





## KAREEBERG LOCAL MUNICIPALITY

CARNARVON 22kV SUBSTATION

**TENDER NUMBER: 39/2021**

ISSUED BY:	PREPARED BY:
 <p><b>KAREEBERG LOCAL MUNICIPALITY</b></p> <p>Hanau Street Carnarvon 8925</p> <p>Mr. Z. Mjandana</p> <p>Tel: (053) 382 3012 Fax: (053) 382 3142</p>	 <p><b>TCB ENGINEERING</b></p> <p>PO Box 151 Douglas 8730</p> <p>Mr. Andries Jooste</p> <p>Tel: 083 640 5002</p>

<b>NAME OF BIDDER (FULL NAME)</b>	
<b>TEL NUMBER:</b>	
<b>FAX NUMBER:</b>	



## KAREEBERG LOCAL MUNICIPALITY

### CARNARVON 22 kV SUBSTATION

**TENDER NO.: 39/2021**

#### **SUMMARY FOR BID OPENING PURPOSES**

NAME OF BIDDING ENTITY:	
PHYSICAL ADDRESS:	
POSTAL ADDRESS:	
TELEPHONE NUMBER:	
EMAIL ADDRESS:	
CONSTRUCTION PERIOD:	
CONTRACT PRICE: <i>Amount brought forward from the Form of Offer and Acceptance</i>	
SIGNED BY AUTHORISED REPRESENTATIVE OF THE BIDDING ENTITY:	
DATE:	

*Note: Form of Offer and Acceptance amount will take precedence should a discrepancy be found in contract price listed above.*



# KAREEBERG LOCAL MUNICIPALITY

## CARNARVON 22 kV SUBSTATION

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## PART T1.1 – TENDER NOTICE AND INVITATION TO TENDER



### KAREEBERG LOCAL MUNICIPALITY

**TENDER NO: 39/2021**

### CARNARVON 22 kV SUBSTATION

Kareeberg Local Municipality hereby invites tenders for the CARNARVON 22 kV SUBSTATION. It is estimated that the tenderers should have a CIDB grading of 6EP or higher. Only tenderers who conform to the criteria stated in the Tender Data and Tender conditions are eligible to submit tenders.

The tender will be advertised on e-tender portal and CIDB. Documents will be issued via e-tender portal and will not be available in hard copy.

A compulsory clarification meeting with representatives from the Employer will take place at the municipal offices of Kareeberg Local Municipality in Carnarvon on **30 July 2021 at 11:00 strictly**. Only tenderers who attend the clarification meeting shall be eligible to submit tenders.

This tender will close on **13 August 2020 at 12:00**. Completed tender documents, sealed in an envelope and clearly marked with “**TENDER NO. 39/2021: CARNARVON 22kV SUBSTATION**” must be placed in the tender box in the municipal offices in 10 Hanau Street, Carnarvon. No tenders will be accepted after the closing time or per fax or per e-mail.

The Municipality does not bind itself to accept the lowest or any tender and reserves the right to accept the whole or part of a tender. All tenders will remain valid for a period of 90 days after the time and date of opening. This tender will be evaluated according to the 80/20 point system and the MFMA.

Technical enquiries relating to this tender should be addressed to **Mr. A. Jooste**, telephone 053 831 1609 | Cell number 083 640 5002 | fax 086 503 5564 | Email andries@hvr.co.za

MR. Z. MJANDANA  
ACTING MUNICIPAL MANAGER

P.O Box 10  
CARNARVON  
8925

## PART T1.2 – TENDER DATA

The conditions of bid are the Standard Conditions of Tender as contained in Annex F of the CIDB Standard for Uniformity in Construction Procurement dated July 2015. A copy is attached hereto as Addendum F. The under mentioned items of data and deviations will have precedence over the Standard Conditions of bid conditions in Addendum F.

The Standard Conditions of Bid for Procurements make several references to the bid data for details that apply specifically to this bid. The bid data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the standard conditions of bid.

Clause	Wording
F1.1 ACTIONS	The Employer is: The Acting Municipal Manager KAREEBERG LOCAL MUNICIPALITY Hanau Street Carnarvon 8925
F1.2 TENDER DOCUMENTS	The bid documents issued by the Employer comprises:  Parts T1, T2, C1, C2, C3, C4 and the Addendums.
F1.4 COMMUNICATION AND EMPLOYER'S AGENT	The Employer's Agent is: TCB Engineering Name: Andries Jooste Tel: 053 831 1609 Email: andries@hvr.co.za
F2.1 ELIGIBILITY	Only tenderers who satisfy the following eligibility criteria are eligible to submit tenders: <ul style="list-style-type: none"> <li>a) Availability of resources.</li> <li>b) Availability of skilled and experienced human resources to perform the contract allocated to this tender.</li> <li>c) Previous experience on similar projects with complete and responsive references.</li> <li>d) Only B-BBEE Level 1 and 2 tenderers allowed.</li> </ul> <p>Only those bidders who are registered with the CIDB in a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered as 6EP class of construction work.</p> <p>Joint Ventures are eligible to submit bids provided that:</p> <ul style="list-style-type: none"> <li>a) Each member of the joint venture is registered with the CIDB,</li> <li>b) The lead partner has a contractor grading of 5EP, and</li> <li>c) the combined contractor grading designation calculated in accordance with the CIDB is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a 6EP class of construction work.</li> </ul>
F2.7 CLARIFICATION MEETING	The arrangements for a compulsory clarification meeting are: As listed in the Tender Notice and Invitation to Tender – Part T1.1
F2.12 ALTERNATIVE TENDER OFFERS	No alternative offers will be considered for this tender.
F2.13.3 SUBMITTING A TENDER OFFER	The whole original bid document as issued by the Kareeberg Local Municipality must be submitted. No copies will be accepted. Bids may only be submitted on the bid document issued by the employer.
F2.13.5 TWO ENVELOPE SYSTEM	The employer's address shall for the delivery of the bid documents and marked as follows:  The Acting Municipal Manager KAREEBERG LOCAL MUNICIPALITY

	<p>Hanau Street CARNARVON</p> <p>Tender No: 39/2021</p> <p>CARNARVON 22 kV SUBSTATION</p>
F2.13.6 TWO ENVELOPE SYSTEM	Two envelope procedure will not be followed.
F2.15 CLOSING TIME	The closing time for submission of bids is: <b>13 August 2021 at 12:00.</b> Telephonic, telegraphic, fax or emailed bid documents will not be accepted.
F2.16 TENDER OFFER VALIDITY	The bid documents will remain valid for 90 days.
F2.19 INSPECTIONS, TESTS AND ANALYSIS	Access shall be provided for inspections, tests and analysis as may be required by the employer.
F2.23 CERTIFICATES	<p>The bidder is required to submit the following with his bid:</p> <ul style="list-style-type: none"> <li>a) Tenderers shall be registered and in good standing with the South African Revenue Service (SARS) and shall submit documentary evidence in the form of an original valid tax Clearance Certificate issued by SARS or proof that he or she has made arrangements with SARS to meet his or her outstanding tax obligations. Each party to a Consortium/Joint Venture shall submit a separate Tax Clearance Certificate, or proof that he or she has made the necessary arrangements with SARS.</li> <li>b) Either a Certificate of Contractor Registration issued by the Construction Industry Development Board OR a copy of the application Form for registration in terms of the Construction Industry Development Board Act (Form F006).</li> <li>c) Copies of all municipal accounts of the bidder or for each partner in the JV.</li> <li>d) Certified copy of the B-BBEE certificate.</li> </ul>
F3.4 OPENING OF BID SUBMISSIONS	<p>The time and location for the opening of the bid documents are: Immediately after the closing time for submission of bid.</p> <p>Location: Kareeberg Local Municipality Hanau Street Carnarvon 8925</p>
F3.5 TWO-ENVELOPE SYSTEM	A two envelope system will not be followed.
F3.9 ARITHMETICAL ERRORS	<p>Replace the contents of the clause with the following:</p> <p>Check responsive tender offers for arithmetical errors, correcting them in the following manner:</p> <ul style="list-style-type: none"> <li>a) Where there is a discrepancy between the amounts in figures and in words, the amount in words shall govern.</li> <li>b) If bills of quantities (or schedule of quantities or schedule of rates) apply and there is an error in the line item total resulting from the product of the unit rate and the quantity, the rate shall govern and the line item total shall be corrected.</li> <li>c) Where there is an error in the total of the prices either as a result of corrections required by this checking process or in the tenderer's addition of prices, the total of the prices shall be adjusted to reflect the arithmetically correct summation of corrected line item totals.</li> </ul> <p>Consider the rejection of a tender offer if the tenderer does not accept the correction of the arithmetical errors in the manner described above.</p>
F3.11	The procedure for the evaluation of the responsive tenders is METHOD 2.

EVALUATION OF BID DOCUMENTS	<p>The functionality criteria and maximum score in respect of each of the criteria are as follows:</p> <table border="1" data-bbox="523 315 1337 685"> <tr> <th>Functionality criteria</th><th>Maximum number of points</th></tr> <tr> <td>Quality Control</td><td>20</td></tr> <tr> <td>Local Labour and Sub-Contracting Plan</td><td>10</td></tr> <tr> <td>Experience on previous contracts of a similar nature, scope or complexity (over the last ten years).</td><td>40</td></tr> <tr> <td>Experience of the site supervisor/responsible person allocated to the project.</td><td>30</td></tr> <tr> <td><b>Maximum possible score for quality</b></td><td><b>100</b></td></tr> </table> <p>The following documents will be used for judging the Quality Criteria:</p> <ul style="list-style-type: none"> <li>• Quality Control: The Tenderer is to provide a short document (maximum 4 pages) on the proposed method for quality control on THIS PROJECT. It should focus on the different stages of the project, critical milestones and the interaction between contractor, material supplier and engineer.</li> <li>• Local labour &amp; Subcontracting: The Tenderer is to provide a short document (maximum 2 pages) on the proposed work (indicate value of such work, local employees employed and length of employment) that will be done by local labour and local sub-contracted firms.</li> <li>• Experience on previous projects of similar nature: Form T2.3</li> <li>• Qualification/Experience of supervisor/responsible person allocated to this project: Form T2.6 and its required documentation.</li> </ul> <p><b>The minimum number of evaluation points for functionality is 75. Tenderers failing to meet this criteria will not be evaluated further.</b></p> <p>Each evaluation criteria will be assessed in terms of five indicators – no response, poor, satisfactory, good and very good. Scores of 0, 40, 70, 90 or 100 will be allocated to no response, poor, satisfactory, good and very good, respectively.</p> <p>Tenderers having passed the minimum score for functionality will be subsequently scored on the 80/20 principle for price and preference.</p>	Functionality criteria	Maximum number of points	Quality Control	20	Local Labour and Sub-Contracting Plan	10	Experience on previous contracts of a similar nature, scope or complexity (over the last ten years).	40	Experience of the site supervisor/responsible person allocated to the project.	30	<b>Maximum possible score for quality</b>	<b>100</b>
Functionality criteria	Maximum number of points												
Quality Control	20												
Local Labour and Sub-Contracting Plan	10												
Experience on previous contracts of a similar nature, scope or complexity (over the last ten years).	40												
Experience of the site supervisor/responsible person allocated to the project.	30												
<b>Maximum possible score for quality</b>	<b>100</b>												
F3.13 ACCEPTANCE OF BID DOCUMENTS	Bids containing any one or more of the errors or omissions, or bids not having complied with the peremptory bid conditions of this bid document; or bids that are not signed by the authorized signatory shall not be considered and shall automatically be rejected.												
F3.17 PROVIDE COPIES OF THE CONTRACT	The number of paper copies of the signed contract to be provided by the Employer is one.												
ADDITIONAL CONDITIONS APPLICABLE TO THIS BID	<p>The additional conditions of bid are:</p> <ol style="list-style-type: none"> <li>The Employer/Engineer may also request that the bidder provide written evidence that his financial, labour and other resources are adequate for carrying out the contract.</li> <li>The Employer reserves the right to appoint a firm of chartered accountants and auditors and/or execute any other financial investigations on the financial resources of any bidder. The bidder shall provide all reasonable assistance in such investigations.</li> <li>The Employer reserves the right to appoint a different Contractor for each Section as listed in the Schedule of Quantities. The bidder shall be required to complete the Form of Offer and Acceptance (C1.1) and Bills of Quantity for the Sections for which they intend to bid for.</li> <li>The Employer may appoint more than one Contractor on this project, subject</li> </ol>												

	<p>to the specific conditions agreed to in the Form of Acceptance.</p> <p>e) The bid document shall be submitted as a whole and shall not be taken apart.</p> <p>f) List of returnable documents (PART T2) must be completed in full. (A bidder's company profile will not be used by the Kareeberg Local Municipality to complete PART T2 on behalf of the bidder)</p> <p><b><i>NB: If PART T2 is not completed in full by the bidder, this offer will be rejected.</i></b></p> <p>g) No part of this document, or any document supplied by the Engineer during this project, may be copied, photographed or repeated in any manner or process without consent by the Engineer in writing. Copyright is reserved on all designs, drawings, specifications, systems and processes contained in the documents.</p> <p>h) All designs, drawings, specifications, bill of quantities, systems and processes are only intended for this project and in its current configuration. Professional approval is only applicable to the current project and in its current configuration.</p> <p>i) Tenders are required to comply fully with all minimum local content requirements as stipulated by National Treasury. The tenderer shall attach all the required forms in this regard.</p> <p>j) The tender shall be considered non-responsive if the offer is not signed and rejected.</p> <p>k) At least 5%, before P&amp;Gs, of the tender shall be used on local labour and the contractor shall report on this monthly on the template that will be provided. Please note that the rates that will be paid shall be as per latest bargaining council applicable to the trade.</p>
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## **PART T2 - RETURNABLE DOCUMENTS**

*Please note that all the documents in this bid document must be completed and signed where applicable and submitted as a complete set of documents.*

## PART T2.1 – PARTICULARS OF TENDERER

### TENDERER

Name Of Tenderer:	
Address:	
Contact Person for questions:	
Telephone Number:	
Email Address:	
Company Registration Number:	
VAT Registration Number:	

### BANK

Name of Bank:	
Branch Name:	
Branch Code:	
Name of Account:	
Account Number:	
Contact Person:	
Telephone Number:	

If the above bank account is NOT the account to deposit payment claims during the project, provide details of such account.

The information MUST correspond with the information reflecting on the CSD report.

Date	Name	Signature

## PART T2.2 – FINANCIAL RATING

Name of Contractor	
Banker:	
Name of Bank:	
Account Number:	
Tender Amount:	
Construction Period:	
10% Guarantee Amount (if not opting for retention):	

Performance Guarantee must be 10% of total Tender amount including VAT and valid for the entire period of the construction period.

### BANK RATING

<input type="checkbox"/>	CATEGORY A	Indisputable for Enquiries
<input type="checkbox"/>	CATEGORY B	Good for the amount mentioned
<input type="checkbox"/>	CATEGORY C	Good for the amount, strictly in accordance with business
<input type="checkbox"/>	CATEGORY D	Reasonable business risk
<input type="checkbox"/>	CATEGORY E	High risk – not to be recommended
<input type="checkbox"/>	CATEGORY F	Financial position unknown
<input type="checkbox"/>	CATEGORY G	Cheques occasionally dishonoured
<input type="checkbox"/>	CATEGORY H	Cheques frequently dishonoured

The value on which our Bank Rating of the Bidder is based is R.....

Manager of the Financial Institution:

Date	Name	Signature

Bank Stamp of Financial Institution.

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## PART T2.3 – SCHEDULE OF EXPERIENCE OF CONTRACTOR

Tenderers must insert, in the space provided below, a list of work or contracts of similar nature that have been successfully carried out.

NOTE:

1. Tenders must include a separate detailed summary of what the projects listed below entailed technically (the project works). This is needed so that evaluators can see how these projects relate to the one at hand.
2. Tenders must include full Practical (if achieved separately from First Handover) and First Handover (*Works Completion*) certificates as proof of experience listed below. Failure to include these will render listed project null and void.

Note – referring to Company profiles instead is prohibited.

### PROJECT 1

Project:	
Employer (name & contact no.):	
Consulting Engineer (name & contact no.):	
Nature of Work:	
Value of Work:	(Excl. VAT)
Contract Period:	
Actual Completion date (As per hand over certificate):	
Reason for deviation (if applicable):	

### PROJECT 2

Project:	
Employer (name & contact no.):	
Consulting Engineer (name & contact no.):	
Nature of Work:	
Value of Work:	(Excl. VAT)
Contract Period:	
Actual Completion date (As per hand over certificate):	
Reason for deviation (if applicable):	

**PROJECT 3**

Project:	
Employer (name & contact no.):	
Consulting Engineer (name & contact no.):	
Nature of Work:	
Value of Work:	(Excl. VAT)
Contract Period:	
Actual Completion date (As per hand over certificate):	
Reason for deviation (if applicable):	

**PROJECT 4**

Project:	
Employer (name & contact no.):	
Consulting Engineer (name & contact no.):	
Nature of Work:	
Value of Work:	(Excl. VAT)
Contract Period:	
Actual Completion date (As per hand over certificate):	
Reason for deviation (if applicable):	

Date	Name	Signature

## T2.4 - SCHEDULE OF CURRENT WORKLOAD

List your current contracts and obligations:

Description & Client/Engineer Contact Details	Value	Start Date	Duration	Expected Completion Date

Date	Name	Signature

## PART T2.5 – SCHEDULE OF PLANT

Schedule of Plant the tenderer intends to use on the work, if his tender is successful:

Plant	Quantity	Own Property	Rented

Date	Name	Signature

## PART T2.6 – SCHEDULE OF STAFF AND LABOUR

Note, a person may only be added once to the staff schedule at the position best suitable for his current job description. See detailed requirements at end of schedule

### PERMANENT STAFF:

Position	Quantity	Highest Qualification	Experience (years) after Qualification	HDI (Y/N) + Age	Male / Female
Contract manager (office bound)					
Installation Electrician (responsible person on this site)					
Installation Electrician (other)					
Foreman / Site Agent					
Electricians					
Labourers Skilled					
Labourers Unskilled					

### INTENDED CONTRACTED STAFF FOR THIS PROJECT:

Position	Quantity	Highest Qualification	Experience (years) after Qualification	HDI (Y/N) + Age	Male / Female
Contract manager					
Installation Electrician					
Foreman / Site Agent					
Electricians					
Labourers Skilled					
Labourers Unskilled					

Detailed requirements:

- Proof of qualifications of foreman, responsible person, installation electrician(s) and electrician(s) are to be attached.
- Responsible person shall have minimum relevant experience of 10 years of substation construction and MV overhead reticulation works.
- Provide organogram of company showing names, job descriptions, years employed by the company and highest qualifications of all staff and directors.
- Provide organogram of staff allocated to this project.



- Tenderers to allow for rates that are not less than the minimum wages as prescribed by the Department Of Labour.

Date	Name	Signature

## **PART T2.7 – LIST OF PROPOSED MATERIAL SUPPLIERS**

Tenderers shall set out in the schedule hereunder the details of any Suppliers.

<b>Name of Proposed Supplier</b>	<b>Contact Person &amp; Telephone Number</b>	<b>Type of Material</b>	<b>Credit Value with Supplier</b>

Date	Name	Signature

## PART T2.8 – REGISTRATION AS ELECTRICAL CONTRACTOR

In terms of the OHS Act 2005, Electrical Installation Regulation 8, the successful tenderer / electrical sub-contractor must be registered as an Electrical Contractor with the Chief Inspector. They also need to be registered with the Workmen's Compensation Commissioner and the Unemployment Insurance Commissioner to qualify for this contract.

The tenderer must complete the following questionnaire and submit it with the tender.

THE TENDER WILL NOT BE CONSIDERED UNLESS ALL THE NECESSARY INFORMATION HAS BEEN SUBMITTED.

a) Is the company registered as an Electrical Contractor with the Department of Labour?

YES	NO
-----	----

Registration Number:

Date of Issue:

Name of Accredited Person (please attach CV for this person under relevant section)

ID Number:

Registered Person's Registration Number:

Date Issued:

Registered Person's Telephone Number:

Years Employed by the Company:


b) Is the company registered with:

i. The Workmen's Compensation Commissioner?

YES	NO
-----	----

Registration Number

Date of Issue:


ii. The Unemployment Insurance Commissioner?

YES	NO
-----	----

Registration Number

Date of Issue:


c) Name of Accredited Person responsible for this site (if different to that listed in (a)), who will be responsible for FULL TIME supervision on site:

Registration Number

Date of Issue:


Qualifications of the above person:

I/We certify that the above information is correct and undertake to comply with the provisions in Regulations 5, 6, 7, 8 & 9 of Government Notice No. 31975 of 6 March 2009, promulgated under Section 43 of the Machinery and Occupational Safety Act 1993. The applicable section reads as follows:

1. Regulation 5

Design and Construction

- 1.1. No person may authorize, design, install or permit or require the installation of an electrical installation, other than in accordance with a health and safety standard incorporated into these Regulations under section 44 of the Act.
- 1.2. No person may use components within an electrical installation unless those components comply with the standards referred to in the relevant incorporated standard referred to in sub-regulation (1), and proof of compliance shall be identifiable on the components or certification shall be available from the manufacturer or supplier of the materials or components in terms of the National Regulation of Compulsory Specification Act, 2008 (Act no.5 of 2008).
- 1.3. Items of an electrical installation not covered by an incorporated health and safety standard, and the conductors between the point of supply and the point of control, shall be installed in accordance with the by-laws or regulations of the supplier concerned.
- 1.4. A registered person shall exercise general control over all electrical installation work being carried out, and no person may allow such work without such control. **(Amend to read: a registered person shall exercise full time control)**
- 1.5. Where the voltage exceeds 1kV, a person deemed competent in terms of paragraphs (b), (c) or (d) of the definition of a competent person in regulation 1 of the General Machinery Regulations, 1988, or a person registered in a professional category in terms of the Engineering Profession Act, 2000, shall approve the design of that part of an electrical installation.
- 1.6. Where the intention is to supply five or more users from a new point of supply, they shall appoint an approved inspection authority for electrical installations or a person deemed competent in terms of paragraph (b), (c) or (d) of the definition of a competent person in regulation 1 of the General Machinery Regulations, 1988, or a person registered in a professional category in terms of the Engineering Professions Act, 2000, who shall ensure the compliance contemplated in sub-regulation (1) from the commencement to the commissioning of the electrical installation.
- 1.7. No supplier may restrict the application of a health and safety standard referred to in sub-regulation (1) when an electrical installation is installed, except where the distribution system of the supplier may be adversely affected by the application thereof.

2. Regulation 6

Electrical Contractor

- 2.1. No person may do electrical installation work as an electrical contractor unless that person has been registered as an electrical contractor in terms of these Regulations.
- 2.2. Any person who does electrical installation work as an electrical contractor shall register annually in the form of Annexure 3 with the chief inspector or a person appointed by the chief inspector.

- 2.3. An application for registration as referred to in sub-regulation (2) shall be accompanied by the fee prescribed by regulation 14.
- 2.4. The chief inspector or a person appointed by the chief inspector shall register any person referred to in sub-regulation (1) as an electrical contractor and enter such registration into the national database.

### 3. Regulation 7

#### Certificate of compliance

- 3.1. Subject to the provisions of sub regulation (3), every user or lessor of an electrical installation, as the case may be, shall have a valid certificate of compliance for that installation in the form of Annexure 1, which shall be accompanied by a test report in the format approved by the chief inspector, in respect of every such electrical installation.
- 3.2. Subject to the provisions of sub regulation (3), every user or lessor of an electrical installation, as the case may be, shall on request produce the certificate of compliance for that electrical installation to an inspector, a supplier or, subject regulation 4(1), an approved inspection authority for electrical installations.
- 3.3. Sub-regulation (1) shall not apply to an electrical installation that existed prior to 23 October 1992, and where there was no change of ownership after 1 March 1994: Provided that, if any addition of alteration is effected to such an electrical installation, the user or lessor of the electrical installation, as the case may be, shall obtain a certificate of compliance for the whole electrical installation, where after the provisions of sub-regulation (1) shall be applicable to such electrical installation.
- 3.4. Where any addition or alteration has been effected to an electrical installation for which a certificate of compliance was previously issued, the user or lessor of such electrical installation shall obtain a certificate of compliance for at least the addition of alteration.
- 3.5. Subject to the provisions of section 10(4) of the Act, the user or lessor may not allow a change of ownership if the certificate of compliance is older than two years.
- 3.6. The relevant supplier may at any reasonable time inspect or test any electrical installation: Provided that the supplier shall not charge any fee for such an inspection or test unless the inspection or test is carried out at the request of the user or lessor.
- 3.7. If an inspector, an approved inspection authority for electrical installations or supplier has carried out an inspection or test and has detected any fault or defect in any electrical installation, that inspector, approved inspection authority for electrical installation or supplier may require the user or lessor of that electrical installation to obtain a new certificate of compliance: Provided that is such fault or defect in the opinion of the inspector, approved inspection authority for electrical installation or supplier constitutes an immediate danger to persons, that inspection authority for electrical installations or supplier shall forthwith take steps to have the supply to the circuit in which the fault or defect was detected, disconnected: Provided further that where such fault or defect is of such a nature that it may indicate negligence on the part of a registered person, the inspector, approved inspection authority for electrical installations or supplier shall forthwith report those circumstances in writing to the chief inspector.

### 4. Regulation 8

#### Commencement and permission to connect installation work

- 4.1. No person shall commence installation work which requires a new supply or an increase in electricity supply capacity unless the supplier has been notified thereof in the form of Annexure 4: Provided that the supplier may waive this requirement in respect of such types of work as it may specify.
- 4.2. No person shall connect or permit the connection of any completed or partially completed electrical installation to the electricity supply unless it has been inspected and tested by a registered person and a certificate of compliance for that electrical installation has been issued: Provided that the supplier

may on request connect the supply to the electrical installation for the purpose of testing and the completion of the certificate of compliance by a case where the electricity was disconnected for the non-payment of the electricity account or where there has been a change of tenant but not of ownership.

## 5. Regulation 9

### Issuing of certificate of compliance

5.1. No person other than a registered person may issue a certificate of compliance.

5.2. A registered person may issue a certificate of compliance accompanied by the required test report only after having satisfied himself or herself by means of an inspection and test that –

5.2.1. A new electrical installation complies with the provisions of regulation 5(1) and was carried out under his or her full time control; or

5.2.2. An electrical installation which existed prior to the publication of the current edition of the health and safety standard incorporated into these Regulations in terms of regulation 5(1), complies with the general safety principles of such standard; or

5.2.3. An electrical installation referred to in paragraph (b), to which extensions or alterations have been affected, that –

5.2.3.1. The existing part of the electrical installation complies with the general safety principles of such standard and is reasonably safe, and

5.2.3.2. The extensions or alterations effected comply with the provisions of regulation 5(1) and were carried out under his or her general control.

5.3. If at any time prior to the issuing of a certificate of compliance any fault or defect detected in any part of the electrical installation, the registered person shall refuse to issue such certificate until that fault or defect has been rectified: Provided that if such fault or defect in the opinion of the registered person constitutes an immediate danger to persons in a case where electricity is already supplied, he or she shall forthwith take steps to disconnect the supply to the circuit in which the fault or defect was detected and notify the chief inspection thereof.

5.4. Any person who undertakes to do electrical installation work shall ensure that a valid certificate of compliance is used for that work.

5.5. No person may amend a certificate of compliance.

Name of Contractor:	
Address:	
Signature of Contractor:	
Date:	

## PART T2.9 – SITE VISIT CERTIFICATE

*If a compulsory Site Visit is required as per Tender Notice, this page shall be taken to the site visit and completed.*

### A COMPULSARY BRIEFING SESSION WILL BE HELD AT THE FOLLOWING VENUE:

Venue:	
Time:	
Date:	

The briefing session and site inspection meeting are compulsory and companies not attending will be excluded from the tendering process.

### ATTENDANCE CERIFICATE

This is to certify that:	
Representative(s) of:	
has/have attended the Tender Briefing.	

TCB Engineering's Representative:	Tenderer's Representative:
Signature	Signature
Date	Date

### NOTES:

For direction to the venue, contact Mr. Andries Jooste on 053 831 1609. Note that any clarification on the venue should be done the day before the meeting is scheduled.

Please bring the Tender Document on the day of the briefing and make sure you have familiarised yourself with its contents.

You are also required to sign an attendance register at the meeting.

The meeting will start strictly as per the time indicated and the Engineer has no obligation to repeat information already discussed.

## PART T2.10 – SUPPLEMENTARY TENDER INFORMATION

Should the Engineer have distributed supplementary information during the **tender period**, please indicate it here and attach copies under EXTERNAL RETURNABLE DOCUMENTS:

Date:	Short Description:

If no supplementary information was received, strike through above list and write NOT APPLICABLE.

Date	Name	Signature



**PART T2.11 – SUB-CONTRACTORS**

The contractor shall indicate which part of the works shall be contracted out to an external entity. This shall include such items as testing.

Works	Anticipated Value	Company	Reason

Date	Name	Signature

**PART T2.12 – CSD**

Attach full CSD Report.

## PART T2.13 – AUTHORITY FOR SIGNATORY

### 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 EMPLOYER 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			
5			
6			
7			

*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**

## RESOLUTION OF BOARD OF DIRECTORS TO ENTER INTO CONSORTIA OR JOINT VENTURE

**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 EMPLOYER 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 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.
4. 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)

## 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:**

1. The abovementioned Enterprises submit a Bid in Consortium/Joint Venture to the EMPLOYER in respect of the following project:

\_\_\_\_\_

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, 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.

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

\_\_\_\_\_

4. The Enterprises to the Consortium/Joint Venture accept joint and several liability 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.
5. 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 days 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.
6. 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.
7. The Enterprises choose as the domicile citadel et executants 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: \_\_\_\_\_

Postal address: \_\_\_\_\_

Telephone number: \_\_\_\_\_

Fax number \_\_\_\_\_

	<b>Name</b>	<b>Capacity</b>	<b>Signature</b>
1			
2			
3			
4			
5			
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 Representative of the Legal Entities to the Consortium Joint/Venture submitting this Bid*
3. *Should the number of Duly Authorised Representative 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*



## T2.14 - DECLARATION OF INTEREST (MBD4)

### DECLARATION OF INTEREST

1. No bid will be accepted from persons in the service of the state<sup>1</sup>.
2. Any person, having a kinship with persons in the service of the state, including a blood relationship, may make an offer or offers in terms of this invitation to bid. In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons connected with or related to persons in service of the state, it is required that the bidder or their authorised representative declare their position in relation to the evaluating/adjudicating authority.
3. In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.
  - 3.1. Full Name of bidder or his or her representative:.....
  - 3.2. Identity Number: .....
  - 3.3. Position occupied in the Company (director, trustee, shareholder<sup>2</sup>):.....
  - 3.4. Company Registration Number: .....
  - 3.5. Tax Reference Number:.....
  - 3.6. VAT Registration Number: .....
  - 3.7. The names of all directors / trustees / shareholders members, their individual identity numbers and state employee numbers must be indicated in paragraph 4 below.
  - 3.8. Are you presently in the service of the state? **YES / NO**
    - 3.8.1. If yes, furnish particulars. ....

<sup>1</sup>MSCM Regulations: “in the service of the state” means to be –

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

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

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

- 3.9.1. If yes, furnish particulars.....

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

3.10.1. If yes, furnish particulars.....  
.....

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

3.11.1. If yes, furnish particulars.....  
.....

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

3.12.1. If yes, furnish particulars.....  
.....

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

3.13.1. If yes, furnish particulars.....  
.....

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

3.14.1. If yes, furnish particulars.....  
.....

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

Full Name	Identity Number	State Employee Number

Date	Name	Signature

## T2.15 – PREFERENCE POINTS CLAIM FORM (MBD 6.1)

### PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2017

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

**NB:BEFORE COMPLETING THIS FORM, BIDDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF B-BBEE, AS PRESCRIBED IN THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017.**

---

#### 1. GENERAL CONDITIONS

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

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

1.2

- a) The value of this bid is estimated to **not exceed** R50 000 000 (all applicable taxes included) and therefore the 80/20 preference point system shall be applicable; or

1.3 Points for this bid shall be awarded for:

- (a) Price; and
- (b) B-BBEE Status Level of Contributor.

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

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

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

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

## 2. DEFINITIONS

- (a) **“B-BBEE”** means broad-based black economic empowerment as defined in section 1 of the Broad-Based Black Economic Empowerment Act;
- (b) **“B-BBEE status level of contributor”** means the B-BBEE status of an entity in terms of a code of good practice on black economic empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act;
- (c) **“bid”** means a written offer in a prescribed or stipulated form in response to an invitation by an organ of state for the provision of goods or services, through price quotations, advertised competitive bidding processes or proposals;
- (d) **“Broad-Based Black Economic Empowerment Act”** means the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- (e) **“EME”** means an Exempted Micro Enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment Act;
- (f) **“functionality”** means the ability of a tenderer to provide goods or services in accordance with specifications as set out in the tender documents.
- (g) **“prices”** includes all applicable taxes less all unconditional discounts;
- (h) **“proof of B-BBEE status level of contributor”** means:
  - B-BBEE Status level certificate issued by an authorized body or person;
  - 1) A sworn affidavit as prescribed by the B-BBEE Codes of Good Practice;
  - 2) Any other requirement prescribed in terms of the B-BBEE Act;
- (i) **“QSE”** means a qualifying small business enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment Act;
- (j) **“rand value”** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;

## 3. POINTS AWARDED FOR PRICE

### 3.1 THE 80/20 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**

$$P_s = 80 \left( 1 - \frac{P_t - P_{\min}}{P_{\min}} \right) \quad \text{or} \quad P_s = 90 \left( 1 - \frac{P_t - P_{\min}}{P_{\min}} \right)$$

Where

- $P_s$  = Points scored for price of bid under consideration
- $P_t$  = Price of bid under consideration
- $P_{\min}$  = Price of lowest acceptable bid

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

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

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

#### 5. BID DECLARATION

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

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

- 6.1 B-BBEE Status Level of Contributor: . = .....(maximum of 10 or 20 points)

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

#### 7. SUB-CONTRACTING

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

(Tick applicable box)

YES		NO	
-----	--	----	--

- 7.1.1 If yes, indicate:

- i) What percentage of the contract will be subcontracted.....%
- ii) The name of the sub-contractor.....
- iii) The B-BBEE status level of the sub-contractor.....
- iv) Whether the sub-contractor is an EME or QSE

(Tick applicable box)

YES		NO	
-----	--	----	--

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

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

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

8.1 Name of company/firm:.....

8.2 VAT registration number:.....

8.3 Company registration number:.....

8.4 **TYPE OF COMPANY/ FIRM**

Partnership/Joint Venture / Consortium

One person business/sole propriety

Close corporation

Company

(Pty) Limited

[TICK APPLICABLE BOX]

8.5 **DESCRIBE PRINCIPAL BUSINESS ACTIVITIES**

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

8.6 **COMPANY CLASSIFICATION**

Manufacturer

Supplier

Professional service provider

Other service providers, e.g. transporter, etc.

[TICK APPLICABLE BOX]

## 8.7 MUNICIPAL INFORMATION

Municipality where business is situated: .....

Registered Account Number: .....

Stand Number:.....

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

8.9 I/we, the undersigned, who is / are duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the B-BBE status level of contributor indicated in paragraphs 1.4 and 6.1 of the foregoing certificate, qualifies the company/ firm for the preference(s) shown and I / we acknowledge that:

- i) The information furnished is true and correct;
- ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;
- iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 6.1, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claims are correct;
- iv) If the B-BBEE status level of contributor has been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the purchaser may, in addition to any other remedy it may have –
  - (a) disqualify the person from the bidding process;
  - (b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;
  - (c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
  - (d) recommend that the bidder or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted by the National Treasury from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and
  - (e) forward the matter for criminal prosecution.

### WITNESSES

1. ....

2. ....

.....  
SIGNATURE(S) OF BIDDERS(S)

DATE: .....

ADDRESS .....

.....



**T2.16 – CERTIFICATE FOR MUNICIPAL SERVICES (MBD10)**

## T2.17 – DECLARATION OF BIDDER’S PAST SUPPLY CHAIN MANAGEMENT PRACTICES (MBD8)

- 1 This Municipal Bidding Document must form part of all bids invited.
- 2 It serves as a declaration to be used by municipalities and municipal entities in ensuring that when goods and services are being procured, all reasonable steps are taken to combat the abuse of the supply chain management system.
- 3 The bid of any bidder may be rejected if that bidder, or any of its directors have:
  - a. abused the municipality’s / municipal entity’s supply chain management system or committed any improper conduct in relation to such system;
  - b. been convicted for fraud or corruption during the past five years;
  - c. willfully neglected, reneged on or failed to comply with any government, municipal or other public sector contract during the past five years; or
  - d. been listed in the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004).
- 4 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

Item	Question	Yes	No
4.1	Is the bidder or any of its directors listed on the National Treasury’s database as a company or person prohibited from doing business with the public sector? (Companies or persons who are listed on this database were informed in writing of this restriction by the National Treasury after the <i>audi alteram partem</i> rule was applied).	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.1.1	If so, furnish particulars:		
4.2	Is the bidder or any of its directors listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004)? (To access this Register enter the National Treasury’s website, <a href="http://www.treasury.gov.za">www.treasury.gov.za</a> , click on the icon “Register for Tender Defaulters” or submit your written request for a hard copy of the Register to facsimile number (012) 3265445).	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.2.1	If so, furnish particulars:		
4.3	Was the bidder or any of its directors convicted by a court of law (including a court of law outside the Republic of South Africa) for fraud or corruption during the past five years?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.3.1	If so, furnish particulars:		
Item	Question	Yes	No
4.4	Does the bidder or any of its directors owe any municipal rates and taxes or municipal charges to the municipality / municipal entity, or to any other municipality / municipal entity, that is in arrears for more than three months?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

4.4.1	If so, furnish particulars:		
4.5	Was any contract between the bidder and the municipality / municipal entity or any other organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.5.1	If so, furnish particulars:		

### CERTIFICATION

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

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

Date	Name	Signature

## **T2.18 – CERTIFICATE OF INDEPENDENT BID DETERMINATION (MBD9)**

- 1 This Municipal Bidding Document (MBD) must form part of all bids<sup>1</sup> invited.
- 2 Section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerted practice by, firms, or a decision by an association of firms, if it is between parties in a horizontal relationship and if it involves collusive bidding (or bid rigging).<sup>2</sup> Collusive bidding is a *pe se* prohibition meaning that it cannot be justified under any grounds.
- 3 Municipal Supply Regulation 38(1) prescribes that a supply chain management policy must provide measures for the combating of abuse of the supply chain management system, and must enable the accounting officer, among others, to:
  - a. take all reasonable steps to prevent such abuse;
  - b. reject the bid of any bidder if that bidder or any of its directors has abused the supply chain management system of the municipality or municipal entity or has committed any improper conduct in relation to such system; and
  - c. cancel a contract awarded to a person if the person committed any corrupt or fraudulent act during the bidding process or the execution of the contract.
- 4 This MBD serves as a certificate of declaration that would be used by institutions to ensure that, when bids are considered, reasonable steps are taken to prevent any form of bid-rigging.
- 5 In order to give effect to the above, the attached Certificate of Bid Determination (MBD9) must be completed and submitted with the bid:

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

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

# CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

(Bid Number and Description)

in response to the invitation for the bid made by:

**KAREEBERG MUNICIPALITY**

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

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

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

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

.....  
Signature

.....  
Date

.....  
Position

.....  
Name of Bidder

<sup>3</sup> *Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.*

## **T2.19 – DECLARATION CERTIFICATE FOR LOCAL PRODUCTION AND CONTENT FOR DESIGNATED SECTORS (SBD 6.2)**

Standard Bidding Document (SBD) must form part of all bids invited. It contains general information and serves as declaration form for local content (local production and local content are used interchangeably).

Before completing this declaration, bidders must study the General Conditions, Definitions, Directives applicable in respect of Local Content as prescribed in the Preferential Procurement Regulations, 2011, the South African Bureau of Standards (SABS) approved technical specification number SATS 1286:2011 (Edition 1) and the Guidance on the Calculation of Local Content together with the Local Content Declaration Templates [Annex C (Local Content Declaration: Summary Schedule), D (Imported Content Declaration: Supporting Schedule to Annex C) and E (Local Content Declaration: Supporting Schedule to Annex C)].

### **1. General Conditions**

- 1.1. Preferential Procurement Regulations, 2011 (Regulation 9) makes provision for the promotion of local production and content.
- 1.2. Regulation 9.(1) prescribes that in the case of designated sectors, where in the award of bids local production and content is of critical importance, such bids must be advertised with the specific bidding condition that only locally produced goods, services or works or locally manufactured goods, with a stipulated minimum threshold for local production and content will be considered.
- 1.3. Where necessary, for bids referred to in paragraph 1.2 above, a two stage bidding process may be followed, where the first stage involves a minimum threshold for local production and content and the second stage price and B-BBEE.
- 1.4. A person awarded a contract in relation to a designated sector, may not sub-contract in such a manner that the local production and content of the overall value of the contract is reduced to below the stipulated minimum threshold.
- 1.5. The local content (LC) expressed as a percentage of the bid price must be calculated in accordance with the SABS approved technical specification number SATS 1286: 2011 as follows:

$$LC = [1 - x / y] * 100$$

Where

x is the imported content in Rand

y is the bid price in Rand excluding value added tax (VAT)

Prices referred to in the determination of x must be converted to Rand (ZAR) by using the exchange rate published by South African Reserve Bank (SARB) at 12:00 on the date of advertisement of the bid as indicated in paragraph 4.1 below.

The SABS approved technical specification number SATS 1286:2011 is accessible on [http://www.thedti.gov.za/industrial development/ip.jsp](http://www.thedti.gov.za/industrial%20development/ip.jsp) at no cost.

- 1.6 A bid may be disqualified if –

- (a) this Declaration Certificate and the Annex C (Local Content Declaration: Summary Schedule) are not submitted as part of the bid documentation; and
- (b) the bidder fails to declare that the Local Content Declaration Templates (Annex C, D and E) have been audited and certified as correct.

### **2. Definitions**

- 2.1. “bid” includes written price quotations, advertised competitive bids or proposals;
- 2.2. “bid price” price offered by the bidder, excluding value added tax (VAT);

- 2.3. “contract” means the agreement that results from the acceptance of a bid by an organ of state;
- 2.4. “designated sector” means a sector, sub-sector or industry that has been designated by the Department of Trade and Industry in line with national development and industrial policies for local production, where only locally produced services, works or goods or locally manufactured goods meet the stipulated minimum threshold for local production and content;
- 2.5. “duly sign” means a Declaration Certificate for Local Content that has been signed by the Chief Financial Officer or other legally responsible person nominated in writing by the Chief Executive, or senior member / person with management responsibility(close corporation, partnership or individual).
- 2.6. “imported content” means that portion of the bid price represented by the cost of components, parts or materials which have been or are still to be imported (whether by the supplier or its subcontractors) and which costs are inclusive of the costs abroad (this includes labour or intellectual property costs), plus freight and other direct importation costs, such as landing costs, dock duties, import duty, sales duty or other similar tax or duty at the South African port of entry;
- 2.7. “local content” means that portion of the bid price which is not included in the imported content, provided that local manufacture does take place;
- 2.8. “stipulated minimum threshold” means that portion of local production and content as determined by the Department of Trade and Industry; and
- 2.9. “sub-contract” means the primary contractor’s assigning, leasing, making out work to, or employing another person to support such primary contractor in the execution of part of a project in terms of the contract.

**3. The stipulated minimum threshold(s) for local production and content (refer to Annex A of SATS 1286:2011) for this bid is/are as follows:**

Description of services, works or goods	Stipulated minimum threshold
_____	_____ %
_____	_____ %
_____	_____ %

4. Does any portion of the services, works or goods offered have any imported content?

(Tick applicable box)

YES		NO	
-----	--	----	--

- 4.1 If yes, the rate(s) of exchange to be used in this bid to calculate the local content as prescribed in paragraph 1.5 of the general conditions must be the rate(s) published by SARB for the specific currency at 12:00 on the date of advertisement of the bid.

The relevant rates of exchange information is accessible on [www.reservebank.co.za](http://www.reservebank.co.za).



Indicate the rate(s) of exchange against the appropriate currency in the table below (refer to Annex A of SATS 1286:2011):

Currency	Rate of Exchange
US Dollar	
Pound Sterling	
Euro	
Yen	
Other	

NB: Bidders must submit proof of the SARB rate (s) of exchange used.

5. Were the Local Content Declaration Templates (Annex C, D and E) audited and certified as correct?  
(Tick applicable box)

YES		NO	
-----	--	----	--

- 5.1. If yes, provide the following particulars:

- (a) Full name of auditor: .....
- (b) Practice number: .....
- (c) Telephone and cell number: .....
- (d) Email address: .....

(Documentary proof regarding the declaration will, when required, be submitted to the satisfaction of the Accounting Officer / Accounting Authority)

6. Where, after the award of a bid, challenges are experienced in meeting the stipulated minimum threshold for local content the DTI must be informed accordingly in order for the DTI to verify and in consultation with the AO/AA provide directives in this regard.

**LOCAL CONTENT DECLARATION  
(REFER TO ANNEX B OF SATS 1286:2011)**

**LOCAL CONTENT DECLARATION BY CHIEF FINANCIAL OFFICER OR OTHER LEGALLY RESPONSIBLE PERSON NOMINATED IN WRITING BY THE CHIEF EXECUTIVE OR SENIOR MEMBER/PERSON WITH MANAGEMENT RESPONSIBILITY (CLOSE CORPORATION, PARTNERSHIP OR INDIVIDUAL)**

IN RESPECT OF BID NO. ....

ISSUED BY: (Procurement Authority / Name of Institution):

NB:

1. The obligation to complete, duly sign and submit this declaration cannot be transferred to an external authorized representative, auditor or any other third party acting on behalf of the bidder.
2. Guidance on the Calculation of Local Content together with Local Content Declaration Templates (Annex C, D and E) is accessible on [http://www.thdti.gov.za/industrial development/ip.jsp](http://www.thdti.gov.za/industrial%20development/ip.jsp). Bidders should first complete Declaration D. After completing Declaration D, bidders should complete Declaration E and then consolidate the information on Declaration C. Declaration C should be submitted with the bid documentation at the closing date and time of the bid in order to substantiate the declaration made in paragraph (c) below. Declarations D and E should be kept by the bidders for verification purposes for a period of at least 5 years. The successful bidder is required to continuously update Declarations C, D and E with the actual values for the duration of the contract.

I, the undersigned, ..... (full names),

do hereby declare, in my capacity as .....

of .....(name of bidder entity), the following:

- (a) The facts contained herein are within my own personal knowledge.
- (b) I have satisfied myself that:
  - (i) the goods/services/works to be delivered in terms of the above-specified bid comply with the minimum local content requirements as specified in the bid, and as measured in terms of SATS 1286:2011; and
  - (ii) the declaration templates have been audited and certified to be correct.
- (c) The local content percentage (%) indicated below has been calculated using the formula given in clause 3 of SATS 1286:2011, the rates of exchange indicated in paragraph 4.1 above and the information contained in Declaration D and E which has been consolidated in Declaration C:

Bid Price, excluding VAT (y)	R
Imported content (x), as calculated in terms of SATS 1286:2011	R
Stipulated minimum threshold for local content (paragraph 3 above)	
Local content %, as calculated in terms of SATS 1286:2011	

**If the bid is for more than one product, the local content percentages for each product contained in Declaration C shall be used instead of the table above.**

**The local content percentages for each product has been calculated using the formula given in clause 3 of SATS 1286:2011, the rates of exchange indicated in paragraph 4.1 above and the information contained in Declaration D and E.**

- (d) I accept that the Procurement Authority / Institution has the right to request that the local content be verified in terms of the requirements of SATS 1286:2011.

- (e) I understand that the awarding of the bid is dependent on the accuracy of the information furnished in this application. I also understand that the submission of incorrect data, or data that are not verifiable as described in SATS 1286:2011, may result in the Procurement Authority / Institution imposing any or all of the remedies as provided for in Regulation 13 of the Preferential Procurement Regulations, 2011 promulgated under the Preferential Policy Framework Act (PPPFA), 2000 (Act No. 5 of 2000).

SIGNATURE:

DATE: \_\_\_\_\_

WITNESS No. 1

DATE: \_\_\_\_\_

WITNESS No. 2

DATE: \_\_\_\_\_

*Attach all other documentation and declarations for local content requirements as published and required by National Treasury and Department of Trade and Industry.*

## C1.1 FORM OF OFFER AND ACCEPTANCE

### FORM OF OFFER

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

#### *NEW 22kV SUBSTATION – CARNARVON*

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

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

#### THE FIXED PRICE OFFERED TOTAL OF THE PRICES INCLUSIVE OF VALUE ADDED TAX IS:

<b>Rand (in words):</b>	
<b>Rand (in figures):</b>	<b>R</b>

This offer may be accepted by the Employer by signing the acceptance part of this form of offer and acceptance and returning one copy of this document to the Tenderer, whereupon the Tenderer becomes the party named as the Contractor in the conditions of contract identified in the contract data.

#### FOR THE BIDDER:

Signature(s) \_\_\_\_\_

Name(s) \_\_\_\_\_

Date \_\_\_\_\_

Capacity \_\_\_\_\_

Name and Address of Organization \_\_\_\_\_

#### WITNESS:

Signature(s) \_\_\_\_\_

Name(s) \_\_\_\_\_

Date \_\_\_\_\_

## ACCEPTANCE

By signing this part of this form to 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 in this agreement and in the contract that is the subject of this agreement.

The terms of the contract are contained in:

C1: Agreements and contract data (which includes this agreement)

C2: Pricing Data

C3: Scope of Work

C4: Site Information

Addendums

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

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

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

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

### FOR THE EMPLOYER:

Signature(s)	_____	_____
Name(s)	_____	_____
Date	_____	_____
Capacity	_____	_____
Name and Address of Organization	KAREEBERG LOCAL MUNICIPALITY	

### WITNESS:

Signature(s)	_____
Name(s)	_____
Date	_____

## SCHEDULE OF DIVIATIONS

Notes:

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

1. Subject:
Detail:

2. Subject:
Detail:
3. Subject:
Detail:

4. Subject:
Detail:

5. Subject:
Detail:

6. Subject:
Detail:

7. Subject:
Detail:

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

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender 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 BIDDER:**

Signature(s)	_____	_____
Name(s)	_____	_____
Date	_____	_____
Capacity	_____	_____
Name and Address of Organization	_____	_____

**WITNESS:**

Signature(s)	_____
Name(s)	_____
Date	_____

**FOR THE EMPLOYER:**

Signature(s)	_____	_____
Name(s)	_____	_____
Date	_____	_____
Capacity	_____	_____
Name and Address of Organization	KAREEBERG LOCAL MUNICIPALITY	

**WITNESS:**

Signature(s)	_____
Name(s)	_____
Date	_____

## C1.2 CONTRACT DATA

The contract is subject to the NEC 3 Engineering and Construction Short Contract June 2005.

Copies are obtainable from Engineering Contract Strategies (ECS) 116 Edison Crescent, Sunninghill, Johannesburg.

Tel: 011-803 3008

Fax: 011-803 3009

[www.neccontract.com](http://www.neccontract.com)

**The Tenderer must complete the following:**

The Percentage for overheads and profit added to the Defined Cost for people is .....%

The Percentage for overheads and profit added to other Defined Cost is .....%



The <i>Employer</i> is	Name:	Kareeberg Local Municipality
	Address:	Hanau Street Carnarvon
	Telephone:	053 382 3012
The <i>Employer</i> is represented by:	Name:	TCB Engineering
	Address:	657 Long Street Douglas 8730
The <i>works</i> are	Supply, delivery and construction of a complete 22 kV substation with required site works as detailed in this document in the different sections.	
The <i>site</i> is	Carnarvon, Northern Cape, South Africa	
The <i>starting</i> date	As per the approved program.	
The <i>completion</i> date	As per the approved program.	
The <i>period for reply</i> is	2 weeks	
The <i>defects date</i> is	52 weeks after completion	
The <i>defects correction period</i> is	7 calendar days	
The <i>delay damages</i> are	0.1% per day of the estimated final contract value	
The <i>assessment day</i> is	The last site meeting date of each month	
The <i>retention</i> is	10% till first handover, 5% thereafter until final hand over	

The following additional conditions of contract are part of this contract:	
A1	In carrying out his obligation as the mandatory to the <i>Employer</i> for this contract in terms of Section 37(2) of the Occupational Health & Safety Act No. 85 of 1993, the <i>Contractor</i> ensures that he complies with the Act when Providing the Works or using Plant, Materials or Equipment. The <i>Contractor</i> indemnifies the <i>Employer</i> against loss and damage to property, death of or injury to a person and claims proceedings compensation and costs arising from the <i>Contractor's</i> transgression of the Act, except to the extent that the transgression was caused by the <i>Employer</i> .

A2	Additional condition: Compensation event for force majeure:
A2.1	<p>The following is an additional compensation event:</p> <p>The <i>Contractor</i> proves that it would be illegal or impossible for him to perform his obligations required by this contract due to any one of these events:</p> <ul style="list-style-type: none"> <li>• War, civil war, rebellion, revolution, insurrection, military or usurped power,</li> <li>• Strikes, riots and civil commotion not confined to the employees of the <i>Contractor</i>, sub-contractors and suppliers,</li> <li>• Ionising radiation or radioactive contamination from nuclear fuel or nuclear waste resulting from the combustion of nuclear fuel,</li> <li>• Radioactive, toxic, explosive or other hazardous properties of an explosive nuclear device,</li> <li>• Natural disaster, fire and explosion, or impact by aircraft or other aerial device or thing dropped from them.</li> </ul>
A2.2	Any amounts due to the <i>Contractor</i> from insurers in claims arising from any of the listed events are deducted from assessments of the compensation event.

<b>A3</b>	<b>Additional condition: Provision of a Surety (priced contracts only).</b>
A3.1	The <i>Contractor</i> gives the <i>Employer</i> a performance bond. The bond is for an amount equal to 10% of the offered total of the prices.
A3.2	The bond is provided by a bank or insurer which the <i>Employer</i> has accepted. If the bond was not given by the date of the <i>Employer's</i> Acceptance, it is given within four weeks of the <i>Employer's</i> Acceptance.
A3.3	Draft wording of the bond to be approved by the Engineer.
<b>A4</b>	<b>Additional condition: <i>Employer's</i> right to sanction a sub-contractor</b>
A4.1	The <i>Contractor</i> submits the names of each proposed sub-contractor to the Employer for acceptance. The <i>Contractor</i> does not appoint a sub-contractor until the <i>Employer</i> has accepted him.
<b>A5</b>	<b>Additional condition: Price adjustment for inflation</b>
A5.1	This is a fixed price contract.
<b>A6</b>	<b>Registration as Electrical Contractor</b>
A6.1	The successful tenderer/electrical sub-contractor must be registered as an Electrical Contractor with the Department of Labour, with the Workmen's Compensation Commissioner and the Unemployment Insurance Commissioner to qualify for this contract.

## C2.1 Pricing Instructions

1. The work listed hereunder is fully described in the specification or shown on the drawings. In order to describe certain items, reference is also made to the specification and drawings in the Bill. The Contractor shall, however, refer to the General Conditions of Contract, Specification, Special Conditions and all the drawings.
2. All prices shall be the inclusive cost of all the work necessary to complete the work specified in the item and to comply with all the requirements of the Conditions of Contract, Specification and Special Conditions.
3. All rates shall be excluding Value Added Tax (VAT).
4. The unit prices will be taken as correct in the case of discrepancies. Should the corrected tender price differ from the original tender price, the tenderer shall be given the opportunity to sign a new form of offer.
5. The Contractor will be paid according to the nett final measurement and all wastage shall be allowed for in the rates.
6. Tenderers shall clarify any doubt about the meaning of anything in the Bills of Quantities before the closing date of the Tenders.
7. Quantities in the Bills are not fixed and can be increased or decreased.
8. When no price is shown for an item, it will be taken to be included elsewhere.
9. The Bills of Quantities shall not be used for the ordering of material. The Contractor shall ascertain the correct quantities before ordering.
10. The following shall be considered for excavation:
  - a. Measurement will be to the bottom side of cables and measurements in m<sup>3</sup> will be calculated from the minimum dimensions in accordance with the specification and drawings.
  - b. The rates shall allow for all additional like over break, storing, protection of other services, pumping, smoothing of sides and bottoms, removal of rocks, clearing and removal of waste, compacting as per drawing's instruction, and all work incidental but not specifically mentioned in the Bill.
  - c. The excavations shall be protected as called for in the Construction Regulations.
  - d. The excavation will be measured for the following types:-
    - i. Pickable Soil
    - ii. Soft Rock (Compressor & JCB)
    - iii. Hard Rock (Blasting, Excavator & Pecker)
11. When alternative prices for equipment and material from different manufacturers are offered, the lowest price shall be quoted in the Bills as the main offer, when complying fully with the Specification. All other alternative prices shall be mentioned in the covering letter.
12. Although names and suppliers are provided throughout the document and addendums, alternative equipment that are similar in specifications may be offered. It is the tenderer's responsibility to proof similarity.
13. The rates for concrete work shall be inclusive of:-
  - a. All concrete in structures to be mixed according to mass.
  - b. Suitable vibrators shall be used for all concrete work except floors.
  - c. All tariffs shall include for all treatment of the concrete.
  - d. Test cubes by an accredited laboratory for 7 & 28 day results per structure, or truck load whichever is the smallest
14. In these schedules the following meaning is attached to:-
  - a. Supply and Delivery  
The prices for each item shall include for the complete supply and delivery to the sites and must be inclusive of all sundry material necessary for the completion, commissioning and putting to work of the equipment, as required by the specification whether set out in detail or not.
  - b. Installation  
Prices to include for off-loading, transportation on site, assembling, positioning, levelling and preparation of site,

co-ordination, approvals, organising of permits and all the necessary civil and building work excavation of trenches, laying of cables, bedding, backfilling, jointing, connecting, testing including any drying out process and filtering, completion, painting, commissioning, completion of quality control documentation, initial maintenance, O&M manuals/Data books/files, handing over to the Employer in a satisfactory operating condition of the Works.

c. Termination

Prices for Terminations shall include the cable gland or K-clamp and the connection of the cables' tails to the terminals of the switchgear or bus bars. It shall also include all labels as required (plastic nursery labels on low voltage cables and punched metal labels on medium voltage cables).

15. Where structures are listed as D-DT references, the cost thereof shall:
  - a. Include sub-structures as referenced on the main D-DT drawing
  - b. Include any other requirements as shown on the particular Standard Detail drawing
  - c. Take cognisance of deviations as noted on the detailed notes section to ensure no duplication between the cost allowed for on the main structure and that at the detailed note section, mainly referencing any omissions in lieu of for example a longer cross arm than the standard on a particular structure.
  - d. The notation "E" denotes extra over material that is not part of the standard D-DT material, but shall be included in that particular structure price.
16. Where existing structures / transformers be replaced with new, the contractor shall allow in his rate for new for the removal/modifications of old as necessary.
17. Payment claims submitted by the contractor shall use these bills as basis, in the prescribed template that will be provided by the Engineer. Contractor shall keep a site diary and record all material installed referenced to area installed and the date when it is installed, and shall upon request by Engineer submit these as supporting documentation to any payment request.
18. No compensation shall be made towards the contractor for loss of profit should any part of the works not be executed.
19. This is a fixed price contract.
20. The tenderer is made aware that the progress of the project will be dictated by the funding availability and the project will likely be executed over 3 financial years.

## **C2.2 Price List (Bills of Quantities)**

Refer to Addendum A for Bills of Quantities

### C2.2.1 Schedule of Delivery Dates

Guaranteed delivery times	Weeks
Pine Wood Poles	
ACSR Conductor	
MV Insulators	
Miniature Substation	
Site and Yard	
Substation Building	
22kV Switchboard	
22kV Supply Cables	
Battery System	
Control Panel	
Total project completion (taken that full funding is available)	

Signed .....

Date .....

Name .....

Position .....

Tenderer .....

## C2.3 Schedule of Variation Rates for Day Work

These rates will be applicable only if no rate exists in the Price List.

Item	Description		Rate
1.	Labour charge for Foreman	per hour	
2.	Labour charge for Artisan	per hour	
3.	Labour charge for Apprentice	per hour	
4.	Labour charge for Labourer	per hour	
5.	All-inclusive rate for Engineers	per hour	
6.	Percentage profit charge on additional material	%	
7.	Charge for private car	per km	
		per day	
8.	Charge for truck not exceeding 1 ton, including driver	per km	
		per day	
9.	Charge for truck not exceeding 8 tons, including driver	per km	
		per day	
10.	Charge for truck not exceeding 12 tons, including driver	per km	
		per day	
11.	Machinery & Equipment (specify for all to be used on the project, per item)		

Signed .....

Date .....

Name .....

Position .....

Tenderer .....

## C2.4 Technical Schedules

### 1 GENERAL

Tenders shall submit all requested information in full but if the Tenderer desires, additional information may be submitted in a covering letter.

Refer to Technical Schedules, Bills of Quantities and Drawings before completing the schedules to ensure all material supplies complies to the specification.

The schedules will be scrutinized by the Representative/Agent and should any material offered not comply with the requirements contained in the specification, the Contractor will be required to supply material in accordance with the contract at no additional cost.

MV will refer to 22kV distribution and LV will refer to 400V distribution.

All material must be S.A.B.S. approved.

Adherence to National Treasury's requirement for local content to be adhered to. Contractor to use the relevant schedule and addendum in this regard.

### 2. WOODEN POLES

Description	Unit	MV			LV SC	LV
1. Length of wood poles	m	16	12	11	7m	9m
2. Type of wood	n.a.	Pine	Pine	Pine	Pine	Pine
3. Type of treatment of wood	n.a.	Creosote	Creosote		Creosote	Creosote
4. Top diameter of pole	mm	200-220	200-220	180-200	120-140	140-160
5. Supplier of wood poles	n.a.	.....			.....	.....
6. Planting depth	m	2.5	2.0	1.8	1.3	1.5

### 3. STAYS

Description	Unit	MV	LV
1. Base plate diameter	mm	375	375
2. Base plate plant depth	mm	1600	1600
3. Stay rod diameter	mm	20 x 2000	20 x 2000
4. Stay rod type	n.a.	Nuteye M20	Nuteye M20
5. Threaded rod type	n.a.	M20	M20
6. Threaded rod length	mm	350	350
7. Main supplier for stay	n.a.	.....	.....



4. MV OVERHEAD CONDUCTORS

	Unit	MV	MV	MV
1. Type of conductor	n.a.	Hare	Mink	Fox
2. Average length of conductor on drum	m	.....	.....	.....
3. Supplier of conductor	n.a.	.....	.....	.....

5. MV INSULATORS

Description	Unit	Intermediate	Strain
1. Type of Insulators	n.a.	22 kV, 150 kV BIL Cullinan EP 967	22 kV, 150 kV BIL EBM 744 – CT long Rod silicone
2. Pin Insulated Spindles	n.a.	M20 x 250	M20 x 250
3. Spacing between Insulators	n.a.	600 mm	600 mm
4. Spacing from top of pole to first Insulator	n.a.	200 mm	200 mm
5. Supplier for Insulators	n.a.	.....	.....
6. Ties	n.a.	Non metallic (PVC) Preformed Side ties	Dead end Preformed

6. LV INTERMEDIATE AND STRAIN ASSEMBLIES (NOT APPLICABLE)

Description	Unit	Intermediate	Strain
1. Type of clamps	n.a.	Suspension clamp (SICAME ES S4 – 14)	Strain clamp (SICAME EAS 54-10)
2. Catalogue number	n.a.	.....	.....

7. LV ABC CONDUCTOR AND CABLES

Description	Unit	ABC	Cables
1. Current Rating for:			
25 mm <sup>2</sup>	A	98A	119A
35 mm <sup>2</sup>	A	120A	140A
50 mm <sup>2</sup>	A	150A	167A
70 mm <sup>2</sup>	A	200A	200A
95 mm <sup>2</sup>	A	240A	243A
120 mm <sup>2</sup>	A	n.a	310A
150 mm <sup>2</sup>	A	n.a	354A
2. Type	n.a.	3 phase conductor with 54.6mm <sup>2</sup> bare neutral	4 Core CU cable (600/1000 PVC PVC SWA PVC Cu)
3. Average length of conductor on drum	m	.....	.....
4. Supplier	n.a.	.....	.....

8. SERVICE CONNECTIONS (NOT APPLICABLE)

Description	Unit	Name
1. Distribution box supplier	n.a.	.....
2. Split Concentric Airdac	n.a.	.....

9. SURGE ARRESTORS

Description	Unit	22 kV
1. Name of Manufacturer	n.a.	.....
2. Type No.	n.a.	.....
3. Type of surge arrester		
a) Passive gap      Yes/No	n.a.	.....
b) Active gap        Yes/No	n.a.	.....
c) Zinc oxide        Yes/No	n.a.	.....
4. Creepage distance over insulator	mm	.....

10. DROP-OUT FUSES

Description	Unit	22 kV
1. Name of Manufacturer	n.a.	.....
2. Type No.	n.a.	.....
3. Creepage distance over insulator	mm	.....
4. Additional information Tenderer Wishes to submit	n.a.	.....

11. LOW VOLTAGE FUSES (NOT APPLICABLE)

Description	Unit	Data
1. Name of Manufacturer	n.a.	.....
2. Type of material	n.a.	.....
4. Overall dimensions of housing		
a) Length	mm	.....
b) Depth	mm	.....
c) Height	mm	.....

12. MEDIUM VOLTAGE CABLES

1.	Name of Manufacturer	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
2.	Type of cable according to SANS 97	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
3.	CABLE JOINTS (RAYCHEM ONLY)	
3.1	Name of Manufacturer	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
3.2	Type	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
4.	CABLE TERMINATIONS (RAYCHEM ONLY)	
4.1	Name of Manufacturer	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
4.2	Type (Outdoor)	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
4.3	Type (Indoor)	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>

13. LOW VOLTAGE CABLES

1. Name of Manufacturer
2. Type of cable according to SANS 1507


3. CABLE JOINTS

- 3.1 Name of Manufacturer
- 3.2 Type


4. CABLE TERMINATIONS

- 4.1 Name of Manufacturer
- 4.2 Type


14. MINIATURE SUBSTATION

1. Name of Miniature Substation Manufacturer

--

2. TRANSFORMER

- 2.1 Name of Manufacturer:

--

- 2.2 Ratios: 22kV / 420V / 242V

- 2.3 kVA Rating: 630

- 2.4 Vector Group: Dyn 11

- 2.5 Tap: Max:

--

- 2.6 Positive Sequence Impedance Z%

--

- 2.7 Reactance/Resistance ratio X/R

--

- 2.8 Zero Sequence Impedance Z0%

--

- 2.9 Core losses

--

- 2.10 Max permissible 2 hr % overload @ 45°C

--

3. RING MAIN UNIT

- 3.1 Name of Manufacturer
- 3.2 Model Number


4. LOW VOLTAGE COMPARTMENT

- 4.1 Circuit Breakers

CBi
-----

4.2 Max Demand Meters

4.3 Voltmeter

5. Colour

Eskom Grey

15. LOW VOLTAGE DISTRIBUTION BOARD

1. Name of Manufacturer

GSBM

2. Name of Manufacturer and type of:

2.1 Circuit Breakers

CBi

2.2 Earth Leakage Unit

2.3 Current Transformers

2.4 Voltage Transformers

2.5 Voltmeter

2.6 Relays

2.7 Terminals

3. Type of Application of Final Paint (Power Coated, Baked Enamel, etc.)

4. Describe Details for Audible and Visual Substation Alarm

4.1 Type of Battery

4.2 Rating (Ah)

4.3 DC Voltage (V)

4.4 Time Between Replacement (Years)

4.5 Type of Charger

16. ELECTRICAL INSTALLATION

1. Manufacturer and Type of Light Fitting:

1.1 1200x600mm LED Panel

1.2 External Bulkhead

1.3 Exit Sign

2. Manufacturer and Type of Fittings

2.1 Light Switches

2.2 Switch Plugs

3. Manufacturer and Type of Audible and Visual Substation Alarm

3.1 Siren

3.2 Red Light

17. CONTROL PANEL

1. Name of Manufacturer:

2. Dimensions:

2.1 Width (mm)

2.2 Depth (mm)

2.3 Height (mm)

3. Access to Equipment

4. Type of Application of Final Paint (Powder Coated, Baked Enamel, etc.)

5. Manufacturer and Type of:

5.1 Indication Lights

5.2 Control Switches

18. BATTERY SYSTEM

1. Name of Manufacturer:

2. Type No.

3. Output Voltage (V)

4. Rated Output (Ah)

5. Cubicle Dimensions:

5.1 Height (mm)

5.2 Width (mm)

5.3 Depth (mm)

6. Cubicle Mass with Batteries and All Components (kg)

7. Describe Finishes and Method of Corrosion Protection

8. Describe Method of Vermin Proofing of Units

9. Position of Gland Plate and Cable Access

10. Batteries:

10.1 Type

10.2 Number of Cells

10.3	Period Between Successive Topping up Operations (days)	
10.4	Floating Charge:	
	i) Minimum Voltage (V)	
	ii) Maximum Voltage (V)	
10.5	Boost Charging:	
	i) Minimum Voltage (V)	
	ii) Maximum Voltage (V)	
	iii) Duration of Automatic Boost Charging under Normal Conditions	
10.6	Maximum Value of Output Current Under:	
	i) Full Load Conditions	
	ii) Boost Charge Conditions	
10.7	Charger:	
	i) Type of Rectifier	
	ii) Rating of Transformer (VA)	
	iii) Float Charging:	
	iii-1) Input Current (220VAC)	
	iii-2) Output Current (110VDC)	
	iv) Boost Charging:	
	iv-1) Input Current (220VAC)	
	iv-2) Output Current (110VDC)	
	v) Automatic Boost Charging (yes/no)	YES
	vi) Maximum Duration of Automatic Boost Charging to Operate Override Timer	
10.8	Relays:	
	i) Mains Fail Relay:	
	i-1) Type of Relay and Location	
	i-2) No. and Type of Auxiliary Contacts	
	ii) Charge Fail Relay:	
	ii-1) Type of Relay and Location	
	ii-2) No. and Type of Auxiliary Contacts	
	iii) Battery Fail Relay:	

iii-1) Type of Relay and Location	
iii-2) No. and Type of Auxiliary Contacts	
iii-3) Describe Monitoring Facility to Test Battery Conditions	
iii-4) Period Between Testing Batteries (days)	
iii-5) Describe Method in which Testing is Halted Under Mains or Charge Fail Condition	
iv) Battery High Voltage Relay:	
iv-1) Type of Relay and Location	
iv-2) No. and Type of Auxiliary Contacts	
iv-3) Minimum Voltage for Relay Pickup	
iv-4) Time Period between Relay Pickup and Alarm Function	
10.9 Manufacturer and Type of Accessories:	
i) Indication Lights	
ii) Ammeter	
iii) Voltmeter	
iv) Push Buttons	
v) Fuses	
vi) Terminals	



19 22kV SWITCHBOARD

1.	Voltage	22 kV
2.	Fault Level	25 kA
3.	Impulse Level	95 kV
4.	Busbars	1 250 A
5.	Colour	

	Panel Function		Incomer	Ring Feeders
Circuit Breakers	Quantity		1	5
	Circuit Breaker Type			
	Circuit Breaker Rating			
	Medium (Vacuum / SF6)			
	Mechanism Type			
	Tripping / Shunt Voltage			
	Integral Earthing			
	Key Interlocking			
	Racking Switches			
Instrument Panel Equipment	Selector Switch			
	Circuit Breaker Closed			
	Circuit Breaker Open			
	Circuit Breaker Trip			
	Trip Healthy			
	Cable Alive Indication			
	Lamp Test Button			
	MD Ammeter			
	Voltmeter			
	Voltmeter Selection Switch			
Relays	O/C & E/F & Arc Protection Relay			
	Test Block Protection			
	Test Block Metering			
VTs	Ratio			
	Burden / Class			
	Location			
CTs	Metering	Ratio		
		Burden / Accuracy		
	OC+EF	Ratio		
		Burden / Accuracy		
Cable Term.	Position			
	Clamp/Gland/Compound			
	Cable size			
	Cable Type			

Signed .....

Date .....

Name .....

Position .....

Tenderer .....

## **C3 Scope of Work**

### **(a) EXTENT OF THE WORKS**

This specification provides for the manufacture, supply, delivery, transportation to site, off-loading, installation, assembling, positioning, connecting, testing including any drying out process and filtering, completion, painting, commissioning, initial maintenance of 12 months and handing over to the Employer in a satisfactory operating condition of the complete contract as set-out in the specifications, schedules drawing and summaries as follows:

- a) The supply delivery and erection of new MV lines and hardware.
- b) The excavation, backfilling and compaction of cable trenches.
- c) The supply, delivery and installation and termination of MV feeder cables.
- d) The supply, delivery and installation and termination of LV cables.
- e) The supply and construction of a substation building, including yard works, earthmat and fences.
- f) The supply and installation of a complete 22 kV switchgear and associated systems.
- g) The commissioning and put into operation of the entire works.
- h) The preparation of a detailed O&M manual as prescribed (which shall include the training of the municipal personnel).

Works shall be done in sections based on:

- Site constraints and isolation of areas
- Maximum allowed shutdown times
- Alternative temporary feeds from other existing lines nearby
- Contractor's capacity
- Funding Constraints

No sectional completion shall be done, and the works shall be handed over as a whole (unless funding constraints require the project to be completed in sections).

The contractor including all his specialized sub-contractors (when applicable) shall comply fully to all requirements as set-out in the contract and related documentation.

### **(b) ORDER OF THE WORKS**

Order of the works shall be planned between the client, engineer and contractor and be finalised after programme has been accepted but before works can commence.

The works shall be completed as a whole and no sectional completion shall be applicable (unless funding constraints require the project to be completed in sections).

### **(c) SHUTDOWNS**

The duration of shutdowns shall be determined based on practical isolation of sections of the network, client detailed requirements and construction activities, preparation and execution methodologies and to be agreed with the client in writing.

### **(d) ACCESS & PERMITS**

Access to crucial plant, emergency services facilities and businesses to be maintained at all times as far as practically possible. Permit systems to be employed as described in more detail under the specification. Site constraints, storage space available on site, rigging and erection requirements, possible Traffic management, and OHS requirements to be taken into consideration and allowed for.

### **(e) OCCUPATIONAL HEALTH AND SAFETY**

Refer to Addendum E.

Necessary Agreements to be signed between Employer and Contractor.

No work may commence before Health and Safety file has been approved.

**(f) PROGRAMME AND MANAGEMENT**

Refer to electrical specification for minimum programme set-up. It shall be noted that the programme shall be so arrange that progress can be tracked on a 2 weekly cycle be indicating planned and actual per bill line item. It shall further have the ability to track total percentage planned completed versus actual completed measured in terms of time lapsed. Programme shall be provided 24hrs before each technical and monthly meeting in electronic format to the Engineer.

It should be noted that the electrical construction shall be supervised on a full time basis by an installation electrician with relevant experience, and in the full time employment of the selected electrical contractor.

Refer to more detail on this under the detail specification.

**(g) SITE FACILITIES**

Contractor shall made allowance for:

- Ablution facilities.
- Meeting room facilities.
- Construction power & water during the works.
- Staff eat & rest facilities.
- Own storage facilities with necessary security.

## C3.1 General Specification

### 1. APPLICABLE STANDARDS AND REGULATIONS

#### REGULATIONS, FACTORIES ACT AND BY-LAWS:

- (a) The latest issue of the SANS 10142-1 "Code of Practice for the Wiring of Premises" hereafter called the "Wiring Code".
- (b) The Machinery and Occupational Safety Act 1993.
- (c) The Municipal By-Laws and any special requirements of the local Supply Authorities.
- (d) The local Fire Offices Regulations.

#### STANDARDS:

The standard electrical specification from the Department of Public Works shall form part of this tender, and be regarded as the minimum requirements. Copies here-off can be downloaded from the department's website at the following address, or alternatively a copy can be obtained from the consultant's office on request:

- <http://www.publicworks.gov.za/consultantguidelines.html> , item 6.5& 6.6, namely:
- [General Electrical Specification PartA and PartB.doc](#)
- [General Electrical Specification Part C.doc](#)

Additionally all equipment used shall comply with regulatory and compulsory specifications as referred to in latest version of SANS 10142-1-1, table 4.2.

1	2	3	4
Commodity	Scope	Safety Standards	Recommended Performance Standard
Aerial bundled Conductors	≤ 1 000 V	SANS 1418-1	
Bushbar	Copper, aluminium or aluminium alloy (purity and dimensions only)		SANS 1195
Busbar trunking systems	All	SANS 60439-2	
Cables (fixed extruded)	Fixed extruded insulation 300/500V to 600/1 000 V	VC 8075 <sup>a</sup>	

Cables (Flexible)	Flexible, PVC or rubber insulated $\leq 600/1\ 000\text{ V}$ Conductors $\leq 185\text{ mm}^2$	SANS 1574-3 SANS 1574-5	
Cables (Flexible cords)	Flexible cords Conductors $\leq 4\text{ mm}^2$	VC 8006 <sup>a</sup>	
Cables (heat-resisting)	Fixed, flexible, PVC or rubber insulated $\leq 600/1\ 000\text{ V}$	SANS 1574-3 SANS 1574-5	
Cable (single core, heat-resisting)	Single core; Cu; $\leq 300\text{ V}$ Rated temperature $\leq 250\text{ °C}$	SANS 529	
Cable glands	Excluding  - entirely non-metallic - for flameproof use		SANS 1213
Circuit-breakers	$/n \leq 125\text{ A}$ and $/cu \leq 10\text{ kA}$	VC 8036 <sup>a</sup>	
Circuit-breakers	$/n \leq 125\text{ A}$ and $/cu \geq 10\text{ kA}$	SANS 556-1, or SANS 156, or SANS 60947-2 (Ed.2 or later ed.)	
Circuit-breakers	$125\text{ A} < /n \leq 1\ 000\text{ A}$	SANS 556-1, or SANS 156, or SANS 60947-2 (Ed.2 or later ed.)	
Circuit-breakers	$1\ 000\text{ A} < /n$	SANS 556-1, or SANS 60947-2 (Ed.2 or later ed.)	
Circuit-breakers used as switch-disconnectors (isolators)	$/n \leq 125\text{ A}$ and $/cu \leq 10\text{ kA}$	VC 8036 <sup>a</sup> , or VC 8036 <sup>a</sup> plus SANS 60947-2 (ed.2.1 or later ed.)	
Circuit-breakers used as switch-disconnectors (isolators)	$/n \leq 125\text{ A}$ and $/cu \leq 10\text{ kA}$	SANS 556-1, or SANS 156, or SANS 60947-2(ed.2), or SANS 60947-2 (ed 2.1 or later ed.)	
Circuit-breakers used as switch-disconnectors (isolators)	$125\text{ A} < /n \leq 1\ 000\text{ kA}$	SANS 556-1, or SANS 156, or SANS 60947-2(ed.2), or SANS 60947-2 (ed 2.1 or later ed.)	

Circuit-breakers used as switch-disconnectors (isolators)	1 000 A < /n	SANS 556-1, or SANS 156, or SANS 60947-2(ed.2), or SANS 60947-2 (ed 2.1 or later ed.)	
Conduit	Conduit and fittings: Rigid Pliable Flexible  PVC rigid conduit and fittings: 20 mm to 63 mm dia.  Metal conduit: 20 mm to 50 mm dia.  Metal fittings		SANS 61386-1 SANS 61386-21 SANS 61386-22 SANS 61386-23  SANS 61386-1 SANS 61386-21 SANS 61386-23
Connectors (terminals)	Terminal blocks: - clamping: $\leq 300 \text{ mm}^2$ - screw type: $\leq 35 \text{ mm}^2$  Flat push-on: - $0,75 \text{ mm}^2$ to $10 \text{ mm}^2$ - $\leq 300 \text{ }^\circ\text{C}$		SANS 1433-1 IEC 60998-2-1 IEC 60998-2-2  SANS 1433-2
Contactors, motor starters and overload relays	All	SANS 60947-4-1 SANS 60947-4-2 SANS 60947-4-3 UL 508	
Disconnectors (non-trip)	$\leq 1\,000 \text{ V a.c.}$ or $1\,500 \text{ V d.c.}$	SANS 60947-3	
Distribution boards	$\leq 10 \text{ kA}$ short-circuit current low-voltage switchgear and control gear  Assemblies > 10 k A  For outdoor use and exposed to public  Assemblies for construction sites	SANS 1973-3  SANS 1973-1 SANS1973-8  SANS 60438-5  SANS 60439-4	

Earth leakage circuit-breakers (ELCBs) used as switch-disconnectors (with isolation function)	/Δn ≤ 30 mA See NOTE	VC 8035 <sup>a</sup> plus 7.2.7 of SANS 556-1	
Earth leakage circuit-breakers (ELCBs) used as switch-disconnectors (with isolation function)	/n ≤ 125 A; /Δn > 30 mA See NOTE	VC 8035 <sup>a</sup> plus 7.2.7 of SANS 556-1	
Earth leakage circuit-breakers (ELCBs) used as switch-disconnectors (with isolation function)	/n ≤ 125 A; /Δn > 30 mA See NOTE	SANS 60947-2 classified with an isolation function	
Earth leakage switches (ELSWs) used as switch-disconnectors (with isolation function)	/Δn > 30 mA See NOTE	VC 8035 <sup>a</sup> plus 7.2.7 of SANS 556-1	
Earth leakage switches (ELSWs) used as switch-disconnectors (with isolation function)	/Δn > 30 mA See NOTE	SANS 61008-1 (ed. 2.2)	
Earth rods	All		SANS 1063
Earth wire	Bare Copper	SANS 1411-1	
Electricity dispensers (pre-payment meters)	All		SANS 1524-1
Emergency stop devices	With mechanical latching function	SANS 60947-5-5	
Enclosures	IP ratings		SANS 60529
Ferrules and lugs	Ferrules and lugs for copper and aluminium conductors		SANS 61238-1
Fuses (low-voltage)	Rated voltage < 1 000 V a.c. Breaking capacity at least 6kA Rated current < 1 250 A Rated voltage < 690 V a.c.	SANS 60269-1	
Light dimmers	For incandescent lamps – - electromechanical 250 V - electronic – maximum of 3kW		SANS 1012 SANS 60669-2-1

Luminaires	ELV systems Pools and similar applications Supply track systems	SANS 60598-2-23 SANS 60598-2-18 SANS 60570	
Medical electrical equipment	General		SANS 60601-1
Medical monitoring device	Medical IT systems	IEC 61557-8	
Meter cabinets	For outdoor use and exposed to public	SANS 60349-5	
Outlet boxes	All		SANS 1085
Proximity switches	Not with analogue outputs < 250 V		SANS 60947-5-2
Push button, indicator lights, etc.	Electromechanical control circuit devices- ≤ 1 000 V	SANS 60947-5-1	
Ready boards (SPDU)	Non- extendable and extendable – rated 230 V	SANS 1619	
Shaver supply transformers (isolating transformers)	Input: 250 V a.c. supply Output: 110/230 V a.c. Isolating: 20VA to 50 VA	SANS 61558-2-5	
Socket-outlets	6 A, 3-pin, 250 V  16 A, 3-pin 250 V  Dedicated 16 A, 3-pin, 250 V  IEC systems for SELV plugs and socket-outlets  13 A fused flat pin	VC 8008 and SANS 164-3  VC 8008 and one of SANS 164-1 or SANS 164-2  VC 8008 and SANS 164-4  SANS 60906-3  BS 1363-2	
Socket-outlets (industrial type)	≤ 690 V: ≤ 250 A	SANS 1239 SANS 60309-1 and SANS 60309-2	
Stove coupler	All	SANS 60309-1 of dimensions as in SANS 337	



Surge arresters for low-voltage systems	$\leq 1\,000\text{ V}$	SANS 61643-1	
Switches (manually operated)	50 V – 440 V; 63 A	VC 8003 <sup>a</sup>	
Switches (photoelectric)	$\leq 1\,800\text{ VA}$ ; 230 V		SANS 1777
Switches and switch-disconnectors (non-trip)	$\leq 1\,000\text{ V a.c.}$ or $1\,500\text{ V d.c.}$	SANS 60947-3	
Switch-disconnectors (trip)			See circuit-breakers used as switch-disconnectors
Time switches	All		IEC 60730-2-7
Transfer switches	$< 1\,000\text{ V}$	SANS 60947-6-1	
Transformers (distribution)	$\leq 3\,150\text{ kVA}$ Maximum 36 kV	SANS 780	
Transformers (isolating)	Test Control Separating (double –wound) Shaver units Safety isolating Medical locations Electronic converters (for lamps)	SANS 61558-1 SANS 61558-2-2 SANS 61558-2-4 SANS 61558-2-5 SANS 61558-2-6 SANS 61558-2-15 SANS61347-2-2	
Watt-hour meters	Electromechanical induction type $< 600\text{ V}$  Electronic static for active energy $< 600\text{ V}$		SANS 62052-11 SANS 1799 SANS 62053-11  SANS 65052-11 SANS 62053-21
Wireways	Busways/busbartrunking  Cable trunking and ducting for electrical installations		SANS 60439-2  SANS 61084-1

Other Applicable Reference Specifications:

TOPIC	DOCUMENT
Aerial bundled conductor systems	SANS 1518
Aluminium conductors with steel reinforcing	SANS 182, Part 3
Aluminium conductors	SANS 182, Part 2
Batteries	SANS 1632 and 60896
Boxes and enclosures for electrical	SANS 60670
Circuit breakers of rated voltage above	IEC 60056
Conduits for electrical purposes	SANS 60615
Cross-linked polyethylene insulated cables	SANS 1339
Current transformers	SANS 60044
Direct acting indicating electrical measuring instruments	IEC 60051
Disconnectors and earthing switches	IEC 60129
Distribution transformers	SANS 780
Earth leakage units	SANS 767
Electric cables	SANS 1507
Electrical terminals and connectors	SANS 1533
High gloss enamel paints	SANS 630
High voltage testing techniques	SANS 6284
High-voltage alternating current contactors motor-starters	SANS 60470
High-voltage fuses	SANS 60282
High-voltage switchgear and control gear	SANS 62271
Hot dip (galvanized) zinc coatings	SANS 121 and 1561
Impregnated paper insulated metal sheathed cables	SANS 97
Insulated bushings for alternating voltages	SANS 60137
Insulated bushings	SANS 60137
Insulating oil	SANS 555
Luminaires for interior , street- and floodlighting	SANS 475
Metal-enclosed switchgear and control gear	IEC60298
Miniature substations	SANS 1029
National colour standards for paint finishes	SANS 1091
Optical fiber cables	SANS 60794
Overhead lines - Requirements and tests for fittings	SANS 61284
Paint finishes aluminium type	SANS 682
Paint for interior use	SANS 515
Painting of buildings	SANS 10305
Pine poles for power distribution and street lighting	SANS 753
Plugs and socket-outlets for fixed installation	SANS 60884
Porcelain and toughened glass insulators	SANS 60383
Power transformers	SANS 60076
Preparation of steel surfaces for coating	SANS 10064
Protection against lightning	SANS 10313, 62305-1 to 4
Rotating electrical machines	SANS 60034
Small transformers	SANS 60044
Steel structure sections	SANS 10162
Structural steel paint	SANS 684
Surge arresters	SANS 60099
The wiring of premises: low-voltage installations	SANS 10142
Undercoats	SANS 681
Voltage transformers	SANS 60044 and 60186
Zinc chromate primers for steel	SANS 679
Zinc-coated steel wires for conductors and stays	SANS 182, Part 5

<b>METAL CLAD SWITCHGEAR COMPONENTS</b>	<b>DOCUMENT</b>
Specification for AC metal enclosed switchgear and control gear, for voltages above 1kV up to and including 52kV	IEC 62271
Common specifications for HV switchgear and control gear standards (Previously IEC 60694)	IEC 62271 Part 1
Alternating current Circuit breakers	IEC 62271 Part 100
Alternating current disconnectors and earthing switches	IEC 62271 Part 102
Switches for rated voltages above 1kV and less than 52kV	IEC 62271 Part 103
Alternating current contactors and contactor-based motor-starters	IEC 62271 Part 106
AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV	IEC 62271 Part 200
Protection Fuses	IEC 60282-1
Degree of protection (IP rating)	IEC 60529
Instrument transformers – Part 1: General requirements	IEC 61869-1
Instrument transformers – Part 2: Additional requirements for current transformers	IEC 61869-2
Instrument transformers – Part 3: Additional requirements for inductive voltage transformers	IEC 61869-3
Current sensors	IEC 60044-8
Voltage sensors	IEC 60044-7
Voltage detection system VDS	IEC 61243-5
Insulation coordination	IEC 60071-1
Protection relays	IEC 60125
SF6 gas	IEC 60376

## 2. GENERAL

This part relates to the General Technical and Quality Specification for equipment, material and work to be supplied and installed.

Where trade names and trademarks are mentioned, it relates to type and quality of manufacture, but does not exclude equal and similar products of other manufactures.

## 3. DESIGN AND STANDARDISATION

The contract works shall be designed to facilitate inspection, cleaning and repairs, and for operation where safety of personnel is the first consideration and continuity of electricity supply of the utmost importance. All apparatus shall be designed to ensure satisfactory operation under the atmospheric conditions prevailing at the site and under such sudden variations of load and voltage as may be met with under working conditions on the system, including those due short circuits.

All nuts and pins shall be locked in position. On outdoor equipment all bolts, nuts and washers in contact with non-ferrous parts shall be of a material which will not cause electrochemical action or corrode.

All apparatus shall operate without undue vibration and with the least practicable amount of noise. All metal joining surfaces and all moving, running or wearing surfaces shall be machined or ground.

The underside of all tanks shall be ventilated in an approved manner to prevent corrosion. Kiosks, cubicles and similar enclosed compartments forming part of main switchgear or auxiliary equipment shall be adequately ventilated to restrict condensation. All contactor or relay coils and other parts shall be suitably protected against corrosion. The Tenderer shall allow for anti-condensation heaters if considered necessary.

Low temperature heaters shall be fitted inside indoor equipment where the supporting frameworks are of the box type in which secondary wiring and connections are housed.

All apparatus shall be designed to obviate the risk of accidental short-circuit due to animals, birds and vermin.

#### 4. INTERCHANGEABILITY

Corresponding parts shall be made to gauge and shall be interchangeable wherever possible throughout the contract works. When required by the Engineers, the Contractor shall prove this quality by actually interchanging the various parts.

#### 5. DESIGNATION

All designations of circuit elements and interlocking shall be as per the specification and drawings. No deviation of this will be allowed.

#### 6. EARTH MAT & EARTHING

##### 6.1. General

All metal parts other than those forming part of any electrical circuit shall be earthed in an approved manner to the earthing system. Any necessary terminals on any part of the equipment required for this purpose shall be provided by the Contractor. The earthing of equipment shall be by copper connections from the earth point to the earthing system. Earthing of equipment via the steel support structure is not acceptable. The structures shall be earthed separately as indicated on the drawings.

The substation's earthing system consists of the following:

- Buried horizontal round copper conductor earth grid with flat copper earth conductor connecting the buried grid to metallic parts of structures and equipment
- Connections to grounded system neutrals
- The safety layer of crushed rock at ground surface

The earth rods and tails will be welded together at crossings and connections. All joints shall be oxy-acetylene brazed. Crimping shall not be used. All the earthing in and around the substation must adhere to the Eskom standard DDT 5240 (latest revision).

Precaution shall be taken to prevent electro-chemical action between dissimilar metals.

##### 6.2. Main Earth Grid

The main earth grid will use 10 mm diameter round annealed copper buried  $\pm 1000$  mm below the finished platform level. Where passing under deeper foundations and drains, it must be 150 mm below the concrete. Backfilling around the earth conductors and rods must be well compacted. Where a concrete blinding is cast under building foundations, the earth grid meshes are to be installed on top of the blinding and under the concrete footing of columns, etc. Where passing over drains with less than 1000 mm of soil cover, they are to be buried as deep as possible.

Installed earthing shall be increased by the Contractor should tests show that the safe step and touch voltages may be exceeded. The earth resistance shall be as low as possible and Contractors are required to perform the necessary test after site clearance to ascertain the soil resistivity.

The earth mat resistance and measurement thereof shall be to the approval of the Engineer and shall be less than 1 ohm.

##### 6.3. Foundation Reinforcing

Connection of the reinforcement bars in the foundations to the earth grid shall be according to DDT 5240 sheet 10 and the relevant foundation details. The connections shall be done with a line tap clamp, as per DDT 3048. Reinforcing mesh is to be bonded on one side only to the main earth grid.

##### 6.4. Bolted Connections

All bolted down surfaces must be cleaned (wire brushed) and filled with a suitable joint compound (non-oxide

grease) to prevent oxidation of the joint. No paint barrier is allowed. Any paint films which might cause a highly resistive joint should be removed. Any scraped area around the joint shall be made good by using the original type and colour of paint.

#### 6.5. Steelwork and Main Equipment

All the equipment must be earthed at two (2) places using a single 50 mm x 3 mm flat copper earth strap connected to the main earth grid.

The connection from the earthbar to the 22 kV switchgear earthbar shall be done in an approved manner. The earthbar shall be mounted inside the cable trench in the building.

#### 6.6. Fencing and Gates

All fences must be earthed at intervals less than or equal to 20 m. Reference must be made to the earth grid layout for the details of all the points to which the fence is to be connected to the main earth grid. The 50 x 3 mm copper leads shall be bolted to the steel fence posts at the lug points provided, with the instruction that these connections must not be visible above the final layer of yard stone.

Each gate unit shall be electrically coupled to the adjacent gate post by means of a 70 mm<sup>2</sup>, UV stabilized, sheathed, stranded and flexible copper conductor that is suitably lugged and bolted at each end.

### 7. 22 kV INDOOR METAL-CLAD SWITCHGEAR

#### 7.1. General

The switchgear being a circuit breaker or on load isolator, must be suitable for the system as specified. The switch units shall be constructed of the best quality steel plates fixed to a substantially constructed steel framework of suitable design, to successfully withstand the mechanical forces during normal and short circuit conditions and must be fully vermin-proof.

It shall be of modular design.

Nothing in this specification shall lessen the obligation of the supplier. The supplier shall be fully responsible for the design and its satisfactory performance in service. Approval by the Engineer shall not relieve the supplier of the responsibility for the adequacy of the design.

This specifications covers the requirements for metal-clad switchgear. Metal-clad switchgear shall be manufactured in accordance with SANS 1885 & IEC62271 to ensure:

- Loss of service continuity type LSC2B.*
- Partitioning Class: Type PM.*
- Racking operation of switching device is only possible with the compartment door closed.*
- Mounting of all voltage transformers are within the arc proof enclosure.*
- Arrangement for future extensions on both sides of the switchgear.*

#### 7.2. Panels

##### 7.2.1. Construction

All cubicle housings are to be of a folded sheet metal construction of sufficient gauge (minimum 2mm) to ensure rigidity when sections are aligned and bolted together for transportation, erection and short circuit stresses. The cubicles shall be of neat and attractive appearance and attest of good workmanship. All welds shall be ground smooth.

The switchgear will be so constructed that all the different functions are segregated by metal partitions:

- busbar compartment
- power cable and cable instrument transformer (CT/VT) compartment
- circuit breaker compartment

- busbar voltage transformer compartment
- instrument compartment

Explosion vents shall be incorporated in the design in such a way that the hot gases are vented to the outside of the cubicle. The switchgear will be so constructed to allow natural ventilation within the cubicles.

After manufacture but prior to painting, all rust, mill scale, dirt, grease, moisture or other contaminants must be removed to give a clean, dry and metallic finish. Galvanised steel shall be cleaned with a suitable solvent.

Correct performance of operation shall be ensured by proper interlocks with mechanical position indicators and inspection windows, to facilitate the correct and safe operation of the switchgear.

Protection rating for outer cover protection: IP4X or better

Protection rating for inner partitions: IP20 or better

*The above in accordance with IEC 60529*

### 7.2.2. Internal Arc Requirements

#### *Construction*

The switchgear shall be so designed and manufactured to prevent the occurrence of an internal arc. The switchboard shall ensure maximum personnel safety even in case of an internal arc. The switchboard shall be built to withstand the overpressure ensuing from the internal arc for 1 second. The minimum requirement is classification AFLR.

#### *Protection System*

The switchboard shall be equipped with a specific arc protection system to protect against internal faults in each partitioned compartment. This arc protection system shall be based on light sensors suitably located in the switchboard and the presence of fault current at a pre-determined level. The system shall detect the presence of an internal arc fault at the instance of the arc inception and promptly open the circuit breakers. The fault shall be cleared within less than 100 ms (including the circuit breaker operating time). The arc protection system can be part of the main protection relay or supplied as a separate system independent of the main protection system.

Arc detection shall provide selective tripping of the faulted zone, including selective tripping of feeder cubicles for faults in the cable compartment. Arc detection is not permitted on circuits protected by a fused contactor arrangement, as the fuse limits the fault current let through, and the contactor is normally incapable of breaking fault currents up to the switchboard rating.

The inclusion of the arc protection equipment **shall not** be used as a basis for reducing the internal arc capability of the switchboard, as described above. The purpose of the arc protection system is to minimize the effects of the internal arc on the switchgear, for safety and so that the switchgear can be returned to service in a reasonable time.

### 7.2.3. Finishes

All metal cleaned as specified above, shall be primed within eight hours while still rust-free and uncontaminated.

The prepared metal surfaces shall be primed with one coat of epoxy, of a different colour to that of the final coats. The wet film thickness of the primer shall be between 40 and 50 microns. The metal surfaces shall be finally coated with at least two (2) coats of approved quality enamel to the following total dry film thicknesses, with a scratch resistance of 2 kg.

Coastal and corrosive areas 80 – 90 microns

All other areas 60 – 70 microns

All painted areas will be smooth, free of runs and any other defects such as peeling and misses.

#### 7.2.4. Busbars

The busbars shall consist of hard drawn high conductivity copper bars or tubes of adequate cross section area, to suit the current rating as specified.

The busbars shall be supported by epoxy resin supports within the cubicle, if required. The busbar supports shall be so designed as to withstand all possible stresses which may affect them in the course of service.

The busbars passing between cubicles shall be segregated by an epoxy resin insulated busbar section that will facilitate the removal of a cubicle without removing the busbars in the adjacent cubicles. The method of securing the removable busbar sections shall be done in such a way that the alignment of busbars can take place without any modifications to the steelwork of the cubicles.

Busbars shall be of such construction that bolted joints shall maintain contact pressure at rated current and temperature. Bolts and washers of suitable strength shall be used for bolting busbar sections. No bolt shall be used twice, once the bolt has been torqued up.

#### 7.2.5. Earth Bar

A HDHC copper earth bar shall be provided on each panel of dimensions as approved and shall be so arranged that connections between panels will ensure that the earth bar covers the total length of the board. The earth bar shall be rated to handle the full fault current of the switchgear.

Provision shall be made on the earth bar of each cubicle so that a connection can be made between the cubicle and the substation earth bar. Each section of the cubicle, all fixed equipment and removable or moving parts of the switchgear, including the circuit breaker shall be securely connected to the cubicle earth bar.

Provision shall be made so that the cable end compartment, gland and cable armouring can be connected to the cubicle earth bar.

The earth bar shall be connected to the switchgear chassis, in accordance with IEC 62271 Parts 1 and 200.

#### 7.2.6. Power Cable Compartment

The power cable compartment, shall be accessible from the front or rear of the switchboard. The cable compartment shall comprise the following:

- branch system for connecting the power cables to the circuit breaker insulating contacts
- a fault make cable earth switch with operation from the front of the Panel.
- an integral interlocking device between circuit breaker and earth switch.
- current transformers or current and/or voltage sensors
- removable voltage transformers, where cable voltage transformers are required
- Earth bar suitable for the full fault rating of the switchboard (refer to section above)

The termination distance between the gland plate and the termination point on the switchgear shall be a minimum distance of 600mm, to facilitate termination of three core cables. Where single core cables are used the termination distance may be reduced to 400 mm.

Gland plates shall be made from non-ferrous material, with a minimum thickness of 3 mm. Gland plates shall be pre-drilled and make provision for compression type glands, with cable supporting clamps, for the project cables. Where no cable information is specified blank cable plates shall be provided with at least 3 cable support clamps per panel.

#### 7.2.7. Circuit Breaker Compartment

This compartment shall be so designed as to accommodate the withdrawable circuit breaker or contactor complete with its truck. For racking operations (in and out) the compartment door shall be closed. It shall be possible to mechanically trip the circuit breaker in the racked out or racked in position with the compartment door closed.

The following components shall be mounted in this compartment:

- the primary connections, namely the bushings containing the power connections to the circuit breaker compartment the bus-bar and cable compartments
- metal shutters automatically operated by the movement of the circuit breaker truck.
- connection for the circuit breaker control wiring

The position of the withdrawable truck (Circuit breaker / contactor) shall be observed at any time through a security glass type window on the compartment door.

The colour of the shutters for the busbars shall be red and the shutters for the cables shall be yellow. In addition “busbar” or “cable” shall be painted on the shutters.

#### 7.2.8. Cable Voltage Transformers (for Metering and Protection)

If cable voltage transformers are required, this switchgear shall be so designed as to accommodate the connection and disconnection of cable voltage transformers from the front of the switchboard, complete with its truck, without compromising the internal arc rating of the switchboard. Access to the cable voltage transformer shall be from the front of the switchgear, and only be allowed once the compartment has been de-energised, and a safety earth applied. The VT compartment access door shall be interlocked with the cable earth switch to prevent access until the cable earth switch is applied. The voltage transformer shall be connected on the cable side of the current transformer. The following components shall be mounted in this compartment:

- The primary connections, namely the bushings containing the power connections between the voltage transformer and the busbar compartment
- Three single phase voltage transformers, with suitable rated HRC primary fuses, and secondary windings in accordance with the requirements
- Interlocks to ensure safe access after earthing of the switchgear.
- Connection for the voltage transformer secondary wiring

#### 7.2.9. Busbar Voltage Transformer Compartment (for Metering and Protection)

This compartment shall be so designed as to accommodate the withdrawable busbar voltage transformer complete with its truck, without compromising the internal arc rating of the switchboard. Racking operations (in and out) shall be achieved from the front of the switchboard with the compartment door closed, while the busbar is energized. The following components shall be mounted in this compartment:

- The primary connections, namely the bushings containing the power connections between the voltage transformer and the bus-bar compartment
- Three single phase voltage transformers, with suitable rated HRC primary fuses, and secondary windings in accordance with the requirements
- Metal shutters automatically operated by the movement of the voltage transformer. The shutters shall make provision for padlocks.
- Interlocks to ensure safe access after only after the VT is removed from the service position to the test position, as well as interlocks to prevent racking of the VT until the compartment door is closed.
- Connection for the voltage transformer secondary wiring

The position of the voltage transformer shall be observed at any time through a security glass type window on the compartment door.

#### 7.2.10. Installation Facility

The panels are to be delivered to site as factory assembled, and tested units. A base frame / floor frame shall be provided with the switchgear. A base frame / floor frame / base Irons comprises of a steel



channel assembly that is placed on top of the floor or cast into the floor to create a level surface for mounting of the switchgear. After the Panel (or Panel assemblies) have been positioned side by side in a single row and bolted together and the power and control cables are connected, the system must be ready for operation.

#### 7.2.11. Insulators

Insulators with mechanical fixings are preferred but a design which embodies insulators fixed by other means will be considered, provided a full description and a suitable drawing is furnished with the tender. Supports and clamps shall prevent busbar deflection under short circuit conditions.

All insulator material shall be spaced and shaped as to provide protection against tracking and / or flash-over.

The mechanical fixings or other method are to be of such a design that the insulator can be removed and replaced in the shortest possible time.

#### 7.2.12. Instrument Section

All instruments and relays for a particular panel must be flush mounted on a hinged door of that panel. No instruments, relays or fuses shall be surface mounted.

The door, as well as the hinges, shall be of such construction as to accommodate the total mass of all equipment to be mounted on the door. Seals of suitable non-ageing material shall be installed on the door to ensure that the section is dust-proof when closed.

If specified, indicating lamps and lamp holders shall be of approved types, so arranged that replacement of lamps and the cleaning of glasses and reflectors can be readily carried out. To reduce heating and fouling of panels, lamps which are continuously alight shall have the minimum consumption consistent with good visibility of indications in a bright lit room. LED technology to be used.

All auxiliary cubicle wiring shall be 300/500V PVC insulated. The insulation shall have a glossy finish, and shall be incapable of supporting combustion. The wiring shall be neatly run in plastic channels. Where lacing is done, no strings are allowable and the method and material shall be approved by the Engineer. Wiring passing out of instrument section shall be run in corrosion free flexible tubes.

The wire shall be stranded and of minimum 2,5mm<sup>2</sup> or as otherwise dictated by the load.

All wires shall have ferrules which bear the same number at both ends unless otherwise approved. The same ferrule number shall not be used on wires in different circuits on the same section. Ferrules shall be of insulating material and shall be provided with glossy finish to prevent the adhesion of dirt. They shall be clearly and durably marked and shall not be affected by dampness or oil. All wires associated with the tripping circuits shall be provided with red ferrules marked "Trip". The numbering system used shall follow the system as shown on the schematics.

Stranded wires shall be terminated by means of crimping lugs. Back of panel wiring shall be arranged so that access to the connecting stems of relays and other apparatus is not impeded. The wire shall be neatly arranged and plastic channels shall be preferred.

Wires shall not be jointed or teed between terminal joints. Bus wires shall be fully insulated and run separately along the top or bottom of the instrument section. Fuses and links shall be provided to enable all circuits in a section, except the lighting circuit, to be isolated from the bus wires.

All wiring diagrams for the instrument sections shall be drawn as if viewed through the access door and shall show the terminal boards arranged as in service.

If required, anti-condensation heaters of an approved type shall be provided inside each cubicle. The heater shall be shrouded and so located as not to cause injury to personnel or damage to equipment.

The heaters shall be controlled from a common double-pole miniature circuit breaker and shall be fed from a single phase A.C. supply.

### 7.3. Labels

Each panel must be provided with approved engraved labels of a sandwich construction.

Labelling shall be clear and concise and shall be to the approval of the Engineer. Labels to be positioned on the front, back and all removable sections of the panel.

Labels shall be secured by means of brass screws or rivets. Fixing by means of self-tapping screws and / or glue is not acceptable.

Labels indicating all CT and VT particulars to be provided and mounted inside the instrument section.

### 7.4. Test to be Carried Out

Full scale operational and functional tests in the presence of the Engineer or his representative, shall be carried out on every completed switchboard at the manufacturer's factory.

These test shall include polarity checks on all CTs and VTs.

Tests on site will include operational, insulation resistance, over-voltage or any other tests as required by the Engineer.

### 7.5. Test Certificates

All circuit breakers must comply with the guaranteed breaking capacity of the system parameters as specified. The cubicles and circuit breakers shall be tested to withstand the specified conditions.

Test certificates from independent test authorities shall be submitted with the tender.

### 7.6. Information to be Supplied for Approval

Before construction of panel commences, drawings must be submitted to the Engineer for his approval. Failure of the above mentioned could result in the rejection of panels. All revised drawings must again be submitted for approval.

The Contractor must submit copies, to the Engineer, of all test records, as carried out by an independent authority, during tender stages.

### 7.7. 22 kV Circuit Breakers

#### 7.7.1. Type

Circuit breakers are to be designed according to the ratings as specified. Circuit breakers must be of the metal clad, three pole, horizontal isolating type and shall have vacuum as isolating medium. The circuit breaker shall be withdrawable and fully comply with IEC 62271 Part 100.

Circuit breaker housings shall be constructed out of high quality epoxy resin in which the circuit breaker operating mechanism and contactors are situated.

The contacts inside the vacuum bottle shall be suitably lined with silver or other approved material. The contact pressure shall be such that this is maintained under all circumstances other than trip even under overload conditions.

The bottles shall be easily replaceable. Any leak in the bottle shall block the circuit breaker to avoid tripping. Indication to this extent shall be provided unless otherwise approved.

The circuit breakers shall be provided with surge suppressers where applicable.

#### 7.7.2. Supporting Steelwork

The design of the switchgear is to be such that the movable portion incorporating the circuit breaker, operating mechanism, primary and secondary disconnecting devices, auxiliary switches, position indicators and necessary control wiring can be discounted and withdrawn with the minimum amount of effort for maintenance and adjusting purposes.

The moving portion of the switchgear is to be provided with nylon roller bearing wheels and is to be interchangeable with other units of similar make, type, current and voltage ratings.

Stops shall be provided to prevent over-travel of the moving portion.

#### 7.7.3. Operating Mechanism

All circuit breaker mechanisms shall be of the trip-free type and be spring-assisted such that the opening or closing speeds are independent of the operator, solenoid or motor. The circuit breaker shall be capable of closing and latching against its rated making current.

The circuit breaker shall be fitted with a mechanical trip counter.

Spring operated mechanisms shall have the following additional measures:-

- a) Regardless of the fact that if the circuit breaker has been single or double charged, sufficient energy shall remain in spring so that the circuit breaker can be tripped immediately after closing.
- b) Motor charged mechanisms shall be provided with means for charging the springs by hand and a shrouded push button for releasing the springs.
- c) Under normal operation, motor recharging of the operating springs shall commence immediately and automatically upon completion of each closing operation.
- d) It shall not be possible to close a circuit breaker fitted with a motor charged closing mechanism, whilst the spring is being charged.

All electrical tripping and closing devices shall operate from a power supply as specified. All operating coils must be designed such that satisfactory operation will be maintained, even though the voltage should drop to 50% below normal.

If the circuit breaker is to be operated from a remote control room all electrical operating devices shall be either wired to terminal strips or a plug of approved quality.

Circuit breakers shall be suitable for the following switching duty, in accordance with the latest IEC 62271 Part 100:

- for mechanical endurance, class M2
- for electrical endurance, class E2
- Capacitor switching class C2

Circuit Breaker operating sequence shall be O-0,3s-CO-3min-CO, suitable for reclosing of a circuit breaker after a fault.

#### 7.7.4. Indication

Positively driven mechanically operated indicating devices, as approved, shall be provided to each circuit breaker to indicate whether a circuit breaker is in the open or closed in the service, isolated or earthed position.

Labelling shall be provided to show whether the equipment is prepared for "Service", "Busbar Earth" or "Circuit Earth".

All indication shall be visible from the front of the equipment at all times.

All indication on the panel shall be electrically duplicated on the remote control panel situated in the control room if specified.

#### 7.7.5. Control and Auxiliary Contacts

The electrical connection between the fixed and moving parts of the circuit breaker can be as follows:-

- a) The female portion of plug mounted on an extension cable can be used for providing the electrical connection between the moving and fixed parts of the circuit breaker. The length of the flexible cable shall be such that all functional tests on the circuit breaker can be carried out in the racked out position. The male portion of the plug will be securely mounted on the front of the fixed portion of the circuit breaker panel. The male and female portion of the plug will be an Amphenol plug or equal and must be readily available in South Africa.
- b) Self-aligning plug and socket isolating devices of an approved design shall be provided for all auxiliary contacts. The position of these devices shall be such that individual circuits of different units are in the same relative physical positions for interchanging of similar units.

All auxiliary contacts must be positively driven in both the racked in and racked out positions. All auxiliary contacts must be readily accessible for ease of maintenance.

Provision shall be made so that all auxiliary circuits on the fixed and movable parts of the circuit breaker can be electrically completed when the circuit breaker is isolated and withdrawn, so that all functional tests of the circuit breaker can be carried out.

Despite the number of auxiliary contacts required for the satisfactory operation of the circuit breaker and the number of additional auxiliary contacts as specified in the Detail Specification, one set of normal open and normal closed auxiliary contacts, wired to a set of suitably numbered terminals on the fixed portion of the panel, shall be provided.

#### 7.7.6. Earthing Devices

Earthing devices shall be provided on all circuit breaker units whereby the circuit breaker units can be earthed from circuit side. The circuit breaker shall have a closing mechanism which speed is independent of the operator.

The earthing switch shall have a making capacity equal to the peak withstand current of the equipment.

Padlocking facilities shall be provided for the purpose of preventing inadvertent earthing.

Tenderers shall specify the proposed method of earthing in their tenders.

#### 7.7.7. Locking Facilities

In addition to any requirements specified the following padlocking facilities shall be included:

- a) Selector mechanisms on circuit breaker padlocked in the isolated and service positions.
- b) Safety shutters on primary contact isolating openings in closed position.

#### 7.7.8. Testing Facilities

All circuit breaker units shall be provided with facilities to enable all applied high voltage test to be carried out.

Should current transformers and protective relays be fitted, facilities shall be provided for primary and secondary injection testing.

All facilities shall be such that no wires and connections need to be disconnected for tests that have to be carried out.

#### 7.7.9. Interlocking Gear

Mechanical or key type of interlocking shall be provided to prevent the following operations:-

- a) The moving portion of the circuit breaker from being inserted or withdrawn when the circuit breaker is closed.
- b) The closing of the circuit breaker unless the movable portion is in the racked out position or been correctly racked in.
- c) The circuit breaker being closed in the “Service” or “Earth” position without completing the auxiliary contacts.

Should key interlocking be employed, any attempt to remove the trapped key shall not cause the closing or opening of the associated equipment.

Interlocks shall be provided so that it is impossible for electrical or mechanical devices to be operated simultaneously, should a circuit breaker be equipped with both.

It shall not be possible to return to the service position and close the circuit breaker until the electrical tripping is again operative.

The interlocking shall prevent the circuit breaker from operating should a vacuum leak occur or gas pressure fall below a certain level, whichever applicable.

Notwithstanding any interlocking described above, the switchgear shall comply with any additional interlocking as specified elsewhere in this document.

#### 7.7.10. Local Electrical Operation

Switchgear shall be controlled from a separate control panel erected in the control room. The function of the control panels for the switchgear shall be limited to remote tripping and closing, with indications of the condition of the circuit breakers on the corresponding switchgear/circuit-breaker and they shall be made up as wall mounted units/cubicles.

The local/remote selection switch shall be located on the circuit breaker panel.

Control panels, including spares shall be complete having the following functionalities:

- a) Inhibit local control when selected onto remote.
- b) Inhibit remote control when selected onto local, and
- c) Switchgear panel status indications (open/closed).
- d) Circuit breaker control switch.
- e) Alarm (circuit breaker trip) cancellation switch.
- f) Ammeter (electronic and must indicate instantaneous and maximum demand on all three phases).
- g) Volt meter for all panels equipped with VT units.
- h) Cable earth position indicator.
- i) Mimic diagram and circuit breaker status indication lights with test and select indication.
- j) Indication to which set of busbars the circuit breaker is connected.
- k) Designation label.

The electrical tripping circuit of a circuit breaker shall be provided with a test trip facility wired to the instrument panel terminals.

#### 7.7.11. Auxiliary Components

Current transformers shall have short time current (STC) rating not less than the STC of the switchgear panel.

Current transformers shall be designed for optimal protection relay performance. Tenderers shall provide detail of the current transformer design.

## **8. ELECTRICAL DISTRIBUTION BOARDS (up to 1kV)**

### **8.1. General**

This section covers the manufacturing and testing of flush mounted, surface mounted and floor standing switchboards for general installations in normal environmental conditions and for system voltages up to 1kV.

All switchboards shall be of ample size to accommodate the specified switchgear and provide space for future switchgear. For every four (4x) or part of four (4x) 6 kA circuit-breakers on a switchboard, space for an additional 6 kA circuit-breaker shall be allowed unless future space requirements are clearly specified. For circuit-breakers above 6 kA, this factor shall be 15%. The clearance between adjoining switchgear openings shall be as specified.

All switchboards shall be rendered moisture proof and vermin proof and shall be adequately ventilated.

The load shall be balanced as equally as possible across multi-phase supplies.

### **8.2. Construction of Flush Mounted Switchboards**

Flush mounted switchboards shall comply fully the latest SANS standards. Unless the depths of the switchboards are specified, the depths shall be determined in accordance with the switchgear mounting depths.

Where switchboards are to be built into 115 mm thick walls, expanded metal shall be spot welded to the rear of the bonding trays. The expanded metal shall protrude at least 75 mm on each tray side to prevent plaster from cracking.

Knock-outs shall be provided in the top and bottom ends of each switchboard tray to allow for the installation of conduits for the specified and future circuits. Knock-outs shall be provided for an equal number of 20 mm and 25 mm dia conduits.

Front panels shall have machine punched slots for housing the specified and future flush mounted switchgear. The distance between the inside of the closed doors and the panel shall not be less than 20 mm. No equipment may be mounted on the panel unless the panel is permanently hinged to the switchboard frame.

The front panel shall be secured to the architrave frame by means of captive fasteners similar to "DZUS" or "CAMLOC". Alternatively the panel may be secured to the architrave frame by means of the two pins at the bottom and a latch or lock at the top of the panel. Self-tapping screws will not be allowed.

Switchboard doors shall be equipped with handles and catches. Locks shall only be provided when specified. In all cases where lockable doors are higher or wider than 450 mm, handles consisting of a pushbutton-and-handle combination with spring-loaded catch or rotary handle-and-catch combination shall be installed. Switchboard doors smaller than 450 mm in height and width may be equipped with spring-loaded flush mounted ring type latches. Square key operated catches are not acceptable unless specified.

### **8.3. Construction of Surface Mounted Switchboards**

Surface mounted switchboards shall comply with the latest SANS standards.

Surface mounted switchboards shall be equipped with a 1,6 mm minimum sheet steel reinforced tray, suitably braced and stiffened to carry the chassis, door and equipment. Lugs to secure the switchboard to a vertical surface shall be provided.

All joints shall be welded or securely bolted. The tray shall be square and neatly finished without protrusions. The front tray sides shall be rounded with an edge of at least 20 mm to accommodate flush doors.

A sheet steel chassis for the mounting of equipment shall be bolted to the tray.

The front panel and door shall comply with the above. Doors shall fit flush in the tray when closed.

Unless the depth of the switchboards is specified, the dimensions shall be determined in accordance with the requirements detailed below.

#### 8.4. Mounting of Chassis

The chassis of flush mounted and smaller surface mounted boards shall be mounted in accordance SANS standards. For all free standing switchboards and surface mounted switchboards where the main switch rating exceeds 100A (triple-pole), space for wiring shall be provided between the chassis and tray. This space shall be adequate to install the supply cable behind the chassis and terminate on the main switch without sharp bends in the cable cores.

#### 8.5. Mounting of Equipment

The mounting of equipment shall comply with SANS where applicable. Equipment to be mounted on the chassis shall be mounted by bolts, washers and nuts or by bolts screwed into tapped holes in the chassis plate.

In the latter case the minimum thickness of the chassis plate shall be 2,5 mm. The latter method shall not be used where boards will be subject to vibration or mechanical shocks. Self-tapping screws will not be accepted.

Equipment shall be arranged and grouped in logical fashion. Where earth leakage units are required, the associated circuit-breakers shall be installed adjacent to the unit. All moulded-case circuit-breakers shall be flush mounted with only the toggles protruding. Miniature circuit-breakers may be installed in clip-in trays mounted on the frame. All other circuit-breakers shall be bolted to the chassis. Special provision shall be made for large main switches when designing the framework. Care shall be exercised that the rear studs of circuit-breakers are properly insulated from the steel chassis. Where necessary, insulating material shall be installed between the rear studs and the chassis. Circuit-breakers shall be installed so that the toggles are in the up position when "ON" and down when "OFF".

All metering instruments shall be flush mounted in the front panel or door. The rear terminals of instruments mounted on doors shall be covered with an insulating material to prevent accidental contact. Current transformers for metering shall be mounted so that the rating plate is clearly visible. Fuses for instrumentation shall be mounted in an easily accessible position and clearly marked.

Fuse holders shall be mounted semi-recessed in the front panel so that fuses can readily be changed without removing the front panel. Busbar mounted fuses for instrumentation shall be used as far as possible.

Where equipment requiring fuses is specified on a board (fuse switches etc.), a ruling shall be obtained from the Engineer on the quantity of spare fuses to be provided.

#### 8.6. Wiring

##### 8.6.1. Cabling

Cables connected to incoming or outgoing circuits shall be terminated on a gland plate supplied for this purpose. Power cables may terminate on clamp type terminals where the square area is up to and including 70 mm<sup>2</sup> and clamping screws are not in direct contact with the conductor. Connection to the equipment can then be made with cables that are similarly connected to the clamp terminal. All power cables larger than 70 mm<sup>2</sup> terminate on busbars that are connected to the associated equipment. Parallel incoming or outgoing cables shall be connected to a collector busbar without crossing the conductors.

##### 8.6.2. Current Ratings

The current rating of conductors for the internal wiring shall be sufficient for the maximum continuous current that can occur in the circuit. This value shall be determined from the circuit-breaker or fuse protection of the circuit.

### 8.6.3. Internal Wiring

Standard 600/1000 V grade PVC-insulated stranded annealed copper conductors to SANS shall be employed for the internal power wiring of switchboards. The smallest conductor size to be used for power wiring in switchboards shall be 2,5 mm<sup>2</sup>. Flexible cord of minimal 1,0 mm<sup>2</sup> can be used for control wiring.

Where heat generating equipment is present and the internal temperature of the board is likely to exceed 50°C, silicon-rubber insulated stranded conductors shall be used.

Wiring shall be arranged in horizontal and vertical rows and shall be bound with suitable plastic straps or installed in PVC wiring channels. Under no circumstances may PVC adhesive tape be used for the bunching of conductors or for the colour identification of conductors.

Bunched conductors shall be neatly formed to present a uniform appearance without twisting or crossing the conductors. Conductors leaving the harnesses shall be so arranged that they are adjacent to the chassis.

Conductors to hinged panels and doors shall be secured on both the door and the frame and shall be looped between the two points. The loop shall be arranged to produce a twisting motion when the door is opened or closed. A flexible protection sleeve shall be installed over the conductors.

Where wiring channels are used, they shall be installed horizontally and vertically. Under no circumstances may power and control circuit wiring be installed in the same wiring channel. Channels shall not be more than 40% full.

All wiring between different panels within the same switchboard shall be installed in wiring channels. Grommets shall be installed in each hole in the metalwork through which conductors pass.

All wiring shall be installed away from terminals, clamps or other current carrying parts. Wiring shall also be kept away from exposed metal edges or shall be protected where they cross metal edges.

Conductors may be jointed at equipment terminals or numbered terminal strips only. No other connections are allowed.

Where conductors change direction, smooth bends shall be formed with a radius of at least 5 times the outside diameter of the conductor or harness.

Where screened cables are specified, the screening shall be earthed in the switchboard or control board only unless clearly specified to the contrary. Screened cables entering control boxes through pressed knock-outs, shall terminate in compression glands. Conductors shall as far as possible remain inside the screening at terminations. Where conductors have to separate from the screen, the braiding shall be separated and the conductors drawn through the braid without damaging the braiding. The conductors shall then be connected to their respective terminals and the screening smoothed and connected to the earth terminal.

Where neutral connections are looped between the terminals of instruments, it is essential that the two conductor ends be inserted into a common lug or ferrule and are crimped or soldered together in order that the neutral connection is not broken when the conductors are removed from one of the instruments.

Wiring should as far as possible be confined to the front portions of switchboards for ease of access. This requirement is important for wiring between smaller circuit-breakers and the associated main circuit-breaker as well as the wiring from circuit-breakers to lighting and socket-outlet circuits.

A maximum of two conductors will be allowed per equipment terminal. Where more conductors must be connected to the same equipment terminal (e.g. main circuit-breaker feeding other circuit-breakers), stub busbars shall be provided for the various conductors.



The supply end connections to all equipment shall under all circumstances be at the top and the load end connections at the bottom.

Equipment conductors with a rating exceeding the current rating of 70 mm<sup>2</sup> shall be connected by means of busbars to the main busbars. Looped connections may only be installed for a maximum of two outgoing circuits. Where there are more than two outgoing circuits, busbars shall be used and equipment connected individually to the busbars.

Connections to circuit-breakers, isolators or contactors shall be made by one of the following methods:

- i) a lug of the correct size,
- ii) soldering the end of the conductors, or
- iii) pin lugs of the correct size

All conductors terminating on meters, fuse holders and other equipment with screwed terminals shall be fitted with lugs. The lugs shall be soldered or crimped to the end of the conductor. The correct amount of insulation shall be stripped from the end to fit into the terminal. Strands may not be cut from the end of the conductor.

The colour of the conductors for all 220/250 V circuits shall correspond to the colour of the supply phase for that circuit. Neutral conductors shall be black.

#### 8.7. Paint Finish

Metalwork of switchboards shall be finished with a high quality paint applied according to the best available method. Baked enamel, electro-statically applied powder coating or similar proven methods shall be used.

Painted metal shall be corrosion resistant for a period of at least 168 hours when tested.

Care shall be taken to ensure that all edges and corners are properly covered.

##### 8.7.1. Surface Preparation

Surface preparation shall comply with SANS. Prior to painting, all metal parts shall be thoroughly cleaned of rust, mill scale, grease and foreign matter to a continuous metallic finish. Sand or shot blasting or acid pickling and washing shall be employed for this purpose.

##### 8.7.2. Baked Enamel Finish

Immediately after cleaning all surfaces shall be covered by a rust inhibiting, tough, unbroken metal-phosphate film and then thoroughly dried.

Within forty eight (48) hours after phosphating, a passivating layer consisting of a high quality zinc chromate primer shall be applied, followed by two coats of high quality alkyd-based baked enamel.

Metal parts shall comply with SABS 783, type iv with a minimum paint thickness after painting of 0,06 mm. In coastal areas, the dry film thickness shall be increased to at least 0,1 mm.

The paint shall have an impact resistance of 5,65 J on cold-rolled steel plate and a scratch resistance of 2 kg.

##### 8.7.3. Powder Coated Finish

Immediately after cleaning the metal parts shall be pre-heated and then covered by a microstructure paint powder applied electro statically.

The paint shall be baked on and shall harden within 10 minutes at a temperature of 1900c.

The minimum paint thickness after baking shall be 0,05 mm. The dry film thickness shall be increased in coastal areas. The paint cover shall have an impact resistance of 5,65 J on cold-rolled steel plate and

scratch resistance of 2 kg.

#### 8.7.4. Touch-up Paint

Touch-up paint for all painted surfaces shall be provided. In case where large surfaces have been painted a tin of the matching paint not smaller than 1 litre shall be provided.

#### 8.7.5. Colour

The standard colour of LV switchboards and equipment enclosures is white, unless otherwise specified.

### 8.8. Labelling

Care shall be taken to ensure that all equipment is fully labelled and that accurate descriptions and safety warning notices appear in both official languages.

Engraved plastic or ivory sandwiched strips shall be used throughout. The strips shall bear black lettering on white background for normal labels and red letters on a white or yellow background for danger notices.

All equipment on switchboards shall be identified with the necessary labels. The circuit numbers shall appear at grouped single-pole circuit-breakers. The circuit numbers shall correspond to the circuit numbers on the final installation drawings. The abovementioned circuits shall be identified on a legend card, which shall be installed on the inside of the switchboard door, or in any other position where it can conveniently be observed. All fuses, including instrument fuses, shall have labels stating function, fuse rating and duty or type where applicable. All other equipment shall be identified separately and their functions shall be clearly indicated.

Labels shall not be fixed to components or trunking but to doors panels, chassis or other permanent structures of the switchboard.

Engraved strips shall be secured to facilitate a neat alteration of the designation of the labels. Sufficient fixing points shall be provided to prevent labels from warping. Labels in slotted holders shall be secured in position to prevent unauthorised removal. Labels may be secured by the use of brass bolts and nuts, self-tapping screws, slotted label holders or pop-rivets.

### 8.9. Tests

The Engineer shall be notified when the mechanical construction of the switchboard, i.e. frame, panels and base frame, is complete in order that it may be inspected at the factory.

Function tests of all equipment, control and interlocking circuits shall be conducted to the satisfaction of the Engineer. Testing equipment and facilities including instruments, dummy loads and additional switchgear and cables shall be provided by the Contractor at no extra cost. The Engineer shall be notified in writing two weeks in advance of any test to be conducted, to allow him to be present at such tests. A complete report on the tests shall be handed to the Engineer.

## 9. PROTECTIVE EQUIPMENT

### 9.1. General

The protective relays and instruments shall be in accordance with this document or as shown on the schematic drawings.

Protective equipment shall be suitable for operation under site conditions when connected to the system as detailed in the specification. The protective equipment shall be designed to disconnect faulty circuits timeously and with certainty, without interference to healthy circuits.

The design shall be such as to prevent incorrect operation of circuit breakers as a result of transient phenomena not arising from faulty conditions of the section of line or equipment associated with each set of relays, but which may occur during fault periods due to disturbances on the system.

The contractor shall be responsible for ensuring the correct operation of the protective equipment.

Circuit breaker auxiliary switches in D.C. circuits associated with protective gear shall be connected, unless otherwise approved, in the leads between the negative pole of the battery and the equipment to minimise the effects of electrolysis.

## 9.2. Relays

Preference shall be given to solid state relays incorporating the latest technology.

All relays shall be contained in flush mounted, dust-proof withdrawable type cases. All relays, essential for protection on relay panels, shall be front mounted only. Relays mounted in the rear of panels shall be accessible for inspection and wiring.

All metal bases and frames of the relays shall be earthed, unless otherwise approved.

Relays shall be of an approved type, construction and finish, and shall be so arranged that replacements can be affected quickly and with the minimum amount of labour. Where plug in printed circuit cards are used, they shall be mechanically coded as to preclude incorrect positioning. All such boards shall have gold plated contacts.

Relays incorporating electronic devices shall be arranged to jack-in and shall have a positive means of retaining them in the service position.

All contacts of the relays shall be capable of breaking and making the maximum current which can occur in the circuit which they have to control.

The contacts of the relays shall not be affected by vibration, mechanical shock or by external magnetic fields, and care shall be taken in ensuring that inductive pick-up or other currents that may be flowing in a circuit affect the equipment.

All protective relays which initiate tripping (excluding tripping relays) shall have not less than two independent pairs of contacts, of which one shall operate the tripping relay directly without the interposition of auxiliary contactors, and preferably without the use of reinforcing contactors.

All D.C. relays used for tripping shall operate when the supply voltage is reduced to 50% or raised to 120% of rated voltage.

Relays shall be so designed as not to sustain any damage if inadvertently connected to a D.C. supply with incorrect polarity.

All relays shall be suitably marked with the following information:-

- a) Function of relay (e.g. over-current).
- b) Phase colour of the current supply.
- c) Characteristics curve, where appropriate.
- d) Rated current and / or voltage of the relay coils.
- e) Rated making capacity of tripping contacts.

Items a) to c) shall be visible from the front without removing the cover.

A breaker fail scheme shall be employed. When this scheme measures current flow after a trip signal has been issued, it will trip the upstream breaker (incomer).

The protection relay will have the facility to monitor its own integrity and a protection healthy function will be

mapped to a normally closed contact of the protection relay.

### 9.3. Over-Current Protection

Over-current fault protection shall be provided as back-up protection on all circuits.

Over-current relays shall be of the three pole type and shall be of the definite minimum and inverse time limit pattern, with separately adjustable time and current settings. Unless otherwise approved the definite minimum time shall be continuously variable from 0-3 seconds when a current of 10 times the setting flows through the relay and the current setting range shall be variable between 50 and 200%.

### 9.4. Earth Fault Protection

Earth-fault relays shall be of the single pole type and shall be of the definite minimum and inverse time limit pattern, with separately adjustable time and current settings. Unless otherwise approved the definite minimum time shall be continuously variable from 0-3 seconds when a current setting range shall be variable between 5 and 80%. The time current characteristic shall be detailed by the contractor.

### 9.5. Busbar Protection

Where separate trip coils are used for the busbar protection, similar means shall be used but 15A fuses of approved type shall be supplied instead of links in series with the trip circuits, to ensure clearance of faults on the small wiring.

The trip circuits in the busbar protection cubicle shall be fully insulated or shrouded on the positive side of the master switch contacts and on the trip coil and inter-trip relay coil sides of the fuses and / or links.

### 9.6. Feeder Protection

Feeder protection with pilot wires shall preferably employ not more than two cores of a, optical fibre, pilot cable.

### 9.7. Arc Protection

The switchboard shall be equipped with a specific arc protection system to protect against internal faults in each partitioned compartment. This arc protection system shall be based on light sensors suitably located in the switchboard and the presence of fault current at a pre-determined level. The system shall detect the presence of an internal arc fault at the instance of the arc inception and promptly open the circuit breakers. The fault shall be cleared within less than 100 ms (including the circuit breaker operating time). The arc protection system can be part of the main protection relay or supplied as a separate system independent of the main protection system.

### 9.8. Protection Testing Facilities

Test terminal blocks and / or test units shall be provided for voltage transformer, current transformer and D.C. tripping circuits for each protection and metering system to enable secondary injection testing of protection A.C. and testing of D.C. circuits to be carried out without removal of, or transfer of any wiring or connections and without causing tripping of associated circuit breakers or operation of transfer tripping facilities.

Full provision for testing each part of the equipment shall be made so that it will not be necessary to disconnect wires from terminals.

All terminal blocks shall be constructed as to prevent any accidental touching of terminals.

Where insulated cable glands are supplied in association with current transformers fitted over the cables, means shall be provided for testing the insulation. These means shall comprise the provision of two stages of insulation between the cable sheath and the switchgear framework, the two stages being separated by a metallic island layer fitted with test terminal and removable earth link.

### 9.9. Information to be Supplied

The Contractor shall supply a complete schematic diagram of the protective equipment at an early stage in the progress of the contract, showing the position of the master switch and each link and fuse, and shall obtain approval of the diagram before proceeding with manufacture. Estimated sensitivity and stability figures shall be supplied at the same time.

Internal wiring diagrams of the relays used shall be submitted for approval and included in the maintenance manuals.

Protection schemes for programming the relays shall be proposed and finalized with Engineer to ensure breaker protection functions correctly.

## 10. METERS

### 10.1. General

All meters and associated equipment shall be of a manufacture and type which is readily available on the South African market. All instruments and associated equipment shall be submitted for approval.

All instruments shall be calibrated at 20°C and shall be suitable for use in climatic conditions as specified for the equipment in which they are to be mounted.

Instruments shall be dielectrically tested in accordance to the specifications applicable to the instruments.

### 10.2. Ammeters

Ammeters shall be of the square pattern, flush panel mounting types, with a minimum bezel size of 100 x 100mm.

Where ammeters are used in motor starting circuits, they shall be provided with a suitable over scale, and withstand the system short circuit current for at least 1 second.

Where dual ratio C.T.'s are specified, the ammeters shall be provided with dual scales to cover the ratios requested. All ammeters shall have 100 ° pointer movements allowing for 20% overload movement, and indication arms shall be in red.

Where maximum demand indication is required, the ammeters shall be of the maximum demand and indicating type. These shall be of the thermal movement type with drag pointer and with a 15 min. time lag. These shall be manually resettable.

Ammeters shall meet the overload capacities as laid down in the appropriate specification.

Current transformers shall be used in all cases where the maximum current in the circuit exceeds 25 amps in which case the ammeters will operate off a 1A C.T. secondary unless otherwise stated.

For circuits with maximum current of 25 amps and below, direct reading ammeters shall be used.

**Electronic versions of the ammeters described above must be used that display all three phases on one unit.**

### 10.3. Voltmeters

Voltmeters shall be of the square pattern, flush panel mounting type, with a bezel size of +/- 100mm x 100mm. These shall be of the moving iron type with extended range.

Voltmeters shall meet the overload capacities as laid down in the appropriate specification.

Voltmeter shall be supplied from the secondary 110V side of the potential transformers on high voltage switchboards.

#### 10.4. A.C. Watt & VAR Meters

A.C. Watt and V.A.R. meters shall be of the square pattern, flush panel mounting type, with a bezel size of +/- 100 x 100mm.

The meters shall have an accuracy class of 1,0.

The meters shall be self-contained for the ranges: -

0,5 – 20 amps

12 – 500 volts

Extension to these ranges shall be by transformers.

The type of energy meter required shall be specifically mentioned in the schedules. These must not be surface mounted on the front of the panel. Proper cut-outs must be made through the panel door with the meter face protruding, or they must be mounted behind the panel doors. Where these meters are supplied by the Authority or others, all the wiring shall be complete and terminate in approved terminal blocks next to the meter.

#### 10.5. Frequency Meters

Analog display frequency meters shall have a 240° movement and shall be of the square pattern, flush panel mounted types with a minimum bezel size of +/- 100 x 100mm.

Digital display frequency meters shall have a figure size of not less than 12,5mm. Digital display frequency meters shall be able to display the frequency up to 1 decimal, and shall be of the flush panel mounted types.

All frequency meters shall have self-contained solid state converter circuits and shall have an accuracy class according to the appropriate specification.

### 11. CURRENT TRANSFORMERS

#### 11.1. General

Current transformers shall comply with SANS standards.

The VA rating of the current transformers shall not be less than the sum of all the individual burdens of relays and instruments plus 30%.

#### 11.2. MV Current Transformers (Metal-Clad Switchgear)

The MV current transformers shall be able to withstand all circuit conditions, tests, fault rating etc., as applicable to the associated H.T. switchgear. Therefore all system and environmental conditions as specified will apply.

All secondary connections of each current transformers shall be brought out to terminals and will terminate in the low voltage section of the switchgear panel and will be suitable labelled.

The accuracy class of MV current transformers shall be as follows, if not specified differently on the drawings:

Application	Primary Rating	Accuracy Class
Supply authority, check metering	All	Class 0,5
Metering application	Up to 400 amp	Class 0,5
	Over 400 amp	Class 0,5
Protection	Incomers	Class 5P10
	Feeders	Class 5P10
Differential Protection	All	Class X

All wiring for 5 or 1 amp secondary circuits shall be in PVC insulated wiring of not less than 2.5mm<sup>2</sup>.

Fuse sizes on primary side of MV current transformers shall be specified by the Contractor.

### 11.3. LV Current Transformers

LV current transformers shall be able to withstand for at least one second the fault level as applied to the busbars as specified or as shown on the drawings. The accuracy class of LV current transformers shall be as follows if not specified differently in the Detail Specification.

Application	Primary Rating	Accuracy Class
Indicating Instrument	All	Class 3
Metering Applications	Up to 200 amps 250 amps and above	Class 1  Class 0,5

Current transformers shall be used in all cases should the maximum current exceed 25 amps.

## 12. VOLTAGE TRANSFORMERS

### 12.1. General

Voltage transformers shall comply with SANS standards.

### 12.2. MV Voltage Transformers (Metal-Clad Switchgear)

The MV voltage transformers shall be able to withstand all circuit conditions, tests, fault ratings, etc. as applicable to the associated MV switchgear. Therefore all system and environmental conditions as specified will apply.

The primary side of the voltage transformer shall be protected by means of suitable rated H.R.C high voltage fuses unless otherwise approved.

The two outside phases of the secondary winding shall be protected by H.R.C fuses and the centre phase shall be connected to earth by means of a solid link.

The interlocking shall prevent the unit from being withdrawn in the service position without switching off the associated breaker. The shutters shall move into position automatically as the transformer is withdrawn.

The VA rating of the MV transformers shall depend on the burden of the load such as controls, control panels or any additional equipment as specified. The secondary voltage shall be 110V.

### **13. BATTERY SYSTEMS**

#### **13.1. General**

Batteries, chargers and DC Panels shall confirm to the requirements of this section and to other relevant sections covering, construction, finishes, small wiring, instruments, etc.

A partition is required between the charger and the battery.

#### **13.2. Construction of Cubicle**

The batteries and charger shall be housed in a suitably constructed cabinet manufactured out of non-corrosion materials suitable for floor mounting.

The batteries and charger shall be accessible from the front by means of hinged doors.

The cubicles shall be well ventilated and the section where the batteries are housed shall be damp and corrosive resistant.

#### **13.3. Cable terminations**

The cable access to the battery unit shall be from the bottom only. A removable gland plate mounted at the bottom of the side panel suitable for terminating at least four cables shall be provided. This vertically mounted gland plate can be positioned on either side of the cubicle depending on the substation layout.

A wiring channel or supporting bar for fixing of the cables shall be provided in an approved manner inside the battery compartment against the vertical side of the cubicle from the gland plate to the terminal block in the charger compartment. The openings for the wiring in the barrier plate between the compartments shall be fitted with suitable grommets or other approved means for sealing the opening after cable installation.

A separate housing for installation of the cables in the battery compartment is acceptable.

#### **13.4. Batteries**

##### **a) Battery Type**

Of the low discharge rate type shall be used unless otherwise specified. The containers of the batteries are to be made of high impact material and it shall be possible to check the electrolyte levels visually without opening the container.

The maximum and minimum levels of the electrolyte will be clearly indicated on the containers.

##### **b) Charge Rate**

The charge rate of the batteries shall be  $U/10$  for 16 hours where  $U$  is the rated capacity of the battery in ampere hours at 25°C.

##### **c) Discharge Rate**

The discharge rate of the batteries shall be determined in conjunction with the contractor since the standing connected load of the system shall be taken into account when determining the size of batteries. The batteries shall be suitable for maintaining 50% of the nominal voltage for 24 hours after the last charge operation assuming the batteries are fully charged when the interruption occurs. Taking into account the complete standing load plus one switching action of all connected equipment after 24 hours.



#### d) Copper Connections

The connections between rows of cells and from battery to battery shall be have lead covered copper rod or bars of adequate cross section.

### 13.5. Charger

#### a) Battery Charger

The charger shall be of the automatic constant voltage constant current type complete with all components such as rectifiers, transformers, switchgear, regulators, etc.

The charger shall be suitable for supplying the initial charge, floating charge and any other full rate and boosting charge that may be required. The charger shall have its maximum output current limited to a preset value automatically, and be capable of continuous delivering this value into a short circuit at the output. This capability shall be demonstrated and tested before leaving the factory. Float charge shall be automatic.

Boost charge shall be manual and automatic. The automatic boost charge shall come into operation when the battery is discharged to 90% of the rated voltage. The automatic boost function shall be maintained for four (4) hours after the voltage has increased to 120% of the rated voltage. A timer shall be used in conjunction with the voltage relay to facilitate above requirement. Furthermore an independent override time shall be installed to ensure that the automatic boost function is terminated after 12 hours irrespective of the battery voltage. The current under boost charge conditions shall be at least twice that of the maximum current demand of the load.

Both the above shall be under constant potential conditions, with the maximum current limited to a preset value automatically.

The charger shall be capable of delivering the output current under continuous full load conditions to supply the maximum charge. The voltage applied to the load shall at all times be within the specified lower and upper voltage limits regardless of the value of the charging voltage applied to the battery.

The charger shall operate satisfactorily from a 220V 50Hz single phase mains supply, the voltage of which may vary +/- 5%.

A suitable sized capacitor shall be provided to ensure that no overvoltages occur, which can cause damage to electronic protection relays, if the batteries are disconnected with the charger switched on.

#### b) Transformer

The charger shall be complete with a double wound transformer of suitable rating and rated for the specified auxiliary supply voltage. Off-circuit tapplings shall be provided on the primary windings and the change of tapplings shall be by means of links situated in an accessible position.

The transformers shall be capable of carrying the specified continuous output on all tapplings.

#### c) Rectifiers

Rectifiers shall be of the silicon-conductor type and naturally cooled.

#### d) Relays

The following relays shall form part of the charger unit:-

-Mains fail relay

This relay shall operate immediately the 220V supply falls away. The relay shall be connected after the incoming fuses in the charger. The relay shall operate via a delay-on timer to avoid an operation of the relay if the supply interruption is less than 5 seconds.

-Charge fail relay

This relay shall operate immediately if the charge current to the battery, either float or boost, is insufficient to maintain the batteries at the rated voltage. The relay shall be connected as close as possible to the battery.

-Battery fail relay

This relay shall operate immediately a faulty battery condition occurs. The relay shall operate via an automatic test facility monitoring the battery condition continuously ensuring that the battery is capable of providing the rated output under all circumstances.

The monitoring device shall measure the internal resistance of the batteries and connectors. The battery conditions shall be tested at regular intervals not exceeding 12 hours.

The device shall operate the alarm and shall be manually reset by means of a pushbutton mounted underneath the indication light.

The automatic testing of the battery condition shall not operate if a mains or charge fail condition does occur.

-Battery High

This relay shall operate if the charger voltage remains above the voltage relay normal float voltage remains above the normal float voltage. This relay shall operate via a timer delaying the operating of the alarm 15 hours after high voltage pickup to allow for the automatic boost function.

The relays shall be provided with 220V 5A 2 N/O and 2 N/C contacts wired to common terminals to operate the substation alarm.

e) Indication

The following indication lights shall be provided:-

- Earth fault
- Mains fail
- Charge fail
- Battery fail
- Battery high voltage

One ammeter indicating charging current and one voltmeter with test push button shall be provided.

f) Fuses

The battery charger shall be equipped with primary and secondary fuses. The fuses between the battery and charger shall be located as close as possible to the battery. Two sets of fuses for the outgoing circuits shall be provided.

### 13.6. Accessories

Each battery cell shall be provided with all necessary accessories for determining its state of charge on site, and shall include:-

- a) One – Cell bridging connector.
- b) One – Instruction card.
- c) One – Battery record book.

## **14. SUBSTATION BUILDING**

### **14.1. General**

The quality of workmanship for building work is detailed in the section 'Building Work' and shall be of the highest standard and to the satisfaction of the Engineer. For the construction of the substation buildings only new materials shall be used of the best quality available shall be used.

The buildings shall be constructed according to the drawings but shall be suitable for the offered equipment. If necessary the design shall be adapted by the contractor to suit his equipment and any such design changes shall be incorporated in the tender prices.

The building shall be water, vermin and fire proof

The foundation shall be suitable for the type of ground of the site. If deemed necessary the contractor shall obtain soil test to determine the exact conditions. Such costs shall be included in the tender price.

The contractor shall submit substation building drawings for approval prior to construction work.

### **14.2. Doors**

The doors are standard substation doors unless otherwise indicated on the drawings.

The doors shall be suitable for locking with padlocks (on a key system to be advised) provided with this contract. Doors are to seal as best possible to keep dust out and fire suppression gas in.

### **14.3. Windows**

Windows shall be installed according to the relevant schedules shown on the drawings. The windows shall open to the inside to facilitate cleaning. The windows shall be fitted with 4mm clear glass. Windows are to seal as best possible to keep dust out and fire suppression gas in.

The windows shall be completely protected against vandalism by means expanded metal screens permanently secured on the outside wall.

All window sills shall be waterproofed.

### **14.4. Roof**

The roof shall be installed according to the drawings. The roof shall be completely waterproof and this waterproofing shall carry a 10 year written guarantee. This guarantee, with all particulars, is to be mounted on the inside substation wall.

The contractor shall have the roof structure designed by the supplier or a structural engineer to ensure that the roof structure is of adequate strength.

The roof shall be fitted with galvanised gutters and rain water down pipes.

### **14.5. Floor**

The drawings show the proposed floor and duct layout. Tenderers must allow for the correct layout and floor strength to suit the offered equipment.

The floors shall be floated to a smooth finish and covered with the specified floor covering as indicated on the drawings.

The design shall allow for cable ducts in the floor suitable sized to accommodate all present and future cables. The cable ducts are to be build complete out of concrete with suitable edge kerbing to allow for chequer plate

covers.

#### 14.6. Painting

All surfaces shall be painted to the approval of the Engineer. All wood structures shall be painted with 'pink' wood primer. Exposed wood shall be finished according to the surrounding surfaces.

All steel surfaces shall be painted with a high gloss enamel paint after preparation to SANS standards.

Plastered walls and ceiling boards shall be prepared with a suitable plaster primer. The ceilings shall be painted with white PVA and the final paint for the walls is washable PVA of a colour to be specified.

#### 14.7. Accessories

The substation building shall be equipped in suitable positions with the following:

- a) two 9 kg CO2 hand held fire extinguishers at each side of every door.
- b) notices with instructions for artificial respiration
- c) danger and unauthorised entry notices on the outside of every door
- d) all required notices in terms of local supply authority requirements and the Occupational Health and Safety Act
- e) one fully equipped first aid kit
- f) one writing top, 1500 x 800 mm, with drawer for substation records
- g) Pin-up boards

All signs and notices shall be in English, Afrikaans and the applicable local language. All signs and notices to be of pressed steel or aluminium. Plastic signs are not acceptable.

### 15. ELECTRICAL INSTALLATION IN SUBSTATION BUILDING

#### 15.1. General

All installation work shall be in accordance with the latest version of The Wiring of Premises: Low-Voltage Installations, SANS 10142 Part 1 as amended.

The Contractor shall allow for and pay all of the required fees in respect of the installation to the local authorities.

#### 15.2. Material

The material and equipment to be used for the electrical installation is not specifically mentioned in this document but all material shall be suitable for its purpose, new and carry the SABS mark of approval.

#### 15.3. Building Work

Chasing shall only be done in exceptional cases where it is not possible to build conduits, boxes, etc. into the walls. The standard procedure is that the Contractor shall place all conduits, boxes, etc. in the correct position so that the builder can build or cast this into the building structure. If chasing is necessary it shall be done with the utmost care ensuring no unnecessary damage is done to surrounding brickwork. It shall be noted that chasing in face bricks, finished surfaces or structural concrete is only acceptable after approval from the Engineer.

#### 15.4. Conduit and Conduit Accessories

Conduits shall bear the SABS mark.

All conduit shall be heavy gauge, welded or solid drawn, hot-dip galvanised or black enamelled, screwed tube Galvanised conduit and accessories shall be hot-dipped inside and outside in accordance with SANS 121.

All conduit ends shall be reamed and threaded on both sides and delivered with a coupling at one end and a plastic cap on the other end.

All metal conduit accessories shall be malleable cast iron or pressed steel with brass bushes. Alloy or pressure cast metal accessories or zinc base alloy fittings are not acceptable. All fittings whether galvanised or black enamelled, shall be fitted with brass screws.

The boxes shall be of the long spout pattern, manufactured of malleable cast iron or pressed steel and stove enamelled jet black or galvanised as required. The two cover fixing holes shall be diametrically opposite each other, drilled and tapped at 50 mm centres.

Junction, draw-in and inspection boxes shall be of adequate size and shall be supplied with heavy gauge metal cover plates.

All switch boxes and socket-outlet boxes shall be manufactured of pressed galvanised steel of at least 1 mm thickness. All boxes shall be fitted with the necessary lugs to suit standard flush mounted switches and socket-outlets manufactured in accordance with applicable SANS standards.

Only galvanised or metal wall boxes will be acceptable. Even if the tenderer offered to use non metallic conduit and accessories. Light switch boxes shall be 100 x 50 x 50 mm with two 20 mm knock-outs on the sides and a single knock-out on the top, bottom and back.

Socket-outlet boxes shall be 100 x 100 x 50 mm with two 20 mm knock-outs each on the top, bottom, sides and back.

Where cavity walls are encountered Tenderers must allow to install deep back to back open ended or one end closed wall boxes. Switch and socket-outlet cover plates shall comply with SABS 1084.

Flexible steel conduit and adaptors shall comply with BS 731, Part 1 where applicable. Flexible conduit shall be of galvanised steel construction and plastic sheathed (copex or equal). Flexible conduit shall only be used as specified and shall then be installed in accordance with par. 5.4.4 of SABS 0152.

As an alternative to the threaded conduit, plain-end (unthreaded) metallic conduit with accessories may be used. Unthreaded conduit shall be manufactured of mild steel with a minimum thickness of 0,9 mm and shall comply with SANS. Bending and setting of conduit shall be done with the correct apparatus recommended by the manufacturer of the conduit.

The Contractor or Supplier shall be responsible for obtaining the approval of local authorities for the use of this system.

All conduit and accessories used in areas within 50 km of the coast shall be hot-dip galvanised.

Non-metallic conduit shall comply fully with SANS standards.

Earth clamps shall consist of copper strips at least 1,2 mm thick and not less than 12 mm wide secured with a brass bolt, nut and washer and shall be so constructed that the clamp will fit firmly to the conduit without any additional packing.

Conduit runs in roof space to be square and perpendicular with trusses.

#### 15.5. Light Switches

Light switches of one manufacturer only, will be accepted per project.

All switches shall be suitable for mounting in 100 x 50 x 50 mm boxes, shall carry SABS mark. Switches shall be of tumbler operated micro gap type rated at 16A, 220/250V. Switches shall have protected terminals for safe wiring. Contacts shall be of silver material. On multi-lever switches, it shall be possible to individually change any of its switches. The yoke strap shall be slotted to allow for easy alignment.

The covers of surface mounted switches shall have toggle protectors.

Cover plates shall be finished in ivory coloured baked enamel, anodised bronze or aluminium unless otherwise specified. Cover plates shall overlap the outlet to cover wall imperfections.

#### 15.6. Unswitched and Switched Socket-Outlets

Switch sockets of one manufacturer only, will be accepted per project. All switched socket-outlets shall be suitable for mounting in 100 x 100 x 50 mm or 100 x 50 x 50 mm boxes shall carry the SABS mark.

Switches shall be of the tumbler operated microgap type rated at 16A, 220/250 V. Terminals shall be enclosed for safe wiring. Contacts shall be of silver material. Safety shutters shall be provided on live and neutral openings. The yoke strap shall be slotted to allow for easy alignment. The covers of surface mounted switched sockets shall have toggle protectors.

#### 15.7. Luminaires

Luminaires, associated equipment and control gear shall be new and unused and shall be supplied complete with lamps, control gear, diffusers, mounting brackets, etc. as applicable, and shall be delivered to site in a protective covering.

Tenders shall be accompanied by full descriptive information of the luminaires offered.

All luminaires shall carry the SABS mark.

The luminaire body shall be designed to accommodate the control gear, wiring, lamp holders and, where applicable, the diffuser. It shall be possible to reach the control gear without disconnecting wiring or removing the luminaire. Except for mounting holes and/or slots and the required openings in air-return luminaires, the back of the body channel shall be closed over the full length of the luminaire. Suitable knockouts shall be provided in the rear of the luminaire body for wire entry.

All components, including screws, bolts and nuts utilised in the construction of the luminaire or fixing of its components, shall be corrosion proof.

Luminaires shall be completely wired internally. Conductors shall be protected with grommets where they pass through holes in the body. The wiring shall be totally metal enclosed to prevent any possible contact with live components while changing lamps. The wiring shall terminate on a suitable terminal block. There shall be no joints in the internal wiring.

An earth terminal, welded to the luminaire body, shall be provided. To ensure good earth continuity the earth terminal shall not be spray painted. The earth conductor shall be connected to this terminal by means of a crimped lug.

Lamp holders shall preferably be of the telescopic spring-loaded type. Where twist lock type lamp holders are provided the mounting of the holders shall be able to accommodate the tolerances experienced in the length of lamps and in the manufacture of luminaries.

Only electronic control gear shall be accepted.

Only LED lamps / modules will be accepted. Lamps shall comply with applicable SANS standards. If no colour is specified the light colour shall correspond to cool white or daylight (4000 K and more). Lamps of the same colour shall be provided for an entire installation unless specified to the contrary. There shall be no visible flicker in the lamps and lamps shall readily strike when switched on.

#### 15.8. Wiring

All wiring shall be installed in conduits and shall not commence until all conduit work is completed.

Circuit	300/500 V PVC insulated conductors	Earth conductor
Light (L)	2 x 1,5 mm <sup>2</sup>	2,5 mm <sup>2</sup>
Plug (P)	2 x 2,5 mm <sup>2</sup>	2,5 mm <sup>2</sup>

Where required or specified 600/1000 V PVC/PVC/SWA/PVC cables with the size cores as specified above shall be used.

#### 15.9. Earthing

The electrical installation shall be effectively and completely earthed ensuring that the earth resistance at any given point does not exceeds the prescribed values. The complete installation shall be connected with an earth wire to the main switchboard.

All sub-switchboards, wiring boxes or control panels shall be earthed and connected to the main switchboard with a bare stranded copper earth conductor. All metal clad luminaires shall be earthed with a 2,5mm<sup>2</sup> bare copper earth conductor.

Steel (roof) constructions and metal roofs shall be properly earthed in at least four positions and all metal gutters and down pipes shall be earthed with copper tape. The contractor shall take care that all steel and metal work is bonded together.

### 16. CABLES

#### 16.1. 22 kV Cables

22 kV cables of impregnated paper insulated type shall be manufactured according to SANS 97 table 20 as amended and shall carry the SABS mark. All cables shall have stranded copper conductors, unless otherwise specified, and shall be suitable for the application.

#### 16.2. 22 kV Cable Joints and Terminations

The design of cable joints, indoor and outdoor terminations, as well as all material used for the jointing or terminating shall be approved by the Engineer prior to jointing or terminating of a cable. This is also applicable to the instructions issued to the cable jointer.

Before 22 kV cables are made off a crackle test on a sample paper at the cable end shall be applied to determine if any moisture is present. If this is the case the cable shall be cut back until no moisture is found. In addition a 5000 V megger test shall be carried out to assure continuity of the cores and earth resistance.

All cable jointing shall be done in a first class workmanship with particular attention being paid to cleanliness, insulation and undue bending of the cores. No cable end shall be made off ready for jointing and left open for any length of time. Only Raychem joints will be allowed.

The jointing of the cores shall be done by means of 100mm solid core ferrules. Before these ferrules are covered up care shall be taken that they are free of sharp edges. The armour and lead sleeve of each cable end shall be bonded together by means of plumbing on a flexible cable of adequate size to maintain the original cable size at the joint.

The cable trench shall be widened at the point of joint and at least 1,5 m of spare cable at either side of the joint shall be provided.

All cable terminations shall be done in a first class workmanship with particular attention being paid to cleanliness, insulation and undue bending of the cores. No cable end shall be off ready for termination and left

open for any length of time. Only Raychem screened connector termination kits shall be allowed. The contractor shall ascertain beforehand if the equipment supplier has any specific requirements for the type of terminations that connect to the equipment.

The termination of the cores onto bushings or busbars shall be done by means of lugs of adequate size ensuring sufficient contact surface thus avoiding heat generation during normal and fault conditions. The terminations shall be completely covered to avoid surface tracking, ultra violet radiation and weathering.

The cable termination shall be supported by means of a suitable wooden block given sufficient support in such a way that there is no mechanical tension due to cable weight at the bushings or busbars. The woodblock shall be installed around the original cable thus ensuring that the cable termination material is free from the woodblock. Pre-made plastic clamps for this purpose may also be used.

Mechanical torque shear lugs and ferules are preferred.

It is required that cores shall not cross each other when terminating in equipment.

It is a requirement that the person performing MV joints and terminations must have passed the training provided by the joint and termination supplier. Attendance register/certificate is not acceptable.

#### 16.3. Low Voltage Cables

All low voltage cables shall be manufactured in accordance with SANS 1607 and shall carry the SABS mark. The cables shall be for general purpose and shall be 600/1000 V grade with coloured PVC insulated cores, black PVC inner sheath, galvanised Steel Wire Armour and black PVC outer sheath. The conductors shall be of high conductivity annealed stranded copper and the cores may be shaped or circular.

#### 16.4. Low Voltage Cable Joints

The ends of low voltage cables shall be made of in the conventional way with an earth bond between the armour and the cores jointed by means of crimped ferrules. The electrical continuity of all the conductors, screens and armour shall not be impaired by the joints and the earth continuity shall be carried out inside the joint.

**No** joints shall be allowed in low voltage cables, except where existing service connections to be extended to new LV Lines. Scotch cast or equal to be used and approved by the Engineer and appropriate Crimpers to be used when doing joints/terminations.

Joints in streetlight poles shall only use non-spark Pratley joints.

#### 16.5. Low Voltage Cable Terminations

Terminating low voltage cables shall be by means of cable glands and suitable gland plates only. The termination of the cores onto bushings or busbars shall be done by means of crimping lugs of adequate size ensuring sufficient contact surface thus avoiding heat generation during normal and fault conditions.

##### a) Terminations (In Kiosk or Floor standing LV Transformer Distribution Boards)

Cables shall be terminated by means of K clamps / suitably sized cable glands while all strands of the armouring shall grouped in 2 separate twisted stings and terminated on the earth bar using a suitable lug.

All cable terminations shall be done with heat shrink boots, with armouring bended backwards and exiting the heat shrink downwards. Photos of the accepted end-product is available on request.

Only one termination per bolt will be allowed except in distribution stubby's on the earth bar, where the armouring and earth conductor may be terminated on one bolt, on opposite sides of the earth bar.



All LV cables shall be labelled with plastic nursery type label. Labels shall be the same label as the feeder circuit breaker label, indicating the first stubby number / stand number / street light that it feeds to and the size on the other side. The cost of this labelling shall be included in the price for the termination.

Where appropriate/necessary low voltage cables shall be terminated with Pratley or similar cable glands of a make approved by the Engineer. The gland shall be covered with an appropriate sized neoprene or PVC shroud.

**b) Terminations (In LV Pole Mount Transformer Distribution Boards)**

Cables shall be terminated by means of suitably sized Pratley or similar cable glands approved by the Engineer while all strands of the armouring shall grouped in 2 separate twisted stings and terminated on the earth bar using a suitable lug.

Only one termination per bolt will be allowed except in distribution stubby's on the earth bar, where the armouring and earth conductor may be terminated on one bolt, on opposite sides of the earth bar.

All LV cables shall be labelled with plastic nursery type label. Labels shall be the same label as the feeder circuit breaker label, indicating the street name of the ABC feeder (& direction if required) / stand number / street light that it feeds to and the size on the other side. The cost of this labelling shall be included in the price for the termination.

**c) Kicker Pipes (For raised pole mount transformer Distribution Boards)**

All cables shall exit the Box at the bottom and run in appropriately sized pre galvanised Heavy Duty kicker pipes into the ground up to a minimum depth of 300mm below finish ground level. Ensure that exit point from kicker pipe is free from sharp edges to avoid damage to cable. Contractor shall allow for additional galvanized cross arms to support the kicker pipes as necessary to ensure a solid construction.

**16.6. Testing of Cables**

All required test instruments and electricity to carry out these tests shall be provided by the contractor and these costs shall be included in the tender price. All testing equipment shall be calibrated and calibration certificate must still valid on date of testing.

**Voltage Test for Cable before Laying, Jointing and Termination:**

- |                        |        |
|------------------------|--------|
| a) high voltage cables | 5000 V |
| b) low voltage cables  | 500 V  |

**Voltage Test for Cable after Laying, Jointing and Termination**

After cables have been laid, jointed and terminated, they must be subjected to the appropriate test voltages. The test voltage must be applied between conductors and between each conductor and the metal sheath, which should be held at earth potential. In each case the voltage should be increased steadily from zero to the stipulated value and maintained at this level for 15 minutes.

Impregnated Paper Cables Newly Installed Table A-1 – In Situ Test Voltages (Refer SANS 97, p. 42)						
1	2	3	4	5	6	7
	Test Voltages kV					
Voltage Rating of Cable	Belted Cables				Single-Core and Screened Cable	
	Between Conductors kV		From Conductor to Sheath		Between Conductor and Sheath or Screen	
	AC	DC	AC	DC	AC	DC
3.3/3.3	7	9	7	9	-	-
3.8/6.6	13	19	8	11	8	11
6.6/6.6	13	19	13	19	-	-
6.35/11	22	31	13	19	13	19
11/11	22	31	22	31	-	-
12.7/22	-	-	-	-	25	36
19/33	-	-	-	-	38	54

Or previously installed and older cables, the following test voltage is recommended (Eskom Standard).

Impregnated Paper Cables On-Site Tests for Installed Cables (Fault Detection & After Repairs)						
1	2	3	4	5	6	7
	Test Voltages kV					
Voltage Rating of Cable	Belted Cables				Single-Core and Screened Cable	
	Between Conductors kV		From Conductor to Sheath		Between Conductor and Sheath or Screen	
	AC	DC	AC	DC	AC	DC
3.3/3.3	5	7	5	7	-	-
3.8/6.6	10	14	6	8	6	8
6.6/6.6	10	14	10	14	-	-
6.35/11	16	23	10	14	10	14
11/11	16	23	16	23	-	-
12.7/22	-	-	-	-	19	27
19/33	-	-	-	-	28	40

low voltage cables                      2 000 V megger test between conductors and between conductors and armouring

Cables that breakdown during testing shall be replaced and the cable ends redone. This is entirely to the contractor's account.

#### 16.7. Cable Accessories

Cables shall be supplied to the site on uniquely numbered new cable drums. The drums shall be of sufficient strength to protect the cable against mechanical damage during transport and installation i.e. uncoiling of the drum. The cable particulars shall be clearly indicated on the drum. Both cable ends shall be sealed to avoid the ingress of moisture.

The installed cable shall be tagged by means of cable identification markers. These markers shall be fixed to the cable in an approved manner and the markers shall be manufacturer of a non-deteriorating material of at least 100 x 40 mm with 6 mm high lettering.

A yellow warning tape shall be installed above the cable over the full length of the cable route. This warning tape shall be indelibly marked at maximum 3 m intervals with at least 35 mm black lettering reading: DANGER ELECTRICAL CABLE BURIED BELOW.

Where specified the cable route shall be marked with reinforced concrete markers of smooth finish and of the following dimensions:

- |                   |              |
|-------------------|--------------|
| a) height         | 500 mm       |
| b) top surface    | 200 x 200 mm |
| c) bottom surface | 300 x 300 mm |

An aluminium plate of 100 x 100mm shall be cast into the top surface of the marker. This plate shall be clearly marked, punched characters, with the cable and cable route particulars, to the approval of the Engineer, after installation of the cable. Upon completion of the marking the plate shall be painted red.

If specified the cables shall be mechanically protected by means of reinforced concrete slabs installed in the trench above the cable but below the yellow warning tape. The smooth finished interlocking slabs shall be 600 mm long, 300 mm wide and 40 mm thick. Prefab wall sections are not allowed.

The cables shall be installed in 160mm Ø PVC cable sleeves at roads crossings and other specified locations. The joints of the cable sleeves shall be smooth and adequately sealed and all sleeves shall be free of sand, stone or any other objects. 2.5mm galvanised draw wires, protruding 2 m at either end of the cable sleeve, shall be installed in every sleeve. Spare sleeves as well as sleeves with cables installed shall be plugged and sealed to avoid that water and soil will enter.

#### 16.8. Installation of Cables

3m of extra MV cable shall be installed in the trench at a joint and at each termination preferably in the "snake" formation. The extra cable shall be installed in such a way that no other cables cross over it.

The LT cables shall be installed in the foundations of the miniature substations and kiosks in such a way that 1 m of extra cable is available in the event of a fault at the termination. This shall also be done for high mast lights. Refer to termination photos for indication of terminations at street lights.

Cables shall be installed such that no twisting, kinking, unnecessary crossing or damaged cables occur.

Care shall be taken that cables pulled through sleeves or pipes are not stretched, twisted, kinked or nicked. No joints shall be located in a sleeve. Sleeves used shall be appropriately sealed after the cable has been installed.

Where cables are not terminated or jointed, the open ends shall be protected with heat shrinkable end caps to prevent moisture ingress.

No cable shall have its bending radius exceeded as recommended by the manufacturer.

Tenderers must base their tender price on the preliminary lengths specified in the Bills of Quantities. After works commencement the exact lengths shall be determined on site and be given to Engineer, highlighting any differences from the Bill of Quantities, before cables are ordered. Cables shall be ordered to correct lengths; no joints shall be excepted unless it exceeds the standard drum length of that particular cable on a single run. Adjustments to the contract price shall then be calculated using tariffs in the Bill of Quantities.

It shall be the responsibility of the Electrical Contractor to establish the correct lengths of cable on site, before placing an order. The Contractor shall not be reimbursed for any surplus cable.

All low voltage cables must be tested on site. All test results must be submitted to the engineer. On each completed section of the laid cable, the insulation resistance shall be tested to approval with an approved "Megger" type instrument of not less than 500V for low voltage cables. The Engineer or his representative shall inspect the cable trench at indicated Hold Points as shown on the trench detail drawings. Failure to keep to this arrangement, shall result in the contractor opening up the entire trench on his expense. The contractor shall notify the Engineer timeously of upcoming inspections.

No cable or conductor shall be installed within the boundaries of an erf or property.

The tenderer's special attention is drawn to the risk of theft. The contractor shall take all necessary precautions to avoid theft of any material and if theft does take place, the contractor shall replace the stolen goods at his own cost. Any theft of material will not be accepted as motivation for delays. If during the execution of the contract, existing cables are unearthed, the responsibility will be on the contractor to protect such cables against theft.

Danger tape of 150mm wide shall be installed 200-250mm below final ground level for each run of cable

All cables shall be installed as indicated on the construction drawings or as approved by the Engineer.

The 22kV cables shall be laid in trenches of 1 m deep and sufficient width to allow 100 mm of space between the cable and the side of the trench. The spacing between cables varies from 150 mm to 300 mm depending on the installation details. The cables are laid at a depth of 1000 mm with 150 mm soft backfilling (red soil) underneath and soft backfilling (red soil) on top of the cable. The cable trenches are detailed on the drawings.

The cables shall be laid by means of proper hoist, rollers, drum lifters, trestles, etc. together with sufficient man power. The engineer reserves the right to scrap cables that are not installed in the proper way and such cables shall be replaced at the contractor's expense.

The back filling of the trench shall be done in steps of 150mm with proper consolidation per step. No back filling can be done before the cables have been inspected and the trenches approved by the Engineer.

The cable identification markers, indication voltage, cable size and termination points shall be tagged to the cable at 20 m intervals. Where more than one cable is installed in the same trench the identification markers shall be staggered.

If specified the concrete slabs shall be installed midway in the soft backfilling i.e. at 650 mm depth.

The contractor shall submit, upon completion of the cable installation work, final route plans. These as installed plans shall indicate:

- a) route length for each cable as well as distances between joints
- b) cable route positions with reference to fixed points
- c) cable joint positions with reference to fixed points
- d) cable drum number for each cable length
- e) positions of cable route markers with reference to fixed positions

The contractor shall note that no completion certificate will be issued without the submission of the approved as installed plans.

Where required, cables shall be neatly strapped together when rising against poles with HD stainless steel strapping of not less than 12mm in width at intervals of 500mm apart evenly spaced starting from 200mm below connection.

#### 16.9. Transportation & Storage

All cables shall be transported and stored in accordance with the specifications of SANS 10198.

## **17. INSTALLATION WORK**

### **17.1. General**

The workmanship and final finish for this contract shall be of the highest standard and to the satisfaction of the Engineer.

### **17.2. Site Preparation**

The sites for substations shall be levelled where necessary and allowance shall be made for natural drainage. Tenderers shall therefore allow for all foundations for structures and buildings to be on one level.

The site shall be cleared of bush and vegetation and all rubble shall be removed. All holes shall be filled and consolidated and the area properly treated with an approved weed killer before the gravel layer is spread.

The contractor shall allow for adequate drainage so that the cable trenches or any area inside or adjacent to the substation yard cannot be flooded and that water will not enter the yard from outside.

The tender price shall allow for all site conditions which may affect the preparation of the site, foundations, buildings, structures, etc. No extra claims will be entertained in this respect.

The contractor shall seal the cable duct at the point of entry at the building after installation of all the cables with a watertight weak cement mix to avoid that rain water will seep inside the building.

### **17.3. Installation of Switch and Control Boards**

Floor mounted boards shall each be bolted down firmly by means of adequately sized foundation bolts in the channels provided with the relevant sides plumb and level to the walls.

Wall mounted boards shall each be installed with the lower horizontal side 1350 mm above floor level provided the upper horizontal side is not higher than 2000 mm.

After installation any damaged to paint finish shall be made good to the approval of the Engineer.

### **17.4. Earthing**

All equipment shall be earthed as specified and indicated on the drawings.

The perimeter fence shall be earthed and the earthing system connected to the main earth bars inside the substation building.

### **17.5. Labelling, Signs and Notices**

All labels for equipment, switchgear, relays, circuits, control panels, etc. shall be provided by the contractor to the approval of the Engineer.

All substation signs and notices shall be installed, including all signs and notices on gates and fences.

### **17.6. Insulation Medium**

All insulation mediums, being air, oil, vacuum or gas shall be checked for proper clearance distances and/or sufficient pressure. Where clearance distances were disturbed during erection the incorrect (part of) equipment shall be positioned in the original position. Oil shall be topped up where necessary. If vacuum or gas filled equipment is found lacking this equipment shall be replaced with new equipment. No repair work to faulty equipment is acceptable.

#### 17.7. Setting of Relays

The contractor shall allow for the correct settings of all protection relays ensuring a properly working substation to the approval of the Engineer. The settings shall be documented together with instructions on how to alter these settings. Meters and other registering instruments shall be calibrated where necessary and the multiplying factors documented.

The contractor shall allow for a specialist in the field to do the coordination and programming of the relays.

### 18. CIVIL CONSTRUCTION WORK

#### 18.1. Site Preparation

The site preparation shall be done in accordance with the specification and drawings. However the contours as indicated are given as a guidance only and the Contractor shall ascertain the correct levels.

The areas around the substation shall be adequately graded to prevent flooding of the substation site.

A weed killer shall be applied to the substation sites. A certificate issued by the applicator shall be provided to the Engineer.

The site area and line connections to the substations shall be cleaned of all bushes and trees and fenced as indicated on the drawing. Turf and vegetable matter shall be removed to a minimum depth of 230mm and replaced with good soil if necessary to obtain the level of the substation.

No buildings shall be erected on loose fill unless it is compacted to the required standard.

#### 18.2. Slopes and Kerbing

The entire yard shall be provided with a 1:200 slope to provide natural drainage into the drains and the gravel layer shall be applied at an even thickness to indicate the general direction of the slope. The colour of the stone shall be consistent throughout the yard. Drawings shall be submitted by the Contractor to show the proposed slopes, etc.

Kerbing shall be provided around the yard, along the fence so to provide proper segregation between the different areas and ground material. The kerbing shall be at least 50mm above the height of the stone.

The stone shall be spread to a depth of 100mm and rolled with a hand roller.

All kerbing and channelling shall be constructed according to SABS 1200 MK.

#### 18.3. Drainage and Storm Water Protection

Seepage drains shall be provided inside the substation area to provide natural drainage of rain water from the yard and the transformer pits etc. into the lower discharge areas. Soak pits shall be provided where necessary and where natural drainage into existing storm water systems is not possible.

Storm water drainage system shall be provided outside the fenced area to prevent flooding of the yard by water from outside. The ground shall be terraced such that grass can be established on the slopes and around the substation.

#### 18.4. Fences and Gates

The external fence and gates shall be according to the detail drawings. The fence and the gates shall fit neatly so that small animals, including cats, will be prevented from entering the yard. The kerbing shall be brought into the gates and mountable kerbs shall be provided underneath the gates to avoid spillage of gravel. Double gates shall have a galvanised chain welded on to allow for padlocking.

### 18.5. Buildings

The Contractor will be responsible for the erection of the Substation building.

The drawings and specification are meant as a guide for tender purposes only. The final design of the buildings will depend on the type of equipment offered, but the design included in this document shall be the basis for the final design.

The onus is on the Contractor to prove that structural steel, concrete, slabs, foundations, etc. are of sufficient strength for the anticipated loadings.

Any particular building requirement for the type of equipment offered, i.e. floor channels, etc. shall be included in the prices. No claims for extras to the contract amount will be entertained in this respect.

## 19. MINIATURE SUBSTATION

All miniature substations shall be type B miniature substations and only transformer manufacturers which carry the SABS mark shall be acceptable. (No Free State Transformers transformers will be acceptable). The contractor shall include specifications as listed in Addendums. It shall be constructed from 3CR12 or mild steel.

Miniature substation colour shall be ESKOM GREY. Transformer compartment (tank) to match the rest of mini-sub exactly.

Photocell to be protected by an expanded metal mesh box.

No hinges should be visible from the outside when doors are closed. Doors should align horizontally and should be fitted with hinges appropriate for the weight of the door.

The miniature substation shall be equipped with the following compartments:

Compartment	Typical Equipment	Doors	Lock
Medium Voltage	Ring Main Unit	2	Padlock
Metering	All electronic/bulk meters	1	Padlock
Low Voltage	Feeder breakers/fuses, ammeters, voltage meters, etc.	2	Padlock
Low Voltage End Compartment	Main low voltage breaker.	1	Padlock

All compartments to have 3 point locking mechanism with the locks specified above. Provide anti-tamper boxes over door padlocks - Open at the bottom with inspection holes drilled in the top (no welded mesh).

Internal door seals to make use of glue, not tape adhesive that can withstand high temperatures. The contractor will be responsible for acceptable corrective measures should the seals detach, disintegrate, etc. within the 12 months retention period.

All outdoor labels to be engraved aluminium with black lettering. Treat aluminium properly so that black paint do not peel off. Outside labels should appear uniform and align horizontally. Outside labels to be attached with blind pop-rivets (Eskom specification). Engraved or Silk Screen printed signs (UV resistant to limit fading) on metal sheets only – No stickers.

Provide the following engraved aluminium labels on the different compartment doors.

Compartment	Label
Medium Voltage	MV – 22 000 V
Metering	METERING
Low Voltage	LV – 420/242 V
Low Voltage End Compartment	LV – 420/242 V

External Metallic corrosion-resistant warning signs (WW7 with "No Unauthorized entry allowed") attached to first opening door of each compartment. Template to be provided for approval by Engineer.

Branding from minisub manufacturer to be limited to ONE label on a compartment door.

All signage to be in English only, with allowance for other recognised languages where required such as warning signs.

One safety sign shall be fitted on the inside of the first door that opens on the MV and LV compartments. It should be noted that all internal signs shall either be installed completely against a door panel or on a backing frame. This sign should contain the following information:

- a) In the case of fire
- b) Treatment of electric shock
- c) Cardiopulmonary Resuscitation (CPR) instructions
- d) "Unauthorized persons are prohibited from handling or interfering with electrical apparatus"
- e) "Unauthorized entrance prohibited"

A sample of abovementioned signage to be provided for approval by engineer in electronic format.

Provide one Elster A1700 kVA / kWh meter to measure total consumption of the entire miniature substation and one kWh meter on area lighting circuit and/or pump station feeders to measure municipal consumption. The meters should be positioned so that the LCD display and any buttons are clearly visible when standing in front of the compartment. Wiring to meters should not be visible and taken behind the faceplate (to which the meter is attached) via holes covered by the meter itself. All meters installed in the miniature substation shall be seals with approved municipal seals and the meter number and seal number recorded. Photos clearly showing both the meter number and the seal number shall be included in the handover document and provided in electronic format to the Engineer.

The factory needs to confirm the meter wiring and programming with Elster for the configuration of the CTs and VT used.

Programming of the Meters:

**Minisub Bulk Meter:** This meter should by default display the accrued kWh quantity for the entire minisub (no pressing of any buttons should be required and no resetting of the value allowed). When pressing the selector switch, the following needs to be displayed: Maximum demand in kVA, Maximum ampere demand per phase with time and date and Instantaneous ampere and voltage measurements per phase. The meter should also store historic data with regards to kVA, kWh and allow for historic data to be retrievable using the optical connector.

**Large User Meters:** These meters should by default display the accrued kWh quantity for the specific user (no pressing of any buttons should be required and no resetting of this value allowed). When pressing the selector switch, the following needs to be displayed: Maximum demand in kVA, Maximum ampere demand per phase with time and date and Instantaneous ampere and voltage measurements per phase.

**Pumpstations Meters:** These meters should by default display the accrued kWh quantity for the pump supplied (no pressing of any buttons should be required and no resetting of this value allowed). Instantaneous ampere and voltage measurements per phase to be accessed through pressing selector switch.

**Streetlight Meter:** This meter should by default display the accrued kWh quantity for the streetlights (no pressing of any buttons should be required and no resetting of this value allowed).

Meters that require separate power sources, shall be wired with 4mm<sup>2</sup> wiring and protected by 5 A fuses.



The contractor is to provide the Engineer with the meter manufacturer's programming sheet showing options to be loaded for approval. The contractor shall also provide the test/calibration certificate of the meter including the commissioning printout.

Faceplates shall be free of unnecessary holes.

Contactors installed shall be sealed in a casing to prevent the ingress of dust. Wiring holes shall be sealed accordingly.

Surge arrestor housing/base to be mounted behind faceplate, complete with wiring, and protrude neatly through cut-out that does not allow for any gaps. The removal of this faceplate should not be obstructed by other equipment mounted on it. Surge arrestors (modules) should be replaceable without removing the face plate. If this proves problematic, contact the Engineer for approval of alternative.

A chassis plate with cut-outs to match the LV breakers' protrusions exactly to be fitted over LV breakers. No more than 1mm space between the breaker's protrusion and the chassis plate will be allowed. If a cut-out is required for a future breaker installation, this shall be blanked off. The blank plate shall have its corners rounded, edges chamfered and it will be finished with the same method as the chassis plate. Six breakers to be provided for, populated with specified breakers and spare spaces to cater for CBI F25D size breakers. Final cut out provision sizes to be confirmed on approval drawings.

The polycarbonate barrier in the LV end compartment shall be at least 5mm thick. This thickness shall govern for any polycarbonate used.

The Voltage indicator should have an integral voltage selector switch. The selector switch should have a durable knob (securely fastened to prevent possible detachment) and be able to indicate clearly all line-to-line and line-to-neutral voltages for all three phases. An off position should also be present.

A logbook holder and a separate spare fuse holder shall be attached to the second door that opens on the MV compartment. An A4 laminated sheet holder with Perspex cover and 3 brass fixing screws attached to the spare fuse holder. An A4 laminated sheet holder with Perspex cover and 3 brass fixing screws attached to the second door that opens on the LV and MV compartments. More information about construction available on request.

The MV earth busbars (beneath RMU) shall be predrilled with 7 holes (dedicated for incoming cables and not to be used for transformer connections) and appropriate bolts and nuts installed. The LV busbars, including the earth busbar, shall be predrilled with enough holes for 6 breakers. These holes should have their nuts and bolts installed.

Only one termination per bolt will be allowed.

Appropriate mechanical support to be provided for the transformer feeder cables from the RMU T-off.

P1000 unistrut to be provided for K-clamp termination in LV compartment.

Internal wiring for live phases to be colour coded – RED, YELLOW and BLUE. Neutral shall be BLACK and earth GREEN & YELLOW. Heat shrink caps with colour coding shall not be used for colour coding.

Internal labels to be black lettering on white labels. Font type and font size to be identical throughout entire SL/Metering, LV and LV end compartment. The size of the labels shall be consistent unless the available space prohibits it. NO wiring shall pass in front of a label. This rule shall not be enforced at the street light terminal compartment.

LV circuit breaker labels to be installed in aluminium label holders. The holders are to be attached with pop-rivets. No joints are allowed in the label holders. Other labels not housed in a label holder shall be fixed with brass screw. No traces or residue of glue to be present on faceplate.

All labels – MS name, HT circuits, equipment functions, circuit designation, etc. shall be included. Minisub foundations to be built according to drawings provided. Earth mat shall be provided according to relevant Addendum.

An earth fault indication unit with battery backup (6h minimum) and external LED indication to be mounted in MV compartment. An internal indication LED and reset function should also be present. It should be protected by a 2 A fuse and wired with 1,5 mm<sup>2</sup> wire. Unit to automatically reset upon return of power to the miniature substation.

1 x 3 point (15 A) Waterproof plug point protected by a 20 A fuse (to limit high fault current) and double pole circuit (1+N) breaker with earth leakage protection. Wiring to be 2,5 mm<sup>2</sup>.

1 x Die cast bulk head IP42 luminaire c/w 15W energy efficient lamp (Osram or Philips only) with waterproof switch (crabtree) protected by a 1 A fuse (to limit high fault current) and wired with 2,5 mm<sup>2</sup> wire.

All the test reports that come from the manufacturers (RMU, transformer, minisub builder, metering equipment, etc.) to be forwarded to the Engineer.

#### MEDIUM VOLTAGE COMPARTMENT

This cubicle will be fitted with a Schneider RM6 RMU (RM6 NE-IDI) SF6 GIS Unit with VIP 45 relay and 200A circuit breaker T-off. Standard Schneider key interlocking facility on earthing of both isolators. Ensure enough space in compartment when interlocking.

A system with separate luminous modules of VPIS (Voltage Presence Indicating System) complying with IEC 62271-206 standard.

Operating handle to be included with bracket.

Rated Voltage		kV	24
Short-Time Withstand Current		kA RMS	25
		Duration (s)	1
Rated Current Busbars		A	630
<b>NETWORK SWITCH (I FUNCTION)</b>			
Number of Units			2
Rated Current		A	630
Breaking Capacity	Active Load	A	630
	Earth Fault	A	320
	Cable Charging	A	110
Making Capacity of Switch and Earthing Switches		kA	62.5
Bushing			C
<b>TRANSFORMER FEEDER BY DISCONNECTING CIRCUIT BREAKER (D FUNCTION)</b>			
Number of Units			1
Rated Current		A	200
No-Load Transformer Breaking Capacity		A	16
Short-Circuit Breaking Capacity		kA	25
Making Capacity		kA (Peak)	62.5
Bushing			C

2 x Cable terminations suitable for terminating 95mm<sup>2</sup> Cu 12.7/22kV PILCDSTA (PVC) cable including galvanised support frame with wooden cable blocks (or appropriate alternative that will not damage cable). The support frame shall be designed in such a way that it will be possible to install the wood block at 500mm, 600mm or 700mm below the switchgear bushings. Should wood blocks be used, the hole must be drilled with a hole saw.

The contractor shall allow for training of municipal employees on the SF6 RMU unit.

Transformer protection:

VIP 45 relay with O/C & E/F protection and a 230V shunt trip which shall be wired to the thermometer contacts.

Circuit Breaker appropriately set to protect size of transformer installed – Confirm with Engineer.

#### Switchgear Labels

Traffolite labels to be fitted on each RMU isolator from left to right.

- Previous miniature substation/substation/switchgear on the MV cable
- Next miniature substation/substation/switchgear on the MV cable
- “Transformer & kVA rating”
- Labels to be black letters on white background.

Two labels stating “Aware Ring Feed” with white letters on a red label should be attached to the RMU cable box covers with glue.

#### TRANSFORMER COMPARTMENT

- |   |                             |
|---|-----------------------------|
| a) Specification  | SANS 780 as amended         |
| b) Quantity   | 1                           |
| c) Voltage at Normal Tap Position   | HV 22 000 V<br>LV 420 V     |
| d) Rating   | As Indicated in Addendums   |
| e) Losses   | Low                         |
| f) Number of Phases   | 3                           |
| g) Cooling  | ONAN                        |
| h) Service  | Outdoor                     |
| i) Load type  | Industrial                  |
| j) Windings   | HV Delta<br>LV Star         |
| k) Vector Group   | Dyn 11                      |
| l) Tap Changer  | No load $\pm 2,5\% \pm 5\%$ |
| m) Connection   | HV Bushings<br>LV Bushings  |
| n) Dial type thermometer with trip contacts without emergency trip knob.    |                             |
| o) Transformer compartment colour to match rest of mini-sub colour exactly. |                             |

## MINISUB INSPECTIONS

If applicable, an inspection of the complete minisub will be required at the minisub manufacturer. It is the contractor's responsibility to confirm in advance of this requirement. Even if an inspection is done by the Engineer or his representative, it does not distance the contractor of his responsibilities to comply with the specifications and requirements of this document.

The minisub shall be presented complete. All labels, breakers, blank plates, chassis plates, etc. installed. No roof installed to allow inspection of the internal compartments and wiring.

Before the inspection by the engineer or his agent, it is the responsibility of the contractor to ensure that all requirements set forth are met. Should the minisub be failed on any of the listed requirements, either in this document, relevant SANS codes or additional requirements given in writing, the cost of the engineer and/or his agent(s) will be for the contractor's account. Costs will include time, travel and other costs incurred with the inspection.

The appropriate inspection schedule is to be signed off by the manufacturer and contractor before applying for an inspection. This will be provided to the contractor by the Engineer.

## ADDITIONAL LABELS

Where a minisub is cut into a MV Ring, the contractor shall consider the impact on the minisub sequence. New labels for the RMUs shall be created to update the minisub sequence in the existing minisubs. This cost shall be included in the minisub.

The new labels shall match the existing as close as possible.

## MAKE-UP OF MINIATURE SUBSTATION

Refer to Addendum B.

## EARTHING OF THE MINIATURE SUBSTATION

The miniature substation shall be connected to the substation earth. No need for an additional earth mat unless the final position of the miniature substation is not over the substation earth mat.

Refer to detail drawing.

## **C3.2 Detail Specification**

### **DETAIL SPECIFICATIONS**

#### **INDEX**

1. Quality and Standards
2. Construction Day Camp
3. Name Board
4. Restoration of Damage
5. Erection and Commissioning Engineers
6. Supervision
7. Pegging of Structure Positions
8. Operating Conditions and System Parameters
9. Inspection and Tests
10. Shop Drawings for Approval
11. Protection Against Theft
12. Health and Safety
13. Explosives
14. Restoration and Cleaning Up
15. Permits
16. Programme and Monitoring
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18. Signs and Notices
19. Equipment
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22. Quality Control
23. Material / Component Samples
24. General Administration, Testing and Inspection
25. Operation & Maintenance Manuals & Training of Personnel
26. Bulk Supply
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28. Low Voltage Switchboard
29. Labels
30. Fuses
31. Medium Voltage Switchgear
32. Control Panel
33. 22 kV Reticulation
34. Low Voltage Cables
35. Luminaires

## **C3.2 DETAIL SPECIFICATIONS**

### **1. QUALITY AND STANDARDS**

Workmanship shall be of the highest standard throughout and to the satisfaction of the Engineer.

The achievement of quality shall be planned into the project from the outset and his employees facilitated to pro-actively focus on quality. Processes and procedures shall advance quality assurance while quality control shall act as final confirmation that the required quality has been achieved.

The services of competent skilled personnel shall be made available to supervise the erection and commissioning of the whole contract works.

### **2. CONSTRUCTION DAY CAMP**

The Contractor shall provide transport to and from site for all workmen on a day to day basis. He shall, however, be responsible for his own day camp, comprising eating house or same, if so required. The site shall be approved by the Employer. This camp shall at all times be kept neat and tidy. The Contractor shall provide and maintain fix or portable toilets and hand wash facilities appropriate for the number of employees present on the site.

The office must be furnished with tables (x2), chairs (x4) and suitable airconditioning.

The contractor shall arrange and pay for all sanitary removals, water supplies, temporary electrical supply and telephone connections.

### **3. NAME BOARD**

The Contractor must supply and erect a notice board with the details of the contract, client, Consulting Engineer and Contractor shown on the board. Full detail to be provided to the successful tenderer, but board will be of size 1950mm x 2800. This board must be erected in a position indicated by the Municipality and approved by the Engineer.

### **4. RESTORATION OF DAMAGE**

The Contractor shall be responsible for the restoration of any damage to buildings, streets (tarred, untarred or paved), walkways, pipes, surveyor pegs, etc. caused during the execution of the contract works. Any such damage shall immediately be reported to the Engineer.

The Contractor shall be held responsible for the repair of such damage to the satisfaction of the Engineer. The cost for the repair of such damage shall be borne by the Contractor. Claims by the Contractor in this connection will not be considered.

The Employer will assist the Contractor by indicating the existing services where known. However, the Employer accepts no responsibility as to the correctness of such markings.

It is the contractor's responsibility to obtain written confirmation of existing services at individual client departments and other service providers such as Telkom by way of permit approval system per zone prior to commencing setting out. Client will not reimburse contractor for any damaged cause by not following procedures for obtaining this approval.

### **5. ERECTION AND COMMISSIONING ENGINEERS**

The services of skilled Personnel shall be made available to supervise the erection and commissioning of the whole contract works and to provide the required training to the Employer's personnel in the operation and maintenance of the contract works. Refer also to Operation Manuals and Training of Personnel for further details

## 6. SUPERVISION

The contract shall be supervised on a full time basis by a registered person in terms of the Occupational Health and Safety Act, 1993 – Electrical Installation Regulations 5(4).

This individual shall have adequate relevant experience of at least 10 years in substation construction and MV overhead reticulation.

## 7. PEGGING (SETTING OUT) OF STRUCTURE POSITIONS

The Contractor shall be responsible for the setting out of the yard, building, masts, MV & LV structures and cable routes based on the information given on the drawings. The centre line of the overhead lines from stands' boundary lines shall be determined beforehand unless otherwise noted on the drawings.

The tenderer shall have identified all existing services and provide a copy of the info to the Engineer and professional land surveyor as part of his preparation works upfront. Failure to do so may result in additional time spent by the Engineer for which the contractor shall be liable.

Setting out shall be done by a professional land surveyor utilising the information on drawings as basis. Where in doubt, contact the Engineer to assist in making a decision. When full setting out are complete, it shall then be approved by the Engineer prior to commencing works. Allowance to be made for extra trip for surveyor for minor adjustments that may be necessary based on site conditions. If erf boundaries are not clearly visible to set out positions, the professional land surveyor to set-out these positions as well for referencing.

## 8. OPERATING CONDITIONS AND SYSTEM PARAMETERS

All material and equipment being supplied in terms of this Contract must be suitable for continuous operation at the total specified output or capacity under the conditions stipulated below:

### **Electrical:**

a.	System nominal voltage	22 kV/420 V/242 V	
b.	System highest voltage	HV	22 kV
		LV	420 V
c.	Neutral Earthing	HV	Solid
d.	Nominal system frequency	50Hz	
e.	Number of phases	3	
f.	Minimal symmetrical three phase breaking capacity of circuit breakers	HV LV	25 kA per phase According to each trf max Ph-E fault current
g.	Minimum Impulse Withstand Test Voltage 1,2/50 microsecond full wave in kV crest	HV	95
h.	Minimum 60 seconds withstand voltage in kV:		
	-Test in Works	HV	28
	-Test on Site after Erection	HV	24

## Environment

a.	Altitude	1300 m
b.	Average Maximum Temperatures	43°C
c.	Average Minimum Temperatures	-5°C
d.	Average Relative Humidity	50%
e.	Lightning	heavy
f.	Dust	severe

Ground conditions are mostly hard.

## 9. INSPECTION AND TESTS

### Witnessing of Tests

The Engineer reserves the right to appoint a representative to inspect the equipment at any stage of manufacture or to be present at any of the tests specified. Such inspection shall not relieve the Contractor of his responsibility for meeting all the requirements of the specification, and it shall not prevent subsequent rejection if such material or equipment is later found to be defective.

The Contractor shall ascertain whether inspection or witnessed tests, or both, are required and the Contractor shall then give the Engineer not less than seven days' notice of when the equipment will be ready for the inspection or witness tests requested.

### Routine Tests

The following tests shall be performed and 5 copies of test certificates be submitted:-

- i. Switchgear and all associated equipment shall be routine tested to the requirements of Part 8 of BS 162 and all the tests prescribed in relevant BS, SANS and IEC specifications.
- ii. Transformers and earthing compensators shall be tested according to the relevant standard specifications.
- iii. Cables shall be routine tested according to SANS 97, 1339 and 150.
- iv. Protective equipment shall be routine tested to ensure that all the relays operate according to their characteristics.

### Type Tests

Test certificates of type tests on all equipment offered shall be submitted with the tenders.

The Engineer may require type tests to be performed on any selected items of equipment.

## 10. SHOP DRAWINGS FOR APPROVAL & AS-BUILT DRAWINGS

All drawings to be in A sizes.

Drawings for approval shall be submitted prior to building, manufacture and installation and failure to do so will be at the Contractor's risk. Such approval however, shall not relieve the Contractor of his responsibility for meeting all the requirements of the specification or relieve him of responsibility for the correctness thereof or from the consequences of error or omission.

Each drawing shall indicate the particulars of the Employer, Contract, Contractor and Consulting Engineer.

As-built drawings shall be submitted after erection and commissioning. All schematic and wiring diagrams shall be submitted in hard copy and approved electronic format. Final retention shall not be released if these drawings have not been submitted to the Engineer and if they do not conform to the Engineer's requirements.



## 11. PROTECTION AGAINST THEFT

The tenderer's special attention is drawn to the risk of theft.

The contractor shall take all necessary precautions to avoid theft of any material and if theft takes place, the contractor shall replace the stolen goods at his own cost. Any theft of material will not be accepted as motivation for delays.

If, during the execution of the contract, existing cables are unearthed, the responsibility will be on the contractor to protect such cables against theft.

The protection against theft and vandalism shall include the client's premises and infrastructure when the fence around the substation is replaced as per the contract works.

## 12. HEALTH AND SAFETY

### **Health and Safety Requirements and Procedures**

#### **Risk Assessment**

Every Contractor shall appoint a competent person in writing to perform a Risk Assessment before the commencement of any Construction work. This Risk Assessment shall form part of the Occupational Health and Safety Plan and be implemented and maintained as contemplated in Construction regulation 5(1).

The Risk Assessment shall include at least the following:

- the identification of the risks and hazards to which persons may be exposed to
- the analysis and evaluation of the identified risks and hazards
- a documented plan of safe work procedures to mitigate, reduce or control the risks and
- hazards that have been identified
- a monitoring plan, and
- a review plan

Based on the Risk Assessments, the Contractor must develop a set of site-specific Occupational Health & Safety rules that will be applied to regulate the Occupational Health & Safety aspects of the construction. The Risk Assessments, together with the site-specific Occupational Health & Safety rules shall be submitted to the Client before mobilisation on site commences.

The Contractor is required to conduct a baseline Risk Assessment and the aforesaid listed Risk Assessments shall be incorporated into the base-line Risk Assessment. The baseline Risk Assessment must further include the Standard Working Procedures (SWP) and the applicable Method Statements based on the Risk Assessments.

All contractors must include H&S costs in their Quoted price.

#### **Protection of the Public**

The Contractor is responsible for ensuring that non-employees affected by the construction work, like visitors, the surrounding community and passers-by, are made aware of the dangers likely to arise from the construction work as well as the precautionary measures to be observed to avoid or minimise these dangers. Appropriate signage must be posted to this effect and all employees on site shall be instructed to ensure that non-employees are protected at all times. All non-employees entering the site must receive induction into the hazards and risks and the control measures.

The contractor shall take note that theft and damage to barricading and warning apparatus can be expected. This shall not relieve the contractor from continuously ensuring that the entire construction area complies with the regulations.

#### **Barricades and Lighting**

The Contractor is responsible for the provision of all fences, signs, barricades and lighting necessary for the protection of all persons, plant, vehicles, equipment or facilities, as required by the specification and requirements of the Occupational Health and Safety Act, 1993 and its regulations, as amended.

The Contractor is responsible for the maintenance, repair or replacement for whatever reason of fences, signs and barricades used for the Works. Photo evidence of existing fences and structure to be moved or temporary demolished shall be taken to ensure the exact state thereof and submitted to the owner, client and engineer to seek written approval to move/ demolish prior to commencing with the said works. This includes for the provision of security guards for the safeguarding of the items provided should this be necessary. Failure to submit evidence and seek approval to move may result in the entire fence/structure to be replaced with new to the satisfaction of all parties at the contractor's expense.

### **Traffic Control on Roads**

The Contractor shall be responsible for the safe and easy passage of public traffic past or over sections of streets of which he has occupation.

In addition to complying with the requirements of Sub-clause 5.1.1 of SANS 1200 D, the Contractor shall provide, erect, and maintain all warning and regulatory signs, barricades and traffic management that may be necessary to ensure the safe and easy passage of public traffic past around or over sections of roads of which he has occupation.

### **Excavations** (taken from the Construction Regulations)

13. (1) *A Contractor must -*
- a) *ensure that all excavation work is carried out under the supervision of a competent person who has been appointed in writing for that purpose; and*
  - b) *Evaluate, as far as is reasonably practicable, the stability of the ground before excavation work begins.*
- (2) *A contractor who performs excavation work –*
- a) *must take reasonable and sufficient steps in order to prevent, as far as is reasonably practicable, any person from being buried or trapped by a fall or dislodgement of material in an excavation;*
  - b) *may not require or permit any person to work in an excavation which has not been adequately shored or braced: Provided that shoring and bracing may not be necessary where –*
    - i) *the sides of the excavation are sloped to at least the maximum angle of repose measured relative to the horizontal plane; or*
    - ii) *such an excavation is in stable material: Provided that –*
      - aa) *permission being given in writing by the appointed competent person contemplated in sub-regulation (1) upon evaluation by him or her of the site conditions; and*
      - bb) *where any uncertainty pertaining to the stability of the soil still exists, the decision from a professional engineer of a professional technologist competent in excavations shall be decisive and such a decision shall be noted in writing and signed by both the competent person contemplated in sub-regulation (1) and the professional engineer or technologist, as the sub-regulation (1) and the professional engineer or technologist, as the case may be;*
  - c) *must take steps to ensure that the shoring or bracing contemplated in paragraph (b) is designed and constructed in a manner that renders it strong enough to support the sides of the excavation in question;*
  - d) *must ensure that no load, material, plant or equipment is placed or moved near the edge of any excavation where it may cause its collapse and consequently endanger the safety of any person, unless precaution such as the provision of sufficient and suitable shoring or bracing are taken to prevent the sides from collapsing;*
  - e) *must ensure that where the stability of an adjoining building, structure or road is likely to be affected by the making of an excavation, the steps are taken to ensure the stability of such building, structure or road and the safety of persons;*

- f) *must cause convenient and safety means of access to be provided to every excavation in which persons are required to work, and such access shall not be further than six meters from the point where any worker within the excavation is working;*
  - g) *must ascertain, as far as is reasonably practicable the location and nature of electricity, water, gas or other similar services which may in any way be affected by the work to be performed, and must before the commencement of excavation work that may affect any such service, take the steps that are necessary to tender the circumstances safe for all persons involved;*
  - h) *must ensure that every excavation, including all bracing and shoring, is inspected –*
    - i) *daily, prior to the commencement of each shift;*
    - ii) *after every blasting operation;*
    - iii) *after an unexpected fall of ground;*
    - iv) *after damage to supports; and*
    - v) *after rain,**by the competent person contemplated in sub-regulation (1), in order to ensure the safety of the excavation and of persons, and those results must be recorded in a register kept on site and made available on request to an inspector, the client, the client's agent, any other contractor or any employee;*
  - i) *must cause every excavation which is accessible to the public or which is adjacent to public roads or thoroughfares, or whereby the safety of persons may be endangered, to be –*
    - i) *adequately protected by a barrier of fence of at least one metre in height and as close to the excavation as is practicable; and*
    - ii) *provided with warning illuminates or any other clearly visible boundary indicators at night or when visibility is poor, or have resort to any other suitable and sufficient precautionary measure where sub-paragraphs (i) and (ii) are not practicable;*
- Note: The contractor shall allow in his excavation rates to provide sufficient barricading as per clause 13i.*
- j) *must ensure that all precautionary measures as stipulated for confined spaces as determined in the General Safety Regulation, 2003, are complied with by any person entering any excavation;*
  - k) *must, where the excavation work involves the use of explosives, appoint competent person in the use of explosives for excavation, and must ensure that a method statement is developed by that person in accordance with applicable explosives legislation; and*
  - l) *must cause warning signs to be positioned next to an excavation within which or where persons are working or carrying out inspections or tests.*

### 13 EXPLOSIVES

All government regulations with regard to the transport storing and handling of explosives shall be strictly adhered to.

### 14 RESTORATION AND CLEANING UP

Upon completion of the work, or any portion thereof, the ground, fences and other structures that have been interfered with shall be carefully restored to their original condition with photo evidence to proof against earlier photos. All rubbish, tools, tackle, plant and materials shall be removed and the whole of the Works or each complete portion thereof shall be left in a neat, orderly and working condition.

After erection on site is completed, all external surfaces shall be cleaned down, touched up as necessary, and a final coat applied of a glossy, oil and weather-resisting and non-fading enamel of approved quality and colour. For equipment despatched completely assembled, the final coat may be applied at the works unless otherwise required by the Engineer. Damage to paintwork incurred during transport and erection shall be made good by thoroughly cleaning the damaged portion and applying the full number of coats that had been applied before the damage was caused.

Exposed galvanised nuts, bolts and washers which may have to be removed for maintenance purposes shall have a minimum of one coat of approved paint after erection.

## 15 PERMITS

### **Construction Notices & Permits**

The contractor shall give the necessary notices to Department of Labour and obtain the necessary construction permits prior to commencing works

### **Existing Service Permit**

The contractor shall implement an approved “Existing Services Permit”. The permit shall be signed off by the local authority’s electrical and civil department, other service providers for Telecoms & Data services, the engineer’s representative and the contractor. The contractor is responsible to obtain sign off in time prior to commencing setting out of the works.

### **Excavation Permit**

The contractor shall obtain an “Excavation Permit” from the employer’s representative before any excavation work.

### **Request for Shutdown Permit**

The works plan shall indicate required shutdowns at least 2 weeks in advance and request permit shall be approved by the Engineer and reach the municipality at least 8 working days prior to the shutdown date.

### **General**

All permit formats shall be approved by the engineer and shall reference a drawing clearly indicating the area of works, who to be notified and shall be submitted with all signatures to the Engineer prior to commencing works

## 16 PROGRAMME & MONITORING

The Contractor must submit a detailed programme before commencement of any work based on prior experience and accounting for site conditions. The Engineer and the employer reserve the right to alter the programme to meet the priorities of the employer. These amendments will be such that the Contractor will still be able to complete the works within the tendered construction time. The completion date of the contract shall be as indicated at the site handover meeting or in the appointment letter.

The programme shall contain measurable line items for each task aligned to bill items and be set-up such that planned and actual can be easily identified for monitoring and verification purposes.

The Contractor must submit a progress report every two weeks based on this original programme. The report shall also indicate as a minimum progress on long lead item deliveries, challenges, forward outlook of activities for next period, labour force in prescribed format and equipment on site.

## 17 TESTS

The Contractor must allow for a complete set of tests of the equipment as prescribed by the Engineer. These tests shall be carried out at the premises of the manufacturer and on site.

## 18 SIGNS AND NOTICES

All the necessary signs and notices according to the required regulations or Engineer must be provided on the outside of all equipment.

## 19. EQUIPMENT

### **General**

All equipment supplied by the Contractor must be new, of the best quality and must comply with the specification.

### **Inspection.**

The contractor shall inform the Engineer of any equipment which is ready for despatch, in which case the Engineer will arrange for an inspections at the factory of the manufacturer if it is deemed necessary. Such notification of the Engineer must be 14 days prior to despatch.

All factory inspections on equipment must be done by the Engineer. No equipment may be delivered to site without being released from the factory by the Engineer.

### **Commissioning**

The Contractor shall be responsible for the testing and commissioning of the complete installation.

The Contractor shall notify the Engineer, in writing, 14 days prior to the abovementioned test to allow him to make the necessary arrangements.

## 20. SHOP DRAWINGS

Shop Drawings of items to be manufactured shall be approved to the Engineer before being manufactured. Failure to comply may result in items being rejected and the cost and delay will be for the contractor's account. It remains the contractor's responsibility to first liaise with the manufacturer to have all errors on the drawings corrected. Care should be taken to have all relevant information shown or indicated. When satisfied the drawing are complete, they shall be submitted for comment or approval. It further remains the contractor's responsibility manage these drawing and their approval process timeously and diligently. Allow at least 2 weeks in the program for drawing approval by the Engineer and any time deemed necessary for the pre-approval as mentioned above.

All shop drawings shall have the following details on each page:

- Name of Consultant: As per contract document
- Name of Client: As per the contract document.
- Name of Contractor
- Name of Project: As per the contract document.
- Proper revision numbers and history of revisions up to date.

## 21. AS-BUILT DRAWINGS

As-Built drawing shall be meticulously kept up to date by the contractor. Any deviation from the Issued For Construction (IFC) drawings shall be indicated and accurate measurements given. Measurements shall be from fixed and permanent land marks. Where coordinates are also taken of the MV cables, these shall correspond to the measurements taken on site. Should the contractor's actions or lack thereof with regards to the accuracy of the as-built drawings give reason to suspect failure in complying, the Engineer will have the right to have crucial points exposed to have measurements taken or confirmed.

The Contractor shall handover the as-built drawings marked as "REDLINE DRAWINGS" with the date and signatures of construction manager and person responsible for the as-builds.

The Engineer will not certify the final payment claim should the satisfactory as-built drawings not be received.

## 22. QUALITY CONTROL

The Engineer shall provide all documents and templates to be used by the contractor for the purpose of quality control. Some of these documents shall require the witnessing of tests by the Engineer or his representative.

The contractor shall pro-actively arrange for tests to be done by competent staff that shall include the installation electrician. Completion of documents shall be done as soon as possible after tests. Progress on completed test / quality sheets shall accompany Payment certificates as a compulsory deliverable.

### 23. MATERIAL / COMPONENT SAMPLES

The contractor shall submit samples of ALL components to be used on this project for formal sign-off by the client or his representative, irrespective of whether it was described by catalogue reference in the bill of quantities or not. The contractor shall submit this at least 4 weeks prior to the date on which a decision is required. The samples shall remain in the sample rooms/site office until completion of the project. The Contractor shall prepare a booklet and list all components that needs approval. It shall be itemized and have columns for: Item type & description, catalogue number, supplier and contact detail, approval name, approval signature, date, Comments. Each item shall have a corresponding label to identify it back to the booklet. Any material procured without sign off will not be paid for until acceptance by means of sign-off.

### 24. GENERAL ADMINISTRATION, TESTING AND INSPECTION

The contractor shall keep a site diary, and complete inspection and quality related documentation as required by the contract. The Contractor shall be responsible to proof his own snagging and de-snagging after completion of each stage prior to continuing with the next stage of the works, per DB Zone, mast or distribution zone and broken down into setting out, first fix (poles), second fix (lines) and final fix (service connections, terminations) and testing and commissioning. This shall include completion of the required Quality Control Sheets for each part of the installation that will be provided by the Engineer and completed by the Contractor.

Site Inspection Records shall be issued by the Engineer from time to time. The actions/corrective measures required following the issue of such SIRs shall be timeously executed by the contractor, signed off and returned to the Engineer. Lack of action by Contractor may result in payment relating to the defect part of the work be delayed until such a time that it is corrected.

Material delivery to the site store and issue to site shall be recorded and proof be available with each progress payment request, neatly itemized follow bill items and descriptions.

Dry testing shall commence at the earliest convenience after second fix, and final fix may not commence until this is completed. As part of this test, all circuit labelling shall be done and recorded test sheets be available upon completion per DB zone.

The Contractor shall test the entire installation in conjunction with and to the satisfaction of the Supply Authority or Engineer. The Contractor shall make all arrangements for testing and inspection, the costs thereof being included in the Tender Price. Should any part of the installation fail during a test or should the equipment in the opinion of the Engineer not meet the requirements, the Contractor shall replace, repair or correct such equipment at his expense, to the satisfaction of the Engineer.

Each length of cable shall be tested for insulation and polarity by means of a 1000 volt megger designed for that purpose. In the case of underground cables this shall be done before backfilling. In addition, the earth-loop impedance of each main and sub-main feed shall be measured, or calculated and such calculation be provided with the COC readings.

The earth resistance at each down conductor earth electrode shall be measured. The earth resistance shall be tested by means of an approved instrument that has a valid calibration certificate - not multi meter.

If there is no power on the day of the test, the Contractor shall supply a 3 kW, 230 V or 6kW, 400V generating plant (whichever is applicable) for testing purposes – only applicable to LV building installations.

"DANGER" notices shall be displayed at remote ends of cables under test.

Load balancing shall be undertaken by the Contractor and submitted to the Engineer per DB per section seeking his approval. For buildings, layout of specifically the AC plant needs to be drawn up per phase prior to DB drawings are approved to ensure a balanced phase approach is followed. For reticulation projects, the number of consumers as well as the phasing and estimated load to be taken into consideration prior to

connecting these to the network to ensure a balanced system approach is followed. Service connections shall be balanced after connection where it is an existing installation, records of loads over 24hr period to be taken per feeder until the most balanced load is obtained and recorded as part of the quality documentation. Where conductors are altered to achieve satisfactory results the necessary adjustments shall be done by the Contractor at no additional compensation. The contractor remains responsible for load balancing until final handover, and shall attend to imbalances when found during the retention period immediately.

The Contractor shall provide all the necessary instruments for the proper testing of the complete installation. If there is reason to doubt the accuracy of such instruments, the Contractor shall take the necessary action to prove their accuracy. The contractor shall submit with test results a copy of the calibrate certificates of the specific equipment used to carry out the testing (not older than 6 months). The manual of each test instrument shall be available during testing for reference.

The contractor shall notify the Engineer when he is ready for COC witness testing and first delivery inspection in writing. The request shall be accompanied by all signed-off outstanding inspection sheets together with his own snagging and de-snagging report to demonstrate the installation is completed.

The EC shall ensure that the installation is completed in every respect and that there are no major defects prior to notifying the Engineer (in writing) for a first delivery inspection. A pre-inspection list will be provided to Contractor who shall rectify all items on the list and use that as basis for the entire installation. Signed copy hereof to be sent to Engineer requesting 1st delivery inspection. The Engineer will accept zero minor defects during the final inspection. Should this number of defects be exceeded at the final inspection then the Engineer will terminate that inspection and requests that an additional final inspection be arranged by the Contractor, and cost associated for the account of the contractor.

The Engineer reserves the right to witness all tests. The Contractor shall advise the Engineer in writing of all results and furnish copies of all certificates. CoC's shall also be produced in electronic format (scanned) onto the O&M manual electronic copy (CD).

## **25. OPERATION & MAINTENANCE MANUALS & TRAINING OF PERSONNEL**

The contractor shall provide operating manuals of the electrical installation and all specialised systems as set out in the bills of quantities including maintenance procedures (O&M manual) in 2 (two) fold, neatly bound and indexed and 1 x electronic copy (CD). A draft version shall be submitted to the Engineer for approval at least 1 month prior to first hand over.

### **The Manual**

It shall be properly indexed and sequentially numbered, containing of a section for each system, consisting of but not be limited to the following elements:

- i) Detailed System description for each system a listed in detail spec/bill.
- ii) Operational Procedures
- iii) Maintenance intervals and inspection/maintenance procedure on all parts of system and intervals of checks and services. Detailed templates for all inspection reports.
- iv) Safety procedures
- v) Complete parts list including manufacturer name & contact details, catalogue numbers and description of parts
- vi) Fault finding list
- vii) A Section for all the as-built drawings (if not added to back of COC-point x below)
- viii) DB charts (where applicable) shall be provided electronically and included on the CD in excel format for future amendment / alterations
- ix) Emergency Battery Test Sheets

The contractor shall draw up a schedule and include it in the O&M manual for testing of the Emergency light battery packs. The schedule shall reference each fitting, its location, which DB zone it is in, test duration, and comment column as a minimum. If confusion as to the exact fitting one refer to on the schedule, a copy of the layout plan can be attached where each emergency fitting is sequentially numbered and referred to on the schedule. It shall be produced in Excel format to ensure future copying and shall be sufficient to record 1 year at a time.

- x) 1 x COC per each DB & prescribed COC addendum reports, neatly separated per block or building.  
A COC for each kiosk, Transformer DB, minisub and generator DB shall also be done.  
For reticulation the prescribed handing over certificates by the Engineer shall be duly completed
- xi) Photos of All distribution boards (doors open, face plates on and DB name visible)
- xii) Refer also to each individual system section for any specific details that might be required.

The Practical Completion Certificate (Hand over) shall not be issued until this manual has been provided and accepted by the client.

### **Training of Personnel**

Once the abovementioned manual is accepted by the Engineer and handed over to the client, he will be given sufficient time to study the manual. The Contractor shall agree in writing with the client upon a date which the training will be undertaken. The Contractor must explain and demonstrate each individual system installed to relevant staff nominated by the Employer or Engineer. Demonstration shall include

- a) Overall operation of system
- b) Hands-on training to ensure the individual(s) can fully operate the system
- c) Fault Finding
- d) Routine maintenance inspection
- e) Routine maintenance
- f) Emergency procedures
- g) Safety procedures

All of the above by referring to the relevant section from the manual for reference.

On successful completion of the training, a certificate to be issued to state that the nominated employee was trained to successfully operate and maintain the system. A prerequisite being that the operating and maintenance manuals have been compiled and supplied up front for the relevant employee to familiarise him/herself with the system.

The Engineer will not certify the final payment claim should the satisfactory data files not be received.

## **26 BULK SUPPLY CONNECTION**

The Bulk Supply for the new substation shall be taken from the new H-pole structure constructed in the substation yard. A new 22 kV cable shall be terminated on the quipment and routed underground into the new building as shown on the drawings.

The associated work indicated on the drawings shall also be carried out to complete the bulk supply connection.

## **27 BATTERY CHARGER AND BATTERIES**

The battery system shall be designed for the expected load including the future extension to the switchboards. The battery systems shall operate on 230V AC from the main low voltage board in the substation building. The mains fail relay shall operate when this 230V AC supply fails.

The various alarm relays, as specified, shall be connected to operate the visual and audible substation alarms. The alarms shall be switched off via an alarm accept pushbutton on the battery unit.



1x	Floor standing sheet metal housing for batteries and battery charger with door(s), sufficient ventilated. Cable access to be from the bottom.
1x	Battery charger, 220V AC input, suitable for set of batteries.
1x	Set of batteries, 110V DC output, suitable for total anticipated load plus 25% spare capacity.
1x	Set of alarms: mains fail, charge fail, battery fail and battery high.
1x	Set of indication lights: earth fault, mains fail, charge fail, battery fail and battery high voltage.
1x	Set of meters, A + V, with test push button.
1x	Set of small wiring, fuses, etc.
1x	Set of labels.

## 28 LOW VOLTAGE SWITCHBOARD

The low voltage switchboard shall provide for all low voltage distribution in the substation. The schematic diagrams supplied with this tender are for guidance only and the Contractor shall submit final diagrams for approval to the Engineer.

The low voltage board shall be supplied with a changeover switch with a 15m 3 x 2,5mm<sup>2</sup> flexible cord that can be taken to an external stand by generator in case of a general power failure.

The low voltage board shall be supplied with a battery and charger to feed the visual and audible alarm system of the substation to operate under emergency conditions. This system shall be charged from the 230V in the board and shall have sufficient capacity to operate the alarm for 60 minutes whereby it shall be noted that the audible alarm shall operate at 5 minutes intervals. An alarm accepts button shall be provided on the door of the switch board. The emergency system shall be completely maintenance free and the battery replacement intervals shall be less than 5 years.

## 29 LABELS

The contractor shall provide labels indicating phase colours and circuit designations as well as warning labels to indicate where to isolate the incoming feeders. In addition all equipment and relays shall be labelled with the correct circuit designation and function respectively. Additional labels for multiplying factors for the various CT ratios shall be provided.

## 30 FUSES

All fuses shall be fully interchangeable. A spare fuse shall be supplied for every fuse used.

## 31 MEDIUM VOLTAGE SWITCHGEAR

### General

It shall be noted that the schedules specify the minimum requirements.

To complete the equipment below, all necessary cable boxes, terminal boards, panel wiring, fuses, interlocking gear, fixing bolts, earth conductors and connections, terminals and connections, sundries, manuals, etc., shall be included whether specified or not to hand over the equipment in a properly working condition.

### 22 kV Incoming Circuit Switchgear (x1)

22 kV ABB UNIGEAR (or similar)		Colour: RAL 7035
1x	Housing and unit of horizontal isolating type, constituting the fixed and moving portions.	
1x	Set of 3 phase 1250A busbars.	
6x	630A single pole isolating plugs and sockets.	
1x	630A 22kV 25kA circuit breaker complete with motorised operated spring assisted operating mechanism, mechanical trip counter, auxiliary switches, 110V DC shunt trip and mechanical ON – OFF indicator.	
3x	Current transformers ratio 200/400/600/5A Class 0.5 for metering.	
3x	Current transformers ratio 200/400/600/5A Class 5P20 for over current, earth fault and arc protection and instruments.	
1x	Voltage transformer ratio 24 000/110 V star-star connected with H.T. and L.T. fuses.	
1x	Ammeter with combined and instantaneous indication (three phases).	
1x	Voltmeter 0-24kV with voltmeter selector switch.	
1x	Integrated solid state REF615 combined over current, earth fault and arc protection relay with optical arc sensors in busbar, CT and VCB chambers	
1x	Set of indication lights:	
	Red - Circuit breaker closed Green - Circuit breaker open Yellow- Circuit breaker trip White - Trip healthy Lamp test pushbutton	
1x	Set of interlocks.	
1x	Interlocking scheme block tripping of incomer on outgoing feeder fault.	
1x	Remote scheme for ON/OFF operation, indication lights and status monitoring on control panel in remote switching room	
1x	Remote control via a 15m plug in type cord must be standard on all switchgear. This will be used for maintenance switching, as the normal operational switching will be done from the switching room.	
1x	Test blocks for secondary testing of relays and metering	
1x	Set of small wiring, etc.	
1x	Set of labels. Labels shall be provided on the back and front of panel, as well as the movable portion.	
3x	Kuvag Capacitive Permanent Integrated Voltage Indicator "Cable alive".	
3x	Cable terminations each suitable for 1x150mm <sup>2</sup> 3 core PILCDSTA cable. The Cable terminations shall be so arranged that the prescribed clearances are kept and that the making off of the cables need not to be done in too cramped a space. No back to back connection of the cables is acceptable.	
1x	Circuit breaker name plate in front on circuit breaker	
1x	Current transformer ratio, class and VA information on nameplate inside CT chamber and outside CT chamber at back of panel	
1x	CT Labs Vector III Power Quality Analyzer	
1x	Elster A1700 meter (can be mounted internally)	
1x	Cable Compartment Light with selector switch	
1x	Set of Surge Arrestors	

## 22 kV Feeder Circuit Switchgear (x5)

22 kV ABB UNIGEAR (or similar)		Colour: RAL 7035
1x	Housing and unit of horizontal isolating type, constituting the fixed and moving portions.	
1x	Set of 3 phase 1250A busbars.	
6x	630A single pole isolating plugs and sockets.	
1x	630A 22kV 25kA circuit breaker complete with motorised operated spring assisted operating mechanism, mechanical trip counter, auxiliary switches, 110V DC shunt trip and mechanical ON – OFF indicator.	
3x	Current transformers ratio 100/200/400/5A Class 0.5 for metering.	
3x	Current transformers ratio 100/200/400/5A Class 5P20 for over current, earth fault and arc protection and instruments.	
1x	Ammeter with combined and instantaneous indication (three phases).	
1x	Integrated solid state REF615 combined over current, earth fault and arc protection relay with optical arc sensors in busbar, CT and VCB chambers	
1x	Set of indication lights:	
	Red - Circuit breaker closed Green - Circuit breaker open Yellow- Circuit breaker trip White - Trip healthy Lamp test pushbutton	
1x	Set of interlocks.	
1x	Interlocking scheme block tripping of incomer on outgoing feeder fault.	
1x	Remote scheme for ON/OFF operation, indication lights and status monitoring on control panel in remote switching room	
1x	Remote control via a 15m plug in type cord must be standard on all switchgear. This will be used for maintenance switching, as the normal operational switching will be done from the switching room.	
1x	Test blocks for secondary testing of relays and metering	
1x	Set of small wiring, etc.	
1x	Set of labels. Labels shall be provided on the back and front of panel, as well as the movable portion.	
3x	Kuvag Capacitive Permanent Integrated Voltage Indicator "Cable alive".	
3x	Cable terminations each suitable for 1x95mm <sup>2</sup> 3 core PILCDSTA cable. The Cable terminations shall be so arranged that the prescribed clearances are kept and that the making off of the cables need not to be done in too cramped a space. No back to back connection of the cables is acceptable.	
1x	Circuit breaker name plate in front on circuit breaker	
1x	Current transformer ratio, class and VA information on nameplate inside CT chamber and outside CT chamber at back of panel	
1x	Elster A1700 meter (can be mounted internally)	
1x	Cable Compartment Light with selector switch	

### 32 CONTROL PANEL

1x	Sheet metal control panel with rear panel access.
11x	Circuit breaker ON/OFF switches suitable for padlocking.
11x	Sets of indication lights:
	Red - Circuit breaker closed Green - Circuit breaker open Yellow- Circuit breaker trip White - Trip healthy Lamp test button
1x	Voltmeters 0-24kV.
1x	Solid state integrated 3 phase kWh, kVA, kVAr, instantaneous and maximum demand meter.
1x	Set of small wiring, etc.
1x	Set of labels.

### 33. 22 kV RETICULATION

#### **General**

A new 185mm<sup>2</sup> cable shall be installed between the new substation and the new H-pole structure that connects with the Eskom four pole structure.

The industrial line shall be reconfigured on site and connected via 95mm<sup>2</sup> cable to the new substation from a new H-pole structure.

A new H-pole shall be built for the 22kV line running to town and connected to the new substation via 95mm<sup>2</sup> cable.

A new 95mm<sup>2</sup> cable shall connect the substation to the existing 22000/400V transformer.

Once all the overhead lines connected to the four pole structure (in the yard) be removed, the structure needs to be decommissioned and removed.

Refer to the detail drawings for exact details.

#### **Poles**

Pine wood poles treated with creosote, must be used. All poles must comply with SANS 753 or SANS 754.

- a) 12m poles are mainly used for road and where it is outlined otherwise on the reticulation design drawings. These poles must be planted 2m deep. They are also used for 2-pole transformer structures.
- b) 11m, 180 – 200 mm top diameter poles are used for general MV / shared structures as well as the transformer structures. These poles must be planted 1.8 m deep.
- c) 11m, 200 – 220 mm top diameter poles are used for turning MV / shared structures. These poles must be planted 1.8 m deep.
- d) 10m, 200 – 220 mm top diameter poles are used for 2-pole transformer structures. These poles must be planted 1.7 m deep.
- e) All medium voltage poles shall be earthed by means of a steel earth wire (6.1 mm dia SWG 7/14) strapped 500mm underneath the bottom insulator going down against the pole and wound around the bottom of the pole underneath the ground.
- f) 2.5m, 100-120mm / 3.5m, 160-180mm 2.5m, 160-180mm top diameter poles is used for the various cross arm applications.

Note: Anti-climbing device / wire must be position 3,0 meter above ground on all the transformer structure poles.

## Stays

All stays shall have an angle of 45° to the vertical and installed in line with the conductors. The stay assembly will consist of:

- a) A round slotted base plate with diameters of 375 mm. The base plate must bear against undisturbed earth 1600mm deep under natural ground level.
- b) M20 adjustable stay rod with a diameter of 20mm and a length of 2000mm. Thimble to be used with guygrip 7/4.0.
- c) Galvanized steel stay wire (1 x 7/4, 96.7 kN) to be used.
- d) Two guygrips inserted in both sides of a 110kN stay insulator.
- e) Galvanized steel stay wire (1 x 7/4, 96.7 kN) to be used.
- f) Threaded rod (M20 x 350) through pole with stay bracket attached to it, thimble and guygrip.
- g) Four lock nuts with two washers making first contact to pole.

Note: See for assembly guidance Standard Details for STAYS for extras and D-DT-0341.

## Strut Poles

- a) Rocks must be used to form the base for the pole end to press against.
- b) The strut pole hole distance, from the pole structure that it supports, must not be less than ½ of the strut pole length above ground.
- c) Ten wraps of barbed stapled to the strut pole, 3m above ground.
- d) Strut must be planted not less than 1.5m.

Note: See for assembly guidance Standard Details for STRUTS for extras and D-DT-0342.

## Overhead Conductors

- a) 6/2.79mm Aluminum and 1/2.79mm steel diameter, code name “Fox” to be used.
- b) 6/3.66 Aluminum and 1/3.36mm steel diameter, code name “Mink” to be used.
- c) 6/4.72mm Aluminum and 1/4.72mm steel diameter, code name “Hare” to be used.

Minimum Clearances (22kV)		Clearance
a)	To ground outside townships	5.1m
b)	To ground inside townships	5.5m
c)	Above roads and railway lines	6.4m
d)	To communication lines and other power lines	0.9m
e)	To buildings and structures not forming part of power lines	3.0m

Sag and tension charts approved by the Engineer for relevant overhead conductor must be obtained. Stringing must be done strictly according to the charts specifications mentioned above.

## MV Insulators

Intermediate Assembly:

- a) Three 22kV, 150 kV B.I.L. Cullinan EP 967 Post insulators with non-metallic (PVC) preformed conductor side ties.
- b) The three insulators shall be fitted through the wooden pole with three spindles (M20 x 250) and six lock nuts with three washers making first contact with the pole.
- c) Insulators shall be mounted in either a Delta configuration or horizontal configuration with the post insulators all mounted 600 mm apart and 200 mm from the top of the pole.
- d) Insulator spindles to be connected with steel earth wire that is wound around the top of the wooden pole and attached to the pole with a coach screw underneath the bottom insulator.

Note: See for assembly guidance Drawing D-DT-1730

Terminal / Strain assembly:

- a) Three or six 22 kV, 150 kV B.I.L. EBM 744 – CT Long Rod silicone insulators with three D-shackles, clamp thimble clevis and pre-formed dead end.
- b) The three or six insulators shall be fitted through the wooden pole with three spindles (M20 x 250) and six lock nuts with three washers making first contact with the pole.
- c) Insulators shall be mounted in either a Delta configuration or horizontal configuration with the post insulators all mounted 600mm apart and 200mm from the top at the pole.
- d) Insulator spindles to be connected with steel earth wire that is wound around the top of the wooden pole attached to the pole with a coach screw underneath the bottom insulator.
- e) Use only PG Clamps (Parallel groove) connectors with two bolts for connecting or tapping of aluminum conductor.

Note: See for assembly guidance Drawing D-DT-1733, 1734, 1745, 1783

#### 34. LOW VOLTAGE CABLES

A number of LV cables currently fed from the old substation building LV panel shall be changed over to the new miniature substation.

The services fed by these old cables shall be identified, the cable size identified and communicated through to the Engineer.

### **C3.3 Project Specification Civil Works**

#### **DETAILED SCOPE OF WORKS**

The work to be done on this contract comprises the following:

##### **CIVIL**

The supply of all necessary materials, equipment and labour to complete the following work:

- a) The removal of the existing security fence.
- b) The clearing of the construction site of vegetation etc.
- c) The excavation for the earth mat, footings and cable trench footings for the new substation.
- d) The construction of a new substation.
- e) The supply and installation of cable racking etc. in the cable trenches.
- f) The construction of a new security fence complete with swing gates.
- g) The construction of kerbing around the perimeter of the security fence.
- h) The placing of crushed stone layer inside of kerbing.

##### **STEELWORK**

The supply of all necessary materials, equipment and labour to complete the following work:

- a) The manufacture and supply of trench rails and covers.
- b) The manufacture and supply of protection angles for the doors and platform.
- c) The manufacture, supply and installation of handrailing.

##### **ELECTRICAL**

- a) Electrical work will be done by others.

##### **MATERIALS**

The Contractor will be responsible for the offloading of the material on site.

##### **DRAWINGS**

The above work shall be in accordance to the specifications and as detailed on the drawings listed on drawing no. SK3841/1

##### **WORKS SPECIFICATIONS**

##### **STANDARDS**

The following standard specifications will be applicable to this contract:

Health and Safety Act  
SANS 1200 A: General  
SANS 1200 C: Site Clearance  
SANS 1200 D: Earthworks  
SANS 1200 LC: Cable Ducts  
SANS 1200 ME Sub – base  
SANS 1200 MK: Kerbing & Channeling  
SANS 1200 H: Structural Steel  
SANS 1200 G: Concrete

##### **Drawings and Dimensions**

Refer any discrepancy between the various drawings directly to the Engineer for his decision.

All dimensions and levels affecting structural steelwork positioning and erection must be verified on site by the Contractor.

The Contractor shall be solely responsible for the correct fitting of the component parts, the positioning of anchor bolts, etc.

### **Cleaning of Steelwork**

Cleaning operations are to be done separately from painting operations.

### **Coating Application**

Paint may be applied by airless spray. Coatings must be spread evenly as visible marks will imply improper application.

### **Protection of Coating**

Exercise care when handling painted members to prevent damage to coated surfaces. Reduce handling to a minimum. Provide protective packing during transport and erection.

## **PAINTING**

All steelwork, where measured in the BOQ, shall be painted to the following specifications:

### *Sandblast*

All items to be painted shall be sandblasted to the Swedish Standard SA 2½. There shall not be more than 2½ % of the mill scale present on any item after it has been sandblasted.

### **Painting of steelwork**

#### Primer

Apply Plascon Zinc Phosphate Primer Red Oxide UC 207 by airless spray.

Dry film thickness	75 micron
Drying time	16 hours @ 23°C

#### Intermediate coating

Apply Plascon Wall and All by airless spray.

Dry film thickness	75 microns
Drying time	2 hours 23°C

#### Final coat

Apply Plascon Wall and All finish by airless spray.

Dry film thickness	40 microns
Colour	

General steelwork: 5<sup>th</sup> Avenue (WAA86)

Colour	Handrailing	Golden Yellow B49 & Black
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## **REPAIRS TO PAINT**

Degrease or derust damaged areas, feather the surrounding paintwork for a distance of approximately 20 mm and repaint.

## **SPECIFICATION FOR BRICKWORK**

### **Sand (SANS 1090)**



Sand to be washed and screened through a 3mm mesh, or as directed.

### **Lime**

Lime shall be hydrated bedding mortar lime complying with the requirements of SANS. Specification 523 - "Limes for use in Building" and shall be freshly burnt when brought on to the works.

### **Cement**

Cement to be ordinary Portland cement to SANS 471 and manufactured in South-Africa.

### **Mixing Platforms**

All mortar shall be mixed on a level, non-absorbent and close-jointed timber or iron platform. Platforms are to be kept clean and old mortar removed before any new batch of mortar is prepared for mixing.

### **Cement Mortar**

Cement mortar, unless otherwise described, shall be composed of five parts by volume of sand and one part of volume of Portland Cement. The materials are to be mixed dry until the mixture is uniform in colour and then clean water is to be added gradually through a fine rose and the mixture turned over until the ingredients are thoroughly incorporated.

Cement mortar is to be mixed in small quantities and must be used within one hour of mixing as no cement that has once commenced to set, will be allowed to be used.

### **Lime Mortar**

Lime mortar shall be composed of three parts by volume of sand to one part by volume of lime, mixed as above described for cement mortar. All lime mortar is to be mixed at least seven days before it is required for use and is to be kept damp with wet sacks.

### **Compo Mortar**

Compo mortar shall be composed of four parts by volume of sand to one part by volume of lime, mixed as above described for cement mortar. Immediately before use, one part by volume of Portland Cement is to be added to 12 parts by volume of the first mixture, the whole being remixed with the addition of extra water. Compo mortar is to be mixed in small quantities as previously described for cement mortar.

### **Bricks Generally**

The bricks for foundations are to be Corobrick NFX Bricks and are to be approved before use.

### **Facing Bricks**

Facing bricks are to be Corobrick Montana Travertine, and are to be approved before use. The contractor shall present samples for approval by client.

Particular care must be taken to preserve arises and faces of bricks during transit and handling.

### **Brickwork**

Where practicable, brickwork is to be built in English Bond. No false headers are to be used and none but whole bricks used, except where legitimately required to form bond.

All bricks to be well-soaked in water before laying and the course of bricks last laid is to be well-watered before laying further bricks. Brickwork is to be kept wet for at least three days after laying.

All bricks are to be solidly bedded throughout the whole width of each course and every joint is to be filled with mortar.

Joints of brickwork are not to exceed 10mm thick.

Brickwork is to be carried up in regular heights so that no part is more than 1,5m higher than any adjoining part. Putlog holes are to be minimum 440mm clear of openings.

All walls, piers, etc., are to be built in level horizontal courses, true to the lines, plumb and true in the vertical plane.

All intersecting walls and partitions shall be properly bonded and secure at the intersections.

Joints of walls, where plastered or tiled, to be well raked out whilst the mortar is soft to form key for the plaster or mortar baking.

### **Hollow Walls**

Hollow brick walls are to be built in two skins with a cavity between and the two skins are to be tied together with 3,55mm galvanized mild steel bent and twisted wire ties of sufficient length to allow not less than 75mm of wash end to be built into brickwork and spaced five to the square metre, unless otherwise described and equal in all respects to the Butterfly Type or the Modified P.W.D. type wall tie as specified in SANS. Specification No. 28 - "Metal Ties for Cavity Walls".

The cavities of hollow walls are to be formed from at least one course of brickwork below the damp-proof course level and are to rise up without interruption except where openings occur.

Where door, window, or other openings occur, the cavities are to be stopped 110mm back from reveals with outer or external thickness returned and stopped against the inner thickness and not bonded to same. A 110mm wide strip of damp-proof sheeting is to be built in between the two thicknesses in the joint formed by the return and the inner thickness.

Cills to windows may be bridged over the cavity but must stop against the inner thickness with strips of damp-proof sheeting inserted between the inner thickness of wall and the bridging for cills.

Lintols unless otherwise specified over openings are to be in two thicknesses with outer thickness bridging the cavity space and with damp-proof sheeting between the two thicknesses to correspond with reveals but to the full depth of lintol.

The top courses forming wall head is to be built in solid brickwork for extent as specified, properly bonded over the two thicknesses to close the top of cavity and the cavity formed in the walling is not to be ventilated.

### **Beam Filling**

Where applicable half brick filling to external walls must be cut between the roof timbers and must be carried hard up to the underside of the roof covering and flushed up in cement mortar.

### **Damp-Proof Courses**

Unless otherwise described, horizontal damp-proof courses shall be of asphaltic sheeting, complying with the requirements for "Type B", as specified in SANS. Specification 952-1985 "Damp-proof Courses". Damp proof courses may also be polyethylene 250micron thickness.

The damp-proof course shall be the full thickness of walls above foundations and shall be laid without longitudinal joints. Laps at end joints shall be 150mm and at angles and passings, the full thickness of the walls. All laps shall be sealed in hot pure bitumen. All damp-proofing is to be stopped 10mm back from the external wall face and is to be pointed in 3:1 cement mortar.

### **Face Brickwork To Be Aligned with Plaster**

Unless otherwise described or shown on drawings, wherever face brickwork abuts on plastered surfaces, the face brickwork is to be built proud of stock brickwork to allow the face work to line up flush with plaster finish. The Contractor is to study the plans carefully to ascertain the levels at which brickwork will differ in thickness

### **Protection and Cleaning Down of Brickwork, Etc.**

External corners and arises of face brickwork, reveals, steps, etc., which are likely to be damaged during the course of the work, to be suitably covered and protected from injury, and all damaged work is to be made good to the approval of the Architect at the Contractor's own expense.

Face brickwork, brick and tile window cills, copings, etc., must be cleaned down as the work proceeds and any surfaces likely to be damaged by plaster and mortar during the course of the work, and must be covered with paper or other suitable means. On completion of the work, these protective coverings must be removed. The surfaces must once again be cleaned and left in a perfect condition to the entire satisfaction of the client.

Cleaning materials used to clean face brickwork, etc., must be such as will in no way harm or damage the adjoining paint or other finishes.

All tile, brick and similar pavings must be cleaned immediately after laying and all signs of mortar, cement dust, etc., must be removed from the surface and the surface must thereafter be suitably protected from staining until the completion of the work.

### **Reinforced Brick Lintols**

Where brick lintols are shown on the drawings or specified, they are to be built in sound, hard, well-burnt bricks, in 3:1 cement mortar, having depth and reinforcement as indicated in the schedule unless otherwise specially detailed on the drawings.

In all cases the full depth and thickness of the lintol must be built solid and joints bedded solid throughout and if exposed to weather, a continuous damp-proof course is to be inserted to cover the top of the lintol. This must be built into the outer skin of the wall immediately above the lintol, raked up one course and then carried through the inner skin. Lintols, except where built over pressed steel door frames and the like, must be built upon rigid temporary centering which is to remain in position for 14 days after completion of the lintol. The steel reinforcement to brick lintols is to be standard high tensile steel wire welded brick reinforcement fabric of the type indicated. It must be straight and continuous along the full length of the lintol and evenly spaced across its thickness in the first horizontal brick joint above the soffit in face brickwork and in the next higher course or courses when indicated in the schedule and is to extend a minimum of 440mm beyond the opening at each end.

The length of the lintol shall be taken as the full width of the opening plus bearing on each side equal to one third of the span. Where this bearing cannot be obtained due to the proximity of the next opening, the lintol shall be continuous over both openings.

Reinforced brick lintols shall be as per Engineers design.

### **Brick Reinforcement to Half Brick Walls**

All half brick walls are to be reinforced with brickwork reinforcement as described. Full height walls bonded to cross walls are to be reinforced with one run of brickwork reinforcement every eight courses, interrupted only by openings, and built at least 110mm into cross walls. Screen walls with one or both ends unsupported are to be reinforced with one run of brickwork reinforcement every four courses.

### **Quarry Tiles**

All quarry tiles to be approved quality, manufactured in the Republic of South Africa, even in thickness, truly square, free from cracks, twists and blemishes and uniform in colour. All tiles are to be well-wetted before being laid.

### **Cleaning Off**

Face brickwork, fair face brickwork, quarry tiles, etc. shall be kept clean as the work proceeds and at completion they shall be cleaned down with spirits of salts and water, or other approved cleaning material.

## **WATERPROOFING**

### **Generally**

All waterproofing, etc. (except damp-proof courses to brick walls) shall be executed by approved specialists, under written guarantees, which shall be deposited with the client before work is commenced.

Butyl rubber sheet, chloroprene rubber sheet and polyethylene sheet for waterproofing shall comply with SANS 187, SANS 580 and SANS 952 respectively

#### **C4 SITE INFORMATION**

1. The site are located in Carnarvon in the Northern Cape.
2. No geotechnical test were done on site to determine the nature of the ground.
3. Contractor must however inspect the site, their surroundings and available in connection therewith and make themselves thoroughly acquainted with the nature of:
  - a. The form and nature of the site and its surroundings.
  - b. The hydrological and climatic conditions. The means of access to the sites and the accommodation required.
  - c. Location and cost associated with red soil.
  - d. Location and costs of dumping excavated material. Allow for 20km (round trip) for dumping at Municipal approved dumping site.

## **ADDENDUMS**

Addendum A	BILL OF QUANTITIES
Addendum B	MINIATURE SUBSTATION
Addendum C	DETAILS
Addendum D	DRAWINGS
Addendum E	OHS SPECIFICATION
Addendum F	STANDARD CONDITIONS OF TENDER
Addendum G	LOCAL CONTENT DECLARATION: SUMMARY SCHEDULE
Addendum H	ESKOM D-DT-5240

## **ADDENDUM A – BILL OF QUANTITIES**

## **ADDENDUM B – MINIATURE SUBSTATION**



## **ADDENDUM C – DETAILS**

## **ADDENDUM D – DRAWINGS**

## **ADDENDUM E – OHS SPECIFICATION**

**ADDENDUM F – STANDARD CONDITIONS OF TENDER**

**ADDENDUM G – LOCAL CONTENT DECLARATION:  
SUMMARY SCHEDULE**

## **ADDENDUM H – ESKOM D-DT-5240**