 3p main switch 3 x 60A earth leakages 9 x 20A 1p 2 x 10A 1p 1 x 32A 3p AC3 contactor incl 5A control circuit 1 x day/night photocell 8 x 16A double socket outlets (note that the door should allow for extension cabling entry/exit for temporary use)	
	S3 F13	
	Complete replacement required Plinth mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 80A 3p main switch 1 x 60A 3p (feed to 63A 3phase socket) 3 x 60A earth leakages 9 x 20A 1p 2 x 10A 1p 1 x 32A 3p AC3 contactor incl 5A control circuit 1 x day/night photocell 8 x 16A double socket outlets (note that the door should allow for extension cabling entry/exit for temporary use)	
	S3 F15	
	Complete replacement required Wall mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 60A 3p main switch 3 x 60A 1p Re-use existing electricity meters	

ITEM NO.	DESCRIPTION	QUANTITY
	S4 F5	
	Complete replacement required Plinth mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 60A 3p main switch 4 x 60A earth leakages 12 x 20A 1p 2 x 10A 1p 1 x 32A 3p AC3 contactor incl 5A control circuit 1 x day/night photocell 12 x 16A double socket outlets (note that the door should allow for extension cabling entry/exit for temporary use)	
	S4 F6	
	Complete replacement required Plinth mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B21 112-100 with suitable CTs. 1 x 60A 2p main switch 2 x 60A earth leakages 4 x 20A 1p 2 x 10A 1p 1 x 32A 3p AC3 contactor incl 5A control circuit 1 x day/night photocell 4 x 16A double socket outlets (note that the door should allow for extension cabling entry/exit for temporary use) Allow space for Rainbird irrigation controller to be mounted inside the kiosk	

ITEM NO.	DESCRIPTION	QUANTITY
	S4 F11	
	Complete replacement required Plinth mounted including the following equipment: Class 1 Surge Protection Devices Energy metering device on main incomer supply - ABB B23 112-100 with suitable CTs. 1 x 80A 3p main switch 1 x 60A 3p (feed to 63A 3phase socket) 3 x 60A earth leakages 3 x 30A 2p 3 x 20A 2p 9 x 20A 1p 2 x 10A 1p 1 x 32A 3p AC3 contactor incl 5A control circuit 1 x day/night photocell 12 x 16A double socket outlets (note that the door should allow for extension cabling entry/exit for temporary use)	
	S4 F14	
	Combined with S4 F11	
	S4 F16	
	Inspect, service and clean. Allow for door hinges, latches, ad weatherproof strips to seal the door. Powder coat the cover plate red	

C3.1.4 Location of the Works

The Free State National Botanical Garden site is located in the Free State, Rayton Road, Dan Pienaar, Bloemfontein, 9310 at the following coordinates:

- 29°03'16.2"S
- 26°12'39.4"E

C3.1.5 Description of Site and Access

Free State National Botanical Garden consists of the following buildings and infrastructure:

- Main Admin Office
- Ablution Blocks
- Male Change rooms
- Female Change rooms
- Guard rooms
- Workshop
- Education Centre

- Visitors Kiosk
- Curators Residence
- Horticulturist Residence
- Potting Shed
- Lapa
- Restaurant
- Two Solar PV ground mount systems
- Various outdoor distribution kiosks
- An 80 kVA standby diesel generator.

Access to the garden is via Bloemendal Street in Dan Pienaar, Bloemfontein.

C3.1.6 Temporary Works

All design and construction of any temporary works must be approved by the Principal Agent.

PART C: THE CONTRACT

Part C3: Scope of Work

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CONTRACT NO:	**SANBI G464/2023**

C3.1.7 National Standards

All codes and standards applicable in South Africa to the scope of supply shall be strictly adhered to. Included in the codes and standards applicable to the scope of supply are the various codes and standards mentioned in this document.

In the event of conflicting codes, the more stringent shall apply. All materials and workmanship shall unless otherwise specified be in accordance with the latest SANS Standards, and in the absence thereof, the latest British Standard Code of Practice.

The Contractor may, subject to the Engineer and Employer's approval, substitute a material or product complying with another equivalent or better international standard.

The following specific codes of practice shall apply:

- SANS 10142-1: The wiring of premises Part 1: Low voltage installations
- SANS 10114-1: Interior Lighting: Artificial lighting of interiors
- SANS 10114-2: Interior Lighting: Emergency lighting
- SANS 10389-1: Artificial lighting of exterior areas for work and safety
- SANS 10389-2: Exterior security lighting
- SANS 10400: The application of the National Building Regulations
- SANS 204: Energy Efficiency in Buildings
- SANS 10313: Protection against lightning
- SANS 61024: Protection of structures against lightning
- All municipal regulations pertaining to building codes and health and safety requirements.
- South African Occupational Health and Safety Act (Act 85 of 1993).

All losses, costs or expenditures which may arise as a result of negligence to comply with any regulation applicable to this service as specified above, shall be for the account of the Contractor.

C3.1.8 Plant and Materials

C3.1.8.1 Plant and Materials Supplied by the Employer

None

C3.1.8.2 Materials, Samples and Shop Drawings

All materials are to be SANS approved as directed by the Engineer.

C3.1.9 Construction Equipment

C3.1.9.1 Requirements for Equipment

The Contractor is required to use plant and equipment that is sufficient for the contract.

C3.1.9.2 Equipment Provided by the Employer

None

C3.1.10 Existing Services

C3.1.10.1 Known Services

None

C3.1.10.2Treatment of Existing Services

Contractor to use caution.

C3.1.10.3 Use of Detection Equipment for the Location of Underground Services

There are no ground services expected to be disturbed during construction.

C3.1.10.4 Damage to Services

It is the responsibility of the Contractor to ensure that no services are damaged during the construction process. In case the known services are damaged, the main Contractor shall be responsible for the repair off the services to the original state before it was damaged, as well as all cost associated with the damaged service.

C3.1.11 Site Establishment

C3.1.11.1 Services and Facilities Provided by the Employer

None.

C3.1.11.2 Facilities Provided by the Contractor

The onus lies with the main Contractor to find a suitable camp site, approved by the Employer.

C3.1.11.3 Storage

No requirements are specified.

C3.1.11.4 Other Facilities and Services

No requirements are specified.

C3.1.11.5 Vehicles and Equipment

No requirements are specified.

C3.1.11.6 Advertising Rights

It is the main Contractor's responsibility that no suppliers advertise on site. Any advertisement from suppliers shall be removed at the cost of the main Contractor.

C3.1.11.7 Notice Boards

The main Contractor is allowed to place a notice board on site. The maximum allowed size of this board should be 2 x 3m.

C3.1.12 Site Usage

The Contractors are not allowed to work outside the allowed working hours, as agreed with the Employer and Principal Agent. The disturbance to the residence should be kept at a minimum.

PART C: THE CONTRACT

Part C3: Scope of Work

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

C3.2. Management

C3.2.1 Planning and Programming

C3.2.1.1 General

This clause describes the requirements for the preparation, submission, updating and revision of the programme for the works. The requirements are in addition to or in expansion of the JBCC PBA clause [15.6].

The programme shall be used by the contractor to plan and execute the works. The programme shall also be used by the Principal Agent to monitor progress and be the sole basis for the assessment of revisions of the date for Practical Completion.

The programme shall be produced by the contractor as follows:

a) A programme for the totality of the works shall be submitted to the principal agent for acceptance. If the principal does not accept such programme, it shall be revised and amended until it is accepted by the principal agent. This programme will then be regarded as the baseline programme.

b) This baseline programme shall be updated with actual progress on a monthly basis, or any more frequent basis as necessitated by construction events. The contractor may submit to the principal for acceptance revisions to the baseline programme.

c) Acceptance by the Principal Agent of any programme submitted by the contractor does not make such programme a contract document, nor does it mandate that the works shall be constructed strictly in accordance therewith. The contractor at all times remains responsible for the construction of the works.

C3.2.1.2 Submission of Programme

Within 10 (Ten) working days of been given possession of the site the Contractor shall submit to the Principal Agent for his review and acceptance a programme for the whole of the works showing the order in which the contractor proposes to execute the works. This programme becomes the baseline programme upon acceptance by the Principal Agent. The baseline programme shall have regard to the contract completion dates, any other milestones and any restraints set out in the contract. Thereafter, if the actual progress does not conform with the baseline programme, the Principal Agent is entitled to require the Contractor to submit a revised programme showing the order of activities necessary to ensure completion of the works by the contract completion dates.

The Contractor shall supply the Principal Agent with an electronic copy of each programme, together with a print-out bar chart or tabular report in a pre-agreed format. All programmes shall be prepared and submitted using Microsoft Project software.

Within 10 (Ten) working days of the contractor submitting a programme complete with all the information required by this clause to the principal agent for acceptance, the principal agent will accept the programme or state reasons for not accepting the programme. If such reasons are given, the contractor shall take account of the reasons and resubmit the programme within 5 (five) working days.

If the Principal Agent fails to act the programme is deemed to be rejected.

C3.2.1.3 Default in submission of programs

Should the contractor fail to submit a programme for acceptance as the baseline programme or not update the programme as described above, the principal agent shall be entitled to withhold 25% of the amount due to the contractor in interim payment certificates until the contractor has complied with its obligations in this regard.

C3.2.2 Health and Safety

C3.2.2.1 Health and Safety specification

In terms of the Occupational Health and Safety Act (Act 85 of 1993) (OHSA) and the Construction Regulation 2014, the Client must provide the Contractor with a Health and Safety Specification to which the Contractor must respond with a Health and Safety Plan for approval by the Client.

The purpose of this Specification is to ensure that Principal Contractors entering into a contract with the Employer maintain an acceptable level of performance with regard to health and safety issues during the performance of the contract. In this regard the OHSA Specification form an integral part of the Contract and the Principal Contractor shall ensure that their contractors and/or suppliers comply with the requirements of this Specification.

PART C: THE CONTRACT

Part C4: Site Information

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

PART C: THE CONTRACT

Part C4: Site Information

PROJECT TITLE:	**REQUEST FOR BIDS FOR THE APPOINTMENT OF A CONTRACTOR FOR THE REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE**
CONTRACT NO:	**SANBI G464/2023**

C4.1 Site Information

C4.1.1 Site Location

The site is located at the Free State National Botanical Garden, Rayton Road, Bloemfontein, Free State.

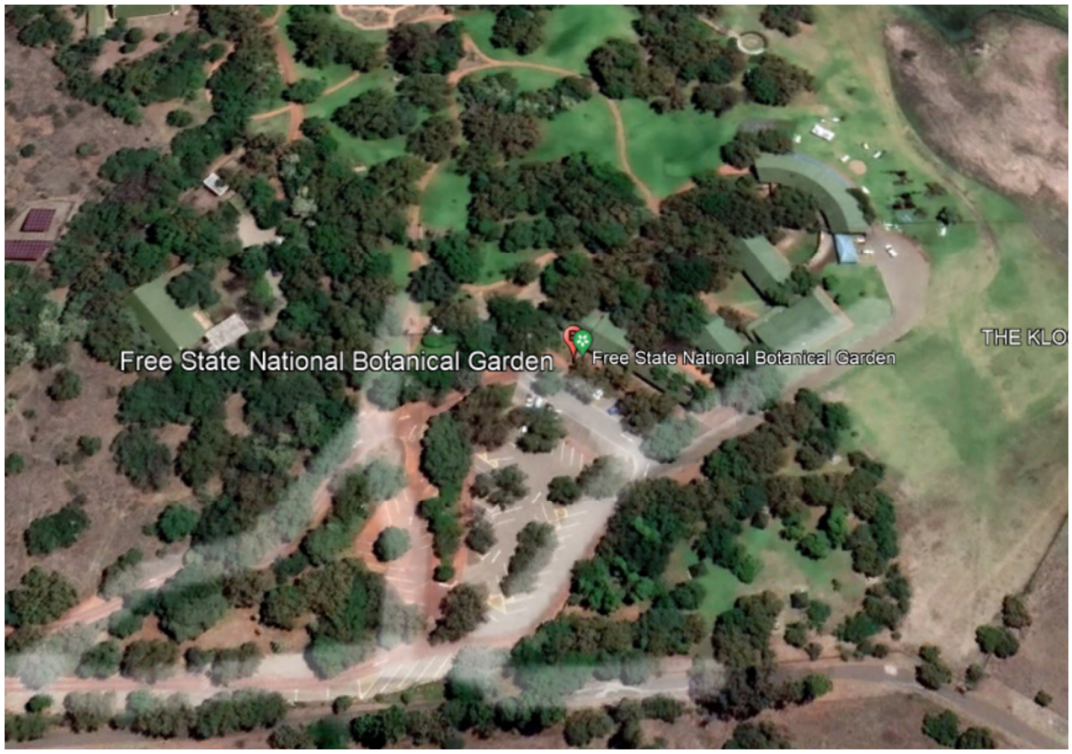

Figure 1: Location of Free State National Botanical Garden

ANNEXURE A: PROJECT ELECTRICAL SPECIFICATIONS

REMEDIAL ELECTRICAL WORK TO VARIOUS INFRASTRUCTURE FOR THE SANBI AT THE FREE STATE NATIONAL BOTANICAL GARDEN, FREE STATE

PROJECT ELECTRICAL INSTALLATION SPECIFICATIONS

May 2023
REV 01

Table of Contents

ELECTRICAL INSTALLATION SPECIFICATIONS

1. SPECIFICATIONS

1.1 STANDARD SPECIFICATIONS

The latest version including amendments as of January 2023 are deemed applicable to this contract.

- SANS 10142-1: The wiring of premises Part 1: Low voltage installations
- SANS 10114-1: Interior Lighting: Artificial lighting of interiors
- SANS 10114-2: Interior Lighting: Emergency lighting
- SANS 10389-1: Artificial lighting of exterior areas for work and safety
- SANS 10389-2: Exterior security lighting
- SANS 10400: The application of the National Building Regulations
- SANS 204: Energy Efficiency in Buildings
- SANS 10313: Protection against lightning
- SANS 61024: Protection of structures against lightning
- All municipal regulations pertaining to building codes and health and safety requirements.
- South African Occupational Health and Safety Act (Act 85 of 1993).

Additional standard electrical specifications are attached as APPENDIX A.

1.2 PROJECT SPECIFICATIONS RELATING TO STANDARD SPECIFICATIONS

1.2.1 POWER SUPPLY AND OTHER SERVICES

The Contractor must make his own arrangements concerning the supply of electrical power and water to the site camp and/or construction site. No direct payment will be made for the provision of electrical, power, water and other services. The cost of providing these services will be deemed to be included in the Contractor's offer for the various items of work for which these services are required.

1.2.2 CONSTRUCTION IN CONFINED AREAS

It may be necessary for the Contractor to work in confined and restricted areas.

1.2.3 CONTRACTOR'S SITE OFFICE AND SITE ESTABLISHMENT

The Contractor to provide his own site office if required of which the Location of the site office to be agreed with the Employer.

1.2.4 SECURITY

The Contractor shall be responsible for the security of his personnel and constructional plant on and around the site of the works and for the security of his camp, and no claims in this regard will be considered by the Employer.

1.2.5 INSURANCE

The Contractor shall be required to take out adequate insurance in order to cover his/her obligations in terms of the Contract and to keep them current for the duration of the Contract.

1.2.6 STANDARD OF WORKMANSHIP

All work covered by this specification shall be carried out by a registered electrical contractor who has under their full-time employment of a qualified, certified and licensed master electrician. Where any aspect of the work is not specifically mentioned in these clauses, SANS 10142 parts 1 and/or 2 shall apply.

Workmanship shall be of a high standard and all tubing and wiring shall be carried out by the Licensed Electrical Wireman assisted by competent employees. The Engineer may, at any time during the course of construction reject any work which is not carried out to his satisfaction and it shall be brought up to standard at the expense of the Electrical Subcontractor. For the purpose of this condition, tubing shall

mean bending, placing, assembling and fixing of all conduit and accessories used in the electrical installation.

On completion of each sub-section of the contract, the Engineer shall be contacted in order for a detailed inspection to be made, to determine whether the quality of workmanship has been satisfactorily carried out.

The Electrical Contractor shall at all times be responsible for the quality of materials and workmanship in his contract.

1.2.7 MATERIALS

All materials and fittings used shall be approved and conform to those specified in the schedules of this specification. Any variance from these standards will not be allowed, except with written consent of the Engineer.

In all cases, reference shall be made to the relevant SANS specifications where such specifications apply and are available for general application.

The Electrical Contractor shall place orders for specified materials and equipment promptly upon being awarded the contract. No excuse or proposed substitution will be considered for materials and equipment due to unavailability unless proof is submitted that firm orders were placed within 14 days of the contract being awarded.

Delay in the works owing to non-delivery of materials will be considered as a cause for delay in completing the contract works.

The Electrical Contractor shall, if called upon to do so, submit samples of materials, equipment or individual components for examination or testing to the Engineer and/or other parties as instructed.

1.2.8 SUPERVISION OF CONTRACT

The Electrical Contractor shall employ, on the project at all times, a competent foreman or charge hand and any instruction given to him by the Engineer shall be deemed to have been given to the Electrical Contractor, except where such instructions or information herein mentioned or inferred as having to be given in writing.

1.2.9 PROGRESS OF WORK

On acceptance of a tender the work shall be put in hand immediately and a sufficient number of workmen and assistants employed to ensure such progress is commensurate with the general progress of the undertaking.

Work shall at all times be commensurate with the general progress of the building and the Electrical Subcontractor shall fully acquaint himself with the Principal Contractor's construction programme with which he shall comply. If, in the opinion of the Engineer, the work is being unduly delayed the Electrical Subcontractor shall, upon being called upon to do so, increase the number of men employed to promote that rate of progress to the required extent.

Where partial occupation of the building is required during building operations, the Electrical Subcontractor shall arrange his work programme accordingly.

1.2.10 COMPLIANCE WITH LAWS AND REGULATIONS

The whole of the work shall be carried out in strict accordance with the current edition of SANS10142-1, the "Occupational Health and Safety Act 85 of 1993" and the local municipal regulations and bylaws.

1.2.11 DISCREPANCIES

All drawings shall be regarded as diagrammatic, and all positions and dimensions shown on drawings are approximate and shall be verified on site. No extra will be allowed for alterations which result from lack of verification of positions and/or dimensions.

Should there appear to be any discrepancy, or lack of agreement in respect of description, dimensions or quantities between various documents, the matter shall be referred by the Electrical Subcontractor to the Engineer for decision.

1.2.12 SANS REGULATIONS AND SPECIFICATIONS

The Electrical Contractor shall acquaint himself with the current SANS regulations / specifications and any other regulation / specification that may apply to this contract.

No breaches will be accepted on account of lack of knowledge of such specifications or regulations.

1.2.13 SITE MEETINGS

Site meetings may be held during the course of the contract. Such meetings shall be convened by the Engineer at a time to be determined after the awarding of the main contract. The Electrical Subcontractor, or his representative, may be required to attend all such meetings, in addition to normal visits to the site as arranged with the Engineer.

1.2.14 INSPECTING AND TESTING

Before submission of a completion notice, the Electrical Subcontractor shall carry out his own testing to ensure that the installation complies with SANS 10142-1 read in conjunction with applicable bylaws and the detailed requirements as set out in this specification.

On completion, the whole installation will be required to be tested by the Electrical Subcontractor in the presence of our representative (Installations Supervisor). A compliance certificate shall be completed by the Electrical Subcontractor and submitted to the Engineer.

1.2.15 VARIATION

The Electrical Subcontractor shall be responsible for seeing that he is issued with variation orders during the progress of the work, as claims for extras will not be recognised after completion of the contract unless the corresponding variation orders have been issued during the course of the works. Such variation orders shall be priced by the Electrical Subcontractor within seven (7) days of the date of issue and forwarded to the Engineer and project cost controllers.

At the time of the award of the contract for the electrical installation, the successful Electrical Subcontractor shall supply a list of rates for materials and labour for the calculation of additions and omissions.

1.2.16 HANDING OVER OF WORKS

No portion of the installation will be accepted until it has satisfactorily passed tests to the satisfaction of the Engineer or his representative.

1.2.17 GUARANTEE

The whole of the installation and fittings carried out and supplied under the electrical contract, shall be handed over in full working order and the best of their respective kinds, and shall be guaranteed for a period of 12 months from the date of completion of the main contract and any faults or defects in materials or workmanship shall be made good free of charge during such period.

1.2.18 SLEEVES AND DRAWINGS

Where sleeves are laid across roads etc., the back filling will conform to the requirements of the Civil Engineer and positions will be marked up on the “as-built” drawings. Accurate dimensioned drawings of these services in relation to buildings will be submitted together with the “As-built” drawings on completion of the contract.

1.2.19 "AS-BUILT" DRAWINGS

The Electrical Contractor must submit two copies of approved marked up drawings of the whole electrical installation, showing details and positions of all services actually installed in the works. All cable joints, markers, etc., must be accurately dimensioned on the drawings. One copy of the as-built single line diagrams and circuiting shall be fixed to the internal surface of the main distribution board door by means of a clear plastic type pocket.

1.2.20 ADDITIONAL TERMS OF ACCEPTANCE OF TENDER

Tenderers are cautioned that previous projects / electrical reticulation undertaken by the aforesaid parties under contract to the employer which have proved to be either unreliable and/or unserviceable and/or unsupported by the suppliers in terms of spares, technical documentation, service etc., shall render tenders liable to disqualification where applicable.

Furthermore, contractors who have failed to provide adequate service levels or have failed to give timeous response to product/technical enquires or have frequently defaulted on repair turn-around times or ignored or refused to meet contractual obligations under previous tender enquires, or have been unable/unwilling to stock product, recommended spares, will also not be considered under this enquire.

1.3 GENERAL SPECIFICATIONS

The electrical contractor shall note which clauses are relevant to this contract:

1.3.1 WIRING

All wiring shall be carried out in the "loop in" system and looping shall be done only at switches, ceiling roses, certain fittings and similar devices.

Joints in the wiring will not be permitted. The lead and return conductors of each circuit shall be drawn into the same conduit.

The cutting away of wire strands from the individual cores will not be allowed.

Circuits fed from isolated power sources, such is isolation transformers, shall be of colour other than red, black and green/yellow, as per SANS 10142.

1.3.2 WIRES

All conductors used shall be PVC insulated.

All sub-circuit earth wires shall be PVC insulated and coloured green/yellow. Phase wires shall be coloured red, white or blue and the neutral conductor black. In the case of lighting circuits, the switch wire may be coloured in any other distinctive colour other than green, green/yellow or black and shall take into account the colour of wiring used for isolated power supplies.

Circuit wire sizes are included in the Electrical Single line Diagrams attached to this document.

The end strands of all circuit wires are to be tightly twisted together on termination into switches, socket outlets, circuit breakers, etc. If the end is to be made off into a lug, the correct lug-crimping tool shall be employed for the corresponding conductor size used.

1.3.3 CONDUIT

All conduits and accessories shall conform to the relevant SANS specifications. All conduit installations shall be carried out in the "loop in" system.

1.3.4 PVC CONDUIT

PVC conduit may only be used if the conduit is recessed or installed in ceiling voids. For surface-mount applications, only galvanised conduits may be used (see Section 1.3.5 below).

The Electrical Contractor shall allow for a separate green/yellow PVC covered earth wire or bare coper earth wire to be drawn into all conduits in order to earth all light fittings, socket outlets, distribution boards, water heaters, cookers, etc.
All conduit joints shall be securely bonded by means of an approved PVC adhesive.

PVC conduit terminations into distribution boards, socket outlet boxes, switch boxes, etc. shall be made by means of threaded PVC conduit adapters bonded to the conduit end, and PVC locking nuts. Conduits merely pushed into the above box knockout holes will not be permitted under any circumstances.

Back entry boxes shall not be used in reinforced concrete structures.
Galvanised extension rings shall be used for light points when PVC boxes are used.
All conduit-coupling joints in concrete slabs shall be reinforced by placing and binding a short section of conduit across the coupling joint.
All light switch boxes, socket outlet boxes and telephone outlet boxes shall be galvanised boxes.
Galvanised conduit shall be used in columns, concrete walls and beams.

1.3.5 GALVANISED CONDUIT

All surface-mount conduits must be galvanised and not PVC. All galvanised conduits must be supported by galvanised saddles at intervals of 1.5 m or less.

Galvanised conduits installed in coastal areas shall be painted or powder-coated to improve resistance to corrosion. The colour shall be finalised with the engineer or employer on site.

Galvanised conduits shall be smooth inside and shall not flake when the conduit is bent.

Before use, conduit shall be carefully scrutinised to ensure smoothness of bore and that it is not damaged in any way. Any conduit from which the galvanising has flaked during bending or which has been split, flattened or damaged in any way, shall be rejected.

All conduit ends are to be cleaned of all sharp edges, neatly rounded off and reamed.

Conduit ends shall be finished off by means of galvanised locknuts and brass bushes. Alternatively, conduits may be terminated by using couplings and male brass bushes.

Joints shall be tightly screwed up and where embedded in concrete or where running joints with long threads are used, a coating of red lead shall be applied.

1.3.6 GENERAL

Where a conduit is to be surface mounted, only galvanised saddles may be employed. Hooks, crampets or tungsten pins will not be permitted. Walls shall be drilled with a tungsten tipped bit and either patented lead, grouted bolts, rawl or plastic plugs may be used for the fixing of saddles or other accessories.

Where switches, socket outlets, etc., occur in brickwork, a masonry cutting machine shall be employed to provide the necessary chase.

The Electrical Contractor shall make allowance in his tender for all chasing and making good of brickwork, plaster, etc., as no extras will be granted for the omission thereof.

Conduits installed in reinforced concrete slabs shall be placed above the bottom reinforcement bars to allow full concrete cover as indicated on the Structural Engineer's drawings.

The Electrical Contractor shall make every effort to avoid the crossing of conduits in reinforced concrete slabs. Where such crossings are unavoidable, the crossing shall be made in ribs or beams, the lower conduit being set into the rib or beam.

The Electrical Contractor shall notify the Engineer in good time, minimum 24 hours, as to his completion of a conduit installation, in order that the work may be inspected and checked in his presence and corrected, if necessary, before concrete is cast.

1.3.7 TRENCHING

1.3.7.1 GENERAL

The Electrical Contractor shall be responsible for all trenching excavations unless specified to the contrary. The Contractor shall, before trenching commences, familiarise himself with the routes and site conditions and the procedure and order of doing the work shall be planned in conjunction with the general construction programme for other services and building requirements.

The Contractor shall acquaint himself with the position of all the existing services such as stormwater pipes, water mains, sewer mains, gas pipes, electrical cables, telephone cables, etc. before any excavations are commenced. For this purpose, he shall approach the Engineer, the local municipal authority and any other authority which may be involved, in writing.

The Contractor will be held responsible for damage to any existing services brought to his attention by the relevant authorities and shall be responsible for the cost of repairs.
The Contractor shall take all the necessary precautions and provide the necessary warning signs and/or lights to ensure that the public and/or employees on site are not endangered.

The Contractor shall ensure that the excavations will not endanger existing structures, roads, railways, other site constructions or other property.

1.3.7.2 MECHANICAL EXCAVATORS

Power driven mechanical excavators may be used for trenching operations provided that they are not used in close proximity to other plant, services or other installations likely to be damaged by the use of such machinery.

The use of power driven mechanical excavators shall be subject to the approval of the Engineer. Should the excavator produce trenches that exceed the required dimensions, payment based on volumetric excavation rates will be calculated on the required dimensions only.

1.3.7.3 ROUTES

Trenches shall connect the points shown on the drawings in a straight line. Any deviations due to obstructions or existing services shall be approved by the Engineer beforehand.

The Engineer reserves the right to alter any cable route or portion thereof in advance of cable laying. Payment in respect of any additional or wasted work involved shall be at the documented rates.

The removal of obstructions along the cable routes shall be subject to the approval of the Engineer.

1.3.7.4 SHORING AND WATERLOGGING

The Contractor shall provide shoring for use in locations where there is a danger of the sides of the trench collapsing due to waterlogging or other ground conditions. Refer to the Occupational Health and Safety Act.

The strength of shoring must be adequate for site conditions prevailing and the shoring must be braced across the trench.

The Contractor shall provide all pumps and equipment required to remove accumulated water from trenches. Water or any other liquid removed shall be disposed of without any nuisance or hazard.

1.3.7.5 TRENCHING

Trenching shall be programmed in advance and the approved programme shall not be departed from except with the consent of the Engineer.

Trenches shall be as straight as possible and shall be excavated to the dimensions indicated in this specification (see Section 1.3.7.6).

The bottom of the trench shall be of smooth contour, and shall have no sharp dips or rises which may cause tensile forces in the cable during backfilling.

The excavated material shall be placed adjacent to each trench in such a manner as to prevent nuisance, interference or damage to adjacent drains, gateways, trenches, water furrows, other works, properties or traffic. Where this is not possible the excavated materials shall be removed from site and returned for backfilling on completion of cable laying.

Surplus material shall be removed from site and disposed of at the cost of the Contractor.

Trenches across roads, access ways or footpaths shall not be left open. If cables cannot be laid immediately the Contractor shall install temporary "bridges" or cover plates of sufficient strength to accommodate the traffic concerned.

In the event of damage to other services or structures during trenching operations the Contractor shall immediately notify the Engineer and institute repairs.

Prior to cable laying the trench shall be inspected thoroughly and all objects likely to cause damage to the cables either during or after laying shall be removed.

Where ground conditions are likely to reduce maximum current carrying capacities of cables or where the cables are likely to be subjected to chemical or other damage or electrolytic action, the Engineer shall be notified before installing the cables. The Engineer will advise on the course of action to be taken.

Extreme care shall be taken not to disturb surveyor's pegs. These pegs shall not be covered with excavated material. If the surveyor's pegs are disturbed, they shall be replaced by a person qualified to do so.

1.3.7.6 DIMENSIONS OF TRENCHES

Cable trenches for one or two cables shall not be less than 300 mm wide and need not be more than 450 mm wide. This dimension shall be valid for the total trench depth.

Trenches should be 675 mm deep to accommodate 75 mm bedding for a cable installed 600 mm below normal ground level.

The width shall be increased where more cables are installed to allow for spacing as specified in SANS 10142-1.

Where trenches change direction or where cable slack is to be accommodated, the Contractor shall ensure that the requirements of the relevant SANS Specification regarding the bending radii of cables are met when determining trench widths.

Payment will be made on a volumetric excavation rate calculated on the basis of the given maximum dimensions or the actual dimensions, whichever is the lesser.

1.3.7.7 BEDDING

The bottom of the trench shall be filled across the full width with a 75mm layer of suitable soil sifted through a 6mm mesh and levelled off.

Only sandy clay or loam soil with a satisfactory thermal resistivity (not exceeding 1.5 °C m/W) may be used for this purpose. Sea or river sand, ash, chalk, peat, clinker or clayey soil shall not be used. The use of crusher sand is acceptable.

Where no suitable soil is available on site, the Contractor shall import fill from elsewhere and make all the necessary arrangements to do so. The cost of importing soil for bedding purposes shall be included in the unit rates for excavations.

After cable laying a further layer of bedding shall be provided to extend to 75 mm above the cables.

The bedding under joints shall be fully consolidated to prevent subsequent settling.

1.3.7.8 CABLE SLEEVES

Where cables cross under roads, railway tracks, other service areas, etc. and where cables enter buildings, the cables shall be installed in Polyethylene pipes (6mm thickness). Pitch fibre and PVC pipes are not acceptable because of the adhesion that occurs after a period of time between the pipe and the sheathing or outer serving of the cables.

Pipes shall be joined in accordance with the manufacturer's instructions.

Sleeves shall cross roads and railway tracks at right angles.

Sleeves shall have a minimum diameter of 100mm. They shall extend at least 2m beyond the tracks of a railway line or of the outermost tracks where there is more than one line. In the case of roads, the sleeves shall extend at least 1m beyond the road edge or kerb on both sides of the road.

All sleeves shall be graded 1:400 for water drainage.

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

1.3.7.9 BACKFILLING

The Contractor shall not commence with the backfilling of trenches without prior notification to the Engineer so that the cable installation may be inspected. Should the Contractor fail to give a timeous notification, the trenches shall be re-opened at the Contractor's cost. Such an inspection will not be unreasonably delayed.

Backfilling shall be undertaken with soil suitable to ensure settling without voids. The maximum allowable diameter of stones present in the backfill material is 75mm.

The Contractor shall have allowed in his tender for the importation of suitable backfill material if required. The backfill shall be compacted in layers of 150mm and sufficient allowance shall be made for final settlement. The Contractor shall maintain the refilled trench at his expense for the duration of the contract. Surplus material shall be removed from site and suitably disposed of.

On completion, the surface shall be made good to match the surrounding area.

In the case of roadways or paved areas the excavations shall be consolidated to the original density of the surrounding material and the surface finish reinstated.

1.3.8 CHASING OF CONCRETE

Where it becomes necessary to chase structural concrete, permission from the Structural Engineer shall first be obtained. If the structure is chased prior to permission being obtained, the Electrical Contractor will be held liable for any damage that may be caused.

1.3.9 EARTHING

The whole of the electrical installation shall be earthed in accordance with SANS 10142 and any other local regulation or bylaw that may apply.

All cold/hot water and metal pipes shall be effectively bonded together by using copper tape (not wire), brass nuts and bolts and earthed.

All metal roofs, gutters, downpipes, wash-had basins, urinals, etc., shall be effectively bonded together and earthed.

All earth wires in sub-circuits, other than E.C.C. cables, shall be insulated and coloured green/yellow.

Earthing of isolated power supplies, such as isolation transformers, shall be separately earth spiked in to ground as in an IT earthing system.
The contractor shall verify and correct where necessary, by a licensed master electrician, all designs issued in this contract for such earthing systems.

1.3.9.1 ADDITIONAL NOTES FOR EARTHING

The Electrical Contractor shall ensure that all urinals have solid copper earthing straps connected and laid visibly between the water inlet and any metal portion of the urinals.

The Electrical Contractor shall ensure that a separate earth conductor is provided and connected to the metal pipe of the water main and the earth bar on the meter frame/meter box/meter cubicle.

1.3.10 DISTRIBUTION BOARDS

All distribution boards shall comply with SANS 1973 and SANS 61439.
The distribution boards detailed in these schedules shall contain approved miniature circuit breakers. In the case of triple pole and neutral boards, the circuit breakers shall be flush mounted in vertical position and arranged in horizontal rows. A neutral bar with provision for connecting each neutral conductor into a separate position, corresponding to the line conductor, shall be provided.
All switchgear, including circuit breakers, shall either bear the SABS stamp. The distribution boards shall be complete with switch disconnectors, the current capacities of which are detailed in the schedules, and where necessary an approved cable entry gland shall be provided.

All metal components should be stainless steel and corrosion resistant. All distribution boards shall either bear the SABS stamp or proof of SABS certification through type testing is to be provided.

All components and equipment shall be supplied and wired in accordance with the abovementioned schedules.

All distribution boards, kiosks and low-tension switchboards shall be equipped with lightning protection devices.

All Essential and UPS distribution boards, kiosks and low-tension switchboards shall be equipped with LED indicators connected to the incoming supply and labelled alternative supply.

Circuits in three phase distribution boards shall be balanced over three phases and this shall in all instances be strictly adhered to.

Each distribution board and each item thereon shall be clearly labelled to indicate supply voltage, board and circuit designation, etc., and the location of the various outlets associated with each circuit. The labels shall be engraved from a suitable material and securely fixed to or adjacent to the item which it represents. Labelling and fixing thereof shall be approved by the Engineer prior to manufacture.

1.3.11 EARTH LEAKAGE RELAYS

All single phase and three phase earth leakage relays shall be of 30 mA sensitivity and in all cases bear the SABS mark of approval or be CE approved.

1.3.12 CIRCUIT BREAKERS AND OTHER SWITCHGEAR

All switchgear, including circuit breakers, shall in all cases bear the SABS mark of approval. Cascading should be applied between all distribution boards and sub-boards.

1.3.13 EARTH FAULT/INSULATION MONITORING SYSTEMS

Where earth fault monitoring systems are required for medical IT installations the following shall apply:

1.3.13.1 INSULATION MONITORING DEVICE:

The earth, or insulation monitoring device shall comply with IEC 61557-8 and shall have the following characteristics:

- Internal impedance of at least 100k Ohm;
- Test voltage not exceeding 25V DC;
- is of a current, even under fault conditions, not exceeding 1 mA DC; and
- shall indicate, at least when the insulation resistance has decreased to 5k Ohm.

A test device shall be provided to test this facility to ensure that the alarm (audible and visual) operates when the insulation resistance reaches 5 k Ohm.

To test the system, two male plugs should be used, each with a resistor of 5k Ohm. Plug No 1 should have a 5k Ohm resistor bridged from the earth pin to the right-hand live pin. Plug No 2 should have a 5k Ohm resistor bridged from the earth pin to the left-hand live pin.

1.3.13.2 MEDICAL ISOLATION TRANSFORMER

A medical isolation transformer shall be provided for Group 2 medical locations as set out in SANS 10142 and shall comply with SANS 61558-2-15 – PART 2-15 Particular requirements and tests for isolating transformers for the supply of medical locations.

The isolation transformer shall consist of 230V primary and 220V/110V secondary winding with a centre tap bonded to the earth fault/insulation monitoring device. The power rating of the isolation transformer is as per the single line diagrams or schedules.

The transformer shall be installed either in a cabinet/DB or enclosure, to prevent unintentional contact with live parts. The transformer/DB shall be located close to the Group 2 Medical Location. Line 1 & 2 and earth should all be Insulated wires with the colour of Line 1 & 2 being different from red and black. It is proposed that brown and blue wire is used for Line 1 & 2, and solid green for earth.

This earth wire shall be connected to an insulated earth bar dedicated to that particular Group 2 location and bonded to the centre point of the secondary winding of the IT. Note a separate earth bonded to the normal electrical installation's earth bar shall be provided to the metal work of the socket outlets, theatre and ICU equipment.

Note, attention to the single line diagrams for the number of isolated circuits per isolated installation is required. At least two circuits per ICU bed, theatre panel, theatre pendant and theatre room outlet cluster are required. These circuits shall be supplied through double pole circuit breakers installed within the Group 2 medical location distribution board.

1.3.14 230 V SOCKET OUTLETS

Where these outlets occur, they shall be flush mounted unless otherwise specified, and shall comply with the relevant SANS specifications.

Minimum size of outlet boxes shall not be less than 100 mm x 100 mm x 50 mm.

Mounting heights of socket outlets shall be 300 mm or 1 400 mm above finish floor level or as stated in the schedules.

Note the colour for socket outlets installed in a Group 2 medical location shall be blue cover plates over white or red (normal or dedicated) socket outlets and include blue double pole isolators or circuit breakers.

All socket outlet switches fed from a circuit connected to an Earth Fault Monitor Supply shall be equipped with double pole switches.

All socket outlets used for patient care (i.e. Computers used in Pharmacy, Consulting rooms, Treatment rooms etc.) shall be connected to the Essential power supply where installed.

1.3.15 LIGHT SWITCHES

All light switches shall be flush or surface mounted as scheduled and installed 1 200 mm above finished floor level unless otherwise specified, and shall conform to the relevant SABS specifications.

The current ratings and switching details are included in the distribution board circuit schedules and shall be strictly adhered to.

Weatherproof switches (if necessary) shall be supplied and installed in the positions as indicated on the drawings and/or as detailed in the specification.

Note: All light switches fed from a circuit connected to an Earth Fault Monitor Supply shall be equipped with double pole switches.

1.3.16 LIGHT FITTINGS

All light fittings and lamps supplied under this contract shall be from new unused stock and shall bare the SABS stamp of approval. Proof of SABS compliance is to be presented and verified. Any fitting that may be damaged or is not as specified shall be rejected and replaced by the Electrical Contractor at his own expense.

All light fittings shall be complete with LED lamps and control gear. LED lamps shall have a colour temperature of approximately 4 000 K unless stated otherwise. All light fittings complete with lamps shall be guaranteed for a period of twelve months from the date of handing over of the main contract. This guarantee applies to defects in materials or manufacture and electrical breakdown in any of the components. All light fittings supplied and installed under this contract shall have a minimum supplier warrantee of 5 years.

The Electrical Contractor will not be held liable if such fittings are damaged due to negligence during the guarantee period.
NB: Any alternative light fittings must be submitted to the Engineer for approval.

1.3.17 COLOUR CODING AND LABELLING

The table below present the preferred colour coding and labelling requirements. Any proposed deviations are to be approved by the Engineer in writing.

Normal / Non-essential Supply: White
Emergency / Essential Supply: Signal Red (SANS 1091 Code A11)
UPS Supply: Blue (SANS 1091 Code F01

Colour coding of light switches:

POWER SOURCE	COVER PLATE COLOUR	SWITCH COLOUR	LABEL TYPE	CONTENTS ON LABEL	LETTER SIZE
NORMAL	White	White	Black letters on white Ivorene label or Black engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the switch as per example. DB A /L1	3 mm
ESSENTIAL	White	Red	White letters on red Ivorene label or Red engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the switch as per example. DB AE/L1	3 mm
UPS	White	Blue	White letters on blue Ivorene label or Blue engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the switch as per example. DB AU/ L1	3 mm

Colour coding of socket outlets:

POWER SOURCE	COVER PLATE COLOUR	SWITCH COLOUR	LABEL TYPE	CONTENTS ON LABEL	LETTER SIZE	EARTH PIN	FEMALE SOCKET
NORMAL	White	White	Black letters on white Ivorene label or Black engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the socket outlet as per example DB A/ P1/1. Each socket outlet on a circuit shall be labelled.	3 mm	Round	White
ESSENTIAL	White	Red	White letters on red Ivorene label or Red engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the socket outlet as per example DB AE/ P1/1. Each socket outlet on a circuit shall be labelled.	3 mm	Round	White
UPS	White	Blue	White letters on blue Ivorene label or Blue engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the socket outlet as per example DB AU/ P1/1. Each socket outlet on a circuit shall be labelled. Note: All socket outlets on UPS supply to be labelled as follows: LIFE SUPPORT ONLY	3 mm	Round	White
DEDICATED This socket outlet shall be used for computer equipment only and shall not be on earth leakage units.	Red	Red	Black letters on white Ivorene label or Black engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the socket outlet as per example DBA/ PD1/1. Each socket outlet on a circuit shall be labelled.	3mm	Shaved	Red

Colour coding of isolators at equipment:

POWER SOURCE	COVER PLATE COLOUR	SWITCH COLOUR	LABEL TYPE	CONTENTS ON LABEL	LETTER SIZE	COMMENTS
NORMAL	White	White	Black letters on white Ivorene label or Black Engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the isolator as per example DBA/ S1.	3 mm	
ESSENTIAL	White	Red	White letters on red Ivorene label or Red engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the socket outlet as per example DB AE/ P1/1. Each socket outlet on a circuit shall be labelled.	3 mm	Where red switches are not obtainable the illuminated type red switch may be used, or a white switch may be used but the switch shall be tagged with a non removable red sticker.
UPS	White	Blue	White letters on blue Ivorene label or Blue Engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the isolator as per example DB AU/ S1	3 mm	Where blue switches are not obtainable the illuminated type blue switch may be used, or a white switch may be used but the switch shall be tagged with a non removable blue sticker.

Distribution boards, kiosks, and low-tension switchboards:

POWER SOURCE	COLOUR OF DISTRIBUTION BOARD, KIOSK, LOW TENSION SWITCHBOARDS	COLOUR OF FACE PLATE	LABEL TYPE	CONTENTS ON EXTERNAL LABEL	CONTENTS OF INTERNAL LABEL ON FACE PLATE	LETTER SIZE	LABELLING OF CABLES
NORMAL	**Distribution Boards in buildings** White or Beige **Outdoor Kiosks, and Low Tension Switchboards** Electric Orange	**Distribution Boards in buildings** White or Beige **Outdoor Kiosks, and Low Tension Switchboards** Electric Orange	Black engraved letters on white Ivorene label. Ivorene label super-glued or pop riveted to face plate or frame.	Distribution Board Number as per example DB A	Distribution Board Number, Indication of Feeder Source, Size of Feeder Cable, Fault Level Rating of Distribution board, Phase rotation direction	Label of Distribution Board: 6 mm Label on Face Plate: 3 mm	All incoming and outgoing cables shall be labelled with Ivorene labels indicating the size of the cable.
ESSENTIAL	**Distribution Boards in buildings** White or Beige **Outdoor Kiosks, and Low Tension Switchboards** Electric Orange	**Distribution Boards in buildings** Red **Outdoor Kiosks, and Low Tension Switchboards** Red	White engraved letters on red Ivorene label. Ivorene label super-glued or pop riveted to face plate or frame.	Distribution Board Number as per example DB AE	Distribution Board Number, Indication of Feeder Source, Size of Feeder Cable, Fault Level Rating of Distribution board, Phase rotation direction	Label of Distribution Board: 6 mm Label on Face Plate: 3 mm	All incoming and outgoing cables shall be labelled with Ivorene labels indicating the size of the cable.
UPS	**Distribution Boards in buildings** White or Beige **Outdoor Kiosks, and Low Tension Switchboards** Electric Orange	**Distribution Boards in buildings** Blue **Outdoor Kiosks, and Low Tension Switchboards** Blue	White engraved letters on blue Ivorene label. Ivorene label super-glued or pop riveted to face plate or frame.	Distribution Board Number as per example DB AU	Distribution Board Number, Indication of Feeder Source, Size of Feeder Cable, Fault Level Rating of Distribution board, Phase rotation direction	Label of Distribution Board: 6 mm Label on Face Plate: 3 mm	All incoming and outgoing cables shall be labelled with Ivorene labels indicating the size of the cable.

1.3.18 PHOTO-ELECTRIC CELL

A suitable approved NEMA type photo-electric cell complete with weatherproof mounting base shall be located at high level under roof eaves.

These devices shall be connected in order to control circuits and triple pole contactors in distribution board.

Photocells are to be installed in weatherproof housings for additional protection.

1.3.19 CABLES

1.3.19.1 TYPE OF CABLE

All LV cables shall be of the stranded copper, PVC insulated, steel wire armoured and PVC sheathed 600 - 1000 V grade. A separate copper earth conductor shall be installed alongside the cable.

All MV cables shall be of the stranded copper, XLPE insulated, steel wire armoured and PVC sheathed 11000 - 33000 V grade. A separate copper earth conductor shall be installed alongside the cable.

1.3.19.2 TERMINATION LV CABLES

Each cable end shall terminate in an approved cable gland which in turn shall be earthed to the earth bar. Cable lugs shall be of the compression type, and proper tools and equipment must be used to ensure best results.
All cable glands shall be complete with shrouds.

1.3.19.3 TERMINATION MV CABLES

The manufacturer's instructions for terminating cables with the specified end kit shall be strictly adhered to.

End kits shall contain all the material and equipment required for completion of the termination of the various cable ends.

Inside switching substations the conductors of the cable shall be connected directly to the switchgear busbars in the cable terminal boxes by means of heavy duty cable lugs. The cable lugs shall be crimped properly to the conductors, by means of a hydraulic hexagonal crimping tool.

If Raychem heat shrink terminations are used the tail length of the termination shall cover the entire length of the cable tail. Separate heat shrinking tubes shall be supplied and installed for each tail to cover the connection between the tails and the lugs.

Voids in the crutch of the cable under the boot shall be kept to a minimum by using Silicon grease or a suitable filler to prevent ionisation of air pockets.

After the cable lugs have been terminated they shall be sealed with B.I.C.C. compound and taped with colour (R-Y-B) PVC power tape.

The terminals shall be able to withstand the same testing voltage as the rest of the cable.

The armouring and screen shall be neatly cut off, tinned and connected to a 70 mm^2 bear earth copper conductor. The copper conductor shall be connected to the earthing system with the aid of a suitable cable lug.

Connection of cables to the switchgear shall always be effected in such a way that the various phases, seen from the front of the switchgear, are in the following positions:

No.1 conductor	:	Left	(red phase) (A)
No.2 conductor	:	Centre	(white phase) (B)
No.3 conductor	:	Right	(blue phase) (C)

Metal chequer plates shall be provided by others to cover the cable trenches in substations. The Contractor shall allow for the cutting of openings in the plates through which the cables shall be installed. The price for the cutting of the openings shall be included in the price for the 11kV termination.

1.3.20 TENDER PRICE

The price tendered shall include the complete termination including the cutting of the chequer plates as well as the supply of all material, labour and equipment necessary to complete the termination.

1.3.21 UNINTERRUPTABLE POWER SUPPLY

The following lists the minimum specification of the UPS system.

1.3.21.1 SCOPE OF WORKS

Supply, install and commissioning of a double conversion, three phase UPS rated at 5 kVA including 15 minute battery backup time.

The UPS shall be installed with an external maintenance, three position, bypass switch suitably rated for the maximum load expected. This bypass switch may be installed in a separate enclosure within 1.5m from the UPS to which it feed and is to include engraved labelling.

1.3.21.2 INFORMATION TO BE PROVIDED BY THE CONTRACTOR

The tenderer will provide full details of the unit offered in the pricing document.

These details will include but not limited to:

- Name of manufacturer of UPS
- UPS datasheets
- Product guarantees and warrantees
- Standards adhered to

Note that prior to procurement of any equipment full approval from the Engineer in writing is required.

1.3.21.3 STANDARD SPECIFICATIONS

- SANS 1474 - Uninterruptible Power Systems
- SANS 1507-1 - Electric Cables
- SANS 1754 - Electric Cables – Flexible Cords and Flexible Cables
- SANS 1632-2 - Batteries
- SANS 1652 - Battery Chargers
- SANS 10119 - Reduction of Explosion Hazards

1.3.21.4 UPS MINIMUM SPECIFICATIONS

1.3.21.5 Input

- Nominal Input Voltage : 230V Single Phase
- Input Frequency : 50 Hz +/- 5 Hz (auto sensing)
- Input Connections : Hard Wire 3-wire (L+N+PE)
- Input Power Factor : 0.96 or better, maintained regardless of load applied
- Input Total Harmonic Distortion : Less than 3% for full load

1.3.21.6 Output

- Output Power Capacity : 5 kVA
- Overload Capacity : Overload, 110% - 150%, and switch to bypass after 10 minutes. Automatically resume when load becomes normal.
- Nominal Output Voltage : 230V Singel Phase + Neutral out +/- 1%
- Output Voltage Distortion : Less than 3%
- Output Frequency (sync to mains) : 50 Hz +/- 5 Hz
- Topology : Double Conversion Online
- Waveform Type : Pure sine wave
- Output Connections : Hard Wire 3-wire (L+N+PE)
- Bypass : Internal and external via suitably rated three-way rotary selector to be supplied with UPS

1.3.21.7 Batteries & Runtime

- Battery Type : Lithium Iron Phosphate or better

- Battery backup time : 15 minutes at full load per UPS
- Battery Housing : Ventilated steel cabinet

1.3.21.8 Communications & Management

- Interface Port(s) : Addressable Ethernet for web-based management and future BMS
- Software : To be included in supply of UPS
- Dry contacts : Yes
- Control panel indication : Input/output voltage and current, input/output frequency, battery voltage, battery status, load capacity, low battery, on-line, inverter bypass, abnormal operation.

1.3.21.9 UPS Accommodation

The UPS is to be installed in the storeroom that contains the Admin Building's distribution board.

2. SERVICING OF THE EXISTING STANDBY DIESEL GENERATOR

The existing 80 kVA, standby, diesel generator is to be serviced and re-commissioned into the off position as a secondary back up to the new main standby generator.

The existing standby generator has a 83.4kW, 6 cylinder, turbo charged, Lovol engine.

The servicing of the standby generator shall include but not limited to the following scope of work:

- Replace all fluid filters including fuel and oil filters.
- Replace all air filters.
- Replace all fluids including oil and coolant.
- Service all serviceable bearings by replenishing the grease with the required specification of grease.
- Thoroughly clean and inspect for leaks.
- Plan and implement a full, 30-minute, load test including the auto mains failure and automatic transfer switch followed up with a detailed report of the test noting all voltage and current readings.
- Refill of the diesel storage tank.
- Provide a detailed report for the servicing of the standby generator.
- Any defects that may be found are to be reported along with a quotation for the replacement/repair of the defects for approval by the principal agent prior to proceeding with such replacement/repair works.

It is advised that the servicing of the existing standby generator be implemented near the completion of the project to ensure the service is valid for at least 12 months after contract completion.

3. NEW STANDBY DIESEL GENERATOR SPECIFICATION

3.1 GENERAL SPECIFICATIONS APPLICABLE TO SCOPE OF WORKS

3.1.1 GENERAL INFORMATION

The design of the system shall conform to all the standards and specifications contained or implied in this document as well as all statutory requirements, whether mentioned in this document or not. It shall be the sole responsibility of the contractor to design, supply and install a fully functional system.

These specifications pertain to the detail design, supply, delivery, unloading, handling, storage, and installation of equipment and materials required for the network installation at the new guardhouses.

The system described in these performance specifications, drawings and bills of quantities is a design and build installation. The contractor will be responsible for the detail design and system engineering of the system based on these performance specifications. Therefore, the tenderer must ensure that the quoted system is complete and fit for purpose.

Drawings applicable to this contract are attached to this document as Annexures.

Should any part of the specification or drawings not be clear, the engineer should be contacted for clarification.

Any deviations from the specifications, drawings and/or equipment specified shall be listed together with the alternatives offered and shall be submitted as part of the tender. If no deviations are listed, it will be assumed that the Tenderer complies with all the relevant technical parts of this specification.

3.1.2 CONTRACTOR'S RESPONSIBILITY

The contractor shall, as specified in all the relevant sections of this document, take full responsibility for the following:

- Providing time/activity mini-programmes, to arrange for the shut-down, interconnection to and re-energizing of all existing and new networks, to ensure proper testing, safety under all conditions and a minimum disruption of service to all consumers. These programmes shall be approved in writing by the engineer before being implemented by the contractor.
- Arranging with local authorities for all stoppages, shut-downs and for all switching of networks.
- Liaising with other contractors regarding all relevant interfaces.
- Ensuring that all parts of the works are at all times safe to the public and to the contractor's own personnel and those of the employer.
- Compiling acceptance test procedures for approval by the engineer.
- Arranging all tests prior to handing over any portion of the works.
- Submission of manuals complete with equipment specifications, and instructions, as-built drawings, test certificates, certificates of compliances for the electrical installation and handing over certificates at the completion of the contract.

The contractor is made aware of the fact that materials and equipment shall when required be ordered well in advance as late deliveries will be his sole responsibility. If for some reason late deliveries are found to be to the advantage of the client or are to be postponed by the contractor, prior approval shall be obtained from the engineer.

3.1.3 CLIMATE

All equipment shall be rated for installation in **inland environment** and shall conform to the following common requirements:

Indoor:

	- Temperature	10 °C to 40 °C
	- Relative humidity	0% to 100%
Outdoor:	- Temperature	-5 °C to 50 °C
	- Relative humidity	0% to 100%

3.1.4 EARTHING AND LIGHTNING PROTECTION

All equipment and cabling shall be earthed in accordance with all relevant codes and regulations and shall be suitably protected against lightning strikes and surges.

3.1.5 PHYSICAL INSTALLATION

The total price shall include a complete installation with all brackets, mounting accessories, signal distribution, switching, display, alarm processing, recorders and control equipment. All components shall be corrosion resistant and suitably rated for installation in marine environments.

3.2 TESTING AND AVAILABILITY

3.2.1 TESTING

All live testing for the purposes of handover shall be based on the acceptance test criteria described below.

3.2.2 ACCEPTANCE TEST CRITERIA

Acceptance test procedures are to be prepared by the contractor and must be approved by the engineer before any acceptance tests are conducted.

3.2.3 AVAILABILITY

Availability of the system shall be 99.5%.

3.2.4 SYSTEM UP-TIME

Downtime caused by external power failures, incorrect usage of the equipment, preventative maintenance, routine maintenance, etc. shall not be part of the equation to calculate system up time. However, downtime caused by system failure and unresponsiveness forms part of the equation.

3.3 documentation

3.3.1 DOCUMENTATION FOR APPROVAL

The tenderer shall provide full details of the unit offered in the form of a document attached to the tender document submission including the details as required below.

Details shall include at least the manufacturer and model numbers of the following equipment:

- Engine
- Alternator
- Change-over unit
- Control unit
- Product guarantees.

The tenderers shall provide the full details of the maintenance plan associated with the generator.

The successful tenderer shall supply the following handbooks and drawings:

Engine and Alternator handbooks:

- Service manual
- Spare parts manual
- Spare part list - indicating make, rating etc.

Control cubicle handbooks:

- Description (operating) manual
- Fault-finding manual
- Component lists - indicating make, rating etc.

Drawings:

Wiring and schematic drawing showing detailed circuitry of the following:

- Engine
- Alternator
- AVR
- Control cubicle
- Interfacing between assemblies, sub-assemblies, components, etc.

Each wire, component, terminal, etc. shall be clearly annotated on the drawing for identification and maintenance purposes.

3.3.2 HANDOVER DOCUMENTATION

Upon commissioning and handover, the installer shall submit the following handover documentation to the engineer in both hard copy and DVD soft copy:

- As-built drawings
- Manuals (installation, operation, maintenance)
- Equipment datasheets, certificates and warranty information
- Test certificates
- Training documentation
- Recommended spare parts list
- Inventory of equipment installed, including serial numbers, IP addresses, etc.
- All usernames and passwords required to operate, maintain and configure the system
- Software installation files
- Configuration files and system backups.
- Drawings shall be produced according to SABS or equivalent standards. All drawings shall be made available on CD and hard copy. As a minimum, the following drawings must be included for approval:
    - Wiring diagrams
    - Installation drawings
    - As-built drawings
    - Documentation drawings for maintenance manuals.
- Drawings shall be prepared specifically for this contract and shall not be marked-up drawings.

3.4 Training (Operational And Maintenance)

3.4.1 OPERATING STAFF

Operating staff is defined as the staff that will operate the system as well as nominated representatives from the employer. The training syllabus shall be developed in accordance with the operating manuals. It can be foreseen that the training of the operators will take four hours and will include a written test as well as an individual practical test. This will be in addition to training on the full operating manual.

3.4.2 TRAINING AIDS (EMPLOYER TO PROVIDE OWN TRAINING)

A set of training aids in the form of notes and presentation material shall be provided by the installer.

3.5 Generator Set

3.5.1 ALTERNATOR OUTPUT AND VOLTAGE

A three-phase 415 V outdoor standby diesel generator with a sound attenuation canopy will be provided. The generator will comply with the following provisional specifications:

Rating	:	150 kVA – Prime Rated
Voltage	:	415V 3-phase/240V 1-phase
Power factor	:	≥0.8 Lagging
Frequency	:	50 Hz

3.5.2 AVAILABILITY OF THE SITE

The contractor shall note availability of the site and physical constraints to the position where the unit shall be placed on site, during the site inspection.

3.5.3 ACCOMMODATION

The following accommodation details shall apply:

The unit shall be suitable for outdoor installation.
The complete generating set shall be installed inside a sheet steel weather-proof, sound attenuating canopy to enclose the generating set and mounted to a steel base frame with integral bunded fuel tank.
Suitable cable sleeves shall be provided to accommodate supply cables.
A suitable precast concrete plinth shall be provided minimum of 250mm thick.

3.5.4 WEATHER-PROOF CANOPY

The weather-proof canopy shall be constructed as follows:

The container shall be manufactured from 1.6 mm thick, grade 3CR12 steel and it shall be treated to prevent corrosion.
Suitable hinged access doors shall be provided to allow easy access to items which must be regularly maintained.
All doors must be lockable.
The day tank shall be incorporated within the base frame and be self-bunded.

3.5.5 MANUFACTURING INCLUSIONS

The following shall be included in the manufacturing of the unit:

- Mounting of the canopy over the generator set
- Mounting of an exhaust system detailed under standard exhaust system
- Lagging of exhaust system within the enclosure, where necessary
- Crankcase breather pipe extension to the outside of the canopy
- The control panel and fuel tank shall be mounted inside the canopy
- Suitable provision on the inside to accommodate the tools spares and maintenance manuals and fire extinguisher as specified
- Adequate working drawings indicated all details with regard to the manufacturing of the container shall be submitted to the engineer for approval prior to manufacturing of same.

3.5.6 ENGINE

A water-cooled diesel engine with frame-mounted radiator is required and preferably be of one of the following brands:

- Perkins
- Cummins
- John Deere
- MTU
- CAT
- Scania

3.5.7 ALTERNATOR

The alternator must be a single bearing, self-exited brushless, four pole, 400/230V, 50Hz, 3-phase alternator capable of operating in high humidity conditions (40% - 90%).

Below are the preferred brands of alternators to be used:

- Leroy Somer
- Marathon
- Marelli
- Stamford

The alternator shall be AVR controlled and shall be capable of operating continuously with a load current unbalance between phases of 100% at both unity and 0,8 p.f.

The efficiency of the alternator shall be supplied at a 0.8. p.f.

The voltage shall be maintained to within ± 10 % of nominal voltage over the range from no-load to full-load, at unity and 0,8 p.f. lag inclusive of cold to hot drift and inclusive of engine speed drop up to 4,5%.

3.5.8 MOUNTING

The generator set shall have a duplex steel frame base accommodating the following:

- The engine shall be supported in such a way that the alternator can be removed without the need to temporary support the engine.
- The base construction shall be such that sufficient space exists for draining off the engine oil.
- The base construction shall be such that it will support and hold the enclosure in position during transportation and service on site.
- For skid mounted sets suitable drip trays shall be provided.
- The base of canopy sets shall be completely sealed including the bottom base and a drain-plug provided at its lowest point. A label indicating the drain-plug shall be fitted.

3.5.9 EXHAUST SYSTEM

Residential type silencers shall be used and shall have a catalyst installed.

3.5.10 VENTILATION, COOLING AND HEATING

Adequate in size, acoustic ventilation louvers (inlet and outlet) shall be provided to ensure proper operation of the machines as specified at all times.

Noise generated by the equipment, if measured, 7 m from the generator container, shall not exceed 65dB (A).

Water-cooled diesel engines with frame-mounted pressure-type, reinforced fan-cooled radiators are preferred. Galvanized ducting shall be provided as required.

Heating shall be provided in the water cooling circuit of the engine.

Proper vermin proofing shall be done with the ventilation louvers.

3.5.11 FUEL SYSTEM

Approved tests shall be conducted on all fuel systems and bulk tanks to ensure no leaks occur, and certificates issued to that effect.

Day tanks shall be provided as part of this contract for the new standby generator.

The tank shall have sufficient fuel capacity for at least eight hours of operation under full load.

The tank will be part of the base frame and first fill diesel is to be included.

3.5.12 CONTROL SYSTEM

Except for the activation of heavy current equipment, all control functions must be battery powered:

The respective control systems must be designed to be fail-safe without exception.
Change-over will be timed to allow a maximum of 15 seconds without power, from “lights off” to “lights on”
The controller must be of the *Deep-Sea* type, or similar
The required operational control function of the set must be selectable with a four position selector switch-mounted on the front panel of the control board. The four respective positions of the switch must be clearly labelled as follows:

- OFF AUTO MANUAL TEST

Protection

The control set must be automatically self-protected against damage resulting from abnormal ambient and/or load conditions, failure of components or electrical fault conditions.

3.5.13 VOLTAGE AND FREQUENCY LIMITS

The generator set must automatically take over the supply to the emergency load as soon as the voltage and/or frequency of the mains supply exceed the following limits for longer than the period prescribed:

Mains power supply failure.
Loss of phase.
Voltage: >+ 10% or <- 10% of the nominal no-load voltage for 3 seconds or longer.
Frequency: Less than 48 Hz or more than 52 Hz for 0.1 seconds or longer.

3.5.14 ALARM SIGNAL

The following minimum status/ alarm signal shall be monitored:

STATUS: Mains Failure
STATUS: Mains phase Failure
STATUS: Auto
STATUS: Local
STATUS: Start Fail
STATUS: General Alarm
STATUS: Generator Ready
STATUS: Local Stop
STATUS: Low Oil Pressure
STATUS: Low Radiator

STATUS: General Voltage
STATUS: Generator Speed
STATUS: Generator kW Overload
STATUS: Battery Charge Fail
STATUS: Generator OFF
STATUS: Fuel Tank Level
STATUS: Fuel Tank Alarm
STATUS: Overheating Alarm.

3.5.15 AUTOMATIC TRANSITION TRANSFER SWITCH

The change-over from normal to emergency and back shall be done by means of a motorized change-over system as part of this installation. The manual operation of the change-over by means of a tool is to be made available.

The change-over system shall be accommodated within the enclosure.

3.5.16 DETAILS OF OFFERED GENERATOR

Full details of unit offered in pricing document shall be submitted with pricing document.

Details shall include but will not be limited to:

Name of manufacturer and specification of engine
Name of manufacturer and specification of alternator
Name of manufacture and specification of control unit.

3.5.17 ANCILLARY WORKS

Sleeves shall be provided by the electrical contractor.

3.5.18 DISTRIBUTION BOARDS

A distribution kiosk shall be provided by the electrical contractor.

3.5.19 WIRING INSTALLATION

All external wiring from mains supply to distribution kiosks etc. shall be provided by the electrical contractor.

4. HANDOVER OPERATION AND MAINTENANCE DOCUMENTATION

The contractor shall submit three copies of operation and maintenance manuals to the Engineer.

Manuals shall consist of:

- Comprehensive literature of the different components of the installation.
- Paper prints of all approved drawings and diagrams, where applicable.
- Start-up and shutdown procedures.
- Commissioning data of all equipment in tabulated form.
- Prescriptions for routine tests, which shall be performed by the user together with the time when such tests shall be performed.
- Schedule of apparatus and equipment complete with model numbers, optional extras, modifications, electrical requirements, etc.
- Detailed daily, weekly, monthly, quarterly, bi-annual or annual preventative maintenance procedures where applicable.
- Manufacturer's catalogues.
- List of spares for all equipment.
- Suppliers' telephone numbers and addresses.
- Wiring diagrams.
- Test certificates.

The operation manuals shall be sturdily bound in a strong hard cover. Material in the manual shall be clear, legible, and well-arranged and provided with an index.

The above manuals shall be available three weeks before first handover / practical completion of the installation and no handover shall be considered without these manuals.

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

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

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

5. SCHEDULE OF EQUIPMENT

If the Tenderer is successful, the following materials or equipment is proposed:

ITEM	DESCRIPTION	SUPPLIER	MAKE OR BRAND NAME	MODEL NUMBER
1.	Distribution Boards	……	……	……
2.	Standby Diesel Generator	……	……	……
3.	UPS System	……	……	……
4.	Conduit	……	……	……
5.	Switchgear	……	……	……
6.	Electrical cabling and wire	……	……	……
7.	Conduit boxes	……	……	……
8.	Light Fittings	……	……	……
9.	Light switches	……	……	……
10.	Socket Outlets	……	……	……
11.	Weatherproof Boxes	……	……	……
12.	Isolators	……	……	……

NAME OF TENDERER: ……..

SIGNATURE OF TENDERER: ……..

DATE: ……..

6. PROVISIONAL BILLS OF QUANTITIES

1. The descriptions in the attached bills of quantities shall be read in conjunction with the specification and drawings.
2. The unit rate for each item in the Bills of Quantities shall include for all materials, labour, profit, transport, etc., everything necessary for the execution and complete installation of the work in accordance with the description.
3. The Bills of Quantities shall **not** be used for ordering purposes. The Contractor shall check the lengths of cables and overhead conductors on site before ordering any of the cables. Any allowance for off-cuts shall be made in the unit rates.
4. The rates shall exclude Value Added Tax and the total carried over to the final summary.
5. All material covered by this Specification shall, wherever possible, be of South African manufacture.
6. The priced rates will be deemed to have included any allowance for any conditions of Tender or Contract as laid out in the Note to Tenderers and Principal Agreement Preliminaries.
7. Tenderers must take care to price the Form of Tender exactly as requested on the Form of Tender. Any exclusion may render the submission invalid.

ANNEXURE B: STANDARD ELECTRICAL SPECIFICATIONS

APPENDIX B

STANDARD

ELECTRICAL SPECIFICATIONS

SECTION A: PREAMBLE TO STANDARD SPECIFICATIONS

SECTION B: INSTALLATION SPECIFICATIONS

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DESCRIPTION **PAGE NO**

SECTION A

A.1 PREAMBLE TO STANDARD SPECIFICATION FOR ELECTRICAL INSTALLATIONS

GENERAL

1. INTRODUCTION

(a) These Standard Electrical Specifications cover the general technical requirements for the equipment, materials, installation, testing, commissioning and maintenance of electrical installations for the Employer. These requirements shall be read in conjunction with the Documents as specified below.

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

(c) "Contractor" shall mean the person, partnership, company or firm appointed for the supply, installation, testing, commissioning and maintenance of the electrical installation.

(d) "Employer" shall mean Wits University.

(e) "Engineer" shall mean the authorized representative of the Employer specifically for the electrical works.

2. INSTALLATION WORK

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

(b) The tenderer is also hereby informed that the attached bill of quantities shall be regarded as re-measurable.

3. REGULATIONS

(a) The tenderer is informed that the contractual, site, and commercial conditions falls outside the scope of this document, and it remains the responsibility of the entity responsible for the electrical installation to ascertain these conditions.

4. ARRANGEMENTS WITH THE SUPPLY AUTHORITY

(a) The Contractor shall give all notices required by and pay all necessary fees, including any inspection fees, which may be due to the local supply authority unless specified to the contrary.

(b) It shall be the responsibility of the Contractor to make the necessary arrangements with the local supply authority at his own cost and to supply the labour, equipment and means to inspect, test and commission the installation to the satisfaction of the local and supply authorities.

5. MATERIAL AND EQUIPMENT

(a) All material and equipment shall conform in respect of quality, manufacture, tests, and performance, with the requirements of the South African Bureau of Standards or where no such standards exist, with the relevant current Specification of the British Standards Institution.

(b) All material and equipment shall be of high quality and suitable for the conditions on site. These conditions shall include weather conditions as well as conditions under which materials are installed, stored, and used. Should the materials not be suitable for use under temporary site conditions then the Contractor shall at his own cost provide suitable protection until these unfavourable site conditions cease to exist.

(c) The Contractor shall, where requested to do so, submit samples of equipment and material to the Engineer for approval prior to installation. Samples may be retained in the Engineer's possession until the contract is completed after which they will be returned.

6. CONNECTIONS INVOLVING ALUMINIUM (CABLES AND TRANSFORMERS)

As a result of the fact that aluminium flows when subjected to pressure and electrical connections based on this principle thus loses proper contact during the course of time, it should be noted that bolted connections between aluminium and copper or any other metal is not acceptable.

7. CODES OF PRACTICE OR STANDARD SPECIFICATION

Where reference is made to any code of practice or standard specification in this document, the latest edition or amendment shall be applicable, except where specified to the contrary.

A.2 STANDARD SPECIFICATIONS

STANDARD ELECTRICAL SPECIFICATIONS APPLICABLE TO THIS CONTRACT

- SANS 10400: All parts: The application of the National Building Regulations
- SANS 10142: All parts: The wiring of premises
- All municipal regulations pertaining to building codes, health and safety requirements
- South African Health and Safety Regulations (OSHACT).

SECTION B.1

B.1 INSTALLATION AND TERMINATION OF CONDUITS AND CONDUIT ACCESSORIES

1. GENERAL

1.1 SCOPE

1.1.1 This section covers the installation of conduits and conduit accessories in buildings and other structures under normal environmental conditions and for system voltages up to 600 V.

1.1.2 The following types of conduit installations are included:

(a) Screwed metallic conduit - black enamelled and galvanised.

(b) Plain-end metallic conduit - black enamelled and galvanised.

(c) Non-metallic conduit.

(d) Flexible conduit.

1.1.3 Conduits may be installed as follows:

(a) In open roof spaces.

(b) Cast in concrete.

(c) Surface mounted against walls, concrete slabs, etc.

(d) In wall chases.

1.1.4 Where conduits are to be installed in concrete, this shall be undertaken while the building work is still in progress. Conduits may only be surface mounted where specified or where the Engineer has given written consent.

1.1.5 Under no circumstances will conduit having a wall thickness of less than 1.6mm be allowed in screeding laid on top of concrete slabs.

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

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

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

1.2 OTHER SERVICES

Conduits may not be installed closer than 150 mm to pipes containing gas, steam, hot water or other materials, which may damage the conduits or conductors. Conduits may not touch pipes of other service installations in order to prevent electrolytic corrosion. Where this is unavoidable, cathodic protection shall be provided.

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

2. SCREWED METALLIC CONDUIT

2.1 GENERAL

2.1.1 In general, screwed steel conduit shall be used in the wiring of buildings.

2.1.2 The installation shall comply with SANS 10142.

2.2 GALVANISED CONDUIT

Galvanised conduit and accessories shall be used in the following:

(a) In damp areas.
(b) In areas exposed to the weather.
(c) For all installations within 50 km of the coast.
(d) In plenum chambers containing humidifying equipment.
(e) For surface mounted conduit installations in kitchens and boiler rooms.
(f) In screeds resting directly on soil.
(g) For connection points to future installations.
(h) For underground conduits containing earthing conductors.
(I) In buildings where animals are housed such as cattle, sheep, dogs, etc.

2.3 TERMINATIONS

2.3.1 Spouted Connections.

Conduits shall be connected directly to draw-boxes with spouted connections. Conduits shall be screwed tightly home and no threads shall be visible.

2.3.2 Switchboards, Power skirting, etc.

Conduits shall be terminated by means of a brass female bush and two locknuts in pressed steel switchboards and distribution boxes, cable ducts, power skirting, etc. The conduit end shall only project far enough through the entry hole to accommodate the bush and locknut. Alternatively the method detailed in 2.3.3 may be used.

2.3.3 Draw-boxes.

A female bush and two locknuts shall be used to terminate conduits at draw-boxes and outlet boxes without spouts, should there be sufficient room in the box. Where there is insufficient room,

a coupling, brass male bush and locknut may be used with sufficient allowance for the reduction of the internal diameter by the male bush.

2.3.4 Holes.

Holes to accommodate brass bushes shall be large enough to accommodate the bush with a minimum of clearance.

2.3.5 Bush-nuts.

Bush-nuts for the connection of earth conductors to conduits are not acceptable.

2.4 SCREWS, BOLTS AND NUTS

Steel locknuts of thick gauge steel with milled sides shall be used in all cases. Cadmium-plated bolts and nuts shall be used except where the installation is exposed to the weather in which case brass bolts and nuts shall be used. Screws shall be installed in all tapped holes in fittings and accessories to prevent damage to the screw thread by concrete or plaster. The screws shall be screwed completely down to prevent damage to the thread on the screw.

2.5 CONDUIT ENDS

Conduit ends shall be cut at right angles to ensure that ends butt squarely at joints. Threads shall not be visible at joints and connections except at running joints. The total length of the thread on the two conduit ends shall not exceed the length of the coupling.

2.6 JOINTS

All conduit ends shall be reamed and all joints tightly screwed. Only approved couplings shall be used. Running joints with long threads shall be kept to a minimum and locknuts shall be provided to ensure a strong mechanical and a continuous electrical joint. Running joints in screwed conduits 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.

2.7 FINISH

All joints shall be painted with red lead to prevent them from rusting in damp areas, areas within 50 km of the coast and in cases where the installation is exposed to the weather for any length of time. Where the galvanising or black paint has been damaged, the area shall first be cleaned and a coat of zinc base paint applied subsequently. Additional coats of paint shall only be applied after the undercoat has completely dried. All surface mounted non-galvanised metallic conduits must be painted. (Refer to par. 8.8 of Section B1).

2.8 CONTINUITY

Mechanical and electrical continuity shall be maintained throughout the conduit installation.

3. PLAIN-END METALLIC CONDUIT

As an alternative to the screwed conduit, plain-end conduits complying with the relevant SANS codes may be installed subject to the following additional conditions:

3.1 Bending and setting of plain-end conduits must be done with special benders and apparatus manufactured for this purpose and which are obtainable from the suppliers of the system. Damaged conduits resulting from the use of incorrect bending apparatus shall be completely removed and any wiring already drawn into such damaged conduits shall be completely renewed at the Contractor's expense.

3.2 Screwed conduits must be used in the following instances:

(a) In flameproof installations.
(b) Load bearing conduit.
(c) For the suspension of luminaries.
(d) Surface mounted conduit.

3.3 Plain-end conduits and associated accessories shall be manufactured of mild steel having a minimum thickness of 1.2 mm and shall comply with SANS 1065. Conduit manufactured of lighter gauge material, i.e. 0.97 mm, will not be permitted.

3.4 All conduit and accessories used in areas within 50 km of the coast shall be hot-dip galvanised to SANS 32 and 121. In inland areas electro-galvanised or cadmium-plated accessories will be accepted.

4. NON-METALLIC CONDUIT

4.1 INSTALLATION CONDITIONS

Where specified for a particular service, non-metallic conduits may be installed under the following conditions:

4.1.1 All non-metallic conduits shall comply fully with SANS 950 and shall be installed in accordance with Appendix C of the same specification as well as SANS 10142.

4.1.2 Insulated heat-resistant boxes shall be used for outlets of totally enclosed luminaries and other fittings where excessive temperatures are likely to occur.

4.1.3 Luminaries and other fittings shall not be supported by non-metallic conduits or conduit boxes. These fittings shall be secured to the surrounding structure in a way that is acceptable to the Engineer. Refer to the specification for "INSTALLATION OF LUMINAIRES", Section B9.

4.1.4 The conduit shall be supported and fixed with saddles with a maximum spacing of 1 m, even in roof spaces. (Refer to SANS 10142.) The Contractor shall supply and install all additional supporting timbers required.

4.1.5 It shall be possible to rewire the completed installation in the future without undue difficulty.

4.1.6 Non-metallic conduits and fittings shall not be used under the following conditions:

(a) Outside a building (unless protected, or sheltered under eaves).

(b) For mechanical load bearing.

(c) Where they may be subjected to temperatures below -10°C or above 70°C for prolonged periods.

(d) As primary electrical insulation.

(e) In areas where they may be subject to mechanical damage.

(f) For applications other than those for which they are designed.

(g) In concrete slab unless specified to the contrary.

4.2 PAINTING OF CONDUITS

Exposed conduit may be painted with normal oil or PVA paints, but care must be taken to ensure that the paint used does not contain any component that will soften or have any other detrimental effect on the materials from which the conduit and fittings are manufactured.

4.3 CONNECTING OF CONDUIT TO METAL EQUIPMENT/COMPONENTS

When any part of a non-metallic conduit system has to be connected to metal equipment or components (e.g. switchboard, surface socket-outlet or switch box, existing metallic conduit system, etc.) fittings and joints manufactured specifically for this purpose must be used. Non-metallic conduit must not be threaded to fit metallic connectors.

4.4 BENDS

In conduits of nominal size, not exceeding 25 mm, bends may be made in accordance with par. 4.5. In all other cases bends must be achieved by the use of accessories that are introduced into the conduit run. Bends shall comply with SANS 10142.

4.5 Bending

Conduit of nominal size up to and including 25mm may be cold bent by hand provided that the radius of the bend is greater than six times the nominal size of the conduit, and that the external angle of the bend does not exceed 90°. The procedure (which involves the use of a bending spring) should be as follows:

(a) Determine the angle through which the conduit is to be bent.

(b) Warm the cold conduit over the length to be bent by rubbing with hands.

(c) Select a bending spring which matches the conduit size and insert in to the conduit at the point where the bend is required.

(d) Bend the conduit slowly with one motion (either with the hands alone approximately 1 m apart, or across the knee) to double the required angle, release the conduit and, when its position is stable, withdraw the bending spring (turning it in an anti-clockwise direction to reduce its diameter) and gently correct the angle.

(e) Install and secure the conduit immediately following bending.

4.6 ADHESIVE JOINTS

All adhesive joints must be made in a clean dry area. The surfaces of all components to be bonded must be dry and clean.

The insertion depth should be marked on the conduit end and the adhesive applied (by means of a soft clean brush) as quickly as possible to the surfaces to be bonded by brushing lengthwise along the conduit, ensuring that a thin coating of uniform thickness is formed. The joint must be made immediately after the application of the adhesive by pushing the prepared parts squarely together with a twisting motion to the full insertion depth. Care must be taken to avoid squeezing adhesive into the cableway and all excess adhesive must be wiped off.

NOTE: Solvent adhesives contain highly volatile liquids and their containers should not be left open.

4.7 Cutting

A fine-tooth hacksaw should be used to cut conduits to the required length. Each cut end should be square and free from swarf, burrs and loose material. When determining the length of conduit to be cut, allowance must be made for the length of couplings or accessories attached to the conduit. Incorrect determination will cause bulging of the conduit or insufficient joint length.

5. FLEXIBLE CONDUIT

5.1 In installations where the equipment has to be moved frequently to enable adjustment during normal operation, for the connection of motors or any other vibrating equipment, for the connection of thermostats and sensors on equipment, for stove connections and where otherwise required by the Department, flexible conduit shall be used for the final connection to the equipment.

5.2 The installation shall comply with SANS 10142.

5.3 Flexible conduit shall preferably be connected to the remainder of the installation by means of a draw-box. The flexible conduit may be connected directly to the end of a conduit if an existing draw-box is available within 2 m of the junction and if the flexible conduit can easily be rewired.

5.4 Flexible conduits shall consist of metal-reinforced plastic conduits or PVC-covered metal conduits with an internal diameter of at least 15mm, unless approved to the contrary. In false ceiling voids, flexible conduits of galvanised steel construction may be used. Connectors for coupling to the flexible conduit shall be of the gland or screw-in type, manufactured of either brass or mild steel plated with either zinc or cadmium.

6. INSTALLATION REQUIREMENTS

6.1 POSITIONS OF OUTLETS

All accessories such as boxes for socket-outlets, switches, lights, etc. shall be accurately positioned. It is the responsibility of the Contractor to ensure that all outlets are installed level and square, at the correct height from the floor, ceiling or roof level and in the correct position relative to building lines and equipment positions as specified. It shall be the responsibility of the Contractor to determine the correct final floor, ceiling and roof levels in conjunction with the Main Contractor. Draw-boxes shall not be installed in positions where they will be inaccessible after completion of the installation. Draw-boxes shall be installed in inconspicuous positions to the approval of the Engineer and shall be indicated on the "as built" drawings.

6.2 COVER PLATES

All draw-boxes and outlets shall be fitted with cover plates, either as part of the switch or socket assembly or with blank cover plates if unused. Blank cover plates shall match other cover plates in the same area. Flush mounted cover plates in both ceilings and walls shall overlap the draw-box and edges of the recess. If the fixing lugs are substantially deeper than the finished wall surfaces, suitable coiled steel wire or tubes shall be used as spacers.

6.3 DRAW-WIRES

Galvanised steel draw-wires shall be installed in all unwired conduits e.g. conduits for future extensions, telephone installations and other services.

6.4 BENDS

A maximum of two 90 bends or the equivalent displacement will be allowed between outlets and/or boxes.

Draw-boxes shall be installed at maximum intervals of 15 m in straight runs. All bends shall be made without heating the conduit or without reducing the diameter of the conduit. The inside radius of a bend shall not be less than five times the outside diameter of the conduit. (Refer to SANS 10142,

6.5 WALL SOCKET-OUTLETS

Where more than one socket-outlet is connected to the same circuit, the conduit shall be looped from one outlet box to the following on the same circuit. Where a metal channel is used, the conduit may be installed from the channel directly to the outlet box on condition that the conductors can be looped from one outlet to the next without making any joints in the wires.

6.6 LUMINAIRES

Where the conduit end is used to support luminaries, a ball-and socket type lid shall be fitted to the pendant box in all cases where the conduit is longer than 500 mm. In all other cases a dome lid may be used. Where luminaries are specified which are fixed directly to the pendant box, the pendant box shall be fixed independently of the conduit installation except where the pendant box is cast into concrete.

6.7 FLUSH MOUNTED OUTLET BOXES

The edges of flush mounted outlet boxes shall not be deeper than 10 mm from the final surface. Spacer springs shall be used under screws where necessary.

6.8 EXCESS HOLES

All excess holes in draw-boxes or other conduit accessories shall be securely blanked off by means of brass plugs to render the installation vermin proof.

6.9 DEBRIS

Care shall be taken to prevent debris or moisture from entering conduits during and after installation. Conduit ends shall be sealed by means of a solid plug which shall be screwed to the conduit end. Conduits shall be cleaned and swabbed to remove oil, moisture or other debris that may be present before conductors are installed. Swabs shall not be attached to the conductors.

6.10 Defects

Each length of conduit shall be inspected for defects and all burrs shall be removed. All conduits that are split, dented or otherwise damaged or any conduits with sharp internal edges shall be removed from site. The Contractor shall ensure that conduits are not blocked.

6.11 WITHDRAWAL OF CONDUCTORS

To ensure that all electrical conductors are easily withdrawable from conduits and to ensure that there are no joints in the conductors, the Engineer will have the right to have the conductors of any circuit removed at his discretion. If the conductors are found to be in a satisfactory condition after having been withdrawn, the Department shall bear the cost of withdrawing and re-installing such conductors. If the conductors are found to have been damaged during installation or removal or if joints are found, they shall be replaced and the cost shall be borne by the Contractor.

7. INSTALLATION IN CONCRETE

7.1 TIMEOUS INSTALLATION

In order not to delay building operations, the Contractor shall ensure that all conduits and accessories which are to be cast in concrete are placed in position in good time. The Contractor or his representative shall be in attendance when the concrete is cast.

7.2 DRAW-BOXES

Draw-boxes, expansion joints and round ceiling boxes shall be installed where required and shall be neatly finished to match the finished slab and wall surfaces. Ceiling draw-boxes shall be of the deep type. In hollow block slabs, rear-entry draw-boxes shall be used. In columns where flush mounted draw-boxes are installed, the conduits shall be offset from the surface of the column immediately after leaving the draw-box.

7.3 ELBOWS

Elbows for conduits of 32mm dia. and smaller and sharp bends will not be allowed in concrete slabs.

7.4 COVER PLATES

Draw-boxes and/or inspection boxes shall, where possible, be grouped together under a common approved cover plate, and must preferably installed in passages or male toilets. The cover plate shall be secured by means of screws.

7.5 NEUTRAL AXIS

All conduits shall be installed as close as possible to the neutral axis of concrete beams, slabs and columns. The conduits shall be rigidly secured to the reinforcing to prevent movement towards the surface of the concrete.

7.6 FIXING TO THE SHUTTERING

All conduits, draw-boxes etc. shall be securely fixed to the shuttering to prevent displacement when concrete is cast. Draw-boxes and outlet boxes shall preferably be secured by means of a bolt and nut installed from the back of the box through the shuttering. Fixing lugs may also be used to screw the boxes

to the shuttering. Wire will not be accepted for securing boxes to the shuttering where off-shutter finishes are required. Where fibreglass shuttering is used by the Builder, the equipment shall be fixed to the steel only and no holes shall be drilled or made in shuttering. All draw-boxes and outlet boxes shall be plugged with wet paper before they are secured to the shuttering.

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

7.7 CONCRETE FLOOR SLABS

Conduits will not be allowed in concrete floor slabs of boiler rooms (or boiler houses), laundries or other damp areas. All socket outlets and three phase outlets in damp areas shall be supplied from above with galvanised conduit and accessories.

7.8 EXPANSION JOINTS

As far as possible, conduits shall not be installed across expansion joints. Where this is unavoidable a conduit expansion joint shall be provided. (Refer to par. 10)

7.9 SCREEDS

The installation of conduits in floor screeds shall be kept to a minimum. Where conduits are installed in screeds, the top of the conduit shall be at least 20 mm below the surface of the screed. Where the screed is laid directly on the ground, galvanised conduits shall be used. This ruling will always be applicable to the lowest floor of a building. A minimum distance of twice the outside diameter of the conduit shall be left free between adjoining conduits. Conduits shall be secured to the concrete slab at intervals not exceeding 2 m. The Contractor shall ensure that conduits are not visible above the screed where the conduits leave the screed.

7.10 INSPECTION

All draw-boxes, conduits, etc. which are installed in concrete shall be cleaned with compressed air and provided with draw-wires two days after removal of the shuttering. Errors that occurred during the installation of the conduits, or any lost draw-boxes, or blocked conduits shall be immediately reported to the Engineer by telephone and confirmed in writing in order that an alternative route can be planned and approved by the Engineer before the additional concrete is cast. Any additional cost shall be for the Contractor's account.

8. SURFACE INSTALLATIONS AND INSTALLATIONS IN ROOF SPACES

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

8.1 APPEARANCE

(a) All conduits shall be installed horizontally or vertically as determined by the route and the Contractor shall take all measures to ensure a neat installation.

(b) Where conduits are to be installed directly alongside door frames, beams, etc. that are not true, conduits shall be installed parallel to the frames, beams, etc.

(c) All labels shall be removed from surface mounted conduit.

8.2 SADDLES

Conduits shall be firmly secured by means of saddles and screws and in accordance with SANS 10142. Where saddles are used to secure vertical lengths of conduit connected to surface mounted switch boxes or socket outlet boxes, the saddles shall be spaced so that the intervals between the box and the first saddle, between any two successive saddles and between the last saddle and the ceiling or roof are equidistant. Conduits shall be secured within 150 mm before and after each 90° bend and within 100mm of each outlet box.

8.3 JOINTS

Joints will only be allowed in surface conduit lengths exceeding 3.5 m. Threads shall not be visible at joints of completed installations, except where running joints are used. Running joints will be allowed only when absolutely necessary. All running joints shall be provided with locknuts and shall be painted with red lead immediately after installation.

8.4 ACCESSORIES

Inspection bends or tee pieces shall not be used. Non-inspection type bends may be used in the case of 32mm or 50 mm diameter conduits. All draw-boxes supporting luminaries or other equipment shall be fixed independently of the conduit installation.

8.5 OFFSETS

Where an offset is required at conduit terminations or crossovers, the conduit shall be saddled at the offset.

8.6 CROSS-OVER

Conduit routes shall be carefully planned to avoid crossovers. Where a crossover is inevitable, one conduit only shall be offset to cross the other. Crossovers shall be as short as possible and shall be uniform. Alternatively, crossovers shall be installed in purpose-made boxes. This method shall be employed on face brick walls and in other circumstances where required by the Engineer.

8.7 PARALLEL CONDUIT

Parallel conduit runs shall be equidistant and saddles shall be installed in line. Alternatively, a special clamp may be used to secure all conduits in unison. In the case of conduits of different diameters, the latter method shall only be used if a purpose-made clamp designed to accommodate the various conduit sizes, is provided.

8.8 PAINTING OF CONDUIT

All surface mounted conduits and accessories shall be painted with two coats of high quality enamel paint or as otherwise specified. The colour shall comply with the colour code specified for the installation or where no code has been specified, shall match the colour of the surrounding finishes.

8.9 CONDUIT IN ROOF SPACES

8.9.1 In open roof spaces (no ceiling) conduits shall run along the wall plates and the rafters. The installation of conduits suspended between the rafters is not acceptable.

8.9.2 Conduit in roof spaces shall be installed parallel or at right angles to the roof members and shall be secured at intervals not exceeding 1.5 m by means of saddles screwed to the roof timbers for metallic conduit and 1m for non-metallic conduit.

8.9.3 Nails or crampets will not be allowed.

8.9.4 Under flat roofs in false ceilings or where there is less than 900 mm clearance, or in instances where the ceilings are insulated with glass-wool or other insulating material impeding access, the conduit shall be installed in a manner which allows for wiring from below the ceilings.

8.9.5 Conduit runs from switchboards shall terminate in fabricated sheet steel draw-boxes installed directly above or in close proximity to the boards. Refer to the specification for "CONNECTIONS TO SWITCHBOARDS", par. 2 of section B10.

8.9.6 Spare conduits covering the total number of spare ways on switchboards, shall be provided between the boards and the roof draw-box.

8.9.7 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.

8.10 FIXING TO WALLS

Only approved plugging materials such as aluminium inserts, fibre plugs or plastic plugs, etc., and round-head screws shall be used when fixing saddles, switches, plugs etc. to walls. Wood plugs are not acceptable nor should plugs be installed in joints in brick walls.

9. FUTURE EXTENSIONS

9.1 OPEN ROOF SPACES

Conduits intended for future switches and socket outlets, shall terminate 40 mm above the tie beams in roof spaces with more than 900 mm free space. The conduit ends shall be threaded and fitted with a coupling and brass plug.

9.2 CONCRETE SLABS

Conduit ends shall protrude 150 mm from the concrete to facilitate the installation of future extensions above, below or to the side of the concrete slabs. All these conduits shall be connected to a draw-box, which is cast into the concrete within 2 m of the end of the concrete. Conduit ends shall be threaded and fitted with a coupling and brass plug. In cases where holes cannot be drilled through the shuttering to accommodate the conduit end, a deep draw-box with rear entry may be placed over the conduit end.

9.3 COVER PLATES

Unused boxes for switches and socket-outlets shall be covered with metal cover plates. Unused boxes for luminaries shall be covered with round galvanised metal cover plates, which fit tightly against the finished surface. The cover plate shall overlap the outlet box and recess.

9.4 GALVANISED CONDUIT

Galvanised conduit shall be installed at all free ends intended for future extensions. The conduit shall be treated with a paint, which will prevent corrosion and white rust.

10. EXPANSION JOINTS

10.1 Where conduits cross expansion joints in the structure, approved draw-boxes which provide a flexible connection in the conduit installation shall be installed.

10.2 The draw-box shall be installed adjacent to the expansion joint of the structure and a conduit sleeve, one size larger than that specified for the circuit, shall be provided on the side of the draw-box nearest the joint. The one end of the sleeve shall terminate at the edge of the joint and the other shall be secured to the draw-box by means of locknuts.

10.3 The circuit conduit passing through the sleeve shall be terminated 40 mm inside the draw-box and in the case of metallic conduit; the conduit end shall be fitted with a brass bush. The gap between the sleeve and the conduit at the joint shall be sealed with 'Pratley Tic-Tac' or equal sealing compound, to prevent the ingress of wet cement. In the case of metallic conduit, an earth clip shall be fitted to the conduit projection inside the draw-box and the conduit bonded to the box by means of 2.5mm2 bare copper earth wire and a brass bolt and nut.

10.4 The end of the other circuit conduit shall be secured to the draw-box by means of locknuts and a brass bush in the case of screwed metallic conduit or a standard bushed adaptor for other conduit types.

10.5 In the case of metallic conduit, a 2.5mm^2 bare copper wire shall be installed between the first conduit boxes on either side of the joint, in addition to an earth wire, which may be specified for the circuit. The conduit boxes shall be drilled and tapped and the earth wire shall be bonded to the boxes by means of lugs and brass screws.

10.6 Suitable steel cover plates shall be screwed to draw-boxes installed along the expansion joint. The cover plates shall be installed before the ceilings are painted.

10.7 Where a number of conduits are installed in parallel they shall cross the expansion joint of the structure via a single draw-box. A number of draw-boxes adjacent to each other will not be allowed.

11. CHASES AND BUILDER'S WORK

11.1 Except where otherwise specified the Builder or Main Contractor shall be responsible for the builder's work related to the installation of conduits, outlet boxes, switchboard trays, bonding trays and other wall outlet boxes and will undertake the necessary chasing and cutting of walls and the provision of openings in ceilings and floors for luminaries and other electrical outlets. The Contractor shall notify the Builder or Main Contractor of his requirements and the responsibility lies with the Contractor to ensure that all builders' work is clearly indicated or marked in accordance with his requirements.

11.2 Electrical materials to be built in must be supplied, placed and fixed in position by the Contractor when required to do so by the Builder or Main Contractor. The Contractor shall also ensure that these materials are installed in the correct positions.

11.3 Where no Builder or Main Contractor is available, the Contractor must provide all chases and is required to cover conduits installed in chases by a layer of 4:1 mixture of coarse sand and cement, finished 6 mm below the face of the plaster and roughened. Chases shall be deep enough to ensure that the top of conduits are at least 12 mm below the finished surface of the plaster.

11.4 Where the Contractor is responsible for the cutting of chases or the building in of conduits and other equipment, he will be held responsible for all damage as a result of this work and will be required to make good to the satisfaction of the Engineer.

This ruling is particularly applicable but not exclusively to the rewiring and renewal of existing installations. Chases shall be made by means of a cutting machine.

11.5 Under no circumstances shall face brick walls or finished surfaces be chased or cut without the written permission of the Engineer. Where it is necessary to cut or drill holes in the concrete structure, the prior permission of the Engineer shall be obtained.

SECTION B2

B2. INSTALLATION OF WIRING CHANNELS, UNDERFLOOR DUCTING AND POWER SKIRTING

1. RESPONSIBILITY OF THE CONTRACTOR

The Contractor shall supply and install all wiring channels, underfloor ducting and power skirting as specified or as required for the cable, socket outlet and wiring installation including the necessary supports, hangers, fixing materials, bends, angles, junctions, T-pieces, etc. He shall further liaise with the Main contractor to verify the position of holes and access routes through the structure and finishes.

2. WIRING CHANNELS

2.1 FIXING

The Contractor shall supply and install all hangers, supports or fixings for the channels. Channels up to and including 76 x 76 mm shall be supported at maximum intervals of 600 mm and larger channels at maximum intervals of 1 m. Channel runs shall be carefully planned to avoid clashes with other services and to ensure that all covers can be removed after completion of the entire installation. Purpose made clamps, hangers, etc. shall be used as required. Where it is not possible to support the channels at the specified intervals, they shall be supported in a sound manner to the satisfaction of the Engineer.

2.2 INSTALLATION IN CONCRETE

Where channels are cast into concrete, the insert type shall be used. Additional spacer blocks shall be used where necessary to prevent ducts from being deformed while the concrete is cast. Channels shall be filled with polystyrene or other suitable fillers to prevent the ingress of concrete and shall be securely fixed in position to the shuttering.

2.3 COVER PLATES

All channels up to and including 127mm width shall have snap-in cover plates of metal or PVC. Cover plates for wider channels shall be of metal and shall be fixed by means of screws at suitable intervals to prevent warping. Cover plates shall be installed over the full length of the channels. Flush mounted wiring channels shall be fitted with overlapping metal cover plates with plastic edge trim to cover irregularities in the wall recess.

2.4 JOINTS

Adjoining lengths shall be aligned and securely joined by means of fishplates fixed by mushroom bolts, washers and nuts or connection pieces that are pop-riveted to both adjoining sections. All adjoining sections shall be rectangular and shall butt tightly. Covers shall fit tightly across the joints.

Where channels cross expansion joints in the structure, suitable expansion joints shall be provided in the channels by means of fishplates pop-riveted or screwed to the channel on one side of the expansion joint and floating freely in the channel on the other side of the expansion joint.

2.5 SUPPORT FOR CONDUCTORS

All conductors in inverted cable channels shall be retained by means of metal clips or metal spacer bars at not more than 1m centres. Where vertical duct lengths exceed 5m, conductors installed in the channels shall be secured at intervals not exceeding 5m to support the weight of the conductors. Clamps shall be provided in suitable draw-boxes for this purpose.

2.6 CONDUIT CONNECTIONS

Conduit connections shall be terminated by means of two locknuts and a brass female bush. Where the channel is wide enough, conduit connections may be made by means of a conduit box and hole through the back or side of the channel. All holes through which conductors pass shall be fitted with bushes or grommets or shall be sleeved.

2.7 INTERNAL FINISHES

Bends and T-joints shall be constructed to ensure compliance with the allowable bending radii specified in SANS 10142, Appendix D in the case of PVC-insulated cables and conductors and shall comply with the relevant specification in the case of other cables. Burrs and sharp edges shall be removed and the inside edges of the joints shall be lined with rubber cement or other suitable rubberised or plastic compound to prevent laceration of the conductor insulation.

2.8 VERMIN PROOFING

All cable channels shall be vermin proofed after installation. Holes shall be covered by means of screwed metal plugs or by means of metal strips, which are bolted, or pop-riveted to the channel. Wooden or other plugs which are driven into holes or other temporary plugs or covers are not acceptable.

2.9 SERVICES

Multiple duct runs or internal metal partitions shall be used where conductors for power, control, communication and other services are present.

3. UNDERFLOOR DUCTING

3.1 GENERAL

3.1.1 Two or three compartment underfloor ducting as specified shall be supplied and installed in the positions and according to the layouts indicated on the drawings.

3.1.2 Three compartment ducting shall have a cross-section of approximately 200 x 32mm, subdivided into three approximately equal compartments, of which the centre compartment shall be used for electrical power distribution with the two outer compartments for telephone and other light current services respectively.

3.1.3 Unless specified to the contrary in the Detail Electrical Technical Specification or on the drawings, each compartment shall be provided with openings (occurring in line) at 1.5 m centres to permit installation of pedestals or recessed outlets in accordance with the design of the system. The openings shall have removable, flush, cover plates and shall have prepared fixing holes for future installation of pedestals or recessed outlets. The centre of the openings shall be offset a distance of 200 mm from the building nodule lines.

3.2 JUNCTIONS

The underfloor ducting installation shall be provided with flush cross-over, T-junction and right angle bend draw-boxes installed in the runs of ducting, generally as indicated on the drawings. The junction boxes shall be complete with cross-over of services. The junction boxes shall have nominal 300 x 300mm removable cover plates secured by means of four countersunk screws.

3.3 PEDESTAL UNITS

Where the system accommodates floor pedestal units, these shall consist of pressed steel or die cast aluminium units, suitable for either two or three services, as specified in the Detail Electrical Technical Specification. Where the pedestals are installed on vinyl tiled or similar floors which will be subject to washing, a matching waterproofing gasket shall be supplied below each pedestal to render the junction waterproof.

3.4 INSTALLATION

The underfloor ducting, junction boxes, pedestals, outlets and other accessories shall be installed strictly in accordance with the manufacturer's instructions and according to the following procedure:

a) The underfloor ducting shall be installed on a mortar bed, provided by the Plasterer for purposes of levelling the channel to the final floor screed level. The Contractor shall assist the Plasterer in marking out the layout of the ducting to enable the mortar bed to be laid. Final height of the underfloor ducting shall be determined in close liaison with the Builder.

b) After installation of the mortar bed, the components of the underfloor ducting shall be assembled and installed by the Contractor, following which the screeding will be completed.

3.5 TERMINATIONS

Up bends manufactured by the supplier of the underfloor ducting shall be supplied and installed wherever the ducting is terminated at a switchboard, telephone duct or telephone distribution box or where the ducting terminates behind power skirting.

3.6 WIRING

3.6.1 Power circuit wiring shall be installed in the centre compartment of the underfloor ducting. Sufficient slack shall be provided to allow for the installation of a floor pedestal outlet at each opening in the ducting, whether an outlet is specified at that position or not. This provision shall take the form of loops in the wiring, including the earth wire, wherever the openings occur. The loops shall be pushed back into the channel and the cover plates replaced. In the instances where pedestals/outlets are not installed, these provisions shall of necessity only be made for the area covered by the circuit and not for the run from the switchboard.

3.6.2 The entire underfloor ducting installation shall be effectively earthed and bonded together.

3.6.3 Galvanised draw-wires shall be supplied and installed along the entire length of the telephone and light current service compartments of the underfloor ducting. The draw-wires shall be interrupted at the junction boxes, with enough slack left coiled up to facilitate the drawing in of cables by others.

3.7 EXPANSION JOINTS

Where expansion joints in the buildings are crossed by underfloor ducting, expansion joints shall be provided as detailed in par. 2.4 of this section.

4. POWER SKIRTING

4.1 GENERAL

4.1.1 Two or three compartment power skirting as specified shall be supplied and installed in the positions and according to the layouts indicated on the drawings.

4.1.2 The top compartment shall be used for power wiring and switched socket outlets, whilst the bottom compartments shall be for telephone and other light current services.

4.2 MODULE

4.2.1 The power skirting shall be manufactured from 1mm (minimum) thick sheet steel or aluminium (as specified) in approximately 2.5m lengths.

4.2.2 The covers shall be manufactured in modular lengths, as specified in the Detail Electrical Technical Specification or otherwise in 1 m lengths and shall be secured to the wall channel by means of toggle or swivel nuts. Snap-in covers are also acceptable.

4.2.3 At the building module lines, covers of specified length or otherwise in 250 mm lengths shall be installed, against which partition walls may be installed, thereby trapping these covers. The removable modular covers shall be installed between these "fixed" covers.

4.2.4 Each modular cover associated with the power compartment shall be punched and prepared for the installation of either a 13A or a 16A, 3-pin standard flush switched socket outlet, whether any is specified or indicated for that module or not. Where socket outlets are not installed, the punched holes shall be blanked off with a metal blanking plate, painted the same colour as the power skirting and installed at the back of the covers. These blanking plates shall be easily removable to permit future installation of socket outlets.

4.2.5 Unless otherwise specified, no provision shall be made on the covers of the telephone or light current services compartments for the installation of sockets.

4.2.6 Factory-made end covers shall be installed at the ends of all runs of power skirting. All internal and external bends or offsets shall be factory-made and shall be installed to provide a neat and workmanlike appearance.

4.3 PAINTING

The power skirting shall be painted in a colour as specified in the Detail Electrical Technical Specification. The painting of steel power skirting shall comply with the relevant SANS codes. Aluminium power skirting shall be anodised. The power skirting channels and covers shall be individually wrapped or packed to protect them against damage in transit and before installation.

4.4 SOCKET-OUTLETS

4.4.1 Standard 13 A or 16 A, 3-pin flush switched socket outlets (100 x 50 mm nominal size) shall be supplied and installed in the positions indicated on the drawings and as specified in the Detail Electrical Technical Specification.

4.4.2 The switched socket outlets shall be secured to the channel by means of suitable brackets.

4.4.3 After installation of the modular front covers, they shall be screwed to the socket outlets to ensure proper alignment between the two components. Separate standard covers need not be provided for the socket outlets.

4.5 CONDUIT FEEDERS

4.5.1 Conduits for the circuit wiring to the power skirting shall be installed in the floor slab and shall terminate in flush conduit or boxes, behind the power skirting and installed to match the height of the power, telephone and light current services compartments of the skirting.

4.5.2 The wiring/cables shall pass through large diameter holes cut in the rear of the power skirting. The holes shall be suitably bushed or trimmed to prevent damage to the wiring or cables.

4.5.3 Alternatively conduits feeding to the telephone compartment may be terminated in boxes facing upwards in the floor slab immediately below the power skirting, with suitable bushed or trimmed openings being provided through the bottom of the power skirting duct for the cables to pass through. (Applicable only where the power skirting occurs at floor level).

4.6 POWER SKIRTING AT DOORWAYS

Where a section of power skirting is interrupted by a doorway, bridging conduits shall be installed to interconnect the power skirting sections. Where conduits are not specifically indicated, a minimum of 1 x 32mm bridging conduit shall be installed for each of the power, light current and telephone compartments.

4.7 CLEANING

Prior to fitting front covers, the power skirting shall be thoroughly cleaned to remove all dust and rubble and damage to paintwork where this has occurred, shall be repaired.

SECTION B3

B.3 INSTALLATION OF CABLE TRAYS AND LADDERS

1. GENERAL

Cable trays and cable ladders complying with the relevant SANS codes shall be supplied and installed where specified and/or where generally suitable for cable distribution.

2. RESPONSIBILITY OF THE CONTRACTOR

The Contractor shall supply and install all cable trays and/or ladders as specified or as required by the cable routes including the necessary supports, clamps, hangers, fixing materials, bends, angles, junctions, reducers, T-pieces etc. He shall further liaise with the Main Contractor for the provision of holes and access through the structure and finishes.

3. SUPPORTS

Cable tray supports shall consist of two steel hangar rods, at least 8mm in diameter, on both sides of the tray with a substantial steel cross-member on the underside of the tray and bolted to the rods. Alternatively, cable trays may be cantilevered from walls on suitable brackets.

4. SPACING OF HORIZONTAL SUPPORTS

4.1 Horizontal trays shall be supported at the following maximum intervals:

(a) 1.2 mm to 1.6 mm thick metal with 12 mm to 19 mm return trays.
-1 m maximum spacing

(b) 2.5 mm thick metal trays with 76 mm return
-1.5 m spacing.

(c) Cable ladders with 76mm side rail of 2mm thickness and with cross rungs.
-1.5 m spacing

(d) Metal cable ladders other than c) above, including site manufactured angle iron types
-1 m spacing

(e) 3 mm thick PVC trays with 40mm return.
-1 m maximum spacing

(f) 4 mm thick PVC trays with 60mm return
-1.5 m maximum spacing

4.2 In addition to the above spacing on the longitudinal run, trays and ladders shall be supported at each bend, offset and T-junction.

5. JOINTS

5.1 Joints shall be smooth and without projections or rough edges that may damage the cables. The Contractor will be required to cover joints with rubber cement or other non-hardening rubberised or plastic compounds if in the opinion of the Engineer joints may damage cables.

5.2 Joints shall as far as possible be arranged to fall on supports. Where joints do not coincide with supports, joints shall be made by means of wrap-around splices of the same material as the tray and at least 450mm long. The two cable tray ends shall butt tightly at the centre of the splice and the splice shall be bolted to each cable tray by means of at least eight round head bolts, nuts and washers. Splices shall have the same finish as the rest of the tray.

5.3 Splices as described above shall be provided at joints, which do coincide with supports if the loaded tray sags adjacent to the joint due to the interruption of the bending moment in the tray.

6. FIXING TO SUPPORTS

Trays shall be bolted to supports by at least two round head bolts per support. Bolts shall be securely tightened against the tray surface to avoid projections which might damage cables during installation.

7. FIXING TO THE STRUCTURE

7.1 Where installed on concrete or brick, the supports for cable trays and ladders shall be securely fixed by means of at least two heavy-duty, expansion type anchor bolts. Cantilevered trays shall be supported by a minimum of two 6mm diameter expansion bolts per support.

7.2 It is the responsibility of the Contractor to ensure that adequate fixing is provided since cable trays and ladders that work loose shall be rectified at his expense. The fixing shall take into account site conditions that prevail during installation.

7.3 Where installed on vertical steelwork, cable trays and ladders shall be fixed by means of 6mm diameter bolts and nuts.

7.4 On horizontal steelwork, use may alternatively be made of "CADDY" type fasteners.

7.5 Horizontal trays and ladders shall in general be installed 450 mm below slabs, ceilings, etc. to facilitate access during installation of cables.

7.6 Multiple runs shall be spaced at least 300 mm apart unless a different spacing is specified in the Detail Electrical Technical Specification.

8. INSTALLATION OF CABLES

Cables shall be installed adjacent and parallel to each other on the trays with spacing as specified in the standard specification for "INSTALLATION OF CABLES", Section B6, and snaked slightly to allow for expansion. Cables shall present a neat appearance and shall under no circumstances be bunched. Cables shall be clamped at maximum intervals of 3 m when installed on horizontal trays and at maximum intervals of 600 mm when installed on vertical trays.

9. EARTHING

Metal trays and ladders shall be bonded to the earth bar of the switchboard to which the cables are connected. Additional bare copper stranded conductors or copper tape shall be bolted to the tray or ladder where the electrical continuity cannot be guaranteed. These additional conductors or tapes shall always be installed in outdoor applications and in coastal regions.

10. CORROSION

PVC trays shall be used in corrosive atmospheres. All supports shall be adequately protected against corrosion, preferably with a powder coated paint finish.

SECTION B4

B.4 FIXING MATERIALS

1. RESPONSIBILITY

It is the responsibility of the Contractor to position and securely fix conduits, ducts, cables and cable channels, switchboards, fittings and all other equipment or accessories as required for the Installation. The Contractor shall provide and fix all supports, clamps, brackets, hangers and other fixing materials.

2. FINISHING

All unpainted supporting steelwork installed by the Contractor shall be wire brushed and given one coat of rust-resistant primer, followed by one coat of high quality enamel paint before any other equipment is fixed.

3. STRUCTURAL STEEL

Supports, brackets, hangers, etc. may only be welded to structural steel members where prior permission of the Engineer has been obtained. "CADDY" or similar fasteners may be used to fix equipment to structural steel members.

4. SCREWS AND BOLTS

Where holes exist in equipment to be fixed, bolts and fixing screws as specified shall be used. Where sizes are not specified, the largest bolt or screw that will fit into the hole shall be used.

5. WALL PLUGS

Where the fixing holes in brick or concrete walls are smaller than 10mm dia. and where the mass of the equipment is less than 10kg, wall plugs may be used to fix conduits, cables and other equipment. Fibre or plastic plugs shall be used. Wooden plugs are not acceptable. Aluminium plugs may be used in face bricks. Plugs installed in joints between bricks are not acceptable. A masonry drill of the correct size shall be used to drill holes for plugs. Round-headed screws of the correct diameter to match the specific plug shall be used throughout.

6. ANCHOR BOLTS

Where the fixing holes are 10mm and larger or where the mass of the equipment is 10kg, equipment shall be fixed by means of expanding anchor bolts or by means of bolts cast into the concrete or built into walls.

7. GALVANISED EQUIPMENT

Brass screws bolts and nuts shall be used to fix galvanised equipment.

8. SHOT-FIRED FIXING

8.1 Materials such as metal cable ducts or channels may be fixed against walls and concrete slabs by means of the shot-fired fixings.

8.2 The Contractor shall ascertain whether this method of fixing will carry the weight of the material including conductors, cables and other items of equipment to be installed later. Should it be found that the method of fixing is inadequate and supports tend to loosen, the Contractor will be required to fix the material by an alternative method to the satisfaction of the Engineer.

8.3 Where the shot-fired method is used, warning signs shall be placed at all entrances leading to the area where this work is in progress. The Contractor shall take all reasonable precautions to prevent accidents. Refer also to The Occupational Health and Safety Act.

8.4 Nails and explosive charges recommended by the manufacturer shall be used throughout.

9. CLAMPS AND BRACKETS

Clamps and brackets used to fix or support equipment such as cable trays, ducts, etc. shall be of a purpose-made type suitable for the specific application. Refer also to the specification for "CABLE TRAYS AND LADDERS", Section B3 and "INSTALLATION OF WIRING CHANNELS", Section B2.

SECTION B5

B.5 WIRING

This section covers wiring in approved wire-ways for electrical installations in buildings or other structures under normal environmental conditions for 50 Hz systems not exceeding 600 V.

1. TYPE OF CONDUCTORS

PVC-insulated or equivalent, stranded copper conductors and bare stranded or green PVC-insulated copper earth conductors shall be used exclusively. Only where cables are specified or in instances where the exceptions stipulated in SANS 10142 are applicable, may the Contractor deviate from this requirement.

2. WIRE-WAYS

2.1 All unarmoured conductors shall be installed in conduits, cable channels (trunking) or power skirting and shall under no circumstances be exposed. Cable channels and power skirting shall be of metal construction unless specifically approved to the contrary.

2.2 Tenderers must note that common wire-ways will only be permitted for relatively light current-carrying conductors such as lighting and socket-outlet circuits. Refer also to par. 4 below. Heavy current-carrying conductors such as feeders to distribution boards and large power points must be installed in separate conduits or wire-ways.

3. ORDER OF WORK

Wiring shall only be carried out after the wire-way installation has been completed, but before painting has commenced. Debris and moisture shall be removed from the wireways prior to the installation of the conductors.

4. CIRCUITS

Conductors that are connected to different switchboards shall not be installed in the same wireway. The wiring of one circuit only will be allowed in a 20 mm dia. conduit with the exception of the wiring from switchboards to fabricated sheet metal boxes close to switchboards in which case more than one circuit will be allowed. For larger conduit sizes the requirements of SANS 10142, shall be met.

5. LOOPING AND JOINTS

A loop-in wiring system where conductors are looped from outlet to outlet shall be employed. Joints in conductors shall be avoided as far as possible but where it becomes unavoidable, joints will be accepted in cable channels only and not in conduits. Joints shall be soldered or shall alternatively consist of approved ferruling, properly covered with heat-shrink sleeves. The use of PVC insulation tape is not acceptable.

6. GROUPING OF CONDUCTORS

In cases where the conductors of more than one circuit are installed in the same wire-way, the conductors of each separate circuit (including earth conductor) shall be taped at intervals of 1m with PVC insulation tape. The conductors of different circuits shall however remain separate in order that any given circuit can be withdrawn. Conductors entering switchboards or control boards shall be grouped and bound by means of plastic or metal bands (not tape).

7. CABLE TRAYS

Conductors may only be installed directly on cable trays if specifically approved by the Engineer. In these cases cable trays shall be at least 2m above walkways or working areas. Conductors of the same circuit shall be grouped in the same manner as described in the previous paragraph. All the conductors on the cable tray shall then be tied down securely to the cable tray at intervals of 2m or less by means of plastic or metal bands (not tape).

8. DRAWING-IN OF CONDUCTORS

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

9. THREE-PHASE OUTLETS

9.1 With the exception of three-phase outlets, circuits connected to different phases shall not normally be present at lighting, switch or socket outlet boxes. Where this is unavoidable, barriers shall be provided between terminals or connections of the various phases and the box shall be suitably labelled internally to indicate the presence of three phase voltages.

9.2 A neutral conductor shall be installed to all three phase outlets intended for equipment connection, whether sockets or isolators, irrespective of whether the particular equipment normally requires a neutral or not.

10. VERTICAL CONDUIT INSTALLATION

Conductors installed in vertical wire-ways shall be secured at intervals not exceeding 5m to support the weight of the conductors. Clamps shall be provided in suitable draw boxes for this purpose.

11. CONNECTIONS

The insulation of conductors shall only be removed over the portion of the conductors that enter the terminals of switches, socket outlets or other equipment. When more than one conductor enters a terminal, the strands shall be securely twisted together. Under no circumstances shall strands be cut off.

12. EARTHING CONDUCTORS

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

12.2 The installation shall be earthed to comply with SANS 10142.

12.3 The installation shall be bonded to comply with SANS 10142.

13. COLOURS

The colours of conductor insulation shall comply with SANS 10142. The colours of conductors for sub-circuits shall as far as possible correspond with the colour of the supply phase. The colours of conductors for wiring to two-way and intermediate switches shall preferably differ from the colour of phase conductors.

14. SINGLE-POLE SWITCHES

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

15. SIZE OF CONDUCTORS

Where conductor sizes are not specified, the following minimum conductor sizes shall be used:

Lighting circuits: 1.5mm² and 2.5mm² copper earth conductor

Socket-outlet circuits: 2.5mm² and 2.5mm² copper earth conductor.

Bell circuits: 1.5mm²

Stove circuits: 10mm² and 6mm² copper earth conductor

Clock circuits: 1.5mm²

16. PARTITIONS

16.1 When wiring is installed in removable partitions, the vertical and/or horizontal metal supports of the walls may be utilised for wiring on condition that:

(a) The conductors are not exposed,

(b) The metal supports are properly earthed,

(c) A separate bare earth continuity conductor is drawn in together with the current carrying conductors and is earthed to the metal parts of the switches and/or the socket-outlets, and

(d) Conductors are installed in the metal and non-inflammable sections of the partitions.

16.2 Conductors enclosed in a copper braiding (harness wiring) may be installed in removable partitions. The braiding can be used as earth continuity conductor. The wiring shall be joined to the conduit (or cable) installation by interconnecting the conductor and the earth conductors in a draw-box using suitable ferrules and heat-shrink sleeves or screwed terminals.

SECTION B6

B.6 INSTALLATION OF CABLES

This section covers the installation of cables for the distribution of power in buildings, other structures and in ground for system voltages up to 11 kV, 50 Hz.

1. GENERAL

1.1 CABLE TYPES

(a) All cables and jointing and termination accessories used for power distribution shall comply with SANS 10142-1.

(b) Cables with copper conductors shall be used throughout unless otherwise specified or approved.

(c) All unarmoured cables shall be installed in metal trunking, sleeves or conduits unless clearly specified to the contrary.

(d) XLPE Cables shall only be used in exceptional circumstances with the written permission of the Engineer.

1.2. COMPETENCE OF PERSONNEL

It is a definite requirement that the Contractor shall only employ personnel fully conversant with the cable manufacturer's recommendations for joining and terminating cables.

2. IDENTIFICATION OF CABLES

2.1 Cables shall be identified at all terminations by means of punched metallic bands or marked with labels or tags. (Refer also to SANS 10142).

2.2 The use of PVC tape with punched characters is not acceptable.

2.3 The identification numbers of cables shall be shown on "as-built" drawings of the installation.

3. TRENCHING

3.1 GENERAL

3.1.1 The Contractor shall be responsible for all trenching excavations unless specified to the contrary.

3.1.2 The Contractor shall, before trenching commences, familiarise himself with the routes and site conditions and the procedure and order of doing the work shall be planned in conjunction with the general construction programme for other services and building requirements.

3.1.3 The Contractor shall acquaint himself with the position of all the existing services such as stormwater pipes, water mains, sewer mains, gas pipes, telephone cables, etc. before any excavations are commenced. For this purpose he shall approach the Engineer, the local municipal authority and any other authority which may be involved, in writing.

3.1.4 The Contractor will be held responsible for damage to any existing services brought to his attention by the relevant authorities and shall be responsible for the cost of repairs.

3.1.5 The Contractor shall take all the necessary precautions and provide the necessary warning signs and/or lights to ensure that the public and/or employees on site are not endangered.

3.1.6 The Contractor shall ensure that the excavations will not endanger existing structures, roads, railways, other site constructions or other property.

3.2 MECHANICAL EXCAVATORS

3.2.1 Power driven mechanical excavators may be used for trenching operations provided that they are not used in close proximity to other plant, services or other installations likely to be damaged by the use of such machinery.

3.2.2 The use of power-driven mechanical excavators shall be subject to the approval of the Engineer. Should the excavator produce trenches that exceed the required dimensions, payment based on volumetric excavation rates will be calculated on the required dimensions only.

3.3 BLASTING

3.3.1 No guarantee is given or implied that blasting will not be required.

3.3.2 Should blasting be necessary and approved by the Engineer, the Contractor shall obtain the necessary authority from the relevant government departments and local authorities. The Contractor shall take full responsibility and observe all conditions and regulations set forth by the above authorities.

3.4 ROUTES

3.4.1 Trenches shall connect the points shown on the drawings in a straight line. Any deviations due to obstructions or existing services shall be approved by the Engineer beforehand. Refer also to par. 10.4.

3.4.2 The Engineer reserves the right to alter any cable route or portion thereof in advance of cable laying. Payment in respect of any additional or wasted work involved shall be at the documented rates.

3.4.3 The removal of obstructions along the cable routes shall be subject to the approval of the Engineer.

3.5 SHORING AND WATERLOGGING

3.5.1 The Contractor shall provide shoring for use in locations where there is a danger of the sides of the trench collapsing due to waterlogging or other ground conditions. Refer to the Occupational Health and Safety Act.

3.5.2 The strength of shoring must be adequate for site conditions prevailing and the shoring must be braced across the trench.

3.5.3 The Contractor shall provide all pumps and equipment required to remove accumulated water from trenches. Water or any other liquid removed shall be disposed of without any nuisance or hazard.

3.6 TRENCHING

3.6.1 Trenching shall be programmed in advance and the approved programme shall not be departed from except with the consent of the Engineer.

3.6.2 Trenches shall be as straight as possible and shall be excavated to the dimensions indicated in this specification.

3.6.3 The bottom of the trench shall be of smooth contour and shall have no sharp dips or rises which may cause tensile forces in the cable during backfilling.

3.6.4 The excavated material shall be placed adjacent to each trench in such a manner as to prevent nuisance, interference or damage to adjacent drains, gateways, trenches, water furrows, other works, properties or traffic. Where this is not possible, the excavated materials shall be removed from site and returned for backfilling on completion of cable laying.

3.6.5 Surplus material shall be removed from site and disposed of at the cost of the Contractor.

3.6.6 Trenches across roads, access ways or footpaths shall not be left open. If cables cannot be laid immediately, the Contractor shall install temporary "bridges" or cover plates of sufficient strength to accommodate the traffic concerned.

3.6.7 In the event of damage to other services or structures during trenching operations, the Contractor shall immediately notify the Engineer and institute repairs. (Refer to par. 3.1.3 and 3.1.4)

3.6.8 Prior to cable laying, the trench shall be inspected thoroughly and all objects likely to cause damage to the cables either during or after laying shall be removed.

3.6.9 Where ground conditions are likely to reduce maximum current carrying capacities of cables or where the cables are likely to be subjected to chemical or other damage or electrolytic action, the Engineer shall be notified before installing the cables. The Engineer will advise on the course of action to be taken.

3.6.10 Extreme care shall be taken not to disturb the surveyor's pegs. These pegs shall not be covered with excavated material. If the surveyor's pegs are disturbed, they shall be replaced by a person qualified to do so.

3.7 DIMENSIONS OF TRENCHES

3.7.1 Cable trenches for one or two cables shall not be less than 300 mm wide and need not be more than 450 mm wide. This dimension shall be valid for the total trench depth.

3.7.2 The width shall be increased where more cables are installed to allow for the spacing stipulated in par. 4.2.

3.7.3 Where trenches change direction or where cable slack is to be accommodated, the Contractor shall ensure that the requirements of the relevant SANS specification regarding the bending radii of cables are met when determining trench widths.

3.7.4 Trench depths shall be determined in accordance with cable laying depths and bedding thickness.

3.7.5 Payment will be made on a volumetric excavation rate calculated on the basis of the given maximum dimensions or the actual dimensions, whichever is the lesser. Refer also to par. 3.2.2 and 3.7.1 above.

3.8 JOINT HOLES

Where cable joints are required to be made in the course of a cable run, a joint hole shall be excavated of sufficient size to enable the cable jointer to work efficiently and unimpeded.

3.9 BEDDING

3.9.1 The bottom of the trench shall be filled across the full width with a 75mm layer of suitable soil sifted through a 6mm mesh and levelled off.

3.9.2 Only sandy clay or loam soil with a satisfactory thermal resistivity (not exceeding 1.5 °C m/W) may be used for this purpose. Sea or river sand, ash, chalk, peat, clinker or clayey soil shall not be used. The use of crusher sand is acceptable.

3.9.3 Where no suitable soil is available on site, the Contractor shall import fill from elsewhere and make all the necessary arrangements to do so. The cost of importing soil for bedding purposes shall be included in the unit rates for excavations.

3.9.4 After cable laying, a further layer of bedding shall be provided to extend to 75 mm above the cables.

3.9.5 The bedding under joints shall be fully consolidated to prevent subsequent settling.

3.10 CABLE SLEEVES

3.10.1 Where cables cross under roads, railway tracks and other service areas, etc. and where cables enter buildings, the cables shall be installed in Polyethylene (6mm thickness), pipes or earthenware pipes. Pitch fibre and PVC pipes are not acceptable because of the adhesion that occurs after a period of time between the pipe and the sheathing or outer serving of the cables.

3.10.2 Pipes shall be joined in accordance with the manufacturer's instructions.

3.10.3 Sleeves shall cross roads and railway tracks at right angles.

3.10.4 Sleeves shall have a minimum diameter of 100mm. They shall extend at least 2m beyond the tracks of a railway line or of the outermost tracks where there is more than one line. In the case of roads, the sleeves shall extend at least 1m beyond the road edge or kerb on both sides of the road.

3.10.5 All sleeves shall be graded 1:400 for water drainage.

3.10.6 Cable sleeves shall be installed to the spacing and depths stated in paragraph 4 below.

3.10.7 Galvanised metallic sleeves up to and including 76mm dia. shall be supplied and installed by the contractor.

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

3.11 BACKFILLING

3.11.1 The Contractor shall not commence with the backfilling of trenches without prior notification to the Engineer so that the cable installation may be inspected. Should the Contractor fail to give a timeous notification, the trenches shall be re-opened at the Contractor's cost. Such an inspection will not be unreasonably delayed.

3.11.2 For high voltage cables (1 kV to 11 kV), a coloured plastic marking tape shall be installed 400 mm above the cable. The tape shall be yellow, marked with the words "ELECTRIC CABLE/ELEKTRIESE KABEL" in red. These markings shall not be more than 1m apart from centre to centre.

3.11.3 Backfilling shall be undertaken with soil suitable to ensure settling without voids. The maximum allowable diameter of stones present in the backfill material is 75mm.

3.11.4 The Contractor shall have allowed in his tender for the importation of suitable backfill material if required.

3.11.5 The backfill shall be compacted in layers of 150mm and sufficient allowance shall be made for final settlement. The Contractor shall maintain the refilled trench at his expense for the duration of the contract. Surplus material shall be removed from site and suitably disposed of.

3.11.6 On completion, the surface shall be made good to match the surrounding area.

3.11.7 In the case of roadways or paved areas the excavations shall be consolidated to the original density of the surrounding material and the surface finish reinstated.

3.12 CABLE MARKERS (FOR HV CABLES ONLY, EXCEPT WHERE OTHERWISE SPECIFIED)

3.12.1 Cable markers shall be provided along all HV cable routes but need only be provided along LV cable routes where specified.

3.12.2 Cable markers shall consist of concrete blocks in the shape of truncated pyramids, approx. 300mm high, 150 x 150mm at the top and 250 x 250mm at the bottom.

3.12.3 Brass plates shall be cast into the tops of the blocks in such a manner that they cannot be prised loose. The wording "ELECTRIC CABLE/ELEKTRIESE KABEL" shall be stamped on the brass plates as well as direction arrows and the cable voltage rating.

3.12.4 Cable markers shall be installed on the surface along all the underground routes and shall project 35 mm above normal ground level unless the projected markers could be a hazard to pedestrian or other traffic, in which case they shall be installed flush with the surface.

3.12.5 Cable markers shall be installed at the beginning and end of a cable run (e.g. where a cable enters a substation or building), at all changes of direction, above all joints, above cable pipe entries and exits and at intervals not exceeding 50 m along the cable route.

3.12.6 The position of cable markers shall be indicated on the "as-built" drawings.

3.13 TRANSNET, PROVINCIAL ADMINISTRATION OR NATIONAL ROAD CROSSINGS

3.13.1 The Contractor shall not trench beneath any railway tracks without the Transnetadministration's supervision. The Contractor shall request the Engineer timeously to arrange for the necessary supervision. The cost of such supervision will be paid for by the Employer.

3.13.2 The Employer and/or Engineer will arrange for the necessary wayleave and permission to cross Transnet property and railway tracks, or provincial or national road reserves and Telkomauthority approval of proposed cable routes.

3.13.3 The Contractor shall carry out the crossing installation in strict accordance with the Transnet and provincial administration's requirements and stipulations. Where these requirements are in contradiction with this specification, the Engineer's ruling shall be sought.

3.13.4 The Contractor shall ensure that he will comply with the various administrations' requirements regarding crossing of provincial and national roads, especially with regard to the safeguarding of the public. The Contractor shall also provide proof of adequate insurance cover against any claim from any accident as a result of work done by the Contractor during the crossing operation. The Employer, Employer's Representatives and the Engineer shall also be indemnified from all liability in this regard.

3.13.5 The Contractor shall liaise with the various administrations well in advance regarding the intended dates, times and expected duration of the crossing operations and obtain their approval of the programme and method of operation before commencing with the work.

4. INSTALLATION OF UNDERGROUND CABLES

4.1 INSTALLATION DEPTHS

4.1.1 Cables shall be installed at the following minimum depths below final ground level:

Up to 11kV: 800 mm

4.1.2 All cable depth measurements shall be made to the top of the cable when laid directly in ground or to the top of the duct or sleeve where these are provided.

4.1.3 The above depths shall apply to the top layer where cables are installed in layers.

4.1.4 The Contractor may only deviate from the above depths provided prior authority in writing has been obtained from the Engineer. In this event the cables shall be protected with a suitable concrete covering.

4.1.5 The depth of cable pipes or ducts beneath railway lines or roads shall be not less than 1.1 m below the formation level.

4.2 CABLE SPACINGS

4.2.1 Cables installed in the same trench shall be laid parallel to each other with the following spacing between cables (LV: up to 1 kV; HV: 1 kV to 11 kV):

LV/LV	:	2 cable diameters
LV/HV	:	150mm minimum
HV/HV	:	150mm minimum
LV/HV/PILOT	:	1 cable diameter

4.2.2 Where HV and LV cables have to be installed in the same trench, both shall be laid at a depth of 800 mm and then covered with 200mm of soil. The soil shall then be compacted, and then backfilled layer by layer and compacted until the trench is completely backfilled.

4.2.3 Cables for telephones, communication systems and other low voltage systems (less than 50 V) shall be separated from power cables by at least 1m. All control or pilot cables without a lead sheath and steel armouring shall be laid at least 300mm from power cables.

4.2.4 Cables shall not be buried on top of each other unless layers are specified. The minimum spacing between layers shall be 200mm.

4.3 CABLE LAYING

4.3.1 Except where ducts, tunnels or pipes are provided, cables shall be laid directly in the ground.

4.3.2 The cable shall be removed from the drum in such a manner that the cable is not subjected to twisting or tension exceeding that stipulated by the cable manufacturer.

4.3.3 Cable rollers shall be used as far as possible to run out cables. Rollers shall be spaced so that the length of cable in the trench will be totally suspended during the laying operation and sufficiently close to prevent undue sagging and the cable from touching the ground. Rollers shall also be placed in the trench in such a manner that they will not readily capsize.

4.3.4 Cable rollers shall have no sharp projecting parts liable to damage the cables.

4.3.5 Where cables have to be drawn around corners, well-lubricated skid plates shall be used. The skid plates shall be securely fixed between rollers and shall constantly be examined during cable laying operations.

4.3.6 Where cables have to be drawn through pipes or ducts, a suitable cable sock shall be used and particular care shall be exercised to avoid abrasion, elongation or distortion of any kind. In the case of oil filled cables, a cable sock may never be used. Special eyes giving access to the interior of the cable must be utilised.

4.3.7 The maximum allowable tension when pulling a cable is 70 N/mm2 of conductor area.

4.3.8 It will be assumed that the price or rates contained in the tender includes for the installation of cables in pipes and ducts or below existing or newly installed services.

4.3.9 The Engineer shall be informed timeously of the intention to carry out all cable laying operations to allow an inspection of the works by the Engineer if so required.

5. INSTALLATION OF CABLES IN CONCRETE TRENCHES

5.1 GENERAL

This paragraph covers the installation of cables in building trenches, service ducts, etc. The trenches, ducts, etc. inside buildings will be constructed and installed by others.

5.2 INSTALLATION

Cables shall be installed in one of the following ways:

(a) On horizontal cable trays.

(b) On horizontal metal supports with suitable clamps.

(c) On vertical cable trays or metal supports fixed to the side of the trench. The cables shall be clamped in position.

Cables shall not be bunched and laid on the floor of the building trenches.

5.3 COVERS

5.3.1 The covering of concrete trenches shall as a rule fall outside the scope of the electrical installation. The Contractor shall however be responsible for the cutting or drilling and smoothing of holes for cables through chequer plates, concrete or other coverings as required.

5.3.2 Cables shall enter and exit the trench through sleeves protruding 300mm beyond the covering. The sleeves shall be permanently secured in position and the open space between the cable and sleeves shall be sealed with a non-hardening, watertight compound.

5.4 FILLED TRENCHES

5.4.1 Where specified, floor trenches shall be filled with fine crusher sand (no river or see sand).

5.4.2 If a sand filling is specified, the cables shall be fixed to non-corroding supports.

5.4.3 Sand-filled trenches other than in substations shall be covered in one of the following ways:

(a) Reinforced concrete covers.

(b) Sand and cement screed.

(c) Removable chequer plates.

5.4.4 Method (a) above shall be used where vehicular traffic may be encountered over trenches. Unless otherwise specified allowance for a mass of two tonnes shall be made.

5.4.5 Cable trenches in substations, switch rooms and generator rooms shall be covered in accordance with Par. 9 or Section B13 "COVERING AND SEALING OF CABLE TRENCHES".

6. FIXING OF CABLES TO TRAYS OR STRUCTURES

6.1 INSTALLATION

Cables may be installed in one of the following ways:

(a) On horizontal cable trays.
(b) Against vertical cable trays with suitable clamps.
(c) Against horizontal or vertical metal supports or brackets with suitable clamps.
(d) On clamps which are fixed to the structure.

6.2 CLAMPS

Suitable clamps (cleats) which will secure cables without damage shall be used. Metal clamps or drilled hard wood blocks shall be used. Clamps shall consist of adjustable metal wings which clamp to a metal support, or consist of two halves that are bolted together. The correct clamp size to fit the cable shall be

used. Cables of different sizes may only be fixed by a common clamp when the clamp is specially made to accommodate the various cables.

6.3 SPACING OF SUPPORTS

Two methods of supporting cables are found in practice. The most generally known method is the restrained installation where the distance between supports is small enough to prevent any noticeable sag in the cable. The alternative method is the unrestrained installation where the distance between supports should be great enough to ensure that there will be obvious sag in each span between supports.

6.4 SPACING OF SUPPORTS OF UNRESTRAINED CABLES

Large single core cables shall always be installed according to this method. Generally, single core cables with conductors exceeding a cross sectional area of 185mm² should be supported at spacing in excess of 2m since the sag between supports will safely accommodate any thermal expansion.

Reducing the spacing between the supports to 1.5m or less shall be avoided at all costs, as expansion cannot be taken up by a change of sag and chances of sheath failure become considerable.

6.5 SPACING OF SUPPORTS OF RESTRAINED CABLES

Additional cleats shall be installed at each bend or offset in the cable run. The maximum distance between supports or cleats for multi-core control cables shall be 20 times the outside diameter of the cable with a maximum spacing of 550mm for unarmoured cables and 30 times the outside diameter of the cable with a maximum spacing of 900mm for armoured cables. Spacing of supports for cables for high voltage lighting shall be in accordance with Table 8 of SANS 10142. A minimum of 20mm ventilation clearance shall be maintained between cables and the wall to which they are cleated.

7. GROUPING AND SPACING OF CABLES IN BUILDINGS AND STRUCTURES

7.1 SPACING CORRECTION FACTORS

Cables shall, as a rule, be spaced two cable diameters apart, for which no grouping correction factor need be applied.

7.2 CABLES ON DIFFERENT LEVELS

Where parallel cable runs are installed at different levels (e.g. on parallel cable trays) and where the spacing of the layers is not specified, a minimum spacing of 300mm shall be maintained.

7.3 SINGLE CORE CABLES

Where single core cables are installed along a three-phase circuit, the cables shall be installed in trefoil formation and bound together at 300mm intervals.

7.4 HIGH VOLTAGE CABLES

High voltage cables shall be separated from other cables and services throughout the installation and shall as far as possible be installed in separate floor trenches, pipes or metal channels. Where this is not feasible a minimum spacing of 500 mm shall be maintained.

7.5 CABLES FOR OTHER SERVICES

Cables for telephones, communication systems and other low voltage systems (less than 50 V) shall be separated from power cables. In building ducts a physical barrier shall be provided between power cables and cables for other services. Where armoured cables are used for such other services, they shall be installed on separate cable trays or shall otherwise be at least 1m away from power cables. Where unarmoured cables are used for these other services, they shall be installed in separate conduits or metal channels.

TABLE B6.1

Cross-Sectional Area of Cable Conductors (mm^2)	MAXIMUM SPACING OF SUPPORTS (CLEATS) (mm) FOR RESTRAINED CABLES			
	Wire Armoured Cables		Other than Wire Armoured Cables and Unarmoured Cables	
	Horizontal Cable Routes	Vertical Cable Routes	Horizontal Cable Routes	Vertical Cable Routes
1.5	450	750	300	400
2.5	450	750	300	400
4.0	600	750	300	400
6.0	600	750	300	400
10.0	750	900	400	450
16.0	750	1000	400	550
25.0	900	1000	450	550
35.0	900	1000	450	550
Bigger than 35.0	900	1000	450	550

For larger cables the spacing shall be 10 x outside diameter of the cable.

8. TERMINATION AND JOINTING OF CABLES

8.1 GENERAL

8.1.1 Cable ends shall be terminated with glands or in cable boxes with the associated accessories such as clamps, shrouds, etc. complying in all respects with the relevant SANS codes.

8.1.2 Connection of cables to switchgear shall always be effected in such a way that the various phases, seen from the front of the switchgear will be in the following positions:

No. 1 conductor: left (red) (A)
No. 2 conductor: centre (white) (B)
No. 3 conductor: right (blue) (C)

8.1.3 Exposed armouring shall be covered with bitumen-base paint.

8.1.4 All cable ends shall be supplied with the necessary earth connection.

8.1.5 A channel or other approved means of support shall be provided to remove mechanical stress from the glands.

8.1.6 Cable cores shall be marked with heat-shrunk sleeves, where necessary, to identify the phases. Refer to SANS 10142.

8.1.7 The current-carrying capacity and breakdown voltage of the cable end shall be the same as for the complete cable.

8.1.8 Cables shall be terminated in accordance with the recommendations laid down by the manufacturers of the cables and glands employed.

8.2 TERMINATION OF PAPER-INSULATED CABLES

8.2.1 The ends shall be terminated in cable end boxes filled with bituminous, cold filling or resin oil semi-fluid compound or heat-shrinkable terminations in accordance with all relevant SANS codes.

8.2.2 Heat-shrinkable materials shall only be used in exceptional circumstances with the written permission of the Engineer.

8.2.3 Before terminating or jointing paper-insulated cables, a test to establish the presence of moisture must be carried out.

The following procedure may be followed:

(a) Place an adequate quantity of cable impregnating oil in a suitable container and heat up to 130 C ± 5 C.

(b) Cut a small length (± 300mm) of the cable concerned and remove the armouring and sheath, taking care not to handle the dielectric in any way.

(c) Dip a section of the outer insulating impregnated paper (belt paper) in the heated oil, taking care not to contaminate the tapes with moisture from the hands. If frothing appears on the surface of the oil, this is a clear indication of the presence of moisture in the paper.

(d) The same procedure should then be repeated on the insulating impregnated paper around the conductors (especially those layers closest to the conductors). Frothing will also indicate the presence of moisture.

(e) Should only a small number of bubbles appear on the surface of the oil, this is an indication of air bubbles on the paper and not moisture since the presence of moisture will result in a series of bubbles rising to the surface of the oil for a number of seconds, until all moisture has been removed.

8.2.4 The armouring shall be bonded to the main earth bar of the switchgear or transformer, but the bond shall be easily removable for testing purposes.

8.2.5 The lead sheath shall be wiped against the conical wiping gland.

8.2.6 All cut cable ends which will be exposed to the atmosphere for more than two hours shall be sealed and wiped to prevent penetration of moisture.

8.3 TERMINATION OF XLPE CABLES

8.3.1 These cables shall only be used in exceptional circumstances and only with the written permission of the Engineer.

8.3.2 Cross-linked polyethylene cables (XLPE) shall be terminated in accordance with the relevant SANS codes.

8.3.3 The copper tapes of the earth screen on the cable shall be bonded to the main earth bar of the switchgear or transformer, but the bond shall be easily removable for testing purposes.

8.3.4 The cable shall be firmly secured on the switchgear by means of a clamp to prevent mechanical stress on the cable and terminations.

8.4 TERMINATION OF PVC-INSULATED CABLES

8.4.1 Cable ends shall be terminated by means of adjustable glands.

8.4.2 The glands shall be fitted in accordance with the cable and gland manufacturer's instructions.

8.4.3 The correct size and type of gland shall be used for the particular cable and application.

8.5 CONNECTION OF CABLE CONDUCTORS

8.5.1 Suitable lugs shall be used, preferably solidly sweated to the cable conductor ends. Lugs may be crimped, using mechanical or pneumatic tools designed for this purpose, on condition that evidence is submitted that the method used complies with the performance requirements of BS 4579, Part 1: "COMPRESSION JOINTS IN COPPER".

8.5.2 Contact surfaces shall be thoroughly cleaned and smoothed and fixing bolts shall match the hole size of the lug.

8.5.3 Cables that are connected to clamp-type terminals where the clamping screws are not in direct contact with the conductor, it need not be lugged but the correct terminal size shall be used.

8.5.4 Ferrules shall be used as far as possible where cable conductors are connected directly to equipment with screws against the conductor strands.

8.5.5 When cutting away insulation from cable conductors to fit into lugs, care shall be taken that no strands are left exposed. Under no circumstances may any of the conductor strands be cut away to fit into lugs.

8.6 JOINTS

8.6.1 Joints in cable runs will not be allowed unless specified in the Detail Electrical Technical Specification or authorised by the Engineer.

8.6.2 Jointing shall be carried out strictly in accordance with the manufacturer's instructions and by personnel competent in jointing the types of cables used.

8.6.3 During outdoor jointing operations, the joint bays shall be adequately covered by tents of waterproof material suitably supported. Where necessary, a trench shall be excavated around the bay to prevent the ingress of moisture. The sides of the hole shall be draped with small tarpaulin or plastic sheeting to prevent loose earth from falling in during jointing operations.

8.6.4 The joint shall not impair the anti-electrolysis characteristics of the cable.

8.6.5 The Contractor shall notify the Engineer timeously of the day on which jointing is to be carried out in order than an inspection may be arranged, if so required. Any cable joint not inspected by the Engineer because of insufficient notice being given, shall be opened for inspection and redone at the discretion of the Engineer at the cost of the contractor.

8.6.6 HV cable joints on paper insulated cables shall be of the compound cast type and the compound used shall comply with all relevant SANS codes.

8.6.7 HV cable joints on XLPE-insulated cables shall be of the heat shrinkable type and shall comply with all relevant SANS codes, or shall be based on a prefabricated system utilising pre-moulded slip-on stress cones.

8.6.8 LV cable joints shall be of the epoxy-resin type.

8.6.9 Joints shall be fully water and air tight and shall be free of voids and air pockets.

8.6.10 The crossing of cores in joints will not be permitted under any circumstances.

9. TESTING

9.1 Each cable shall be tested after installation in accordance SANS 1507 (up to 1 kV) and SANS 97 (up to 11 kV) as well as the requirements of the local and supply authorities.

9.2 LV cables shall be tested by means of a suitable megger at 1 kV and the insulation resistance shall be tabulated and certified.

TABLE B6.2

Cable Rating (kV)	TEST VOLTAGE (Applied for 15 minutes) (kV)				
	Paper-insulated cables				XLPE-insulated cables
6.6 11	Between conductors		Conductors to sheath		Conductors to screen
	AC (RMS)	DC	AC (RMS)	DC	DC
	12 20	18 30	12 20	18 30	11 18

* High Voltage test with DC to 2kV for 1 minute only. Discharge cable slowly via discharge stick (1 minute). Clamp all conductors to earth for 24 hours.

9.3 HV cables shall be high voltage tested in accordance with Table B6.2 and the exact leakage current shall be tabulated and certified.

9.4 The Contractor shall make all arrangements, pay all fees and provide all equipment for these tests. The cost of testing shall have been included in the tender price.

9.5 The Contractor shall notify the Engineer timeously to witness the tests.

9.6 On completion of the tests on any cable, the Contractor shall without delay, submit three copies of the certified test reports to the Engineer.

10. MEASUREMENTS

10.1 All measurements for payments shall be made jointly by the representatives of the Employer and the Contractor and the Contractor shall obtain the signature of the Engineer including approval of such measurements.

10.2 No allowance shall be made for the breaking away of the trench sides, other earth movements or for trenches excavated in excess of the stipulated dimensions. Refer also to par. 3.7.5 above.

10.3 The classification shall be as follows:

Very hard rock shall mean rock that can only be excavated by means of explosives.

Hard rock shall mean granite, quartzitic sandstone, slate and rock of similar or greater hardness, solid shale and boulders in general requiring the use of jack hammers and other mechanical means of excavations.

Soft rock and earth shall mean rock and earth that can be loosened and removed by hand-pick and shovel.

10.4 Where very hard rock and hard rock are encountered, the prior approval of the Engineer shall be obtained before proceeding with the excavation. This requirement is stipulated in order to afford the Engineer the opportunity to determine whether an alternative cable route is justified.

10.5 All cable lengths indicated in the Detail Electrical Technical Specification and/or shown in the cable route drawings shall be regarded as estimates and are given for tendering purposes only. The successful tenderer shall measure actual cable lengths on site before ordering.

10.6 The final price for the supply and installation of all cables will be adjusted, on the basis of the actual lengths of installed cables, in accordance with the unit rates quoted at the time of tendering. Cable lengths shall be measured on site to the nearest 500mm for this purpose and surplus cable will not be paid for.

11. COMPLETION

11.1 The Engineer reserves the right to inspect the installation at any stage during the course of construction. Such inspections will, however, not deem the portions inspected as being complete or accepted and the Contractor shall remain responsible for completing the installation fully in accordance with the Contract Documents.

11.2 The Contractor shall carry out a final "as-built" survey of the cable routes and present to the Engineer "as-built" route plans of the complete installation. The following information shall be reflected on the plans or submitted as separate schedules with the plans:

(a) Overall length of each cable.

(b) Locations of all joints (if any) in relation to permanent reference points. Dimensions shall be shown and the method of triangulation i.e. two dimensions to each joint, shall be used.

(c) Identification of each cable.

11.3 The works will be deemed to be incomplete until all tests have been conducted successfully and all "as-built" drawings and schedules have been handed to the Engineer.

SECTION B7

B.7 INSTALLATION OF LIGHT SWITCHES AND SOCKET-OUTLETS

1. GENERAL

1.1 STANDARDS

Light switches and socket-outlets shall comply with all relevant SANS standards.

1.2 POSITION OF OUTLETS

Switches and socket-outlets shall be accurately positioned in accordance with the drawings. It is the Contractor's responsibility to ensure that all outlets are installed level and square, at the correct height from the floor and at the correct position relative to building lines and equipment positions as specified. It is the Contractor's responsibility to determine the correct final floor level and ceiling level in conjunction with the Main Contractor.

1.3 COVER PLATES

All switches and socket-outlets shall be fitted with standard metal cover plates. The colour of cover plates shall be as specified or shall otherwise match the surrounding finishes as closely as possible. Unless specified to the contrary, ivory cover plates shall be installed on painted walls. Cover plates in the same area shall have the same colour. Flush mounted cover plates shall overlap the draw-box and edges of the recess. Cover plates shall under no circumstances be cut unless authorised by the Engineer.

1.4 ESCUTCHEON PLATES

Where flush mounted switches or socket-outlets are installed in special wall finishes e.g. wood or board panels, acoustic tiles or other cladding, etc. and where the wall finishes must be cut to accommodate the switch, it may be necessary to fix an escutcheon plate to the wall to cover the cut-outs. The escutcheon plate shall fit closely around the outlet boxes and shall be fixed independently of the boxes and cover plates. Bevelled cover plates shall be fixed to the outlet boxes and shall fit firmly against the escutcheon plate.

1.5 APPEARANCE

The sides of adjacent switches, plugs, push-buttons etc. shall be parallel or perpendicular to each other and uniformly spaced. A common escutcheon plate shall be placed around flush mounted outlets and accessories where the standard cover plates do not cover the cut-outs in the finishes.

1.6 DEEP BOXES

Where switch or socket-outlet boxes have been set deep, spiral type steel wire spacers shall be used to fix the yoke of the switch or socket.

2. INSTALLATION OF SOCKET-OUTLETS

2.1 MOUNTING HEIGHT

Unless specified to the contrary, socket-outlets shall be installed at the following heights above finished floor level, measured to the centre of the outlet:

Flush mounted in general:	300mm
Showrooms, shops, servants' quarters:	1.4m
Domestic kitchens, tea kitchens:	1.05m
Commercial kitchens:	1.4m
Factories, workshops, garages:	1.4m

2.2 WALLS

In cases where socket-outlets must be mounted at a nominal height of 300mm and where the lower portion of the wall consists of face brick and the upper portion is plastered, the outlets shall be installed in the plastered portion of the wall. If however the plastered portion of the wall commences 500mm or more above floor level, the outlets shall be installed in the face bricks. Where a wall has different surface finishes the outlets shall be installed within the same finish and not in the dividing lines between the different wall finishes. All outlets shall be installed at least 150mm away from door frames.

3. INSTALLATION OF LIGHT SWITCHES

3.1 MOUNTING

Light switches shall be installed 1.4m above finished floor level unless specified to the contrary. Mounting heights given shall be measured from the finished floor level to the centre of the switch. All single switches shall be installed with the long side of the toggle vertical.

3.2 DOORS

Unless specified to the contrary, switches adjacent to doors shall be installed on the side containing the lock. If the position of the lock is not shown on the drawings, the position shall be verified before the switch-box is installed. Switch boxes in brick or concrete walls shall be installed 150mm from the door frame. Light switches installed in partitions or door frames shall be of the type designed for that purpose.

3.3 WALLS

Where the lower portion of a wall is face brick and the upper portion plastered, light switches shall be installed wholly in the plaster provided that the lower edge of the plaster is not higher than 1.6m above the finished floor level. In general where different wall finishes are used in the same area. Switches shall be installed within the same finish and not on the dividing lines between finishes.

3.4 PARTITIONS

Light switches installed in partitions shall preferably be of the type designed to be accommodated in the partition construction. Switches installed in the metal supports do not require switch boxes. Switches may not be flush mounted in partition walls without switch boxes.

3.5 WATERTIGHT SWITCHES

Switches that are exposed to the weather or are installed in damp areas shall be of the watertight type complying with all relevant SANS codes.

3.6 MULTIPLE SWITCHES

Where several switches are required in one position, multi-lever switches in a common switch box shall be provided wherever possible. All circuits wired into this box shall be on the same phase in order that voltages in excess of 250 V are not present in the box. Where it is not possible or practical to do this, barriers shall be installed and a label shall be prominently displayed within the box stating that voltages in excess of 250 V are present.

SECTION B8

B.8 PHOTO-ELECTRIC DAYLIGHT SENSITIVE SWITCH FOR OUTSIDE LIGHTING

1. INSTALLATION

1.1 The outside lighting of each individual building, shall be controlled by photo-electric daylight sensitive switches.

1.2 The positions of the switches, as indicated on the drawings, are provisional and the exact positions shall be confirmed with the Engineer on site.

1.3 Individual outside lighting circuits on a building may be connected directly to the daylight sensitive switch.

1.4 Where two or more lighting circuits are to be controlled by a single daylight sensitive switch, a contactor actuated by the unit shall be provided in the switchboard.

1.5 A bypass switch enabling the lights to be turned on at any time shall be provided.

1.6 Standard control circuits are indicated in drawings.

2. CONSTRUCTION

2.1 The unit shall comprise a photo cell, thermal actuator and change-over switch. The cover of the unit shall be manufactured from a tough, durable material providing protection against tampering. The cover shall have good weathering properties. It shall be ultraviolet-resistant and shall not deteriorate when exposed to sunlight for prolonged periods.

2.2 The unit shall be of the wall mounting type and shall be supplied complete with a suitable bracket.

2.3 The operational level shall be factory preset for "ON" at a light level of approximately 54 lux and "OFF" at approximately 108 lux. Voltage variations shall not materially affect the operational levels.

2.4 A time delay of not less than 15 seconds shall be provided to prevent the unit from functioning due to short period changes in illumination.

2.5 The unit shall be effectively safeguarded against voltage surges by means of a suitable surge protector which shall preferably form an integral part of the unit.

SECTION B9

B.9 INSTALLATION OF LUMINAIRES

1. POSITIONS

The mounting positions of luminaries shall be verified on site. All luminaries shall be placed symmetrically with respect to ceiling panels, battens, beams, columns or other architectural features of the space unless otherwise indicated. The layout as shown in the Documents shall generally be adhered to but any discrepancies or clashes with structural or other features must be referred to the Engineer, before commencing erection of the installation.

2. COVER PLATES

Cover plates shall be fitted over all draw-boxes and outlets intended for luminaries that are not covered by the luminaire canopy, lamp-holder, ceiling rose or similar accessories.

3. FIXING TO DRAW-BOXES

Where an outlet box or draw-box provides the necessary support for a luminaries, all luminaries with the exception of fluorescent luminaries mounted against ceilings, shall be fixed directly to the box. Fluorescent luminaries and luminaries with a mass in excess of 10kg shall, however, be suspended independently of the outlet box.

4. HANGERS AND SUPPORTS

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

5. SUSPENDED LUMINAIRES

The necessary hangers shall be provided where luminaries, which are of the non-suspension type, have to be fixed below false ceilings or roof slabs. The use of 20mm conduits fixed to the roof slab or ceiling is preferred. Provision shall be made for adjustments to enable the levelling of luminaries. Suspended conduits shall be fixed to the ceiling by means of screwed dome lids, bolts and nuts. Ball-and-spigot type domelids shall be used where conduit lengths exceed 600mm. Wiring shall be installed in the conduit hangers.

6. SUSPENDED WIRING CHANNELS

Luminaries (especially fluorescent luminaries) may also be suspended from ceilings by means of suspended metal channels. The metal channel may be supported by conduits or threaded rods. Should metal rods be utilised, these shall be screwed to anchor bolts fixed in the roof slab. Wiring shall either be installed in conduits fixed to the metal channel or in the metal channels and covered with a suitable cover plate. Purpose-made clamps shall be used to fix the luminaries to the cable channel.

7. CEILING BATTENS

Where wooden blocks are used to suspend luminaries, ceiling battens shall not be cut. The wooden blocks shall be cut to fit around battens and shall be screwed to the ceiling. Battens may however be cut where fluorescent or incandescent luminaries with metal canopies have to be installed against a false ceiling.

8. GLASS-BOWL LUMINAIRES

Unless specified to the contrary, suspended glass-bowl luminaries shall be installed with the underside at least 2.1 m above finished floor level.

9. FLUORESCENT LUMINAIRES FIXED TO CONCRETE SLABS

Fluorescent luminaries to be installed directly against concrete slabs or walls shall be securely fixed to the outlet box and at two additional points. Shot-fired fixings are not acceptable. Where approved, fluorescent luminaries may be installed against metal wiring channels in which the wiring is housed. The channel fixing may in this case be shot-fired. Purpose-made fluorescent fixing adaptors shall be used to fix luminaries to cable channels.

10. FLUORESCENT LUMINAIRES FIXED TO CEILINGS

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

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

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

10.4 In the case of tiled ceilings with exposed or concealed T-section supports, surface mounted luminaries shall be fixed only to the tiles by means of butterfly screws or bolts with nuts and washers. The tiles shall be suitably reinforced.

10.5 Luminaries may alternatively be fixed to metal cross-pieces resting in the ceiling tees.

10.6 Drilling of holes in ceiling tees to support luminaries will not be allowed.

10.7 Luminaries shall be fixed in neat relation to the ceiling lay-out.

11. CONTINUOUS ROWS OF LUMINAIRES

In cases where fluorescent luminaries are installed in tandem, only one connection outlet need be supplied per circuit. All luminaries shall be coupled to one another by means of nipples or brass bushes and locknuts to ensure that wiring is not exposed and that earth continuity is maintained. Luminaries on the same circuit may be wired through the channel formed by the luminaire bodies. In this case silicon-rubber insulated conductors shall be used and internal connections shall be made at porcelain terminal blocks. "SCREW-IT" or similar connectors may only be used if prior permission is obtained from the Engineer. The wiring for any other circuits or outlets, even though these may be in the same row, may not be installed through the

luminaire bodies. The Contractor shall ensure that continuous rows are straight and parallel to the relevant building lines.

12. RECESSED LUMINAIRES

12.1 Where recessed luminaries are specified, the Contractor shall maintain close liaison with the ceiling Contractor. In the case of tiled ceilings, the luminaries shall preferably be installed while the metal supports are being installed and before the tiles are placed in position. The Contractor shall be responsible for the coordination of the cutting of ceiling tiles with the other contractors concerned.

12.2 All mounting rings and other accessories shall fit closely into cut-outs to ensure a proper finish.

12.3 In all false ceilings where wiring channels are used, recessed luminaries shall be connected to the wiring channels by means of unswitched 5 A socket-outlets.

12.4 The following requirements shall be adhered to:

(a) Socket-outlets used shall comply with all relevant SANS codes, particularly SANS 10142-1, and shall be of 5 A minimum rating.

(b) The connector cord attached to the luminaire may not exceed 3m in length and shall consist of 1.5mm² minimum, 3-core, PVC-insulated flexible cord.

(c) The 5A socket-outlets shall be positioned such that they are not more than 600mm above the false ceiling.

13. SPECIAL CEILINGS

In cases where special ceilings e.g. aluminium strips, decorative glass, metal leaves, etc. are to be installed, the Contractor and the Manufacturer of the ceiling shall agree upon the method of fixing of luminaries in the ceiling.

14. BULKHEAD LUMINAIRES

Surface mounted bulkhead luminaries shall not be screwed directly to conduit ends. The conduit shall terminate in a round draw-box at the top or rear of the luminaire. The PVC-insulated conductors shall terminate in a porcelain terminal strip in the draw-box. Silicon-rubber-insulated conductors shall be installed from the terminal strip to the luminaire lamp-holder. "SCREW-IT" or similar connectors may only be used if prior permission is obtained from the Engineer.

15. TYPE OF CONDUCTOR

PVC-insulated conductors, unless protected by an approved heat-resistant sheathing, shall not be used where the temperature of the insulation is likely to exceed 70°C. In unventilated luminaries or luminaries capable of housing incandescent lamps over 60W, the interconnecting wiring from the lamp-holder to the circuit wiring shall consist of silicon-rubber insulated conductors. Silicon-rubber insulated conductors shall be used exclusively in the case of high bay fittings. Refer also to the provisions of SANS 10142.

16. WIRING OF LAMPHOLDERS

The central terminal of Edison Screw (E.S.-type) LAMP-HOLDERS shall be connected to the phase conductor and the screwed housing to the neutral conductor.

17. HIGH BAY LUMINAIRES

17.1 High bay luminaries shall be securely suspended from the roof structure.

17.2 The luminaries may be fixed to suspended wiring channels containing the wiring on condition that:

(a) Rigid channels with a maximum width of 42 mm be used;

(b) The channels are supported at intervals that will prevent sag or warp; and

(c) The channels are large enough to accommodate the wiring.

17.3 Luminaries may be suspended from metal roof trusses with the aid of "CADDY" or similar fasteners.

17.4 Luminaries shall preferably be connected to unswitched 5A socket outlets. Silicon-rubber insulated flexible cord shall be used exclusively to connect the luminaire to the outlet.

17.5 A safety chain to keep the luminaire from falling when loosened shall be provided.

SECTION B10

B.10 CONNECTIONS TO EQUIPMENT

1. GENERAL

This section covers the final electrical connections to switchboards and various equipment in general electrical installations under normal environmental conditions for system voltages up to 600 V. Refer also to the specifications for "WIRING", Section B5 and "INSTALLATION OF CABLES", Section B6.

2. CONNECTIONS TO SWITCHBOARDS

2.1 CONDUIT ENTRIES

2.1.1 Where sufficient space for conduit entries as well as adequate space for future conduit entries is available, conduits may be terminated directly on the switchboard.

2.1.2 Alternatively, conduits connected to switchboards shall terminate in a common fabricated sheet steel draw-box installed in the vicinity of the switchboard. In open roof spaces this draw-box shall be placed in a roof space of not less than 900mm clearance.

2.1.3 Lighting and socket-outlet circuits may be separately grouped in common conduits or metal ducts (trunking) from the distribution board to the draw-box. The draw box shall be of sheet steel with a minimum thickness of 1.6mm and shall be fitted with a removable cover plate.

2.2 FLUSH MOUNTED SWITCHBOARDS

Where flush mounted switchboards are required, the recessed switchboard tray shall be built into the brick or concrete wall. All conduits from the floor or roof shall be fully recessed and shall be bonded directly to the tray by means of locknuts on both sides and the ends of the conduits fitted with a brass bush.

2.3 SURFACE MOUNTED SWITCHBOARDS

Where surface mounted switchboards are specified but where the conduits can be fully recessed, the conduit shall be connected to a recessed connection box installed behind the switchboard. An opening with the same dimensions as the connection box shall be cut in the back of the switchboard and fitted with a suitable grommet.

2.4 SPARE CONDUITS

Where conduits from a switchboard run into a false ceiling space above the board, a minimum of two 25mm and two 20mm spare conduits shall be installed into the ceiling space immediately above the board.

2.5 CABLE CONNECTIONS

2.5.1 Where underground cables are to be connected to switchboards, it shall be the responsibility of the Contractor to ensure that metal, earthenware, asbestos-cement or other approved sleeves are built in correctly to enable installation and connection of the cable to the switchboard.

2.5.2 PVC or pitch fibre sleeves are not acceptable - refer to par. 3.10 of the standard specification for "INSTALLATION OF CABLES", Section B6.

2.5.3 Sleeves shall be installed with a fall from inside to outside of the building to facilitate drainage. The sleeves shall be sealed with a non-hardening compound after installation of the cables to render the installation vermin proof and waterproof.

2.5.4 A metal cable channel with removable metal cover plate shall be installed by the Contractor and shall extend from the switchboard to the floor or into the ceiling void as required. The channel shall coincide with the position of sleeves. The channel shall be flush mounted except in the case of surface mounted switchboards and then only with the permission of the Engineer.

2.5.5 The cable channel shall be large enough to permit the installation of cable glands and future cables, particularly where spare sleeves have been provided.

2.5.6 The colour of the channel cover shall match that of the associated switchboard.

2.6 CABLE TRENCHES

Where cables in floor trenches have to be connected to wall mounted switchboards, approved sleeves or conduits shall be installed from the side of the trench to the bottom of the switchboard. These sleeves shall be positioned and fixed before the concrete is cast.

3. CONNECTIONS TO MOTOR DRIVEN EQUIPMENT.

3.1 An isolator or starter containing an isolator shall be installed within 2m of motor driven equipment. The requirements of SANS 10142 shall be met. If this isolator cannot be installed on a wall, switchboard or other suitable place, an approved free-standing pedestal shall be provided. The pedestal shall be 1m high and outside normal walkways, access routes, etc.

3.2 The connection to the equipment shall be carried out as follows:

(a) Metal reinforced plastic or PVC-covered flexible metal conduits with individual conductors or a multi-core PVC insulated cable and separate bare earth conductor installed inside the conduit may be used. The flexible conduit shall not exceed 600mm. Screwed conduit shall be used from the end of the flexible conduit to the isolator and/or starter. Refer to the specification for "FLEXIBLE CONDUIT", Section B1, par. 5.

(b) Multi-core armoured PVC- or rubber-insulated cable and earth conductor. The installation and termination of the cables shall comply with the specification for "INSTALLATION OF CABLES, Section B6.

(c) Cables and flexible conduits shall be provided with sufficient slack to allow positional adjustment of the equipment.

3.3 Supply cables to equipment may not be installed across floors which are for general use.

4. CONNECTIONS TO WATER HEATERS

4.1 Each water heater shall be connected to a separate circuit with a separate earth conductor.

4.2 The conduit from the switchboard to the water heater shall terminate in a draw-box within 1 m of the water heater terminals. The connection from the draw-box shall be conductors in conduit or

PVC-insulated cable. Only in instances where heaters are mounted out of normal reach may flexible conduit and round boxes with dome lids be used for the final connection.

4.3 The mounting of the water heater and the provision of the water connections will be undertaken by others. The Contractor shall ensure that the elements and thermostats can easily be replaced.

4.4 Before testing a water heater, the Contractor shall confirm with the Plumbing Contractor that the unit is filled with water.

4.5 Unless otherwise specified in the Detail Electrical Technical Specification, the wiring of hot water heater circuits not exceeding 4 kW shall consist of 4mm² conductors and 2.5mm² earth conductors.

4.6 Unless it is specified that isolators for water heaters shall be provided in the switchboard, a local isolator shall be provided for each water heater. In the case of water heaters not exceeding 4 kW, a 30 A double-pole metal-clad isolator shall be surface mounted over the flush conduit outlet box.

5. CONNECTIONS TO HEATERS, FANS AND AIRCONDITIONING UNITS

5.1 ISOLATORS

A flush mounted suitably rated double-pole isolator shall be provided within 1m of the unit. Where the equipment is mounted out of reach, the isolator shall be installed at 1.5m above floor level. Only where units are mounted in easily accessible positions and where an isolating switch is incorporated in the unit, may this isolator be omitted. Where flush isolators are used, flush conduit shall be installed to link with the equipment outlet point. Flexible cords of sufficient rating may be used for the final connection to the equipment.

5.2 WIRING

The minimum conductor size to be used shall be 4 mm^2. Each fan, heater or air-conditioning unit shall be on a separate circuit.

5.3 FLUSH MOUNTED CONVECTION HEATERS

The heater frame or tray shall be built or cast into the wall at a height such that the underside of the heater is at 250mm above floor level. Conduits shall terminate on the frame near the terminals.

5.4 SURFACE MOUNTED EQUIPMENT

5.4.1 Connections to surface mounted equipment shall consist of a draw-box located in the vicinity of the terminals of the unit. In workshops and industrial areas the connections shall be made by means of flexible conduit connected to dome lids on the draw-box. Conductors shall be connected directly to the unit.

5.4.2 In non-industrial applications, PVC-insulated 3-core flexible cables may be used for the connection.

5.4.3 Where flexible cables are used, a bush shall be provided at the rear of the unit for cable entry and a bush and clamp (or gripper gland) at the draw-box. The clamp shall tightly grip the outer insulation of the cable to prevent tension on the connections between cable and conductors in the draw-box.

5.4.4 Where heaters or air-conditioning units are situated above power skirting, the isolator shall be installed in the power skirting and the flexible cable or cord to the unit shall be installed in the

power skirting through a gripper or compression gland. The cable shall be made as short as practical and shall be neatly saddled to the surface of the wall.

5.5 RADIANT HEATERS

The installation of radiant heaters and asbestos heaters, where specified, shall comply with the requirements of paragraph 5.4, with the exception that they shall be mounted on spacers, 25mm away from the mounting surface.

5.6 FAN HEATERS

5.6.1 The contractor shall allow for the supply, installation and electrical connection of the fan heaters as indicated on the drawings. The fan heaters shall be rated at 3 kW and shall be complete with control units.

5.6.2 The heaters shall be secured by means of approved expansion bolts at 2.4m above floor level in positions as shown, with the control units at 1.5m above floor level, directly below the unit.

5.6.3 The fan heater shall be installed on a box directly behind the unit.

5.6.4 Each connection shall be protected by means of a single-pole circuit-breaker on the associated switchboard.

5.6.5 Brass bushes shall be provided to protect the wiring at the rear cable entries to the control unit and fan connection box.

6. CONNECTIONS TO UNDERFLOOR HEATING

6.1 Where underfloor heating cable is specified, the Contractor shall supply the cable and thermostats which shall be purchased from a specialist supplier. The cable shall be laid by the specialist supplier and connected by the Contractor. The Contractor shall also be responsible for testing of the cables prior to their being covered by the screed and immediately thereafter. Details of circuit wiring and control of underfloor heating will be specified in the Detail Electrical Technical Specification.

6.2 PVC-insulated heating cable with a rating of not higher than 13 W per linear metre shall be used. Thermal insulation will be provided by the Builder.

6.3 The capacity of the heating cable shall he sufficient to give a 20°C temperature rise with an outside ambient temperature of 5°C.

6.4 The total heating load shall, however, not he more than 135 W/m².

7. CONNECTIONS TO INCINERATORS

7.1 GENERAL

This section covers connections to incinerators used for domestic purposes in buildings. Unless specified to the contrary, the supply and installation of incinerators will form part of the electrical installation and shall comply with the relevant SANS codes.

7.2 FLUSH MOUNTED INCINERATORS

Where flush mounted incinerators have been specified, the Contractor shall supply the mounting tray to the Builder in good time for it to be built into the structure.

7.3 MOUNTING HEIGHT

Unless specified to the contrary, incinerators shall be installed with the bottom 1m above finished floor level.

7.4 ISOLATOR

A flush mounted 30 A double-pole isolator shall be installed approximately 1.5m above the finished floor level adjacent to each incinerator. The isolator cover plate shall wholly fall within either the tiled or plastered surface of the wall. Unless specified to the contrary, the cover plate shall be finished in white baked enamel. An engraved label shall be provided at each isolator marked as follows:

"SWITCH OFF TO CLEAN AND REMOVE ASH"
"SKAKEL AF VIR SKOONMAAK EN ASVERWYDERING"

7.5 FLUES

The Contractor shall supply flue pipes to the Builder for installation. Two bends and an "H" piece exhaust canopy shall be allowed for each flue pipe.

7.6 EXHAUST FANS

Where more than five incinerators are connected to the same flue or where more than two 90° bends are used in the flue, an exhaust fan shall be installed at the flue outlet. In addition a small fan must be provided at each incinerator.

7.7 WIRING

Single incinerators shall be connected by means of 2 x 4mm² PVC insulated conductors and a 2.5mm² bare copper earth conductor in a 20mm conduit. Each incinerator shall be connected to a separate circuit where a common exhaust fan is not used. Where a common exhaust fan is needed, the following applies:

(a) All fans and incinerators connected to the same flue shall be on the same circuit.

(b) The current rating of the circuit-breaker shall be sufficient to allow the simultaneous operation of all the fans and 50 % of the incinerators.

(c) A 30 A double-pole isolator shall be flush mounted adjacent to each incinerator as described in paragraph 7.4. However, if the current rating of the circuit-breaker protecting the circuit is larger than 15A, a 15A fuse and fuse holder shall be installed at each incinerator in addition to the isolator. The draw-box and cover plate for the isolator shall be large enough to accommodate the isolator and fuse. Alternatively, a 15A circuit-breaker may be installed adjacent to each incinerator in lieu of the isolator and fuse.

(d) The circuitry shall be arranged to ensure that all the fans will operate when any one of the incinerators is switched on.

(e) Earth leakage protection shall be installed on all incinerator circuits.

8. CONNECTIONS TO COOKING APPLIANCES

8.1 Unless specified to the contrary, the circuit connection to each cooking appliance shall consist of:

(a) 2 x 10mm² PVC-insulated conductors and 6mm² bare copper earth conductor for single phase connections, or

(b) 4 x 4mm² PVC-insulated conductors and 2.5mm² bare copper earth conductor for three phase connections.

8.2 A 60A double pole or 30A triple pole micro-gap isolator flush mounted in a wall outlet box shall be installed 1.5m above floor level to the left or right of the appliance in accordance with SANS 10142. A white baked enamel cover plate shall be provided, situated wholly on the tiled or plastered surface as applicable.

8.3 The conduit shall terminate 450mm above floor level behind the appliance position. The conduit end shall be approximately 75mm long and shall face downwards. Connections from the conduit end to the appliance shall be installed in accordance with SANS 10142. Sufficient slack shall be provided in the flexible connection to move the appliance 600mm away from its normal position for cleaning or maintenance.

8.4 Alternatively, a 45A, 3-pin socket-outlet may be mounted on a round draw-box 450mm above floor level. The connection to the appliance shall consist of a plug and 10mm², rubber-insulated and sheathed cable in accordance with SANS 1520. The cable shall be long enough to enable the appliance to be moved 600mm from its normal position for cleaning or maintenance.

8.5 Crimped or soldered lugs shall be provided on all conductors intended for connection to cooking appliances.

8.6 Each appliance shall be connected to a separate circuit. A separate earth wire shall be provided for each appliance.

SECTION B11

B.11 EARTHING

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

1. GENERAL RECOMMENDATIONS ON THE PRACTICAL INSTALLATION OF EARTH ELECTRODES

1.1 REQUIREMENTS OF AN EFFECTIVE EARTH

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

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

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

1.2 TYPES OF EARTH ELECTRODES

Three types of earth electrodes are suitable:

1.2.1 Trench Earths

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

1.2.2 Spike Earths

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

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

1.2.3 Foundation Earths

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

1.3 MATERIALS FOR EARTH ELECTRODES

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

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

1.3.3 Bare aluminium is unsuitable as electrode material.

1.4 CORROSION

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

2. TECHNICAL REQUIREMENTS OF NEUTRAL EARTHING

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

2.1 DISTRIBUTION SYSTEMS

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

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

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

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

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

(d) The overall resistance to earth of the neutral of an LV distributor or distribution system must not exceed 10 ohms.

(e) The LV neutral may be connected to other supply neutrals, earth electrodes, cable sheaths and armouring and these connections used to obtain the required earthing value of 10 ohms or less specified in par. (d). above.

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

(g) Where the overall resistance to earth of the neutral of the distribution system exceeds 10 OHMS, the neutral shall be earthed at intermediate positions on the distributor/s to reduce its resistance to earth to below this limit.

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

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

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

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

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

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

2.2 PROTECTIVE NEUTRAL BONDING (PNB) SYSTEM

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

2.3 SERVICE CONNECTIONS

2.3.1 MEN System

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

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

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

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

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

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

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

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

(h) In a service connection to traffic signals, street light and other power-consuming equipment installed in public places, such equipment is earthed to the ECC of the service connection.

2.3.2 PME System

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

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

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

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

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

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

3. SUBSTATION EARTHING

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

4. FENCES OF OUTDOOR SUBSTATIONS

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

(a) A 70mm² earth wire shall be installed 400mm below ground level and 500mm from the fence on the outside of the sub-station along the entire length of the fence. This earth wire shall be earthed at each corner by means of a 1.8m earth rod and the rod and earth wire bonded to the fence. The earth wire shall also be bonded, at least at two points, to the main earthing system.

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

5. EARTHING OF A GENERAL ELECTRICAL INSTALLATION

5.1 GENERAL

All earth conductors shall be stranded copper with or without green PVC insulation. All earth conductor sizes shall be determined in accordance with SANS 10142, par. 4.6 where the earth does not form an integral part of the cable.

5.2 SWITCHBOARDS

A separate earth connection shall be supplied between the earth busbar of the main switchboard and the earth busbar of every sub-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 utilised.

5.3 SUB-CIRCUITS

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

5.4 RING MAINS

Common earth conductors may be used where various circuits are installed in the same wiring channel in accordance with SANS 10142. In such instances the sizes of earth conductors shall be specifically approved by the Engineer. Earth conductors for 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.

5.5 CONNECTIONS

Under no circumstances shall connection points, bolts, screws, etc. used for earthing be utilised for any other purpose. It will be the responsibility of the Contractor to supply and fit earth terminals or clamps on equipment and materials that must be earthed where these are not provided. Unless earth conductors are connected to proper terminals, the ends shall be tinned and lugged. Lugs may be crimped, using mechanical or pneumatic tools designed for this purpose, on condition that evidence is submitted that the method used complies with the performance requirements of BS 4579, Part 1: "COMPRESSION JOINTS IN COPPER."

5.6 NON-METALLIC CONDUIT

Where non-metallic conduits are specified or allowed, stranded copper earth conductors shall be installed in the conduits and fixed securely to all metal appliances and equipment, including switch boxes, socket-outlet boxes, draw-boxes, switchboards, luminaries, etc. The securing of earth conductors by means of self-threading screws will not be permitted.

5.7 FLEXIBLE CONDUIT

An earth conductor shall be installed in all non-metallic flexible conduits. This earth conductor shall not be installed external 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.

5.8 WATER PIPES

Metal cold water mains shall be bonded to the earth busbar in the main switchboard by solid 15 x 2mm copper strapping. All other hot and cold water pipes shall be connected by 12 x 0.8mm perforated or solid copper strapping (not conductors) to the nearest switchboard. The strapping shall be fixed to the pipe work by brass nuts and bolts and against walls be brass screws at 150mm centres. In all cases where metal water pipes, down pipes, flues, etc. are positioned within 1.6 m of switchboards, an earth connection consisting of copper strapping shall be installed between the pipe work and the board. In vertical building ducts accommodating both metal water pipes and electrical cables, all the pipes shall be earthed at each switchboard.

5.9 ROOFS

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

void, fixed to the top purlin and connected to the main earth conductor of each switchboard. The roof and gutters shall be connected at 15m intervals to this conductor by means of 12 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.

SECTION B12

B.12 PROVISION FOR TELEPHONE INSTALLATION

1. CONTRACTOR'S RESPONSIBILITY

The Contractor shall only supply and install outlet points, wiring channels and/or conduits for telephones. The telephone installation will be carried out by others.

2. REGULATIONS

All provisions for telecommunications and IT equipment shall comply with the latest relevant SANS standards.

3. SEPARATION OF SERVICES

3.1 Cables or conductors for telephone, IT and audio-visual services shall be separated from all other services by:

(a) Providing separate metal channels or conduits, or

(b) Installing power cables, conductors and accessories at a minimum distance of 300mm from routes reserved for communications and IT cables, or

(c) An earthed metal barrier installed in such a manner to ensure that the minimum distance through free air space between the telephone cables and other services is at least 300mm.

3.2 In cases where power cable runs are parallel to telephone cable runs for more than 50m, the correct spacing shall be determined by conferring with the Engineer

3.3 Conduits or wiring channels provided for telephone services may not be used for any other purpose. Where non-metallic channels are used, the separation stated in par. 3.1 (b) shall he maintained throughout the installation.

4. MAIN TELEPHONE DISTRIBUTION BOARD

4.1 The size and position of the main telephone distribution board, where required, shall be in accordance with the requirements of the Detail Electrical Technical Specification.

4.2 The board shall consist of a metal tray, architrave frame and hinged doors and shall be flush mounted in the position shown on the drawing(s).

4.3 A 20mm thick soft wooden panel (fine grade pine to SANS 1359, without knots) shall be installed in the main telephone distribution board and shall cover the entire back of the board. Chipboard or similar materials are not acceptable.

4.4 All conduits and sleeves to telephone outlets or sub-distribution boards in the buildings or on the site as well as the main incoming sleeves shall terminate at the main telephone distribution board as indicated on the drawing(s).

4.5 Where 100 x 100 x 50mm draw-boxes are specified as main or sub-distribution boards, the boxes shall be flush mounted and provided with a cover plate. A wooden panel need not be provided in these cases.

5. VERTICAL BUILDING (SERVICE) DUCTS

5.1 If the telephone cables are to be installed in the same duct as power cables the separation of services described in par. 3 shall be maintained.

5.2 Conduits and metal channels to and from building duct(s) shall be installed from the section containing the telephone cables to obviate telephone cables crossing power cables or other services in the duct.

5.3 Where more than one vertical building duct is provided in the structure, the ducts shall be interconnected by at least 2 x 32mm dia. conduits at each floor level unless otherwise specified or indicated on the drawings.

6. TELEPHONE OUTLETS

6.1 Blank cover plates shall be fitted to all telephone outlets.

6.2 Telephone outlets in walls shall consist of flush mounted 100 x 100 x 50mm draw-boxes.

6.3 Telephone outlets in floors shall be of the same type as floor outlets for power socket-outlets. These provisions also apply to underfloor ducting. If the type of floor outlet is not specified, 100 x 100 x 50mm flush mounted draw-boxes shall be provided in the floor at the positions indicated on the drawings. The cover plates for these draw-boxes shall be of the die cast type.

6.4 Where twin underfloor ducts are provided and where the one duct is intended for telephone cables, the separation between the ducts shall be maintained throughout the underfloor ducting installation.

6.5 Where power skirting is specified for telephone installations, the Contractor need only install the skirting with covers since the telephone socket will be fixed directly to the cover. Where multiple power skirting is provided containing other services, no other cables may be installed in the section intended for telephone cables and the separation between the sections shall be maintained throughout the installation.

6.6 Refer also to the specification for the "INSTALLATION OF WIRING CHANNELS, UNDERFLOOR DUCTING AND POWER SKIRTING", Section B2.

7. CONNECTION OF TELEPHONE OUTLETS

7.1 Telephone outlets shall be inter-connected and connected to the telephone distribution boards as shown on the drawings.

7.2 If the inter-connecting conduits are not specified, conduit sizes shall be determined as follows:

Inter-connection of 10 outlets maximum - 25mm dia. conduit.

Inter-connection of 20 outlets maximum - 32mm dia. conduit.

7.3 Metal channels or power skirting installed on the same floor level on opposite walls of the same area as well as parallel runs of underfloor ducting intended for the installation of telephone cables, shall be interconnected at intervals of 6m. Conduits may be used for these inter-connections.

7.4 All conduits and all ducts or channels which do not have removable covers, shall be provided with galvanised steel draw-wires.

7.5 Conduit connections to power skirting or surface mounted metal channels shall consist of a 100 x 100 x 50mm draw-box which is flush mounted immediately behind the duct or channel in which the telephone cables are to be installed. A hole shall be cut in the back of the duct or channel, immediately opposite the draw-box. The edges of the hole shall be grommeted. The draw-box shall be accessible from the front when the cover is removed.

7.6 Purpose-made accessories for the connection of conduits to underfloor ducts shall be used. Where these are not available, a 100 x 100 x 50mm draw-box shall be installed below the underfloor duct opposite a floor telephone outlet. Inter-connecting conduits shall terminate at the draw-box. The edges of the hole shall be grommeted. The draw-box shall be accessible from the top via the floor outlet.

7.7 Exposed conduit ends intended for future extensions shall be terminated by means of a coupling and screwed brass plug. Only galvanised conduits shall be used in these instances.

SECTION B13

B.13 SUBSTATIONS SWITCH ROOMS AND GENERATOR ROOMS

This section covers the general building arrangement and special requirements for high and low voltage switch rooms, transformer rooms and generator rooms.

1. STANDARD BUILDINGS

This section has been intentionally omitted.

2. OTHER BUILDINGS

If the standard buildings cannot accommodate the equipment required, suitable substation rooms complying with the following constructional details shall be provided:

2.1 The rooms shall have a ceiling height of at least 2.8 m above finished floor level.

2.2 A concrete roof slab shall be provided or alternatively a roof consisting of corrugated iron, or clay or cement tiles with an asbestos ceiling.

2.3 The rooms shall be waterproof, vermin proof and fireproof.

2.4 Door openings shall be 1.85 m wide by 2.5 m high with steel louvered ventilation openings over at least 60 % of the door area. Doors shall open outwards and it shall be possible to readily open them from the inside. Provision shall be made for a night latch and a padlock.

2.5 The floor and transformer base shall be on the same level. Each transformer base shall be able to support a mass of 5 tonness on castors.

2.6 Vermin proof steel louvered ventilation openings shall be provided with an area of at least 20 % of the total floor area for transformer and generator rooms and 10 % for switch rooms if not specified to the contrary. 50 % of the ventilation openings shall be installed in the lower part of the walls, not more than 300 mm above floor level and the other 50 % of the ventilation openings shall be installed in the upper part of the walls, not more than 300 mm below ceiling level to achieve good cross and convection ventilation. Louvers contained in the doors can normally be considered to provide the 50 % required in one of the walls.

2.7 Where possible, windows with an area equal to 5 % of the floor area shall be included to provide natural lighting. It shall not be possible to open these windows. The windows shall be in the upper portion of the walls, as high as possible.

2.8 Corners of transformer bases and cable ducts shall be cut off at an angle of 45° with the splay at least 100mm wide.

2.9 Cable entrance openings shall be at least 600mm wide x 500mm deep and level with the bottom of the cable trenches. Alternatively a separate sleeve for each cable and at least one spare sleeve shall be provided.

2.10 Cable trenches shall be 600mm wide and 800mm deep unless specified to the contrary.

2.11 The floors of cable trenches shall have a fall of 1:100 to make provision for the natural draining of water.

2.12 At least one light with a switch adjacent to the entrance and one standard 16A 3-pin earth leakage protected socket outlet shall be provided in each room. The illumination level in the substations shall not be less than 200 lux. If a battery supply is available one incandescent light per substation room shall be connected to this supply and the switch in the circuit marked "EMERGENCY LIGHT"/"NOODLIG".

2.13 The floors shall be floated to a smooth finish with a steel trowel.

2.14 Any one of the following interior wall finishes is acceptable:

(a) Plastered and painted white.

(b) Unpainted face brick (preferably light colour brick).

(c) Off-shutter concrete painted white.

3. NOTICES

The following notices in both official languages shall be exhibited at all entrances to and suitable places within premises in which are situated generating plant and transforming, switching or linking apparatus:

A notice showing the “Lightning” sign with the wording: Danger-Ingozi-Gevaar.

3.1 A notice prohibiting unauthorised persons from entering such premises.

3.2 A notice prohibiting any unauthorised persons from handling or interfering with electrical apparatus.

3.3 A notice detailing procedure in case of fire.

3.4 A notice containing directions for resuscitation of persons suffering from the effects of electric shock.

4. HIGH VOLTAGE SWITCH ROOMS (ABOVE 1 KV)

4.1 The equipment shall be installed and secured to the floor in accordance with the manufacturer's specification.

4.2 Sufficient space shall be provided between the switchboard and the walls of the switch room to allow for the installation, maintenance and operation of the switchboard.

4.3 In the case of switchboards with uninsulated conductors accessible from the back, a clear space of at least 1.2 m shall be provided between the back and sides of the board and the wall.

4.4 In the case of switchboards which are of a totally enclosed construction, the minimum clear space between the back and sides of the board and the wall shall be at least 900mm.

4.5 A space of at least 1.2 m shall be provided in front of a switchboard for operating and maintenance personnel. If the circuit breakers are of the withdrawable carriage type, this space shall be at least 900 mm when the breaker carriages are in the fully withdrawn position.

4.6 The access door into the room shall be in front of the switchboard.

4.7 The tools and earthing and operating devices for the switchgear shall be contained in a purpose-made sheet metal cupboard secured to the wall of the substation.

4.8 A reticulation diagram displaying sufficient detail to be able to assess problems and trace faults (both on the HV and LV sides of the system) shall be mounted against a wall in the HV switch room behind clear plastic.

5. LOW VOLTAGE SWITCH ROOMS (BELOW 1 KV)

5.1 The equipment shall be installed and secured firmly to the floor or wall of the switch room.

5.2 Sufficient space shall be provided between the switchboard and the walls of the switch room to allow for the installation, maintenance and operation of the switchgear. In general this space shall be 900mm at the back and sides of the board and 1.2 m in front of the switchboard.

5.3 In the case of switchboards with uninsulated conductors which are exposed and accessible from the back, a clear space of at least 1.2 m shall be provided at the back.

5.4 A LV reticulation diagram displaying sufficient detail of at least the main LV reticulation in order to be able to assess problems shall be mounted against a wall in the LV switch room behind clear plastic.

6. TRANSFORMER ROOMS OTHER THAN IN STANDARD BUILDINGS

6.1 Transformer rooms shall be large enough to accommodate the transformer with a 900mm clear space between the walls and the transformer. The minimum dimensions of a transformer room shall in any case be not less than 3.5m wide and 4.0m long.

6.2 The dimensions of the room shall be determined by using the transformer dimensions of TABLE 2 of SANS 780.

6.3 Where natural cross ventilation of the transformer room is not possible, adequate forced ventilation shall be provided to dispose of the transformer's losses and to prevent the air temperature in the transformer room from exceeding 40 C.

6.4 The cable entrances to the transformer room shall be sealed off after the cables have been installed.

7. GENERATOR ROOMS OTHER THAN IN STANDARD BUILDINGS

7.1 The ventilation of generator rooms shall be sufficient to dispose of the heat radiated from the engine while delivering full power.

7.2 The heat from the radiator shall be released outside the building via a ventilation duct or an external heat exchanger.

7.3 The exhaust emission shall be released outside the building and shall comply with the local environmental control regulations.

7.4 The fuel storage tank shall be installed in compliance with SANS 10131 and the position shall be approved by the local fire department. When the storage tank must be located outdoors, it should be underground to insulate the fuel from severe temperature variations which may impede fuel flow.

7.5 An electrical schematic diagram indicating mains supply and change-over arrangement as well as all standby plant electrical control circuitry, shall be mounted on a wall behind clear plastic.

7.6 An emergency light with automatically rechargeable Nickel-Cadmium batteries shall be installed above the generator set to facilitate manual starting or fault tracing in the event that the set does not start during a power failure.

8. CABLES

8.1 Cables shall be installed in cable trenches which shall be provided for this purpose. The installation shall comply with the specification for "INSTALLATION OF CABLES", par. 5 of Section B6.

8.2 Under normal circumstances cables shall not be installed directly on the floor.

9. COVERING AND SEALING OF CABLE TRENCHES

9.1 All the cable trenches shall be covered with steel chequer plate or a compound wood, bound with a water resistant binder, or an approved fibreglass grating. The following types of compound wood coverings are acceptable:

(a) Five ply marine ply, 12 mm thick.

(b) Exterior grade particle board, 22mm thick.

(c) Tempered hardboard, 12.7mm thick.

9.2 The trench coverings shall be ridged and shall not sag more than 5 mm with two normal persons standing on one section.

9.3 The trench covering shall be in sections not exceeding 1.25 m.

9.4 The trench coverings shall be provided with holes or recessed handles to make it possible to remove and replace the covers easily.

9.5 The trench coverings shall be neatly cut where necessary to accommodate cables.

9.6 The covers shall overlap the trench on both sides and shall be recessed to fit flush with the surface of the floor.

9.7 The cable entrances in the trenches of the switch rooms, transformer rooms and generator rooms shall be closed and sealed after the cables have been installed to prevent the backfill material and water from entering the trenches in the building.

9.8 The cable entrances shall be closed with bricks, without mortar, in such a way as to prevent the weight of the bricks from resting on the cables. These bricks shall be plastered on the inside with a 10:1 ratio of sand and cement.

9.9 If the cables enter the trenches via sleeves, these sleeves shall be plugged on both sides with weak mortar, an asbestos and cement mixture or a non-hardening compound.

SECTION B14

B.14 OVERHEAD ELECTRICAL TRANSMISSION LINES

1 GENERAL

1.1 This section covers the supply, delivery, erection and commissioning of overhead transmission lines up to 22 kV on wooden poles.

1.2 An overhead line shall comprise the wooden poles, cross-arms, stays, conductors, insulators, isolators, fuse-links, transformers, lightning arrestors and any other auxiliary equipment specified.

1.3 All materials and fittings used shall be new and of high quality.

1.4 Overhead lines shall be erected in accordance with the "CODE OF PRACTICE FOR OVERHEAD POWER LINES FOR CONDITIONS PREVAILING IN SOUTH AFRICA", issued by the S.A. Institute of Electrical Engineers.

2. STATUTORY REQUIREMENTS

2.1 Occupational Health and Safety Act. (1993) Act 85 of 1993 and subsequent amendments and regulations issued thereunder.

2.2 The Post Office Act, No. 44 of 1958 and the Postmaster General's Requirements issued in terms of that Act.

2.3 The Mines and Works Act, No. 27 of 1956 and subsequent amendments and regulations issued thereunder.

2.4 The Electricity Act, (1994) Act 41 of 1984.

2.5 The Fencing Act, No. 31 of 1963.

2.6 The Forest Act, Article 34 of Act No. 72 of 1968.

2.7 The Advertising on Roads and Ribbon Development Act, No. 21 of 1940 and No. 16 of 1962.

2.8 The Air Navigation Regulations promulgated in terms of the Aviation Act, No. 74 of 1962.

2.9 Explosives Act, No. 26 of 1956.

2.10 The South African Transport Services Safety Regulations.

3. RELEVANT SANS SPECIFICATIONS

3.1 SANS 182 : Conductors for overhead electrical transmission lines.

PART3 : Aluminium Conductors, Steel Reinforced.

3.2 SANS 60383 : Ceramic and glass insulators for overhead lines of nominal voltage greater than 1000V.

3.3 SANS 61284 : Non-current-carrying line fittings for overhead power lines.

3.4 SANS 753 : Wooden power transmission poles and cross-arms.

3.5 SANS 470 : Concrete poles for telegraph, telephone, power and lighting purposes (reinforced and prestressed types).

3.6 SANS 61643 : Low voltage lightning arresters.

4. STANDARD SPECIFICATIONS

4.1 INSTALLATION OF CABLES, par.3.13, Section B6.

4.2 EARTHING, Section B11.

5. NOTICES AND PRECAUTIONS

5.1 The Contractor shall issue all notices and make the necessary arrangements with supply authorities, the Postmaster-General (TELKOM), Transnet, S.A. Transport Services, provincial or National road authorities and other authorities as may be required with respect to the installation of overhead lines.

5.2 The Contractor shall take all the necessary precautions and provide the necessary warning signs and/or lights to ensure that the public and/or employees are not endangered.

5.3 The Contractor shall acquaint himself with the position of all existing services and infrastructure prior to commencing the installation.

5.4 The Contractor will be held responsible for damage to any existing services brought to his attention by the relevant authorities and will be responsible for the cost of repairs.

6. PEGGING THE ROUTE

6.1 The Contractor shall peg out the route for the overhead line but shall maintain close liaison with the Engineer.

6.2 Should the proposed position of poles appear unsatisfactory due to obstructions, poor soil conditions, rock, etc., the Engineer shall be consulted and a ruling obtained.

6.3 The Engineer reserves the right to alter the line route at any time prior to the installation of the overhead wires. Payment in respect of any additional or wasted work involved shall be at the documented rates.

6.4 The removal of obstructions along the route shall be subject to the approval of the Engineer.

7. LINE IMPULSE LEVEL

The line Basic Impulse Level (B.I.L.) shall be maintained at the full voltage, namely:

LINE VOLTAGE (KV)	IMPULSE VOLTAGE WITHSTAND LEVEL (KV)
Up to 6.6	75
11	95
22	150

8. LINE CONFIGURATION

8.1 Lines shall generally be configured as indicated in the drawings.

8.2 Alternate arrangements shall be submitted to the Engineer for approval.

9. POLES

9.1 The line configuration and support structure shall be suitable for the proposed route. Refer also to the Occupational Health and Safety Act.

9.2 Wooden poles shall normally be used and shall comply with SANS 753, Group strength "A" and shall bear the SANS mark of approval.

9.3 Preservatives of the poles shall comply with the requirements for Type Al of SANS 1290 and the impregnation shall be carried out in accordance with SANS 10005 using the empty-cell pressure process.

9.4 Poles shall be “LOOP TENSION” banded at both ends.

9.5 Concrete poles where specified shall comply with SANS 470 and the Detail Electrical Technical Specification.

9.6 If the spacing of poles is not more than 80m specified in the Detail Electrical Technical Specification, poles for 11 kV and 22 kV lines shall be spaced not more than 80m apart and poles for LV lines shall be spaced not more than 45m apart. The spacing of LV lines in suburban areas shall be arranged to suite the requirements of city blocks and street lighting.

9.7 All the poles shall be installed with the marking tags facing the roadside where applicable or shall face in the same direction where a road does not exist alongside the overhead line.

9.8 The pole minimum dimensions listed in the table below shall be used. Poles not complying with these dimensions shall be removed from site.

LENGTH (M)	MINIMUM TOP DIA (MM)
9.0	160
10.2	160
12.0	180
13.0	180
16.0	200

9.9 Templates shall be used for drilling holes required to fix cross-arms, brackets, insulators, etc. to the poles. After drilling, the holes shall be coated with a mixture of creosote and tar.

9.10 The poles shall be planted at the following minimum depths:

LENGTH	PLANTING DEPTH (M)
9.0	1.7
10.0	1.8
12.0	2.0
13.0	2.2
16.0	2.6

9.11 Kicking blocks shall be provided where ground with poor bearing qualities is encountered.

9.12 Poles shall be planted vertically plumb and in line and sufficiently stayed to maintain that position.

10. CROSS-ARMS

10.1 Cross-arms shall be of wood. Steel cross-arms shall only be used when clearly specified in the Detail Electrical Technical Specification. Wooden cross-arms are preferred due to their higher electrical resistance and better lightning performance of the line.

10.2 Steel cross-arms where specified shall be manufactured from standard steel sections complying with BS 4360.

10.3 Wooden cross-arms shall comply with SANS 753, Group Strength "A" and shall be straight in grain. Preservatives shall comply with par. 9.2. above. The minimum diameter of cross-arms shall be as follows:

LENGTH (M)	DIAMETER (MM)	
	MIN	MAX
2.4	140	160
3.0	140	160
3.6	160	185
4.5	160	185

10.4 Cross-arms shall be LOOP TENSION banded at both ends.

10.5 Tie straps shall be manufactured of mild steel to Grade 43 of BS 4360.

10.6 Cross-arms shall be long enough to accommodate the insulator spacing specified below.

10.7 Cross-arms and tie straps shall be bolted to poles using galvanised bolts, nuts and washers. Curved wood pole washers shall be fitted between bolt heads and the poles and between cross-arms and the poles. Back straps and U-bolts may be used to attach wooden cross-arms to the poles.

10.8 Curved wood pole washers shall be galvanised malleable cast iron or mild steel with a minimum thickness of 6 mm and shall have a minimum square outside dimension of 63 mm.

11. INSULATORS AND FITTINGS

11.1 Insulators shall be chosen to provide the mechanical strength and insulation level required by the line at every point in accordance with relevant SANS codes.

11.2 Insulators shall be spaced to provide the conductor clearance required.

11.3 Pin insulators and their pins complying with SANS 60383 shall be used in straight line intermediate positions only.

11.4 Disc insulators shall be used in all strain, tension or angle positions, Clevis-and-tongue or ball-and-socket type insulators complying with SANS 60383 shall be used. Disc insulators may be of glass or porcelain.

11.5 Curved wood pole washers shall be fitted between the collars of insulator pins and the cross-arm or pole and between the pin nut and the cross-arm or the pole. The washers shall comply with par. 10.8 above.

11.6 Insulator hooks shall be of an approved pattern and shall be manufactured from BS 4360 grade 43 mild steel or forged.

11.7 Terminating and yoke straps shall be manufactured from BS 4360 grade 43 steel or forged to a design approved by the Engineer.

11.8 All steel or ironwork i.e., fittings, cross-arms, bolts, nuts, washers, etc., shall be hot dip galvanised to SANS 32 & 121.

12. CONDUCTORS

12.1 Steel reinforced aluminium conductors to SANS 182, Part 3 shall be used for overhead lines. Should copper conductors be specified, they shall comply with SANS 182, Part 1. The cross-sectional area shall comply with the Detail Electrical Technical Specification.

12.2 The spacing between phase conductors shall be increased by 20 % over the spacing determined according to the formula in par. 4.7.5 of the "Code of Practice for Overhead Power times" to compensate for stay movement and other factors and to maintain the B.I.L. of par. 7 above.

The minimum conductor spacing are:

POLE SPACING (M)	SUPPLY VOLTAGE		
	Up to 6.6 kV	11 kV	22 kV
	CONDUCTOR SPACING (mm)		
60	575	635	790
70	635	700	850
80	700	750	910
90	750	810	975

12.3 Manufacturer's stringing and tensioning charts shall be used to erect conductors. Conductors shall not be tensioned to more than 25 % of the breaking strength of the conductor at -5.5 °C with no wind.

12.4 Conductor running blocks shall be installed on all pole positions to run out the conductors. Conductors shall not be dragged along the ground. The three conductors shall be tensioned simultaneously using suitably rated chain-ratchet pullers and "come along" specially designed for the particular conductor.

12.5 The minimum conductor to ground clearances as stipulated in Occupational Health and Safety Act shall be closely observed. Allowance shall be made for conductor creepage and subsequent increased sag after a period.

12.6 Conductors shall be pre-stressed for not less than one hour before binding in.

12.7 Mid span joints shall be kept to a minimum and where unavoidable, shall be made with approved full tension line splices.

12.8 Conductor joints at non-tension points shall be made with two bolt parallel groove clamps of a type approved by the Engineer. The current carrying capacity of the clamps shall be at least equal to that of the conductor.

Non-oxidising conducting paste shall be liberally applied to the inside of these clamps.

12.9 Where aluminium to copper connections are made, suitable bimetal clamps shall be used.

13. CONDUCTOR TERMINATIONS

13.1 Cold compression, bolted snail clamps or preformed terminations shall be used. Suitable thimble clamps shall be used with the preformed terminations.

13.2 The conductor shall be bound in at pin insulators by a single stirrup and binding. A chafer tape of soft aluminium shall be wrapped around the conductor at the insulator contact area. The conductor shall be bound to the stirrup for a distance of 50mm on either side of the insulator. 5mm diameter hard drawn aluminium wire shall be used for binding.

13.3 Suitably sized preformed wrap lock ties with pads may be used as an alternative method to par. 13.2 above.

13.4 Trails and bridge wires must be neatly disposed and connected with clamps or line taps with a minimum of two per connection or by means of other approved mechanical connectors.

14. STAYS

14.1 The position of stays may or may not be indicated in the instructions for the service, but it is the responsibility of the Contractor to provide staying adequate to maintain correct tension of the line and the verticality of every pole in the line, with or without the additional use of kicking blocks as he may decide.

14.2 Wind stays must also be provided for straight lines in exposed positions. Struts shall not be used if this can be avoided by the use of aerial stays and pillar stays.

14.3 Stay wires shall be spliced and bound in, in the accepted manner. Approved preformed materials may also be used.

14.4 The angle between the stay and the pole must be between 35° and 45°. The stay must be made off on the pole, as near as practicable to the point of resultant stress, with one and a half complete turns around the pole, supported by a suitable clamp.

14.5 For terminal poles of vertical line arrangements, at least two stays shall be used to prevent deformation of the pole, with the stay plates buried at least 1.8 m apart.

14.6 Stay holes shall be vertical, not less than 1.5 m deep and no wider than necessary to accommodate the baseplate, with a narrow side channel cut to embed the rod at the correct angle.

The baseplate and portion of rod within the stay pole shall be firmly packed with hard material or concrete where necessary.

14.7 Stay pillars shall be concreted into the ground with top and bottom kicking blocks where required by the nature of the soil.

14.8 Porcelain stay insulators shall be installed in one stay wire as high as possible above ground level but far enough away from the structure to ensure that the portion of the stay below the insulator does not become alive.

14.9 Stay wire shall be of galvanised steel and the individual steel strands shall have a breaking stress of not less than 695 MPA and shall comply with BS 183 or SANS 182, Part 5. Stay wire make-offs shall be painted with bitumastic paint on completion.

14.10 Stay rods shall comply with BS Pattern 2 and shall be of circular section with tubular type turn buckles. Heavy duty construction, deep contoured type thimbles shall be used.

14.11 Galvanised steel stay plates shall be used.

14.12 Stay guards are required in the vicinity of public paths and roadways.

15. EARTHING OF STRUCTURES

15.1 Earthing requirements for service connections are specified in the specification for "EARTHING", Section B11.

15.2 Protective overhead earth wires shall only be provided where specified in the Detail Electrical Technical Specification. In cases where overhead earth wires are specified, a low impedance earth as determined by the Basic Impulse Level of the line shall be provided at every pole along the line.

15.3 An earth connection is not required at every pole along a line with wooden poles and without overhead earth wires. Lines with metal poles shall be earthed at every pole.

15.4 Steelwork on wooden poles shall generally not be earthed except at structures for transformers, isolators, fuse-links, cable boxes, lightning arresters or other equipment which impairs the impulse flashover value of the insulation provided by the wooden structure.

15.5 All metalwork to be earthed shall be bonded together with 1 mm^2 bare copper conductors. These common bonds shall be connected to a 35mm^2 bare stranded or solid copper earth down lead conductor.

15.6 The connection between the overhead conductors and lightning arrestors and between the arrestors and the earth down lead shall consist of bare copper conductors of not less than 25mm^2. The connecting leads shall have smooth bends and shall follow the shortest possible route.

15.7 The earth down lead conductor shall be stapled to the pole at intervals not exceeding 1m. Where atmospheric conditions are likely to cause galvanic action, staples shall be of non-ferrous metal and an earth clip used where possible.

15.8 The earth conductor shall be threaded through a black polyethylene sleeve for at least 2m above the ground.

15.9 The earth conductor shall not be installed in steel conduit nor shall the conductor be wrapped around the pole at any point since this will increase the reactance of the down lead.

15.10 A trench earth shall be installed at earthed structures carrying equipment such as transformers, fuse-links, lightning arresters, etc. extending 10 m on four sides of the structure in the form of a cross. The ends of the earth wires shall be bonded to four earth electrodes of at least 1.8m in length driven into the ground.

15.11 Intermediate earthing for overhead earth wires may consist of wrapping the earth wire 5 - 6 times around the pole below ground level.

15.12 The earth resistance shall be determined following the installation of the trench earth. Earth resistance values specified or required by protective devices shall be checked. The earth resistance values required to maintain the B.I.L. of the line as specified in par. 7 (assuming an average lightning current value of 25 kA), are as follows:

	IMPULSE LEVEL (KV)	**EARTH RESISTANCE (OHM)**
Up to 6.6	75	3.0
11	95	3.8
22	150	6.0

15.13 Should the earth resistance be higher than specified or required, additional earthing shall be provided. Trench earths shall not exceed 50m. Proprietary clays may be used for soil treatment to improve the earth resistance.

16. EARTH WIRE ON LV SYSTEMS

16.1 Where specified, a continuous earth wire shall be installed along LV (up to 660 V) overhead lines in order to provide earth continuity between installations served by the line (ECC).

16.2 The earth wire shall be connected to every earth along the route in addition to the substation earth. Refer also to par. 4 of the specification for "EARTHING", Section B11.

16.3 All metalwork and the top positions of stay wires shall be bonded to the earth wire.

16.4 The earth wire shall be above the conductors.

17. LIGHTNING ARRESTERS

17.1 Lightning arresters shall be of a type approved by the Engineer.

17.2 Lightning arresters shall be installed at all points where the steelwork has to be earthed and where specified.

17.3 The arresters shall be connected to the overhead conductors by 25mm² (minimum) copper conductors minimum and suitable parallel groove clamps.

17.4 Lightning arresters shall be placed on all the phase conductors at the following points in addition to those specified in the Detail Electrical Technical Specification:

(a) As near as possible to the transformer terminals on the transformer side of the fused protection where applicable.

(b) At each termination of a cable on the overhead line.

(c) At every line sectionaliser or recloser.

(d) At each connection point to secondary lines.

17.5 Lightning arresters shall be mounted below the overhead conductors in order to reduce the length of the discharge path.

17.6 An earth shall be supplied and installed at each point where lightning arresters are installed in accordance with par. 15 above.

18. FUSE-LINKS

18.1 Fuse-links shall be of a type approved by the Engineer.

18.2 Details of fixing methods and mounting shall be submitted to the Engineer for approval.

18.3 Fuse-links shall be installed at all transformers and where specified.

19. TRANSFORMER MOUNTINGS

19.1 Transformers shall comply with all relevant SANS codes.

19.2 Transformers with a maximum power rating of 25kVA may be mounted on a single pole with the mounting brackets as specified in SANS 780.

19.3 Transformers with a power rating in excess of 25kVA and with a maximum of 200kVA shall be mounted on a platform between two poles.

19.4 The transformer platform for pole mounting shall consist of galvanised steel channels bolted to the two poles. The platforms shall be manufactured and installed in accordance with the drawings.

19.5 All steelwork as well as the bolts, nuts and washers shall be galvanised to SANS 32 & 121.

19.6 An earth wire shall be installed against each pole of the structure and must extend for at least 500mm above the poles. These earth wires shall be bonded across at the top of the poles to shield the transformer.

19.7 Earthing in accordance with par. 15 shall be provided.

20. SUBSTATION EARTH

Substation earths and earths at transformers along the route intended for earth continuity connections to installations served by the line, shall be provided in accordance with the specification for "EARTHING", Section B11.

21. ANTI-CLIMBING DEVICES

21.1 Anti-climbing devices shall be fitted to all poles carrying transformers or mechanically operated fuses or switchgear.

21.2 Galvanised barbed wire wound around the poles for at least 1m at a height of 2m above ground may be employed for this purpose.

22. CRADLES

Where HV overhead lines cross roadways, railways and other supply lines, important communication lines and where an HV line is run above an LV line, an earthed cradle shall be

installed. The longitudinal wires of the cradle shall not be less than 7.2mm² and the cross-lacing not less than 4mm².

23. DANGER NOTICES (LIGHTNING SIGN)

Danger notices with the wording "DANGER-GEVAAR-INGOZI" shall be fitted to all structures with transformers, mechanically operated switchgear and fuses.

24. EXCAVATIONS

24.1 Excavations for poles, stays and trench earths shall remain open for as short a period as possible. The Contractor shall erect and maintain guards, warning notices and lights at open excavations and soil heaps.

24.2 Excavations shall be classified as follows:-

Very hard rock shall mean rock that can only be excavated by means of explosives.

Hard rock shall mean granite, quartzitic sandstone, slate and rock of similar or greater hardness, solid shale and boulders in general requiring the use of jack hammers and other mechanical means of excavation.

Soft rock and earth shall mean rock and earth that can be loosened and removed by hand-pick and shovel.

24.3 After poles and stays have been planted, the holes shall be backfilled and well compacted. Compaction shall be executed in layers of not more than 300mm to obtain a high compaction density.

24.4 The following dimensions shall be used when calculating the cubic capacity of excavations:

(a) Pole holes: 1.2m x 0.6m x depth

(b) Stay holes: 1.2m x 0.6m x 1.8m

(c) Trench earths: 0.5m x 0.6m x length

24.5 Poles shall be installed in accordance with the Detail Electrical Technical Specification of the installation.

24.6 Poles shall not be installed in clayey soil or in swampy conditions without the necessary precautions to stabilise the installation.

24.7 If unsatisfactory conditions for the installation of poles and stays are encountered during the excavations, the Engineer shall be informed without delay in order to facilitate alteration of the foundation design or alteration of the route of the line.

24.8 Poles and stays shall be installed in undisturbed soil.

24.9 If wooden poles are installed in a concrete or other water retaining foundation, the pole shall protrude through the concrete to ensure adequate natural drainage to prevent rotting of the wooden pole in the foundation due to the accumulation of water between the pole and the foundation.

25. SAMPLES

Samples of equipment, materials and SANS test reports proposed for the installation shall be submitted to the Engineer on request.

SECTION B15

B.15 INSPECTIONS, TESTING, COMMISSIONING AND HANDING OVER

1. PHYSICAL INSPECTION PROCEDURE

1.1 Once the Contractor has completed the installation, written notice shall be given to the Engineer in order that a mutually acceptable date can be arranged for a joint inspection.

1.2 During the course of the inspection, the Engineer will compile a list of items (if any) requiring further attention. A copy of this list will be provided to the Contractor who will have a period of 7 days in which to rectify the offending items of the installation.

1.3 The Contractor shall then provide written notice that he is ready for an inspection of the remedial work to the offending items.

1.4 This procedure will continue until the entire installation has been correctly completed to the satisfaction of the Engineer.

2. TESTING AND OPERATIONAL INSPECTION PROCEDURE

2.1 In addition to the above the Contractor shall have the complete installation tested and approved by the local authorities where applicable.

2.2 Subsequent to the above testing and approval, the Contractor shall in the presence of the Engineer test all circuits with respect to:

(a) Phase balance.

(b) Insulation level.

(c) Polarity.

2.3 Upon completion of the installation and within 3 months of the handover date, the Contractor shall provide and make available a recording voltmeter to record the voltage at three locations in the complex over a period of 48 hours each. These locations will be nominated by the Engineer.

3. "AS-BUILT" DRAWINGS

3.1 As each portion of the work is completed, the Contractor shall provide the Engineer with as-built drawings showing the exact location measured from fixed points of all cables, transmission lines, each outlet point, etc.

3.2 In addition a complete reticulation diagram showing all supply cables and switchboards shall be provided behind a plastic cover in the substation or adjacent to the main switchboard if not located in a substation.

3.3 The installation will not be regarded as complete until all of the above requirements listed in 1, 2 and 3 above have been met.

ANNEXURE C: EARTHING AND LIGHTNING PROTECTION SPECIFICATIONS

EARTHING AND LIGHTNING PROTECTION SYSTEM INSTALLATION

GENERAL SPECIFICATION

1. SATISFACTORY INSTALLATION

The whole of the installation shall be carried out in accordance with:

(a) The latest SANS Codes of Practice:
SANS 10199,
SANS 10313,
SANS 62305-1-2-3-4,
IEC 62305-1-2-3-4.

(b) The Operational Health and Safety Act (Act No 85 of 1993).

(c) The Municipal By-Laws and any other special requirements as deemed necessary by the Local Supply Authority.

(d) Local Fire Regulations.

2. S.A.B.S. APPROVED DRAWINGS

SABS Approved drawings are not required for this project.

3. TEST ON COMPLETION

Upon completion of the lightning protection system, the following tests shall be witnessed by an appointed representative of the Employer. The results shall be recorded on suitable test certificates which must be signed by both the Contractor and the Employers representative. A sketch must be included on each test certificate indicating the positions of each earth electrode in relation to some permanent reference point. It must also indicate the positions at which tests were carried out, the type of test and the results of these tests.

3.1 Earth Resistance Test

The Earth Resistance Test shall involve measuring the resistance to earth of each rod-type electrode, or group of rod-type electrodes, or trench earth which would normally be connected to one down-conductor or earth terminal. This test must be made with the electrodes completely disconnected from any part of the structure or lightning protection system.

3.2 Electrical Continuity Tests

(a) **External Down-Conductors**

Electrical continuity between the lower ends of external down-conductors which must all be dis-connected from the earthing system during the test shall not exceed 1 (one) ohm.

(b) Metallic Services

Electrical continuity between any metallic structures of services (e.g. rainwater pipes) which form an integral part of the lightning protection system shall not exceed 1 (one) ohm. These tests should be carried out with all other components of the lightning protection system disconnected from the component being tested.

4. DESCRIPTION OF MATERIAL

4.1 Air Terminals and Down-conductors

All conductors must be in accordance with the requirements of BSS 1474 or American Standards Specification 6063. All aluminium conductors shall have a cross-section area of not less than 30 mm^2 (domestic dwelling only) or 50 mm^2 for all other applications. The dimensions of flat section conductors to be 20 mm x 3 mm. Where conductors are mounted in stand-off guides, the cross-section area of the conductor must be not less than 70 mm^2 to give adequate mechanical strength.

4.2 Conductor Guides

The conductor must be mounted in aluminium alloy guides conforming with the material specification given in 4.1 above. The guides must allow for free longitudinal movement of the conductor to cater for expansion and contraction of the system caused by temperature variation. The minimum thickness of any part of the guide shall not be less than 3 mm. The guides must be securely attached to the structure using two stainless steel screws and plugs, the use of plated screws is not permitted.

The conductor system shall be supported in guides so that an air gap exists at all times between the aluminium and the surface of the structure, the guides being seated upon plastic or other similar insulating material. Should conductors be installed directly upon the surface of concrete or cement plaster, an insulating strip is to be installed over its whole length to prevent contact between the two surfaces. Guides shall be installed to support the conductor at intervals not exceeding 1,2 metres horizontally or 1,5 metres vertically.

N.B.: No part of an aluminium conductor system must be allowed to come into direct contact with concrete or cement plaster as this may cause the aluminium to corrode.

4.3 Expansion Loops

Where conductors are installed horizontally without deviation from a straight line over long distances, expansion loops must be provided at distances not exceeding 30 metres. These expansion loops must have a cross-sectional area which is at least equal to that of the conductor.

4.4 Protection of Down-conductors

Where external down-conductors are installed in areas which are readily accessible to the public, the lower ends of the conductors shall be enclosed in a semi-rigid insulating material. In the case of a circular section conductor this shall comprise a 2 metre length of 20 mm diameter P.V.C. conduit. This conduit shall be securely attached to the wall by means of galvanized steel saddles fixed with stainless steel screws and plugs, spaced at intervals not exceeding 1 m. Where a flat section conductor is used this shall be covered by a similar length of 25 mm P.V.C. conduit. The lower end of the conduit shall be positioned as close as practicable to ground level, i.e. immediately above an aluminium to copper joint. The ends of the conduit shall not be sealed.

4.5 Earthing Electrodes

Earthing electrodes must consist of either copper-clad steel rods not less than 12 mm in diameter and having a minimum copper thickness of 0,20 mm driven into the ground, or a 50 mm^2 (35 mm^2 for domestic dwellings) bare copper conductor buried in a trench, or a combination thereof. Where copper clad steel electrodes are used they must have a suitable bond between the steel core and copper exterior to prevent moisture ingress between the two metals. Where it is necessary to extend earth rods, an electrolytically compatible corrosion resistant, coupling device, which prevents ingress or moisture into the joint shall be used. The copper conductor below the down-conductor joint shall be covered by a semi-rigid P.V.C. conduit for a distance of approximately 200 mm above ground and 400 mm below ground.

4.6 **Joints Above Ground**

Circular section aluminium conductors shall be joined by aluminium ferrules or lugs which are securely crimped into place. Aluminium lugs must be bolted together using 10 mm diameter aluminium bolts and washers. The material specification for these components must conform with that laid down in paragraph 4.1. Alternatively, heavily tinned copper lugs and ferrules may be used. The lugs should be joined together by means of 10 mm diameter copper, brass or bronze bolts and washers. Care should be taken to inhibit corrosion where dissimilar metals are used by thoroughly cleaning the surfaces of the metal before assembly and subsequently sealing the joint with an inert tenacious compound or tape.

Flat section aluminium conductors shall be joined by double riveting, using aluminium rivets which comply with the material specification laid down in 4.1. Alternatively, 2 x 6 mm diameter stainless steel bolts, nuts and washers may be used. Fold over type bends will not be permitted.

Down-conductors are to be terminated approximately 200 mm above finished ground level. Circular section aluminium is to be jointed to a 50 mm^2 (35 mm^2 in the case of domestic dwellings) stranded copper conductor by securely crimping in place two heavily tinned lugs and bolting these together using 10 mm diameter copper, brass or bronze nuts, bolts and washers.

N.B.: Under no circumstances shall aluminium conductors be buried in the ground.

4.7 **Joints Below Ground**

A joint in the stranded copper conductor which forms part of the earthing system must be made by using a crimped copper ferrule clamping (not lugs) using two copper line taps of suitable dimensions, or exothermic welding. The copper earth conductor must be joined to an earth rod by either clamping, using a standard earth rod clamp or copper line tap or by exothermic welding. Joints which are made between dissimilar metals (i.e. copper conductor to galvanized steel water main), must be thoroughly cleaned before assembly. They shall be rendered watertight using waterproof adhesive tape on a suitable compound for a minimum distance of 200 mm in all directions from the joint.

4.8 **Bonds**

Where it is necessary to bond the aluminium conductor to any other metallic surface, this must be done by bolting or riveting. When attaching aluminium to a dissimilar metal the joints are to be thoroughly cleaned and sealed to prevent corrosion.

5. **GENERAL INSTALLATION PROCEDURE**

5.1 **Air Terminals for Non-metallic Pitched Roofs**

Aluminium conductors are to be installed along all ridges of roofs and projections such as dormer windows, etc., terminating at the ends with conductors running downwards over the surface of the roof and the eaves. Non-metallic chimneys must be protected by means of a finial of sufficient length to cover the chimney within a 45° angle struck downwards from its point. Alternatively, it should have a conductor installed in the form of a closed loop upon the upper surface. The conductors are to follow the outer contour of the stack and must be bonded at a convenient point to the nearest component of the air terminal system.

N.B.: This bond may run in a horizontal or downward direction, but under no circumstances must any part of it run above horizontal.

Conductors may be dead-ended (i.e. have one end free and unbonded), providing that the length of such a conductor does not exceed 10 metres and that the unbonded end is either at the same level or higher than the bonded end. This technique may be used where ridge conductors are installed over dormer windows, etc.

In all cases where metallic gutters have been installed along the eaves of a pitched roof, these must be bonded to the air terminal system. Where metallic gutters do not exist, however, a conductor must be installed over the surface of the roof at eaves level to which the remainder of the air terminal system is to be bonded, with the following exceptions:

(a) Where the maximum distance from the ground level to the eaves of the building is less than 4 metres and the pitch of the roof is more than 1 in 2 (27° from the horizontal).

(b) Where the maximum distances from ground level to the eaves is less than 7 metres and the pitch of the roof is more than 1 in 1,5 (34° from the horizontal).

(c) Where the distance from the ground level to the eaves is more than 7 metres and the pitch of the roof is more than 1 in 1 (i.e. the included angle at the apex of the roof is less than 90°).

Under these circumstances eaves conductors need not be installed.

Any non-metallic objects which protrude above the general roof lines, such as Cape Dutch gable ends, must be protected as described above with a suitable air terminal system. Any metallic objects which protrude above the general roof line, such as hot water expansion pipes must be bonded as directly as possible to the nearest eaves conductor, gutter or other part of the lightning system.

N.B.: These bonding conductors must run in a horizontal or preferably a downward direction, from the vent pipe, etc., to the lightning protection system.

5.2 Air Terminals for Metallic Pitched Roofs

Buildings with roofs covered with electrically continuous metal sheets do not require separate air terminals but must be earthed via down conductors generally as described in 5.6 and 5.7. Any non-metallic objects projecting above the general roof line must be separately protected as described in 5.1 and bonded to the metal roof covering.

5.3 Air Terminals for Non-metallic flat or Mono-pitched Roofs

For flat or mono pitched roofs of non-metallic construction the air terminal system must consist of aluminium alloy conductors installed around the outer perimeter of each section of the roof structure. These conductors must be installed on top of parapet walls if these exist. Lift motor rooms, tank rooms, penthouses, etc., which protrude above the general roof line must have air terminal conductors installed around the outer perimeter of each roof slab or parapet wall. Any metallic objects which protrude above the roof line, such as expansion pipes, signs, flag poles, handrails, etc., must be bonded directly to the nearest component of the lightning protection system as described in 5.1.

N.B.: It is not permissible for the ends of conductors to be bonded directly to the perimeter air terminal system if the latter is installed upon a parapet wall having a height exceeding 500 mm above roof slab level. In these circumstances the conductors are to be bonded directly to the down conductors.

5.4 Air Terminals for Metallic flat or Mono Pitched Roofs

Metallic flat or mono pitched roofs do not require separate air terminal conductors, providing that there is electrical continuity between the metallic roofing sheets, (see 5.2). A metallic roof surrounded by a non-metallic parapet wall shall have conductors installed at the top of the parapet wall and these must be bonded to the metallic roof at intervals not exceeding 20 metres. If the parapet wall is clad with metal over its upper surface or a handrail is installed which affords good electrical continuity, separate air terminal conductors need not be installed. Under these circumstances the metal handrail or cladding must be bonded to the metal roof covering at intervals not exceeding 20 metres.

All non-metallic covering such as slates, tiles, asbestos cement sheeting, etc., supported by a steel structure being electrically continuous throughout may be treated as being of a complete metal construction. In these circumstances no separate air terminal system need be installed providing the steel roof structure is bonded to earth at intervals given in 5.5.

5.5 Down Conductors for Non-metallic Structures

Down conductors must be installed at regular intervals around structures and to run as directly as possible between the air terminal and earthing system. They must, where practicable, be positioned at the external corners of the structure. The maximum separating distance between down conductors around the perimeter of the structure must not exceed 30 metres. In the case of very tall buildings having a slender base (i.e. chimney stacks, water towers, etc.), a minimum of two down conductors must be installed.

The lower ends of down conductors are to be terminated and bonded to the earthing system approximately 200 mm above finished ground level. Under no circumstances must aluminium conductors be buried underground. Test joints must be provided between the down conductors and earthing system. Down conductors must run vertically between the air terminal and earthing systems. Where this is impracticable, their course may be deviated to run at any angle up to and including horizontal.

Where it is necessary to run conductors horizontally over the upper surface of a structural protrusion, such as an exposed concrete slab, the conductor may run down vertically over the edge of the slab and return to the main structure, so that the distance between the upper and lower conductors exceeds one third of the length of the horizontal run. Looped down conductors are not permitted. Down conductors must not run over the underside of large overhangs which are less than 6 metres above ground level, or other areas where people are likely to be present during a thunderstorm.

External or internal metallic rainwater pipes may be used as down conductors providing these are of substantial section and are jointed by screwing one length into another or welding. Thin gauge galvanized steel pipes whose sections are held together by friction, rivets or screws must not form part of a lightning protection system.

5.6 Down conductors for reinforced concrete framed structures

The steel reinforcement of this type of structure may be used in place of down conductors. Where the reinforcing system is used, the air terminal system must be bonded to it at a maximum of 30 metre intervals using steel clamps. This bond may be achieved by clamping, with a steel clamp, a steel conductor to a selected reinforcing bar, the opposite end of this conductor must terminate at a corrosion resistant metallic terminal such as Grade 316 stainless steel.

The reinforcing system of prefabricated concrete buildings must not be used unless special provision is made for bonding the various prefabricated sections together.

The terminals should be mounted flush with the face of the concrete. An aluminium alloy bond must then be taken from the air terminal system and be connected to the stainless steel terminal by means of a heavily tinned crimp lug for circular section aluminium, or a suitable bi-metallic joint in the case of flat section aluminium. A similar system must be used to bond the reinforcing system at ground level to the earthing system at points directly below the air terminal bonds. Here copper con-ductors must be used as the external bonding material.

Under no circumstances must copper, or other non-ferrous material be allowed to come into contact with steel reinforcing bars, as this may cause severe corrosion and subsequent structural damage. The lightning protection system must not be bonded to any part of the structure which is electrically isolated from the remainder of the building, i.e. cantilevered sections. In these circumstances, or where it is otherwise impracticable to use the reinforcing system, external down conductors must be installed as described in 5.5.

5.7 Down conductors for steel framed structures

Where the framework of a building is constructed of structural steel columns, these may be used in place of down conductors providing the separating distance between them does not exceed 30 metres. The upper ends of the columns must be bonded to the air terminal systems and the lower ends to the earthing system.

5.8 Earthing by means of vertically installed rod type electrodes

Rod-type electrodes must be driven into the ground at a position directly below each down connector. The maximum earthing resistance of each electrode or number of electrodes bonded to any one down conductor shall not exceed N X 30 ohms, where N equals the total number of down conductors which are bonded to a common air terminal system, or 200 ohms whichever is the lower value.

The minimum horizontal separating distance between rod-type electrodes bonded together must not be less than their installed depth. The upper ends of installed rod-type electrodes are to be terminated approximately 500 mm below finished surface level. A 50 mm^2 copper bonding conductor must be installed to run between each earthing electrode system and the lower ends of the adjacent down conductors. A joint is to be made between each of these bonding conductors and the down conductors at a position approximately 200 mm above finished ground level. These bonding conductors must be installed in P.V.C. conduit securely affixed to the wall (see 3.4). The length of this P.V.C. conduit must be approximately 600 mm and must be installed so that approximately 200 mm protrudes above ground level, the remainder being buried into the soil.

5.9 Earthing by means of metallic water mains

Where two or three down conductors are installed the water mains may serve as an earth terminal for one of these. Where three of more down conductors are installed the water mains may serve as an earth terminal for two of these. Regardless of whether the water mains are used as an earth terminal or not, the incoming metal water pipe must be bonded to the lightning protection earthing system underground.

5.10 Earthing by means of trench type electrodes

Where the soil conditions prevent the satisfactory installation of rod-type electrodes, a trench earth system must be installed. This method is to comprise a 50 mm^2 stranded copper conductor installed horizontally into a trench at a depth of 500 mm below finished ground level. The conductor is to follow the general outline of the structure to be protected and be installed 1 metre away from the outside walls. Where the building stands on rocky ground, the trench earth may be attached to the lower part of the wall in areas where rock protrudes through the soil. The conductor must, however, be buried wherever possible as described above.

Each down conductor must be bonded to the trench earth system as directly as possible by means of a copper conductor.

Trench earth systems must have a maximum earth resistance of 30 ohms. An isolated length of trench earth mat must be bonded to the down conductor system in such a way as to reduce the length of dead-ends to the minimum.

Should trench earths be installed beneath pathways where people are likely to be present during a thunderstorm, a plastic, bitumastic or ceramic pipe must be installed having a length similar to the width of the pathway and the trench earth conductor run inside it.

N.B.: The maximum useful length of a dead-ended trench earth is 80 metres.