TRANSNET

TRANSNET SOC LIMITED
(REGISTRATION NO.1990/000900/30)
TRADING AS
TRANSNET FREIGHT RAIL

NEC3 Engineering & Construction Short Contract (ECSC)

RFQ No. ERAC NS1099 11772CIDB

THE DESIGN, MANUFACTURE, SUPPLY, INSTALL, TEST AND COMMISSION OF PCB CONTROL PANELS AT TURFGROND 25KV AC SUBSTATION UNDER THE CONTROL OF THE DEPOT ENGINEER, KOEDOESPOORT

Opens on:	Thursday, 12 September 2013
Closing date:	Tuesday, 1st October 2013 (10h00)
Validity date:	90 days (31st December 2013)

TRANSNET
freight rail

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Addendum No. 1 to the Tender Notice and Invitation to Tender

PART T1: TENDERING PROCEDURES

T1.1 TENDER NOTICE AND INVITATION TO TENDER

RFQ No. ERAC NS1099 11772CIDB

Transnet SOC Limited trading as Transnet Freight Rail invites tenders for the design, manufacture, supply, install, test and commission of PCB control panels at Turfgrond 25kV AC traction substation under the control of the Depot Engineer, Koedoespoort.

Tenderers should have a CIDB contractor grading designation of 3EP or higher.

The physical address for collection of tender documents is: Transnet Freight Rail, Tender Advice Centre, Ground Floor, Inyanda House 1, 21 Wellington Road, Parktown.

Tender documents may be collected during working hours after **08h00** on Thursday, **12th September 2013** and will only be available until **15h00** on Wednesday, **18th September 2013.**

On payment of an amount of **R150.00** (per set), which is not refundable to be made to Transnet Freight Rail at the Standard Bank, account number **203158598**, branch code **004805,** reference no. RFQ No. **ERAC NS1099 11772CIDB**. The official Bank receipt(s) franked with the official Bank stamp to be provided with the collection of a tender document. No tenders will be sold after **15h00** on Wednesday, **18th September 2013** deadline.

Queries relating to the administrative issues of these documents may be addressed to:
Mr. Nico Swart
Tel. No. 012 315 3083
Fax. No. 012 315 2138
E-mail: Nico.swart3@transnet.net

A compulsory clarification meeting with representatives of the Employer will take place on Thursday, 19th September 2013, at **13h00** in the Jacaranda Boardroom, third floor, NZASM Building, c/o Paul Kruger and Minnaar streets, Pretoria. (Contact person: Nico Swart on tel. 012 315 3083 or Boitumelo Moloko tel. 012 842 5581 (Phillip Mokobake cell. 083 275 7148). The site will be visited after the briefing session. Tenderers without a valid tender document in their possession will not be allowed to attend this compulsory clarification meeting/site inspection. Tenderers shall be responsible for their own travel arrangements and cost regarding the site meeting and site inspections. (Tenderers to wear a safety vest and boots when visiting the site).

Transnet reserves the right to accept the whole or any part of a tender. Transnet also reserves the right to negotiate terms and conditions with all, or a short-listed group of contenders, or the preferred tenderer, should it be deemed necessary.

This tender closes punctually at 10h00 on Tuesday, 1st October 2013.

Tenders may only be submitted on the tender documentation that is issued. Telegraphic, telephonic, facsimile and late tenders will not be accepted. Tenderers are warned that a tender will be liable to disqualification should any attempt be made by a Tenderer either directly or indirectly to canvass any officer(s) or employees of Transnet SOC Limited in respect of a tender between the

date the tender is submitted and the date of the award. A Tenderer may, however, at any time communicate with the Chairperson of the Transnet Freight Rail Acquisition Council, at telephone no. 011 5449486 on any matter relating to his tender.

Envelopes must not contain documents relating to any tender other than that shown on the envelope. *No slips are to be attached to the tender documents. Any additional conditions must be embodied in an accompanying letter. Alterations, additions or deletions must not be made by the Tenderer to the actual tender documents.* Tenders submitted by Tenderers must be neatly bound and the inclusion of loose documents must be avoided.

Requirements for sealing, addressing, delivery, opening and assessment of tenders are stated in the Tender Data.

Compliance of tender(s) with Transnet's requirements is the sole responsibility of the Tenderer and any costs incurred in subsequent modifications to or replacement of equipment accepted by Transnet Limited in good faith on the grounds of certified compliance with specified standards by the contractor and in fact found to be inadequate in such respects, will be to the relevant Tenderer's account.

BROAD-BASED BLACK ECONOMIC EMPOWERMENT AND SOCIO-ECONOMIC OBLIGATIONS

Transnet fully endorses and supports the Government's Broad-Based Black Economic Empowerment Programme and it is strongly of the opinion that all South African business enterprises have an equal obligation to redress the imbalances of the past.

Transnet would therefore prefer to do business with enterprises who share these same values and who are prepared to contribute to meaningful B-BBEE initiatives [including, but not limited to subcontracting and Joint Ventures] as part of their tendered responses. All procurement transactions will be evaluated accordingly.

The Department of Trade and Industry [**DTI**] is currently in the process of reviewing the B-BBEE Codes of Good Practice [Code Series 000]. Transnet reserves the right to amend this RFQ in line with such reviews and/or amendments once they have come into effect. Transnet furthermore reserves the right to adjust the thresholds and evaluation processes to be aligned with such changes which may be issued by the DTI after the issue date of this RFQ.

B-BBEE Scorecard and Rating

As prescribed in terms of the Preferential Procurement Policy Framework Act (PPPFA), Act 5 of 2000 and its Regulations, Respondents are to note the following:

- Phase 1 is included as a pre-qualification stage with a prescribed percentage threshold.
- Quotations will be evaluated on price which will be allocated 80 or 90 points and preference which will be allocated 20 or 10 points, depending on the value of the Services.
- The 80/20 preference point system applies where the acquisition of the Services will be less than R1 000 000.00.
- The 90/10 preference point system applies where the acquisition of the Services will exceed R1 000 000.00.

When Transnet invites prospective suppliers to submit Quotations for its various expenditure programmes, it requires Respondents *[Large Enterprises and QSE's - see below]* to have their B-BBEE status verified in compliance with the Government Gazette No 34612, Notice No. 754 dated 23 September 2011. Valid B-BBEE Verification Certificates must be issued by:

- Verification Agencies accredited by the South African National Accreditation System [**SANAS**]; or
- Registered Auditors approved by the Independent Regulatory Board of Auditors [**IRBA**], in accordance with the approval granted by the Department of Trade and Industry.

A Verification Certificate issued must reflect the weighted points attained by the measured entity for each element of the scorecard as well as the overall B-BBEE rating.

Enterprises will be rated by Verification Agencies or Registered Auditors based on the following:

a) **Large Enterprises** [i.e. annual turnover greater than R35 million]:
   - Rating level based on all seven elements of the B-BBEE scorecard

b) **Qualifying Small Enterprises – QSE** [i.e. annual turnover between R5 million and R35 million]:
   - Rating based on any four of the elements of the B-BBEE scorecard

c) **Exempted Micro Enterprises – EME** [i.e. annual turnover less than R5 million]:
   - In accordance with B-BBEE Codes of Good Practice [Statement 000, Section 4], any enterprise with annual total revenue of R5 million or less qualifies as an EME.
   - Automatic rating of B-BBEE Level 4 irrespective of race or ownership
   - Black[1] ownership greater than 50% or Black Women ownership greater than 50% automatically qualify as B-BBEE Level 3

Sufficient evidence to qualify as an EME would be a certificate [which may be in the form of a letter] from an auditor, accounting officer or a Verification Agency accredited by SANAS. The certificate must confirm the company's turnover, Black ownership / Black female ownership and B-BBEE status level.

Respondents are required to furnish proof of the above to Transnet. [i.e. a detailed scorecard as stipulated above in respect of Large Enterprises and QSEs, or a certificate in respect of EMEs].

In this tender, Transnet will accordingly allocate a maximum of **10/20 [ten/twenty] points** in accordance with the **80/20 / 90/10** preference point system prescribed in the Preferential Procurement Policy Framework Act (PPPFA), Act 5 of 2000 and its Regulations to the Respondent's final score based on an entity's B-BBEE scorecard rating.

N.B. Failure to submit a B-BBEE certificate, which is valid as at the Closing Date of this RFQ, will result in a score of zero being allocated for B-BBEE.

Turnover: Kindly indicate your entity's annual turnover for the past year:
R_____

[1] ***Black*** *means South African Blacks , Coloureds and Indians, as defined in the B-BBEE Act, 53 of 2003*

d) **B-BBEE Joint Ventures, Consortiums and/or Subcontractors**

In addition to the above, Respondents who would wish to enter into a Joint Venture [**JV**] or consortium with, or subcontract portions of the contract to, B-BBEE entities, must state in their RFQs the percentage of the total contract value that would be allocated to such B-BBEE entities, should they be successful in being awarded any business. A valid B-BBEE Verification Certificate in respect of such B-BBEE JV or consortium partners and/or subcontractor(s), as well as a breakdown of the distribution of the aforementioned percentage must also be furnished with the RFQ Bid to enable Transnet to evaluate in accordance with the processes outlined in the B-BBEE Preference Points Claim Form..

e) **JVs or Consortiums**

If contemplating a JV or consortium, Respondents should also submit a signed JV or consortium agreement between the parties clearly stating the percentage [%] split of business and the associated responsibilities of each party. If such a JV or consortium agreement is unavailable, the partners must submit confirmation in writing of their intention to enter into a JV or consortium agreement should they be awarded business by Transnet through this RFQ process. This written confirmation must clearly indicate the percentage [%] split of business and the responsibilities of each party. In such cases, award of business will only take place once a signed copy of a JV or consortium agreement is submitted to Transnet.

(i) Incorporated JVs/Consortiums

As part of an incorporated JV/consortium's Bid response, the incorporated JV/consortium must submit a valid B-BBEE Verification Certificate in its registered name.

(ii) Unincorporated JVs/Consortiums

As part of an unincorporated JV/consortium's tendered response, the unincorporated JV/consortium must submit a consolidated B-BBEE certificate as if it was a group structure and such scorecard must have been prepared for this RFQ in particular.

N.B. Failure to submit a B-BBEE certificate in respect of the JV or Consortium, which is valid as at the Closing Date of this RFQ, will result in a score of zero being allocated for B-BBEE.

f) **Subcontracting**

If contemplating subcontracting, please note that a Respondent will not be awarded points for B-BBEE if it is indicated in its Quotation that such Respondent intends subcontracting more than 25% [twenty-five per cent] of the value of the contract to an entity that does not qualify for at least the same points that the Respondent qualifies for, unless the intended subcontractor is an EME with the capability to execute the contract.

g) A person awarded a contract may not subcontract more than 25% [twenty-five per cent] of the value of the contract to any other enterprise that does not have an equal or higher B-BBEE status level than the person concerned, unless the contract is subcontracted to an EME that has the capability and ability to execute the subcontract.

h) **B-BBEE Registration**

In addition to the Verification Certificate, Transnet recommends that Respondents register their B-BBEE compliance and supporting documentation on the Department of Trade and

Industry's [**DTI**] National B-BBEE IT Portal and Opportunities Network and provide Transnet with proof of registration in the form of an official B-BBEE Profile issued by the DTI.

Transnet would wish to use the DTI B-BBEE IT Portal as a data source for tracking B-BBEE compliance.

For instructions to register and obtain a DTI B-BBEE Profile go to http://bee.thedti.gov.za.

i) ***N.B. Failure to submit a B-BBEE certificate, which is valid as at the Closing Date of this RFQ, will result in a score of zero being allocated for B-BBEE.***

j) Transnet invites its valued suppliers to report any allegations of fraud, corruption or other unethical activities to Transnet Tip-offs Anonymous, at any of the following addresses/contract numbers :-

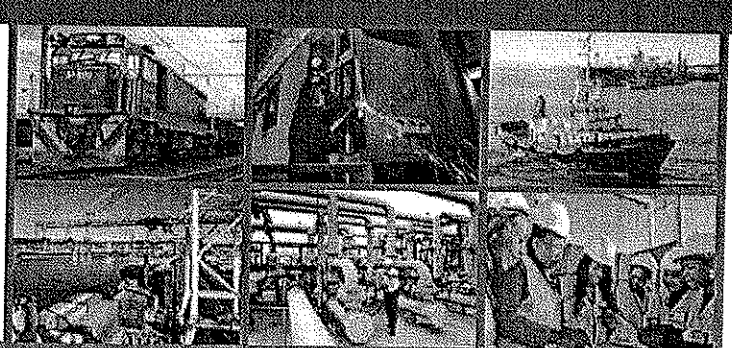
- **Toll free anonymous hotline – 0800 003 056**
- **Email – Transnet@tip-offs.com**
- **Fax number – 0800 007 788**
- **Freepost DN 298, Umhlanga Rocks, 4320**

CONFIDENTIALITY IS GUARANTEED.

TRANSNET

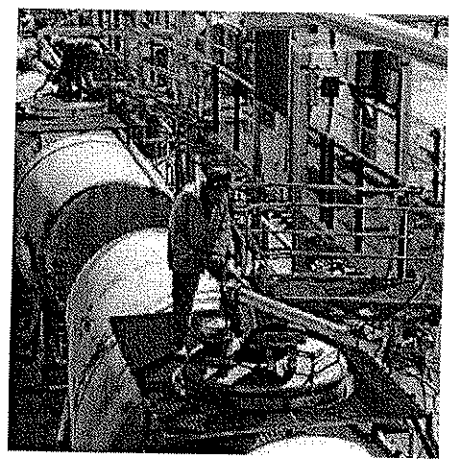
delivering on our commitment ***to you***

Suppliers Code of Conduct



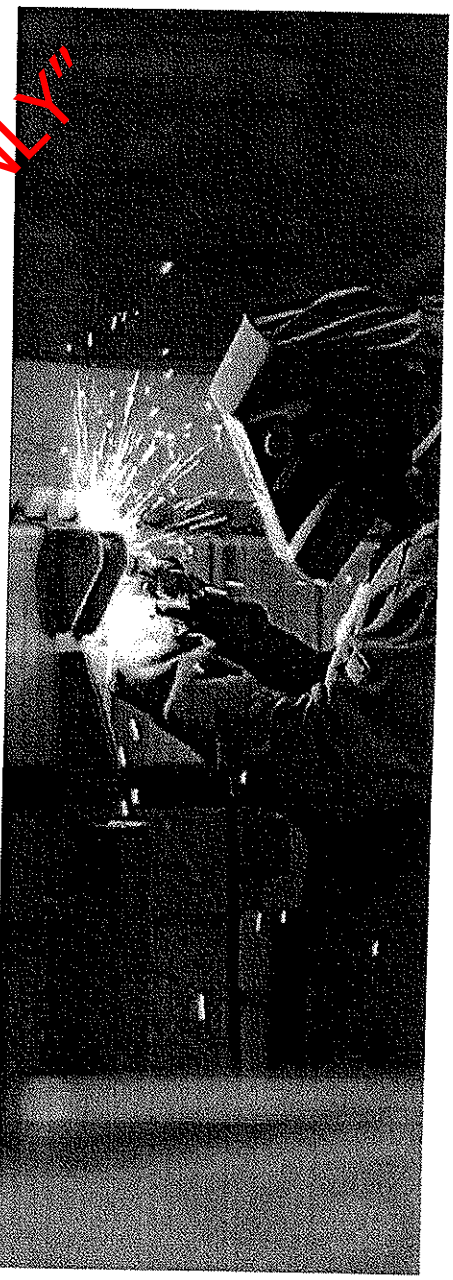
Suppliers Code of Conduct

Transnet aims to achieve the best value for money when buying or selling goods and obtaining services. This, however, must be done in an open and fair manner that supports and drives a competitive economy. Underpinning our process are several acts and policies that any supplier dealing with Transnet must understand and support.



These are:

- Transnet Procurement Policy - A guide for tenderers;
- Section 217 of the Constitution - the five pillars of Public PSCM (Procurement and Supply Chain Management): fair, equitable, transparent, competitive and cost effective;
- The Public Finance Management Act (PFMA);
- The Broad Based Black Economic Empowerment Act (BBBEE); and
- The Anti-Corruption Act.



This code of conduct has been compiled to formally apprise Transnet Suppliers of Transnet's expectations regarding behaviour and conduct of its Suppliers.

Prohibition of Bribes, Kickbacks, Unlawful Payments, and Other Corrupt Practices

Transnet is in the process of transforming itself into a self-sustaining State Owned Enterprise, actively competing in the logistics industry. Our aim is to become a world class, profitable, logistics organisation. As such, our transformation is focused on adopting a performance culture and to adopt behaviours that will enable this transformation.

Transnet will not participate in corrupt practices. Therefore, it expects its suppliers to act in a similar manner.

- Transnet and its employees will follow the laws of this country and keep accurate business records that reflect actual transactions with, and payments to, our suppliers.

>> Employees must not accept or request money or anything of value, directly or indirectly, from suppliers.

Employees may not recieve anything that is calculated to:

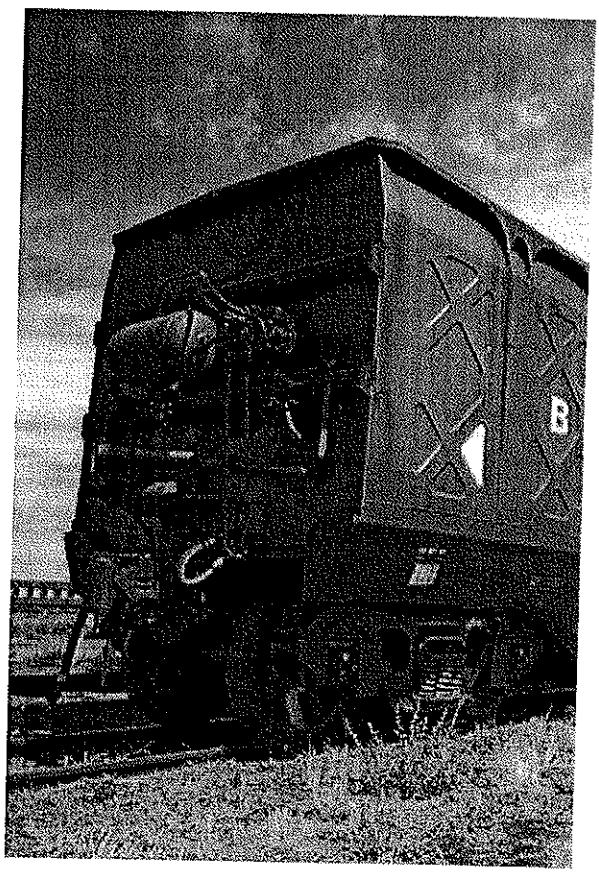
- Illegally influence their judgement or conduct or to influence the outcome of a sourcing activity;
- Win or retain business or to influence any act or decision of any person involved in sourcing decisions; gain an improper advantage.

>> There may be times when a supplier is confronted with fraudulent or corrupt behaviour of Transnet employees. We expect our suppliers to use our "Tip-offs Anonymous" Hotline to report these acts - 0800 003 056.

Transnet is firmly committed to free and competitive enterprise.

>> Suppliers are expected to comply with all applicable laws and regulations regarding fair competition and antitrust practices

>> Transnet does not engage non-value adding agents or representatives solely for the purpose of increasing BBBEE spend (fronting).

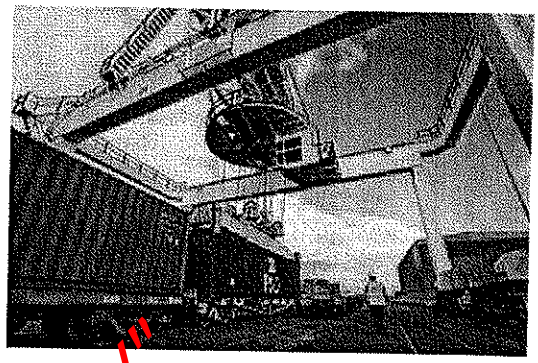


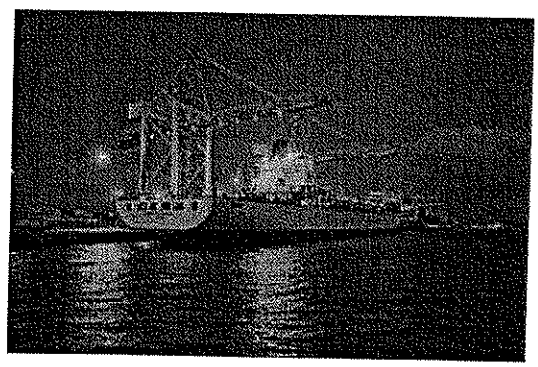
Transnet's relationship with suppliers requires us to clearly define requirements, to exchange information and share mutual benefits.

>> Generally, suppliers have their own business standards and regulations. Although Transnet cannot control the actions of our suppliers, we will not tolerate any illegal activities.

These include, but are not limited to:

- Misrepresentation of their product (origin of manufacture, specifications, intellectual property rights, etc);
- Collusion;
- Failure to disclose accurate information required during the sourcing activity (ownership financial situation, BBBEE status, etc.);
- Corrupt activities listed above; and harassment, intimidation or other aggressive actions towards Transnet employees.





>> Suppliers must be evaluated and approved before any materials, components, products or services are purchased from them. Rigorous due diligence must be conducted and the supplier is expected to participate in an honest and straight forward manner.

>> Suppliers must record and report facts accurately, honestly and objectively. Financial records must be accurate in all material respects.

Conflict of Interest

A conflict of interest arises when personal interests or activities influence (or appear to influence) the ability to act in the best interests of Transnet. Examples are:

>> Doing business with family members.

>> Having a financial interest in another company in our industry.

Show that you support good business practice by logging onto www.transnet-suppliers.net and completing the form.

This will allow us to confirm that you have received, and agree to, the terms and conditions set out in our Suppliers Code of Conduct.

TIP-OFFS ANONYMOUS HOTLINE

0800 003 056

Part T1.2: Tender Data

T1.2 TENDER DATA

The conditions of tender are the Standard Conditions of Tender as contained in Annexure F of the CIDB Standard for Uniformity in Construction Procurement. (See www.cidb.org.za) The Standard Conditions of Tender make several references to the Tender Data for details that apply specifically to this tender. The Tender Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the standard conditions of tender. Each item of data given below is cross-referenced to the clause in the Standard Conditions of Tender to which it mainly applies.

F.1.1 The employer is **Transnet SOC Limited trading as Transnet Freight Rail.**

F.1.2 The tender documents issued by the employer comprise:

Part T1: Tendering procedure
T1.1 Tender notice and invitation to tender
- Suppliers Code of Conduct

T1.2 Tender data

Part T2: Returnable documents
T2.1 List of returnable documents
T2.2 Returnable Schedules

Part C1: Agreements and contract data
C1.1 Contract Data: General
C1.2 Contract data: The Tenderer's Offer and Acceptance
C1.3 Contract Data: Works Information

Part C2: Pricing data
C2.1 Pricing instructions
C2.2 Price list

Part C3: Scope of work
C3.1 Works Information
C3.2 Secondary specifications
C3.3 General Specifications

Part C4: Site information
C4 Site information
- Principal Controlled insurance

F.1.4 The employer's agent is:

Name: Phillip Mokobake
Address: Depot Engineer, Infrastructure Engineering, Koedoespoort
Tel: 012 842 5098
Cell. 083 275 7148
E-mail: Phillip.mokobake@transnet.net

F.2.1.1 The following Tenderers who are registered with the CIDB, or are capable of being so prior to the evaluation of submissions, in a Tenderer grading designation equal to or higher than a Tenderer grading designation determined in accordance with the sum tendered for a **3EP** class of construction work, are eligible to submit tenders.

F.2.7 The arrangements for a compulsory clarification meeting are as stated in the Tender Notice and Invitation to Tender. Tenderers must sign the attendance list in the name of the tendering entity. Addenda will be issued to and tenders will be received only from those tendering entities appearing on the attendance list.

F.2.12 If a Tenderer wishes to submit an alternative tender offer, the only criteria permitted for such alternative tender offer is that it demonstrably satisfies the Employer's standards and requirements, the details of which may be obtained from the Employer's Agent.

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

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

The modified Pricing Data must include an amount equal to 5% of the amount tendered for the alternative offer to cover the Employer's costs of confirming the acceptability of the detailed design before it is constructedNo alternative tender offers will be considered.

F.2.13.2 Return all returnable documents to the employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing in black ink.

F.2.13.3 Parts of the tender offer communicated on paper shall be submitted as an original, plus one copy.

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

If posted, the envelope must be addressed to:

The Chairperson
Transnet Freight Rail Acquisition Council
P.O. Box 4244
JOHANNESBURG
2000

and must be dispatched in time for sorting by the Post Office to reach the Post Office Box indicated above, before the closing time of the tender.

If delivered by hand, to be deposited to the Transnet Freight Rail Acquisition Council tender box which is located in the foyer, and to be addressed as follows:

The Chairperson
Transnet Freight Rail Acquisition Council
Ground Floor, Inyanda House
21 Wellington Road
Park Town
JOHANNESBURG
2001

It should also be noted that the above tender box is accessible to the public 24 hours per day, 7 days a week.

The measurements of the "tender slot" are 500mm wide x 100mm high, and Tenderers must please ensure that tender documents/files are not larger than the above dimensions. Tenders, which are too bulky (i.e. more than 100mm thick) must be split into two or more files, and placed in separate envelopes.

Identification details

Tenders must be submitted before the closing hour on the date as shown in F.2.15 below, and must be enclosed in a sealed envelope which must have inscribed on the outside:
(a) Tender No
(b) Description of work
(c) Closing date of tender

F.2.13.6 A two-envelope procedure will not be followed.

F.2.15 The closing time for submission of tender offers is as stated in the Tender Notice and Invitation to Tender.

F.2.15 Telephonic, telegraphic, telex, facsimile or e-mailed tender offers will not be accepted.

F.2.16 The tender offer validity period is **12 weeks (19th December 2013)**

F.2.19 Access shall be provided for the following inspections, tests and analysis:
Inspection of current arrangement foundation and steelwork condition and measurements in substation yards during the tender period after the site meeting and prior to the closing date of tender.

F.3 The Tenderer is required to submit with his tender:
Either a Certificate of 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) and an original valid Tax Clearance Certificate issued by the South African Revenue Services.

F.3.4 The time and location for opening of the tender offers are:
Time:. **10:00** on the closing date of tender.
Location: **Transnet Freight Rail Acquisition Council, Ground Floor, Inyanda House, 21 Wellington Road, Park Town, JOHANNESBURG**

F.3.11.1 The procedure for the evaluation of responsive tenders is Method 2.
Insert where Method 2 (Financial Offer and Preferences) is used to evaluate tender offers.

The financial offer will be scored using Formula 2 (option 1) where the value of W_1 is:

1) 90 where the financial value excluding of VAT of all responsive tenders received have a value in excess of R1,000,000; or
2) 80 where the financial value excluding of VAT of one or more responsive tender offers equals or is less than R1,000,000.

Up to 100 minus W_1 tender evaluation points will be awarded to tenderers who complete the preferencing schedule and who are found to be eligible for the preference claimed.

F.3.11.3 Only those Tenderers who score a minimum score of **60** points in respect of the following quality criteria are eligible to submit tenders. **(Phase 2)**.

Description of quality criteria and sub criteria			**Maximum number of tender evaluation points**
	Weight	Sub weight	Effective weight
Health, risk and safety plan relevant to scope of works	**100**	%	
echnical capacity / resources		%	
Experience in the relevant field		%	
Total evaluation points for quality (W_Q)			**100**

Criteria to be evaluated on the following scales as per CIDB BEST PRACTICE GUIDELINES #A4:

a) Poor = 20
Satisfactory = 40
Good = 60
Very good = 80
Excellent = 100

F.3.13.1 Tender offers will only be accepted if:

a) The Tenderer has in his or her possession an original valid Tax Clearance Certificate issued by the South African Revenue Services or has made arrangements to meet outstanding tax obligations.
b) The Tenderer is registered with the Construction Industry Development Board in an appropriate Tenderer grading designation;
c) The Tenderer or any of its directors is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector.
d) The Tenderer has not:
   i) abused the Employer's Supply Chain Management System; or
   ii) failed to perform on any previous contract and has been given a written notice to this effect; and
e) has completed the Compulsory Enterprise Questionnaire and there are no conflicts of interest which may impact on the Tenderer's ability to perform the contract in the best interests of the employer or potentially compromise the tender process.

f) A clause by clause statement of compliance to the General Conditions of Contract (NECSC3), the Works Information, the particular specification, all technical specifications and the general specifications.

F.3.18 The number of paper copies of the signed contract to be provided by the employer is **one**.

Additional tender conditions:

1. The Tenderer is deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the *works* and of the prices stated in the priced Activity Schedule in the *works* Information. The rates and prices (except in so far as otherwise provided in the Tender) collectively cover full payment for the discharge of all his obligations under the Contract and all matters and things necessary for the proper completion of the *works*.

2 The tenders shall be completed in black ink only.

2.1 Tenderers shall duly fill in the attached Price list. Items not reflected in the 'Price list, but covered in the particular specification or agreed at site meetings, shall be added to the Price list by the Tenderer and quoted for accordingly.

2.2 Tenderers shall submit qualifications of staff that will be performing the works. Only qualified technical personnel shall perform the works on the electrical equipment or installations thereof.

2.3 During the duration of the contract, the successful Tenderer shall be required to inform the Deputy of any staff changes and provide the qualifications of the replacement staff for approval.

2.4 ***The Tenderer shall provide a provisional Gantt or a similar bar chart showing when the works will be done and energised***. This chart shall be submitted with the tender submission on the closing date of the tender. Should a Tenderer be successful in winning a tender, a final bar chart shall be submitted within 14 days after the award of the contract to the employer by the successful Tenderer.

2.5 The Tenderer shall indicate how the work will be executed and commissioned. (Approach paper and Method Statement).

2.6 Where equipment offered does not comply with standards or publications referred to in the specification, Tenderers shall state which standards apply and submit a copy in English or certified translation.

2.7 Tenderers shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.

2.8 During the duration of the contract period, the successful Tenderer shall be required to inform the Employer / Deputy of any changes to equipment offered and submit detailed information on replacement equipment for approval prior to it being used on this contract.

2.9 Tenderer shall submit equipment type test certificates as specified on the contract. These shall be in English or certified translation.

2.10 The Tenderer shall supply a site diary and site instruction books, both books shall be of triplicates carbon copies.

2.11 During the duration of the contract, the successful Tenderer shall be required to inform the Supervisor of any staff changes and provide the qualifications of the replacement staff for approval.

3 Evaluation criteria of the tender to be met are:

3.1 Phase 1:

Will be a disqualifying phase and those that comply will progress to be competitively evaluated in Phase 2.

Minimum criteria for progressing from Phase 1 to Phase 2 are detailed below:

- An original or certified copy of a valid TAX clearance certificate.
- CIDB grading of **3EP or higher** to be met.
- Clause by clause statement of compliance to the following documents:
  - NEC ECSC General Conditions of Contract.
  - The Works Information, the Particular (project) specification and all technical (secondary) specifications
  - All general specifications (E4B, E4E, and the E7/1 specifications).
- Qualifications of the qualified electrician to be specified.

Clause by clause statement of compliance to General Conditions of Contract, all technical specifications and general specifications

Please take note:

- *Tenderers shall indicate clause-by-clause compliance with all the specifications. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance.*
- *Tenderers shall motivate a statement of non-compliance.*
- *Number the specifications according to the original tender document*
- *The head and sub-headings must be listed next to the specification number*
- *Indicate statement of compliance and motivate (give reasons for not complying)*
- *Indicate other statements which don't require compliance.*

Note: The committee will take decision to give an average score to companies who indicated their compliance but with short comings.

3.2 Phase 2; Refer to clause F3.11.3 for the evaluation criteria of Phase 2.

Technical threshold of a minimum of 60 points to be obtained before a respondent may progress to the next evaluation stage, (Phase 3) i.e. 80/20 or 90/10 in respect of price and preference claimed as mentioned below:

- Health, Risk and Safety plan relevant to the scope of works
- Technical capacity / resources
- Experience in the relevant field

3.2.1 Risk/ Safety Plan

3.2.1.1 A detailed plan indicating how risks and safety will be managed in a site must have the following key points depending on project requirements:

a) Personal Protective Equipment
   - Full personal protective equipment

- Work suit
- Safety boots
- Safety gloves
- Safety goggles
- Safety harness
- Safety helmet

b) Safe working procedures and methods.

- Risk assessment
- A plan on how risk assessment will be conducted
- Procedures and methods to address the identified risks.
- Safe operating procedures.
- Task/job observations.
- Substance abuse testing

c) Project security

- Security risks identified.
- Access control

d) Incident management

- Substance abuse testing (Logbook and registers)
- Health and Safety
  1. Attach proof of medical surveillance of all employees.
  2. Evaluation certificate of employee's physical and psychological fitness

e) Education and training

- Induction training. (Safety talk)
- Site specific training.
- Certificate of competence
- SHE rep

3.2.2 **Technical Capacity/Resources**

3.2.2.1 The following criteria will be used to evaluate technical capacity and resources:

Availability of transport to site:

a Transportation for employees: Any mode of transport that is safe for transporting employees.

b Loading capacity (min requirement): 5 ton truck and van for tools.

Skilled and unskilled labour

a Provide CV's for skilled and unskilled labourers

b Supply qualification certificates for personnel with technical responsibilities.

Delivery period:

a) Approximate 6 months.

Phase 3: to be evaluated on 90/10 for price and preference claimed bid is >R1m but <=R2m.

All Respondents who obtained 60 points more for quality in phase 2 may be evaluated in phase 3. This score out of 60 has no influence in the score for Phase 3.

- Price.
- BBBEE

Weighted evaluation based on 80/20 or 90/10 preference point system:

Pricing and price basis [firm] - whilst not the sole factor for consideration, competitive pricing and overall level of unconditional discounts[1] will be critical

Transnet will utilise the following formula in its evaluation of Price:

$$PS = 80\left(1 - \frac{Pt - Pmin}{Pmin}\right) \quad \text{or} \quad PS = 90\left(1 - \frac{Pt - Pmin}{Pmin}\right)$$

Where:

Ps = Score for the Bid under consideration
Pt = Price of Bid under consideration
Pmin = Price of lowest acceptable Bid

4 DISCLAIMERS

Transnet is not committed to any course of action as a result of its issuance of this RFQ and/or its receipt of a Quotation in response to it. Please note that Transnet reserves the right to:

Modify the RFQ's goods / service(s) and request Respondents to re-bid on any changes;

- reject any Quotation which does not conform to instructions and specifications which are detailed herein;
- disqualify Quotations submitted after the stated submission deadline;
- not necessarily accept the lowest priced Quotation;
- reject all Quotations if it so decides;
- place an order in connection with this Quotation at any time after the RFQ's closing date;
- award only a portion of the proposed goods / service/s which are reflected in the scope of this RFQ;
- split the award of the order/s between more than one Supplier/Service Provider; or
- make no award at all.

Transnet reserves the right to lower the threshold for Technical by 10% [ten percent] if no Bidders pass the predetermined minimum threshold or if only one bidder passes the threshold. This right will be exercised in Transnet's sole discretion.

In addition, Transnet reserves the right to exclude any Respondent from the bidding process who has been convicted of a serious breach of law during the preceding 5 [five] years, including but not limited to breaches of the Competition Act 89 of 1998. Respondents are

required to indicate below whether or not they have been found guilty of a serious breach of law during the past 5 [five] years:

I/We _____ do hereby certify that *I/we* ***have/have not been*** found guilty during the preceding 5 [five] years of a serious breach of law, including but not limited to a breach of the Competition Act, 89 of 1998, by a court of law, tribunal or other administrative body. The type of breach that the Respondent is required to disclose excludes relatively minor offences or misdemeanours, e.g. traffic offences.

Where found guilty of such a serious breach, please disclose:

NATURE OF BREACH:

_____

_____

DATE OF BREACH:

_____

Furthermore, I/we acknowledge that Transnet SOC Ltd reserves the right to exclude any Respondent from the bidding process, should that person or entity have been found guilty of a serious breach of law, tribunal or regulatory obligation.

5 BBBEE status of company

Preference points will 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	8	16
4	5	12
5	4	8
6	3	6
7	2	4
8	1	2
Non-compliant contributor	0	0

Part T2: Returnable Documents

PART T2: RETURNABLE DOCUMENTS / SCHEDULES

T2.1 LIST OF RETURNABLE DOCUMENTS

The tenderer must complete the following returnable documents:

1.0 Returnable documents required for tender evaluation purposes

No	Returnable Documents
1	Letter of Good Standing with the Compensation Commissioner
2	Safety Plan and Fall Protection Plan in accordance with the Construction Regulations of 2003 and Transnet's E4E
3	Quality Assurance/control Plan
4	Environmental Management Plan
5	Certified copy of CIDB certification (**3EP or higher**)
6	Proposed Organization and Staffing
7	Certified Copy of Share Certificates CK1 & CK2
8	Certified Copy of Certificate of Incorporation and CM29 and CM9
9	Certified Copy of Identity Documents of Shareholders / Directors / Members (where applicable)
10	Original or certified cancelled cheque **OR** original or certified letter from the bank verifying banking details (with bank stamp and signature)
11	Current and original or certified Tax Clearance Certificate
12	Certified VAT registration certificate
13	A signed letter from the Accountant/Auditor confirming most recent annual turnover and percentage black ownership in the company **AND/OR** certified BBBEE certificate and scorecard from an accredited rating agency
14	Programme and method statement
15	Statement of compliance or non-compliance with all clauses to the General Conditions of Contract, the Works Information, the Particular Specification, all the Technical Specifications and all the General Specifications. The clause-by-clause statement of compliance shall take the form of a separate document listing all the clause numbers of all the above specifications indicating the individual statement of compliance or non-compliance. Tenderers shall motivate a statement of non-compliance.

T2.2 RETURNABLE SCHEDULES

The tenderer must complete the following returnable schedules:

2.0 Returnable Schedules required for tender evaluation purposes

No	Returnable schedules
1	Certificate of Attendance of Information Briefing Session or site inspection
2	Certificate of Authority for Signatory (Resolution by Board)
3	Schedule of Tenderers experience
4	Schedule of Subcontractors (where applicable)
5	Certificate of authority for joint ventures (where applicable)
6	Schedule of Plant and Equipment (Tools and Machinery)
7	Foreign Exchange Rate Information (where applicable)
8	Record of Addenda to Tender Document
9	Supplier declaration form Duly completed SDF (Supplier declaration form)
10	Compulsory enterprise Questionnaire
11	Approach paper, which responds to the proposed scope of works.
12	Experience of Key Staff in the form of Curriculum Vitae
13	Transnet SOC limited contractual safety clauses which will form part of any resulting contract.
14	Proposed amendments and qualifications
15	Labour Payment Schedule

3.0 Returnable Schedules that will be incorporated into the contract

3.1 Certificate of attendance of information briefing session/site inspection
3.2 Certificate of Authority for Signatory (Resolution of Board of Directors)
3.3 Schedule of Tenderers experience
3.4 Schedule of Sub-contractors
3.5 Certificate of authority for joint ventures (where applicable)
3.6 Schedule of Plant and equipment
3.7 Foreign Exchange Rate Information (where applicable)
3.8 Record of Addenda to Tender Document
3.9 Supplier declaration form duly completed (SDF)
3.10 Compulsory Enterprise Questionnaire
3.11 Approach paper, which responds to the proposed scope of works.
3.12 Experience of key staff in the form of Curriculum Vitae
3.13 Transnet SOC Limited contractual safety clauses which will form part of any resulting contract
3.14 Proposed amendments and qualifications.
3.15 Labour Payment Schedule.

Part T2: Returnable Schedules

CERTIFICATE OF ATTENDANCE AT INFORMATION BRIEFING SESSION/SITE INSPECTION

This is to certify that

_____

(Tenderer)
of

_____

(address)

_____

was represented by the person(s) named below at the compulsory site meeting held for all tenderers at _____ (location) on _____ (date), starting at_____ We acknowledge that the purpose of the meeting was to acquaint ourselves with the Site of the Works and/or matters incidental to doing the work specified in the tender documents in order for us to take account of everything necessary when compiling our rates and prices included in the tender.

Particulars of person(s)(Respondents) attending the meeting/site inspections:

Name: _____ Signature _____

Capacity: _____

Name: _____ Signature _____

Capacity _____

Attendance of the above persons at the meeting is confirmed by the Employer's representative, namely:

Briefing session:
Name: _____ Signature _____

Capacity: _____ Date and time _____

Site visit:
Name: _____ Signature _____

Capacity: _____ Date and time _____

RESOLUTION OF BOARD OF DIRECTORS

Name of firm _____

It was resolved at a meeting of the Board of Directors held on _____ that

FULL NAME(S)	**SIGNATURE**
_____	_____
_____	_____
_____	_____

in his capacity of _____ is/are hereby authorised to enter into, sign and execute and complete any documents relating to Tenders and/or Contracts for the supply of goods and services.

Confirm: Date _____

FULL NAME _____

_____
CHAIRMAN

FULL NAME _____

_____
SECRETARY

Certified true copy:

SIGNED AT _____ ON THIS _____ DAY OF _____

20_____

SCHEDULE OF THE TENDERER'S EXPERIENCE

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

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

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

SCHEDULE OF PROPOSED SUBCONTRACTORS

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

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

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

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

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

CERTIFICATE OF AUTHORITY FOR JOINT VENTURES (WHERE APPLICABLE)

This Returnable Schedule is to be completed by joint ventures.(Where applicable)

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

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

SCHEDULE OF PLANT AND EQUIPMENT

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

(a) Details of major Plant and Equipment that is owned by and immediately available for this contract.

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

(b) Details of major Plant and Equipment that will be hired, or acquired for this contract if my/our tender is acceptable.

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

Signed ..... Date .....

Name ..... Position .....

Tenderer .....

FOREIGN EXCHANGE RATE INFORMATION REQUIRED TO BE FURNISHED BY TENDERERS.

1. Particulars of the exchange rate on which prices are based:

   _____ (Foreign currency) equals R_____(South African currency)

   Note: Tenderers who offer imported material shall base their tenders on the selling rate of exchange that ruling on the last working day of the month prior to the closing date of tenders.

2. The percentage of the tender prices which is to be remitted by the Tenderers from South Africa to another country is _____% of the f.o.b./c. and f./f.o.r. in bond price (delete those not applicable).

   Note: (1) The percentage quoted above will be deemed to apply even though a portion only of the item(s) tendered for is accepted.

   (2) Adjustment in respect of variation in exchange rate will be allowed only on the percentage of the tendered price quoted above.

3. The tendered price shall be computed at the rate of exchange stated by the Tenderer in paragraphs 1 and 2 above as applied to the percentage of the tendered price quoted.

4. Transnet Freight Rail will accept for its account, in respect of such percentage of the tendered price as will be affected by the rate of exchange, any variation between the rate mentioned in paragraph 1 above, and the rate ruling at the date when payment for the goods is made by Transnet Freight Rail; provided that if the Contractor is required to remit the whole or portion of the contract price to another country in payment for goods or portion thereof prior to receiving payment from Transnet Freight Rail, the date(s) of such remittance(s) shall be deemed to be the date(s) of payment by Transnet Freight Rail for the purposes of this paragraph.

5. In the absence of a specific indication by the Contractor at the time of tendering that the proviso to paragraph 3 will apply, it will be assumed that the Contractor desires the adjustment to be effected by reference to the date on which actual payment is made by Transnet Freight Rail.

6. (a) The Contractor shall, if so required, furnish documentary proof to establish that the percentage of the contract price specified by him in paragraph 2 has actually been remitted to another country and the rate of exchange at which that was done.

   (b) Whenever the Contractor is required to remit the whole or portion of the contract price, to another country as contemplated in the proviso to paragraph 2 above, he shall notify Transnet Freight Rail forthwith and furnish documentary evidence of such remittance and of the rate of exchange at which that was done.

7. Invoices in respect of goods supplied must reflect the amount remitted or to be remitted to another country and the amount to be retained in South Africa.

8. The Contractor shall take out forward cover for all imported materials and services within 14 days of award of the contract. Proof shall be submitted to the Project

Manager of the contract. The cost of forward cover shall be invoiced separate from the contract invoices and shall not be included in the tender price.

_____

SIGNATURE OF TENDERER

DATE:_____

WITNESSES:

1._____

2._____

ADDRESS: _____

_____

_____

_____

RECORD OF ADDENDA TO TENDER DOCUMENTS

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

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

Attach additional pages if more space is required.

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

SUPPLIER DECLARATION FORM

Respondents are to furnish the following documentation and complete the Supplier Declaration Form below:

1. **Original or certified** cancelled cheque **OR** letter from the Respondent's bank verifying banking details **[with bank stamp]**
2. **Certified copy** of Identity Document(s) of Shareholders/Directors/Members *[where applicable]*
3. **Certified copy** of Certificate of Incorporation, CM29 / CM9 *[name change]*
4. **Certified copy** of Share Certificates [CK1/CK2 if CC]
5. Original or certified letterhead confirm physical and postal addresses
6. **Original or certified** valid SARS Tax Clearance Certificate [RSA entities only]
7. **Certified copy** of VAT Registration Certificate [RSA entities only]
8. A signed letter from your entity's auditor or accountant confirming most recent annual turnover figures or certified BBBEE certificate
9. **Certified copy** of valid Company Registration Certificate *[if applicable]*

Note: No contract shall be awarded to any South African Respondent whose tax matters have not been declared by SARS to be in order.

Note: No agreement shall be awarded to any Respondent whose tax matters have not been declared by SARS to be in order.

Company Trading Name						
Company Registered Name						
Company Registration Number Or ID Number If A Sole Proprietor						
Form of entity	CC	Trust	Pty Ltd	Limited	Partnership	Sole Proprietor
VAT number (if registered)						
Company Telephone Number						
Company Fax Number						
Company E-Mail Address						
Company Website Address						

Bank Name		Bank Account Number	
Postal Address			
		Code	
Physical Address			
		Code	
Contact Person			
Designation			
Telephone			
Email			

Annual Turnover Range (Last Financial Year)	< R5 Million		R5-35 million		> R35 million
Does Your Company Provide	Products		Services		Both
Area Of Delivery	National		Provincial		Local
Is Your Company A Public Or Private Entity			Public		Private
Does Your Company Have A Tax Directive Or IRP30 Certificate			Yes		No
Main Product Or Service Supplied (E.G.: Stationery/Consulting)					
BEE Ownership Details					
% Black Ownership		% Black women ownership		% Disabled person/s ownership	
Does your company have a BEE certificate	Yes		No		
What is your broad based BEE status (Level 1 to 9 / Unknown)					
How many personnel does the firm employ	Permanent		Part time		
Transnet Contact Person					
Contact number					
Transnet operating division					

TRANSNET
freight rail

Duly Authorised To Sign For And On Behalf Of Firm / Organisation			
Name		Designation	
Signature		Date	

Stamp And Signature Of Commissioner Of Oath			
Name		Date	
Signature		Telephone No.	

COMPULSORY ENTERPRISE QUESTIONNAIRE

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

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

. . . . . .

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

. . . . . .

Section 3: CIDB registration number, if any: . . . . . .

. . . . . .

Section 4: Particulars of sole proprietors and partners in partnerships

Name*	Identity number*	Personal income tax number*

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

Section 5: Particulars of companies and close corporations

Company registration number . . . . . .

. . . . . .

Close corporation number . . . . . .

. . . . . .

Tax reference number . . . . . .

. . . . . .

Section 6: Record in the service of the state

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

- ☐ a member of any municipal council
- ☐ a member of any provincial legislature
- ☐ a member of the National Assembly or the National Council of Province
- ☐ a member of the board of directors of any municipal entity
- ☐ an official of any municipality or municipal entity
- ☐ an employee of any provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act 1 of 1999)
- ☐ a member of an accounting authority of any national or provincial public entity
- ☐ an employee of Parliament or a provincial legislature

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

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

*insert separate page if necessary

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

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

- ☐ a member of any municipal council
- ☐ a member of any provincial legislature
- ☐ a member of the National Assembly or the National Council of Province
- ☐ a member of the board of directors of any municipal entity
- ☐ an official of any municipality or municipal entity
- ☐ an employee of any provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act 1 of 1999)
- ☐ a member of an accounting authority of any national or provincial public entity
- ☐ an employee of Parliament or a provincial legislature

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

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

Signed _____ Date _____

Name _____ Position _____

Enterprise name _____

EVALUATION SCHEDULE: APPROACH PAPER (EXAMPLE)

The approach paper must respond to the scope of work and outline the proposed approach / methodology including that relating to health and safety. The approach paper should articulate what value add the tenderer will provide in achieving the stated objectives for the project.

The tenderer must as such explain his / her understanding of the objectives of the assignment and the Employer's stated and implied requirements, highlight the issues of importance, and explain the technical approach they would adopt to address them. The approach paper should explain the methodologies which are to be adopted, demonstrate the compatibility of those methodologies with the proposed approach. The approach should also include a quality plan which outlines processes, procedures and associated resources, applied by whom and when, to meet the requirements and indicate how risks will be managed and what contribution can be made regarding value management.

The tenderer must attach his / her approach paper to this page. The approach paper should not be longer than 8 pages.

The scoring of the approach paper will be as follows:

	Technical approach and methodology
Poor (score 40)	The technical approach and / or methodology is poor / is unlikely to satisfy project objectives or requirements. The tenderer has misunderstood certain aspects of the scope of work and does not deal with the critical aspects of the project.
Satisfactory (score 70)	The approach is generic and not tailored to address the specific project objectives and methodology. The approach does not adequately deal with the critical characteristics of the project. The quality plan, manner in which risk is to be managed etc is too generic.
Good (score 90)	The approach is specifically tailored to address the specific project objectives and methodology and is sufficiently flexible to accommodate changes that may occur during execution. The quality plan and approach to managing risk etc is specifically tailored to the critical characteristics of the project.
Very good (score 100)	Besides meeting the "good" rating, the important issues are approached in an innovative and efficient way, indicating that the tenderer has outstanding knowledge of state-of-the- art approaches. The approach paper details ways to improve the project outcomes and the quality of the outputs

The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise, confirms that the contents of this schedule are within my personal knowledge and are to the best of my belief both true and correct.

Signed ---------- Date ----------

Name ---------- Position ----------

Tenderer ----------

CURRICULUM VITAE OF KEY PERSONNEL

Name:	**Date of birth:**
Profession:	**Nationality:**
Qualifications:	
Professional registration number:	
Name of employer (firm):	
Current Position:	**Years with the firm:**
Employment record: (list in chronological order starting with earliest work experience)	
Experience record pertinent to required service	

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this data correctly describes me, my qualifications and my experience.

_____ _____

[Signature of person named in schedule] Date

TRANSNET SOC LIMITED / CONTRACTORS / SUB-CONTRACTORS

CONTRACTUAL SAFETY CLAUSES WHICH WILL FORM PART OF ANY RESULTING CONTRACT

The parties agree on the following arrangements according to section 37 (2) of the Occupational Health and Safety Act, 1993 (Act 85 of 1993) to ensure compliance by the mandatory with provisions of the Act.

1) That the Contractor is an "employer" in his own right as defined in section 1 of Act 85 of 1993 and that he must fulfil all his obligations as an employer in terms of the Act.

2) The Contractor shall comply with the requirements of Act 85 of 1993 in its entirety.

3) Where special permits are required, such as electrical switching, hot work permits, etc. the Contractor shall obtain them from a person designated by Transnet SOC Limited for this purpose, and all requirements of the Contractor must rigidly comply with the permit.

4) The Contractor shall conduct a risk assessment of the work to be performed by a competent person prior to the commencement of work, to identify risks and hazards that persons may be exposed to, analyse and evaluate identified hazards.

5) The Contractor shall have a documented Health and Safety Plan based on the risks and hazards identified before commencement of work.

6) The Health and Safety Plan shall include the following:

   6.1 The safety management structure to be instituted with all appointments in terms of the Act and Regulations
   6.2 The safe working methods and procedures to be implemented to ensure work are performed in compliance to the Act.
   6.3 The safety equipment, devices and clothing to be made available by the Contractor to his employees.
   6.4 The site access control measures pertaining to health and safety to be implemented.
   6.5 Control measures for ensuring that the Health and Safety Plan is maintained and monitored for the duration of the contract.

7) The Contractor shall ensure that all work is performed under the close supervision of a person trained to understand the hazards associated with the work performed and who has authority to ensure that the necessary precautionary measures are implemented.

8) The Contractor must appoint a Health and Safety Co-ordinator to liaise with Transnet SOC Limited on matters pertaining to occupational health and safety.

9) The appointed Safety Co-ordinator must liaise at least once a week with the* Health and Safety Section / Risk Manager /Occupational Risk Manager of Transnet SOC Limited.

10) The Contractor shall furnish the* Health and Safety Section/ Risk Manager/ Occupational Risk Manager of Transnet SOC Limited immediately with full particulars of any sub-Contractor which he may involve in the contract in order that the sub-

Contractor himself can be made aware of all the clauses in this contract pertaining to health and safety.

11) The Contractor shall stop any sub-contractor from executing work which is not in accordance with the Health and Safety Plan or which poses a threat to health and safety of persons.

12) The Contractor shall ensure that all his employees and visitors undergoes health and safety induction pertaining to the hazards prevalent, proof of such training must be kept on file.

13) In the event where the risk assessment reveals the risk relating to working from an elevated position the Contractor shall cause the designation of a competent person, responsible for the preparation of a Fall Protection Plan.

14) **The Fall Protection Plan shall include:**

14.1 A risk assessment of all work carried out from an elevated position
14.2 Procedures and methods to address all the identified risks per location
14.3 Evaluation of employee's physical and psychological fitness necessary to work at elevated position.
14.4 The training of employees working from an elevated position.
14.5 Procedure addressing the inspection, testing and maintenance of all fall protection equipment.

15) The Contractor shall advise the * Health and Safety Section / Risk Manager/ Occupational Risk Manager of Transnet SOC Limited of any hazardous situations which may arise from work being performed either by the Contractor or his sub-Contractor.

16) Copies of all appointments required by the act must be given to * Health and Safety Section / Risk Manager / Occupational Risk Manager of Transnet SOC Limited.

17) The Contractor shall ensure that a Health and Safety File is available which shall include all documentation as required by the Act, copy of his and his Sub-Contractors Risk Assessment and Health and Safety Plan.

18) All incidents referred to in Section 24 of the Act involving the Contractor and his Sub-Contractor on Transnet Ltd premises, shall be reported as prescribed. Transnet Ltd hereby obtains an interest in the issue of any investigation, formal inquiry conducted in terms of Section 31 and 32 of the Act into any incident involving the Contractor, his Sub-Contractor, any person or machinery under his control on Transnet Ltd premises.

19) ***No alcohol or any other intoxicating substance shall be allowed on Transnet Ltd premises. The Contractor shall not allow anyone under or suspected to be under the influence of alcohol or any other intoxicating substance on Transnet Ltd premises.***

20) Contractor to ensure its employees undergo medical surveillance as required by legislation

21) Contractor will be required to provide monthly safety performance reports and statistics

22) ***A letter of good standing in terms of Section 80 (Employer to register with the Compensation Commissioner) of the Compensation for Occupational Injuries and Disease Act 1993 (Act 130 of 1993) must also be furnished.***

23) All clauses in the contract pertaining health and safety form an integral part of the contract and if not complied with may be construed as breach of contract.

*As applicable

Tenderer OH & S Management System Questionnaire

This questionnaire forms part of TFR tender evaluation process is to be completed by all Tenderer's and submitted with their tender offer. The objective of the questionnaire is to provide an overview of the status of the Tenderer's OH&S management system. Tenderers will be required to verify their responses noted in their questionnaire by providing evidence of their ability and capacity in relevant matters. **TFR will verify accuracy of this information during the physical visit as part of the tender evaluation**.

The information provided in this questionnaire is an accurate summary of the company's occupational health and safety management system.			
Company Name:			
Signed:	Name:		
Position:	Date:		
Tender Description:			
Tender Number:			
Tenderer OH&S Management System Questionnaire		**Yes**	**No**
1. OH&S Policy and Management			
- Is there a written company health and safety policy? - If yes provide a copy of the policy			
- Does the company have an OH&S Management system e.g NOSA, OHSAS, IRCA System etc - If yes provide details			
- Is there a company OH&S Management System, procedures manual or plan? - If yes provide a copy of the content page(s)			
- Are health and safety responsibilities clearly identified for all levels of Management and employees? - If yes provide details			
2. Safe Work Practices and Procedures			
- Are safe operating procedures or specific safety instructions relevant to its operations available? - If yes provide a summary listing of procedures or instructions			

- Is there a register of injury document? If yes provide a copy		
- Are Risk Assessments conducted and appropriate techniques used? - If yes provide details		
3. OH&S Training		
Describe briefly how health and safety training is conducted in your company:		
- Is a record maintained of all training and induction programs undertaken for employees in your company? - If yes provide examples of safety training records		
4. Health and Safety Workplace Inspection		
- Are regular health and safety inspections at worksites undertaken? -If yes provide details		
- Is there a procedure by which employees can report hazards at workplaces? - If yes provide details		
5. Health and Safety Consultation		
- Is there a workplace health and safety committee?		
- Are employees involved in decision making over OH&S matters? - If yes provide details		
- Are there employee elected health and safety representatives? - Comments		
6. OH&S Performance Monitoring		
- Is there a system for recording and analysing health and safety performance statistics including injuries and incidents? - If yes provide details		
- Are employees regularly provided with information on company health and safety performance? - If yes provide details		

Is company registered with workmen's compensation and up to date? - If yes provide proof of letter of good standing		
- Has the company ever been convicted of an occupational health and safety offence? - If yes provide details		

Safety Performance Report

Monthly DIFR for previous months

Previous Year	No of Disabling Injuries	Total Number of employees	DIFR per month
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

DIFR = Number of Disabling injuries x 200000 divided by number of man hours worked for the period

Signed
(Tenderer)

PROPOSED AMENDMENTS AND QUALIFICATIONS

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

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

Page	Clause or item	Proposal

Signed ..... Date .....

Name ..... Position .....

Tenderer .....

TRANSNET SOC LIMITED
(REGISTRATION No. 1990/000900/30)
TRADING AS
TRANSNET FREIGHT RAIL

LABOUR PAYMENT SCHEDULE

TENDERERS ARE REQUIRED TO COMPLETE THE FOLLOWING SCHEDULE:

DAY LABOUR (IF REQUIRED)

Skilled	Hour _____
Unskilled	Hour _____
Labourer	Hour _____
Driver/Operator	Hour _____
% Profit on Material	_____

TRANSPORT AND MACHINERY	STANDING	RUNNING
1. Light vehicle up to 1 ton	_____	_____
2. 5 Ton vehicle	_____	_____
3. 10 Ton vehicle with crane	_____	_____
4. Crane	_____	_____
5. Scaffolding	_____	_____
6. Generator	_____	_____
7. Other equipment:	_____	_____

_____

_____

_____

8. Full details of any other charges:

_____

_____

_____

TENDERER: _____

DATE: _____

TRANSNET
freight rail

nec 3

Part C1:
Agreement and Contract Data

nec 3

Contract Data

The Employer is

Name **Transnet SOC Limited Trading as Transnet Freight Rail.....**

Address **Nzasm Building, Room 210, Corner Paul Kruger and Minnaar Streets, Pretoria.....**

Telephone **(012) 315 2059** **Fax No. (012) 315-2125.....**

E-mail **Yvonne.scannell@Transnet.net**

The work is The design, manufacture, supply, install, test and commission of PCB control panels for Turfgrond 25kV AC substation under the control of the Depot Engineer, Koedoespoort.

The sites are Turfgrond AC traction substation

The starting date is TBA.....

The completion date is TBA.....

The reply period is Two (2) weeks.....

The defects date is one week after completion.....

The defect correction period is one week after completion.

The delay damages are **R2,000.00** per day (late completion)

The assessment day is the **13th (THIRTEENTH).....** of each month

.

The retention is 10% Retention money will be retained.....

Does the United Kingdom Housing Grants, Construction and Regeneration Act (1996) apply? **No.....**

The Adjudicator is

Name **To be advised if disputes arises.....**

Address .....

Telephone ..... **Fax No.** .....

E-mail .....

Contract Data

The interest rate on late payment is two percent (2%) per complete week of delay.

The *Contractor* is not liable to the *Employer* for loss of or damage to the *Employer*'s property in excess of R2,000,000.00 (two million Rand) for any one event.

The *Employer* provides this: **Insurance Transnet Principal Control Insurance**

The minimum amount of cover for the third insurance stated in the Insurance Table is:
> R25, 000.00 (Limited to R10, 000,000.00. for any one event).

The minimum amount of cover for the fourth insurance stated in the Insurance Table is:

Not applicable.....

The adjudicator nominating body is: **The Chairman of the Association of Arbitrators (Southern Africa)**

The tribunal is: **Arbitration**.....

If the tribunal is arbitration, the arbitration procedure is: **The rules for the Conduct of Arbitrators of the Association of Arbitrators (Southern Africa)**.....

The *conditions of contract* are the NEC3 Engineering and Construction Short Contract (June 2005) and the following additional conditions:

As mentioned in paragraph 1.0 (Contractual obligations)

1.0 **CONTRACTUAL OBLIGATIONS**

This project specification covers Transnet Freight Rail's requirements for the design, manufacture, supply, install, test and commission of PCB control panels for Turfgrond 25kV AC traction substation under the control of the Depot Engineer, Koedoespoort as stated in the Contract Data.

1.1 The Contractor shall not make use of any sub-Contractor to perform the works or parts thereof without prior permission from the Employer's Deputy.

1.2 The Contractor shall ensure that a safety representative is at site at all times. All safety measures prescribed by Transnet Freight Rail – Electrical Safety Instructions and the "Occupational Health and Safety Act 1993 (Act 85 of 1993)" associated with working on a project of this nature shall be adhered to.

1.3 The Contractor shall comply with all applicable legislation and Transnet safety requirements adopted from time to time and instructed by the Employer's Deputy / Supervisor. Such compliance shall be entirely at his own cost, and shall be deemed to have been allowed for in the rates and prices in the contract.

1.4 The Contractor shall, in particular, comply with the following Acts and Transnet Specifications:-

1.4.1 The Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993. The Contractor shall produce proof of his registration and good standing with the Compensation Commissioner in terms of the Act.

1.4.2 The Occupational Health and Safety Act (Act 85 of 1993).

1.4.3 The explosive Act No. 26 of 1956 (as amended). The Contractor shall, when applicable, furnish the Employer's Deputy / Supervisor with copies of the permits authorising him or his employees, to establish an explosives magazine on or near the site and to undertake blasting operations in compliance with the Act.

1.4.4 The Contractor shall comply with the current Transnet Specification E.4E, Safety Arrangements and Procedural Compliance with the Occupational Health and Safety Act, Act 85 of 1993 and Regulations and shall before commencement with the execution of the contract, which shall include site establishment and delivery of plant, equipment or materials, submit to the Employer's Deputy / Supervisor.

1.4.5 The Contractor shall comply with the current Specification for Works On, Over, Under or Adjacent to Railway Lines and near High Voltage Equipment – E7/1, if applicable, and shall take particular care of the safety of his employees on or in close proximity to a railway line during track occupations as well as under normal operational conditions.

1.4.6 The Contractor's Health and Safety Programme shall be subject to agreement by the Employer's Deputy / Supervisor, who may, in consultation with the Contractor, order supplementary and/or additional safety arrangements and/or different safe working methods to ensure full compliance by the Contractor with his obligations as an employer in terms of the Act.

1.4.7 In addition to compliance with clause 1.4 hereof, the Contractor shall report all incidents in writing to the Employer's Deputy / Supervisor. Any incident resulting in the death of or injury to any person on the works shall be reported within 24 hours of its occurrence and any other incident shall be reported within 48 hours of its occurrence.

1.4.8 A penalty charge of **R2,000.00** per day will be levied for late completion.

1.4.9 10% Retention money will be retained and will be released 12 months after the actual completion date of the contract.

1.4.10 The Contractor shall supply a **site diary** (with triplicate pages). This book shall be used to record any unusual events during the period of the work. Any delays to the work shall also be recorded such as delays caused by poor weather conditions, delays caused by permits being cancelled etc. The appointed Employer's Deputy or Supervisor must countersign such delays. Other delays such as non-availability of equipment from 3rd party suppliers must be communicated to the Employer's Deputy or Supervisor in writing.

1.4.11 The Contractor shall supply a **site instruction book** (with triplicate pages). This book shall be used to record any instructions to the Contractor regarding problems encountered on site – for example the quality of work or the placement of equipment. This book shall be filled in by the Employer's Deputy or Supervisor and must be countersigned by the Contractor.

1.4.12 **Both books** mentioned in 1.4.10 and 1.4.11 shall be the property of Transnet Freight Rail and shall be handed over to the Employer's Deputy or Supervisor on the day of energising or handing over.

1.4.13 All processes or the manufacture and assembly of the product components must be subjected to a quality assurance system.

1.4.14 The Contractor will assume full responsibility for assuring that the products purchased meet the requirements of Transnet Freight Rail for function, performance, and reliability, including purchased products from 3rd part suppliers/Manufacturers.

1.4.15 The Contractor shall prove to Transnet Freight Rail that his equipment or those supplied from 3rd party suppliers/manufacturers confirms to Transnet freight rail specifications.

1.4.16 The Contractor will remain liable for contractual delivery dates irrespective of deficiencies discovered during workshop inspections.

1.4.17 The successful Contractor shall provide a Gantt or a similar chart showing when the works will be done and energised. A final chart should be submitted to the Employer's Deputy or Supervisor within 14 days after the award has been made to the successful Contractor.

1.4.18 The Contractor shall be responsible to arrange for a 24 hour security to safeguard the equipment and personnel on site throughout the construction period.

1.4.19 During the duration of the contract, the successful Contractor shall be required to inform the Employer's deputy of any staff changes and provide the qualifications of the replacement staff for approval.

1.4.20 Where equipment offered does not comply with standards or publications referred to in the specification, Contractor shall state which standards y in English or certified translation.

1.4.21 Contractors shall submit descriptive literature consisting of detailed technical specifications, general construction details and principal dimensions, together with clear illustrations of the equipment offered.

1.4.22 The Contractor shall submit equipment type test certificates a specified in the contract. These shall be in English or certified translation.

1.4.23

Contract Data

The *Contractor*'s Offer

The Contractor is

Name .....

Address .....

.....

Telephone ..... **Fax No.** .....

E-mail address .....

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 *Contractor* offers to provide the Works in accordance with the *conditions of contract* for an amount to be determined in accordance with the *conditions of contract.*

The offered total of the prices is: (***Amount in words, VAT inclusive***).....

.....

.....

Total price in figures(VAT inclusive): R.....

Signed on behalf of the Contractor

Name .....

Position .....

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

The *Employer*'s Acceptance

The *Employer* accepts the *Contractor*'s Offer to Provide the Works

Signed on behalf of the *Employer*

Name .....

Position .....

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

Part C2:
Pricing Data

Part C2.1: Pricing Data
Price Instructions

2.0 PRICING INSTRUCTIONS

2.1 The agreement is based on the NEC Engineering and Construction Short Contract 3. The contract specific variables are as stated in the contract data. Only the headings and clause numbers for which allowance must be made in the Price list are recited.

2.2. Preliminary and General Requirements are based on part 1 of SANS 1921, 'Construction and Management Requirements for Works Contracts'. The additions, deletions and alterations to SANS 1921 as well as the contract specific variables are as stated in the contract data. Only the headings and clause numbers for which allowance must be made in the Price list are recited.

2.3. It will be assumed that prices included in the Price list are based on Acts, Ordinances, Regulations, By-laws, International Standards and National Standards that were published 28 days before the closing date for tenders.

2.4. Reference to any particular trademark, name, patent, design, type, specific origin or producer is purely to establish a standard for requirements. Products or articles of an equivalent standard may be substituted.

2.5. The Price list is not intended for the ordering of materials. Any ordering of materials, based only on the Price list, is at the Contractor's risk.

2.6. The amount of the Preliminaries to be included in each monthly payment certificate shall be assessed as an amount prorated to the value of the work duly executed in the same ratio as the preliminaries bears to the total of prices excluding any contingency sum, the amount of the Preliminaries and any amount in respect of contract price adjustment provided for in the contract.

2.7. The amount or items of the Preliminaries shall be adjusted to take account of the theoretical financial effect which changes in time or value (or both) have on this section. Such adjustments shall be based on adjustments in the following categories as recorded in the Price list:

a) An amount which is not to be varied, namely Fixed (F).
b) An amount which is to be varied in proportion to the contract value, namely Value Related (V).
c) An amount which is to be varied in proportion to the contract period as compared to the initial construction period, excluding revisions to the construction period for which no adjustment the Contractor is entitled to in terms of the contract, namely Time Related (T).

2.8. The following abbreviations are used in the Price list:

Sum	=	sum
Each	=	each
Sets	=	sets

2.9 The prices and rates in these Price list are fully inclusive prices for the work described under the items. Such prices and rates cover all costs and expenses that may be required in and for the

execution of the work described in accordance with the provisions of the scope of work and shall cover liabilities and obligations set forth or implied in the Contract data, as well as profit.

2.10 Where the scope of work requires detailed drawings and designs or other information to be provided, all costs associated therewith are deemed to have been provided for and included in the unit rates and sum amount tendered for such items.

2.11 Where no quantity has been provided against an item in the Price list, the Contractor shall use their discretion and provide the quantity.

2.12 The quantities set out in these Price list are approximate and do not necessarily represent the actual amount of work to be done. The quantities of work accepted and certified for payment will be used for determining payments due and not the quantities given in these Price list.

2.13 The short descriptions of the items of payment given in these Price list are only for purposes of identifying the items. More details regarding the extent of the work entailed under each item appear in the Scope of Work.

2.14 Contractor shall ensure that provision (financial as well as time) for excavations in a range of soil types is made for in their tenders.

2.15 For each item in the Price list, including Preliminaries, the Contractor shall provide in the appropriate column the portion of the tendered sum (inclusive of labour and material) which has been sourced locally (Republic of South Africa).

2.16 The Contractor shall provide information related to imported content, i.e. equipment to be imported, value and applicable exchange rates. This information shall be provided as an Annexure to the Price list.

2.17 The total in the Price list shall be exclusive of VAT.

2.18 Transnet Freight Rail payment terms: 30 days from month end statement.

2.19 Contractors shall duly fill in the attached 'Price list'. The prices shall be fixed for the duration of the contract and no escalation will be allowed. Items not reflected in the 'Price list', but covered in the particular specification or agreed at site meetings, shall be added to the 'Price list' by the Contractor and quoted for accordingly.

Contract Data
Price List

Item	Description	Unit	Qty	Rate	Price
A	**Turfgrond 25KV Traction Substation**				
1.	Dismantle, remove and transport old equipment from site to Koedoespoort Depot.	sum	1		
2.	Supply and install AC Primary Circuit Breaker control panel.	ea	1		
3.	Supply and install all control and protection cables from the PCB to the Panel and AC disconnect.	sum	1		
4.	Rewire the protection interlock in panel for phase failure and low SF6 gas with distribution switchgear.	sum	1		
5.	Testing and pre-commissioning of equipment	sum	1		
6.	Provide three complete sets each of the Catalogues, Manuals and drawings	sets	3		
7.	P's & G's (Labour, site establishment, transport, civil works, soil testing and preparation, etc.)	sum	1		
8.	Supply and install the control cable from the PCB control box to the panel.	sum	1		
A	**Total for Hornsnek**			**R**	
B	**VAT @14 % =**			**R**	
A + B	**Total (Incl. VAT)=**			**R**	

Part C3:
Works information

3.0 DESCRIPTION OF WORK.

3.1 The Contractor shall electrically connect the newly installed equipment to the existing earthing system.

3.2 PCB and incomer must be electrically interconnected. In case of the Eskom failure, the PCB must trip.(fail safe mode).

3.3 The Contractor shall test, commission and hand over the equipment.

3.4 All fasteners (nuts & bolts) shall be secured using flat or bevelled washers, as necessary, as well as lock washers.

3.5 All cables shall terminate in compression type glands. These glands shall be fitted with neoprene shrouds.

3.6 The Contractor shall supply and install new control cables between the primary circuit breaker and the control panel in the 88kV switch room. The Contractor shall be responsible to connect and interconnect all new and existing functions in the control panel.

3.7 A new control cable shall be installed between the control panel and the AC disconnects and the fleeting contact be connected to it.

3.8 The following types of cables shall be used: -

- Control cable for PCB N04 – 4mm².

3.9 The cables shall be fixed to the cable trays using UV stabilised cable ties. Cabling and wiring shall be in accordance with CEE.0023.90 and SANS 10142-1.

3.10 When doing any cabling, the ballast stone shall be removed, trenching and laying of cables done, the soil compacted back and the ballast washed and placed back neatly.

3.11 No joining of cables will be accepted. The Contractor shall provide cables that are long enough for the application (earthing, control etc.). No junction boxes, underground, shall be used.

3.12 All the control cables shall be housed in a 110mm diameter PVC pipe between the PCB and the cement cable ducting.

3.13 Contractor shall use plastic covers to separate the soil from the stone when digging the trenches.

3.13 On backfilling of the soil after trenching has been done the Contractor shall compact the soil to the same pressure as the surrounding soil before it is covered with stone.

3.14. The contractor shall allow the provision for contact to connect to telecontrol for all indications as requested by the project manager or his deputy.

3.15. PCB and incomer must be electrically interconnected in case of Eskom failure, the PCB must be in fail safe protection.

3.15 The Contractor's team/s could be requested to attend the Transnet freight rail's electrical safety training course and be authorised to supervise the Contractor's staff whilst working in the substations on this contract. Transnet freight rail will organise the course and further details will be communicated to the successful Contractor.

3.16 The Contractor shall provide his own electrical power whilst working in the substation outdoor yard, since availability of power from Eskom or auxiliary supplies cannot be guaranteed.

3.17 On completion of the installation, it will be required from the Contractor to submit as built drawings and schematic diagrams of all newly installed equipment as well as showing interface to the existing equipment.

4.0 INSTALLATION

4.1 The Contractor shall be responsible for the transport to site, off-loading, handling, storage and security of all material required for the construction/execution of the works.

4.2 Contractor shall supply multi core cable and connect the tele-control. The substation shall not be switched on unless the tele-control is fully operational.

5.0 DRAWINGS, INSTRUCTION MANUALS AND SPARE PART CATALOGUES

5.1 All as built drawings shall be supplied in electronic format (Microstation / Acad).

5.2 The Contractor shall be required to submit all drawings (paper prints), within four weeks of award of tender, to the Employer for approval. No construction or manufacturing activity will be allowed prior to the associated drawings having been approved.

5.3 During the duration of the contract period, the Contractor will be required to inform the Employer of any changes to these drawings and will have to resubmit the affected drawings for approval prior to it being used on this contract.

5.4 All drawings, catalogues, instruction book and spares lists shall be in accordance with Transnet Freight Rail's specification CEE.0224.2002.

5.5 All final as built drawings shall be provided to Transnet Freight Rail within four weeks after commissioning.

5.6 Supply three sets of A3 schematic wiring diagrams in hard copy format and electronic format for approval.

6.0 SITE TESTS

6.1 The equipment shall be inspected / tested and approved by Transnet Freight Rail Quality Assurance at the Contractor's workshop prior to it being taken to site. Only once the approval has been granted can the equipment be taken to site for installation.

6.2 The Contractor shall be responsible for carrying out of on-site tests and commissioning of all equipment supplied and installed in terms of this specification and the contractual agreement.

6.3 Functional on-site tests shall be conducted on all items of equipment and circuitry to prove the proper functioning and installation thereof.

6.4 The Contractor shall submit a detailed list of on-site tests for the approval of the Employer.

6.5 The Contractor shall arrange for the Employer or his representative to be present to witness the on-site tests.

6.6 The on-site tests shall include the following:

6.7.1 Test for the functionality of all electrical circuitry.

6.7.2 Trip tests on relays.

6.7.3 Test on equipment as per manufacturer's instructions.

6.7.4 Insulation tests.

6.8 At the completion of the on-site tests, the Employer or his representative shall either sign the tests sheets (supplied by the Contractor) as having witnessed the satisfactory completion thereof, or hand to the Contractor a list of defects requiring rectification.

6.9 Upon rectification of defects, the Contractor shall arrange for the Employer or his representative to certify satisfactory completion of on-site tests.

6.10 Acceptance by the Employer of satisfactory completion of on-site tests in no way relieves the Contractor of his obligation to rectify defects which may have been overlooked or become evident at a later stage.

7.0 COMMISSIONING OF EQUIPMENT

7.1 Commissioning will only take place after all defects have been rectified to the satisfaction of the Employer.

7.2 On completion of commissioning, the Contractor will hand the equipment over to the Employer in terms of the relevant instruction.

7.3 The commissioning of protection equipment by Transnet Freight Rail will in no way absolve the Contractor from any of his responsibilities during the guarantee period.

7.4 It is the Contractor's responsibility to satisfy himself or herself that the commissioning of the protection equipment has been carried out in a satisfactory manner, and in no way compromises the proper operation of the equipment supplied in terms of the contract.

7.5 The Contractor shall be present during the testing and setting of the protection to rectify any faults found.

8.0 GUARANTEE AND DEFECTS

8.1 The Contractor shall guarantee the satisfactory operation of the complete electrical installation supplied and erected by him and accept liability for maker's defects that may appear in design, materials and workmanship.

8.2 The Contractor shall be issued with a completion certificate with the list of all defects to be repaired within 14 working days after commissioning.

8.3 The guarantee period for these standby plants shall expire after a period of 12 months commencing on the date of completion of the contract or the date the standby plant was handed over to Transnet Freight Rail.

8.4 Any defects that may become apparent during the guarantee period shall be rectified to the satisfaction of Transnet Freight Rail, and to the account of the Contractor.

8.5 The Contractor shall undertake work on the rectification of any defects that may arise during the guarantee period within 7-days of him being notified by Transnet Freight Rail of such defects.

8.6 Should the Contractor fail to comply with the requirements stipulated above, Transnet Freight Rail shall be entitled to undertake the necessary repair work or effect replacement of defective apparatus or materials, and the Contractor shall reimburse Transnet Freight Rail the total cost of such repair or replacements, including the labour costs incurred in replacing defective material.

8.7 Any specific type of fault occurring three times within the guarantee period and which cannot be proven to be due to other faulty equipment not forming part of this contract e.g., faulty locomotive or overhead track equipment, etc., shall automatically be deemed an inherent defect. Such inherent defect shall be fully rectified to the satisfaction of the Employer and at the cost of the Contractor.

8.8 If urgent repairs have to be carried out by Transnet Freight Rail staff to maintain supply during the guarantee period, the Contractor shall inspect such repairs to ensure that the guarantee period is not affected and should they be covered by the guarantee, reimburse Transnet Freight Rail the cost of material and labour.

9.0 QUALITY AND INSPECTION

9.1 Transnet Freight Rail shall inspect the equipment under contract on the premises of the Manufacturer or successful Contractor.

9.2 The Contractor shall notify Transnet Freight Rail 14 days in advance of such an inspection date.

9.3 The Contractor shall apply 14 days in advance for the date of energizing and ensure that all work is completed before any commissioning can take place.

9.4 The Contractor shall be responsible to issue a compliance certificate in terms of SANS 0142 for each site before energizing of the equipment shall take place.

10.0 SPECIFICATIONS

10.1 South African National Standards:

10.1.1	SANS 1091	National colour standard.
10.1.2	SANS-8528	Reciprocating internal combustion engine driven alternating current generating set
10.1.5	SANS 10142	Wiring Code

10.2 Transnet Freight Rail:

10.2.1	BBB 1267 version 9	Specification for outdoor high voltage alternating-current circuit breakers for traction and distribution substations.
10.2.2	BBB 7842 version1	Outdoor, high voltage, alternating current disconnectors combined with earthing switches.
10.2.3	S420 (1999)	Specification for concrete work.
10.2.4	BBC 0198 version 1	Specifications for the supply of cables.
10.2.5	CEE.0023.90	Specifications for installation of cables.
10.2.6	CEE.0111.99	Specification for 25kV traction substation.
10.2.7	CEE.0224.2002	Drawings, catalogues, instruction manuals and spares list for electrical equipment supplied under contract.
10.2.8	CEE-TBD-8	Earthing arrangement 25kV AC Traction Substation.
10.2.9	CEE-TBK-0027	Control circuit diagrams – NO volt operation
10.2.10	CEE TBK 0028	Trip, lockout and indication circuit diagram.
10.2.11	BBB 2721 version 9	AC Primary Circuit Breaker Control Panel and AC/DC Distribution Panel for 3kV DC Traction substation.
10.2.12	CEE-TBD-0007	Earthing arrangement for traction substations.

NOTE: Any other specifications referenced in the above mentioned specification, will be for information purposes and may be provided on request.

10.3 Occupational Health and Safety Act No. 85 of 1993 (Available at depot for referral).

11.0 CONSTRAINTS ON HOW THE *CONTRACTOR* PROVIDES THE WORKS

11.1 The constraints shall be as specified in the specifications of the particular equipment.

12.0 REQUIREMENTS FOR THE PROGRAMME

12.1 Programme of work : To be submitted by successful Contractor

12.2	CIDB rating	: 3EP or above
12.3	Format	: Gantt chart
12.4	Information	: How work is going to be executed and commissioned
12.5	Submission	: 3 weeks after the award of contract
12.6	Site diary	: Successful Contractor to supply in triplicates carbon copies
12.7	Site instruction book	: Successful Contractor to supply in triplicates carbon copies

13.0 SERVICES AND OTHER THINGS PROVIDED BY THE *EMPLOYER*

13.1 Transnet Freight Rail shall inspect all equipment before the equipment can be dispatched to site.

13.2 Transnet Freight Rail shall have an electrician available for isolation and the erection of barriers to live electrical equipment and issuing of work permits.

13.3 Upon successful completion of the works to the satisfaction of Transnet Freight Rail, Transnet Freight Rail shall perform necessary protection tests and commission the equipment.

TRANSNET
freight rail

TECHNOLOGY MANAGEMENT.

SPECIFICATION.

REQUIREMENTS FOR OUTDOOR ALTERNATING-CURRENT CIRCUIT BREAKERS FOR TRACTION AND DISTRIBUTION SUBSTATIONS

Author:	Chief Engineering Technician Technology Management	D.O.Schulz	.....
Approved:	Senior Engineer Technology Management	L.O.Borchard	.....
Authorised:	Principal Engineer Technology Management	W.A.Coetzee	..... p/p

Date: 21st September 2009

Circulation Restricted To:

Transnet Freight Rail – Chief Engineer Infrastructure
- Technology Management

INDEX

1.0 SCOPE

1.1 This specification covers Transnet freight rail requirements for the design, manufacture, testing and supply of outdoor Alternating Current (AC) circuit breakers in accordance to SANS 62271-100.

1.2 The alternating current circuit breakers shall be suitable rated for nominal phase to phase r.m.s voltages ranging from 22 kV to 220 kV.

2.0 STANDARDS, PUBLICATIONS AND DRAWINGS

2.1 Unless otherwise specified all materials and equipment supplied shall comply with the applicable and latest editions of SANS or Transnet freight rail publication.

2.2 The following publications are referred to in this specification:

2.2.1 SOUTH AFRICAN NATIONAL STANDARDS

SANS 121:	-	Hot-dip Galvanized coatings for fabricated iron or steel articles.
SANS 1431:	-	Weldable structural steels.
SANS 60529:	-	Degrees of protection provided by enclosures (IP code).
SANS 60694:	-	Common Specifications for high-voltage switchgear and controlgear standards.
SANS 60815	-	Guide for the selection of insulators in respect of polluted conditions
SANS 62271-100:	-	High Voltage Alternating Current Circuit Breakers.

2.2.2 TRANSNET FREIGHT RAIL SPECIFICATIONS.

CEE.0045:	Painting of Steel Components of Electrical Equipment.
CEE.0224:	Drawings, Catalogues, Instruction Manuals and Spares.

2.2.3 Occupational Health and Safety Act No 85 of 1993.

2.2.4 TRANSNET FREIGHT RAIL DRAWINGS

CEE-TBK-0027:	Control circuit diagram. No-volt coil protection.

2.3 Any items offered in accordance with other standards will be considered at the sole discretion of Transnet freight rail. The tenderer shall supply full details stating where the item differs from these specifications as well as supplying a copy (in English) of the recognised standard specification(s) with which it complies.

3.0 TENDERING PROCEDURE

3.1 Tenderers shall indicate clause-by-clause compliance with this specification as well as the relevant equipment specifications. This shall take the form of a separate document listing all the specifications clause numbers indicating on individual statement of compliance or non-compliance.

3.2 The tenderer shall motivate a statement of non-compliance.

3.3 Tenderers shall complete Appendix 2. " Information to be provided by tenderers".

3.4 Tenderers shall submit detailed technical literature of the current transformers offered together with drawings showing, general constructional details and principal dimensions.

3.5 Any items offered in accordance with other standards will be considered at the sole discretion of Transnet freight rail. The tenderer shall supply full details stating where the item differs from these specifications as well as supplying a copy (in English) of the recognised specification(s) with which it complies.

3.6 Failure to comply with clauses 3.1, 3.2, 3.3, 3.4 and 3.5 could preclude a tenderer from consideration.

4.0 APPENDICES

The following appendices form an integral part of this specification and shall be read in conjunction with it.

4.1 Appendix 1 -"Schedule of Requirements".

This appendix details the specific requirements for this application.

4.2 Appendix 2 - " Information to be provided by tenderers".

This appendix calls for specific technical information to be furnished by tenderers.

5.0 SERVICE CONDITIONS.

The current circuit breaker shall be designed to operate under the following conditions.

5.1 ATMOSPHERIC CONDITIONS

5.1.1	Altitude:	0 to 1800m above sea level.
	Ambient temperature:	-5°C to +45 °C.
	Relative humidity:	10% to 90%
	Lightning Conditions:	12 ground flashes per square kilometre per annum.
	Pollution:	Heavily salt laden or polluted with smoke from industrial sources.

5.2 ELECTRICAL CONDITIONS

5.2.1	Supply voltage:	The incoming AC voltage can vary ± 5% of the nominal system r.m.s voltage.
5.2.2	Frequency:	Frequency of the supply voltage is 50 ± 2.5 Hz.

6.0 REQUIREMENTS FOR ALTERNATING CURRENT CIRCUIT BREAKERS.

6.1 The AC circuit breakers shall be designed, manufactured and tested in accordance with the requirements of specifications SANS 62271-100 and SANS 60694.

6.2 The circuit breakers shall be of the outdoor type suitable for operation under the nominal phase to phase voltages or phase to neutral voltages specified in Appendix 1.

6.3 The insulating medium of the primary circuit breakers shall be SF6 gas or vacuum, depending on the supply voltage. (Refer to Appendix 1)

6.3.1 Vacuum circuit breakers may be used for voltages ranging from 22 kV up to 33 kV

6.4 The AC circuit breakers used on Transnet freight rail may the single, double or triple pole type.

6.4.1 Double or triple pole type circuit breakers shall be ganged operated.

6.5 The circuit breakers shall be rated at the highest r.m.s. voltage for equipment operating at the nominal system voltage specified in Appendix 1.

6.6 The minimum rupturing capacities for the respective voltages and current ratings for the circuit breakers shall be in accordance to the SANS 62271-100. The rated short–circuit breaking current shall be at least 20kA.

6.7 The circuit breakers shall be rated for a continuous current of at least 1250 Ampere

6.8 The circuit breakers shall have a first pole to clear factor of 1.5.

6.9 The circuit breakers shall have a making time not greater than 1 second.

6.10 The circuit breakers shall be capable of twice rupturing the specified fault current at the specified voltages, with a one minute interval between operations and then shall be in a condition to be closed and carry the rated current without it being necessary to inspect or make adjustments.

6.11 The circuit breaker shall be electrically operated from a nominal 110 Volt DC control voltage unless otherwise specified in Appendix 1.

6.12 It shall be possible to close the circuit breaker only when the control voltage is above 85% of the nominal voltage. The circuit breaker shall trip automatically when the control voltage falls below 70% of the nominal voltage.

6.13 The circuit breaker shall have a motor wound spring operating mechanism.

6.14 The operating mechanism shall be provided with shunt release for both opening and closing.

6.15 Pneumatic, hydraulic or gas control for tripping and closing the primary circuit breakers are not acceptable.

6.16 The operating mechanism shall be so designed so that the breaker may be closed manually from ground level by means of a suitable detachable handle.

6.17 The operating mechanism shall be constructed of non-ferrous material.

6.18 The operating springs shall recharge automatically after the completion of a closing operation.

6.19 The circuit breaker shall be of the trip-free type.

6.20 A visual mechanical indicating device shall be provided to indicate the state of the spring and shall be inscribed "Spring Charged" when the mechanism is in the condition to close the circuit breaker and "Spring Free" when it is in any other condition.

6.20.1 One pair of normally open and normally closed contacts shall be provided for the indication circuitry to the substation control panel for indication of the "Spring Charged" and "Spring Discharged" conditions.

6.21 Auxiliary contacts shall be provided for operation in conjunction with the protection and other auxiliary circuits specified. At least one spare pair of normally open and one spare pair of normally closed contacts shall be provided.

6.22 Circuit breaker control switches shall be provided on the circuit breaker mechanism. They shall return automatically to the neutral position when the handle is released after being turned to either the "close" or "trip" positions.

6.23 Local/Remote selector switches shall be provided on the circuit breaker mechanism and shall be of the two-position type. The switch shall have no "off" or "neutral" position.

6.23.1 Provision shall be made that when the circuit breaker is switched to the local position, the protection and trip circuitry to the circuit breaker shall not in any way be by-passed.

6.24 Mechanical operation shall be provided on the circuit breaker for any closing or trip release, which is normally electrically operated.

6.25 The circuit breaker shall be provided with a no volt coil with a mechanical latching mechanism, which will trip, lockout and inhibit the circuit breaker from closing when the no volt coil is de-energised. Refer to Transnet Freight Rail's drawing No. CEE-TBK-27 which forms part of this specification, for details of the control circuitry for the no volt protection.

6.25.1 The no volt coil circuitry with its associated mechanical latching mechanism shall operate separately from the trip coil circuitry.

6.26 A counter shall be provided on the circuit breaker to indicate the total number of operations of the breaker.

6.27 Tenderers shall advise the number of circuit breaker operations under full load and fault conditions, after which maintenance and/or measurement of contact wear is recommended.

6.28 The circuit breaker operating mechanism including its controls and relays shall be housed in a metal enclosure.

6.29 The enclosure housing shall be manufactured from stainless steel or hot dipped galvanised steel.

6.30 The coating of the enclosure if galvanised shall comply with the requirements of Transnet freight rail's specification CEE.0045.

6.31 The degree of protection of the enclosure shall be in accordance with SANS 60529 and shall be IP 55.

6.32 Provision shall be made for the enclosure to be pad-lockable.

6.33 The enclosure shall be provided with a gland plate for bottom entry of the control cables.

6.34 VACUUM CIRCUIT BREAKERS.

6.34.1 Vacuum switching devices shall be evacuated and sealed in accordance with the latest technology and accepted practice.

6.34.2 The pre striking and chopping current shall be kept below 5 amperes. Tenderers shall give full details regarding these characteristics.

6.34.3 Where vacuum circuit breakers are specified in Appendix 1 they shall be either of the motor wound spring operating mechanism or magnetic actuator operating mechanism type.

6. 35 SULPHUR HEXAFLOURIDE CIRCUIT BREAKERS. (SF6)

6.35.1 The SF6 circuit breaker shall be fitted with a pressure gauge/densiometer to monitor the gas pressure.

6.35.2 The pressure gauge/densiometer circuit shall be provided with a minimum of two sets of contacts for alarm and indication for the substation's annunciator or flag circuit.

6.35.3 The supplier shall wire the SF6 circuit breaker local control circuit, such that in the event of a gas leakage or drop in gas pressure, the SF6 circuit breaker will trip and lockout.

6.35.4 A set of normally closed contacts shall be provided in the circuit breaker mechanism control box for the low gas trip circuitry.

6.35.5 The SF6 circuit breaker shall trip and lockout before the minimum safe SF6 gas pressure is reached.

6.35.6 In terms of the Occupational Health and Safety Act No 85 of 1993. Code 1704 (pressure vessels) the successful tenderer shall furnish a certificate of manufacture complying with the terms of the Act for the circuit breakers.

6.36 INSULATION LEVELS, CREEPAGE DISTANCES AND CLEARANCES

6.36.1 INSULATION LEVELS

The rated insulation levels of the AC circuit breakers shall comply with the requirements specified in Table 1.

6.36.1.1 Table 1 lists the nominal system voltages present on Transnet freight rail and the required insulation levels as specified in accordance with SANS 1019.

Highest phase-to-phase r.m.s voltage for equipment. (Um)	Nominal system phase-to-phase r.m.s. voltage	Rated lightning impulse withstand voltage peak.	Rated short duration power- frequency withstand r.m.s voltage.
24 kV	22 kV	150kV	50 kV
36 kV	33 kV	200 kV	70 kV
52 kV	44 kV	250 kV	95 kV
72,5 kV	66 kV	350 kV	140 kV
100 kV	88kV	380 kV 450 kV	150 kV 185 kV
145 kV	132 kV	550 kV 650kV	230 kV 275 kV
245 kV	220 kV	850 kV 950 kV	360 kV 395 kV
Insulation levels for highest voltage for equipment U_m < 100 kV are based on an earth fault factor equal to $\sqrt{3}$ and for U_m > 100 kV an earth fault factor equal to $0,8\sqrt{3}$. Where more than one insulation level is given per voltage system, the higher level is appropriate for equipment where the earth fault factor is greater than 1,4			

TABLE 1: Standard Voltages and insulation levels in accordance with SANS 1019:2008 [1]

6.36.1.2. For the 25 kV and 50kV single phase ac traction systems the ac high voltage circuit breakers shall be designed to the following nominal system phase to phase r.m.s voltages and withstand insulation levels:

- For the 25 kV (phase to earth) ac traction systems the ac high voltage circuit breakers current transformer shall be rated for a nominal system phase to phase r.m.s voltage of at least 44 kV and designed to withstand the required insulation level for that nominal system voltage.
- For the 50 kV (phase to earth) ac traction systems the ac high voltage circuit breakers shall be rated for a nominal system phase to phase r.m.s voltage of at least 88 kV and designed to withstand the required insulation level for that nominal system voltage.

6.36.2 CREEPAGE DISTANCES

6.36.2.1 The standard creepage distance between phase and earth shall be in accordance with table ii of SANS 60815.

6.36.2.2 For coastal areas and very heavy polluted inland areas the standard creepage distance shall be the very heavy polluted level, i.e. 31mm/kV of the highest r.m.s phase to phase voltage U_m for equipment.

6.36.2.3 For inland areas the standard creepage distance shall be the heavy polluted level, i.e. 25mm/kV of the highest r.m.s phase to phase voltage U_m for equipment.

6.36.3 CLEARANCES

6.36.3.1 The following minimum safety outdoor earth clearances shall be maintained between any live conductor or metal and earthed metal: -

Highest phase to phase r.m.s voltage for equipment.	24kV	36kV	48kV	72kV	100kV	145kV	245kV
Outdoor distance	320mm	480mm	540mm	770mm	1000mm	1450mm	1850mm

6.36.3.2 The following minimum safety clearances shall be maintained between any live conductor or metal and ground surface level: -

Highest phase to phase r.m.s voltage for equipment.	24kV	36kV	48kV	72.5kV	100kV	145kV	245kV
Nominal phase to phase r.m.s system voltage	22kV	33kV	44kV	66kV	88Kv	132kV	220kV
Within security fence. (Restricted access way)	2820mm	2930mm	3040mm	3270mm	3500mm	3950mm	4350mm
Outside security fence but within Transnet freight rail's reserve	5200mm	5300mm	5400mm	5700mm	5900mm	6300mm	6700mm
Outside Transnet freight rail's reserve	5500mm	5500mm	5500mm	5700mm	5900mm	6300mm	6700mm

6.37 SUPPORT STEELWORK.

6.37.1 The circuit breaker shall be provided with its own support steelwork, which shall be hot- dip galvanised in accordance with specification SANS 121 and shall comply to requirements of SANS 1431: for weldable structural steels.

6.37.2 Support steelwork exposed to a high pollution/corrosive atmosphere shall be painted in accordance with specification CEE.0045.

7.0 SPECIAL TOOLS, SERVICING AIDS AND MANUALS AND SPARES LISTS.

7.1 The tenderers shall submit a separate offer for special tools and servicing aids necessary for the servicing and maintenance of SF6 circuit breakers.

7.2 Three copies of instruction/maintenance manuals, spares list's and wiring diagrams of the circuit breakers in accordance with Transnet freight rail's specification CEE.0224. shall be supplied upon delivery.

8.0 TRAINING.

8.1 The tenderer shall submit details with the tender of the training courses, which will be conducted by the supplier for the training of Transnet freight rail maintenance staff in the operation and maintenance of the circuit breaker. The courses shall include theoretical as well as practical tuition. The date and venue of this training course shall be arranged with the maintenance manager of the depot. The cost of the training shall be quoted for separately.

9.0 TEST CERTIFICATES.

9.1 The manufacture shall make available type test certificates for the equipment (as specified in SANS 62271-100 when required. Routine test certificates shall be supplied with each circuit breaker.

10.0 GUARANTEE AND DEFECTS.

10.1 The contractor shall guarantee the satisfactory operation of the circuit breaker supplied and accept liability for maker's defects, which may appear in design, materials and workmanship.

10.2 The guarantee period shall expire after: -

A period of 12 months commencing on the date of energising of the circuit breaker.

10.3 Any specific type of fault occurring three times within the guarantee period and which cannot be proven to be due to other faulty equipment not forming part of this contract, shall automatically be deemed an inherent defect. Such inherent defect shall be fully rectified to the satisfaction of the maintenance manager of the depot and at the cost of the Supplier.If urgent repairs have to be carried out by Transnet freight rail staff to maintain supply during the guarantee period the supplier shall inspect such repairs to ensure that the guarantee period is not affected and should they be covered by the guarantee, reimburse Transnet freight rail the cost of material and labour.

11.0 INSPECTION.

11.1 Transnet freight rail reserves the right to carry out inspection and any tests on the equipment at the works of the supplier/ manufacture.

11.2 Arrangements must be made timeously for such inspections to be carried out before delivery of the equipment to the client.

12.0 PACKAGING AND TRANSPORT.

12.1 The tenderer shall ensure that the equipment be packed in such a manner that it will be protected during handling and transport.

12.2 The tenderer shall provide transport for the delivery of the equipment to the site where required.

13.0 BIBLIOGRAPHY

[1] SANS 1019: 2008. Edition 2.5

END

SCHEDULE OF REQUIREMENTS
(To be completed by client)

1.0 SYSTEM DETAIL

1.1 AC Circuit Breakers: _____ substation/location.

1.2 Pollution level: Heavy_____ Very Heavy _____

1.2 Quantity of AC Circuit Breakers. _____

1.1 Nominal phase to phase voltage for 3 phase system: _____ kV.

1.2 Nominal phase to neutral voltage for single phase systems: _____ kV.

1.3 Frequency: _____ Hz

1.4 Circuit breaker control DC voltage: _____ V

1.5 Circuit breakers to be used for the following:

- 3 kV DC Traction substations. Yes/No
- Distribution substations. Yes/No
- 25 kV AC Traction substations. Yes/No
- 50 kV AC Traction substation. Yes/No

DETAIL OF AC CIRCUIT BREAKERS.

2.0 Type of circuit breakers required:

Vacuum: Yes / No

Gas (SF6): Yes / No _____

2.2 Number of circuit breakers required: _____

2.3 Number of poles: _____

2.4 Rated Voltage: _____ kV

2.5 Rated short-circuit breaking current: _____kA

2.6 Rated normal current: _____ Ampere.

END

TECHNICAL DATA SHEET
(To be completed by tenderer)

DETAIL OF CIRCUIT BREAKER

1.1 Make and manufacturer _____

1.2 Rated Voltage _____ kV.
(Highest rated voltage for equipment)

1.3 Rated Insulation level _____ kV.
(Rated lightning withstand Voltage)

1.4 Number of Poles: _____

1.6 Rated short circuit breaking current _____ kA.

1.7 Rated normal current: _____ Ampere.

1.6 Breaker operating time:

1.6.1 Closing: _____ ms.

1.6.2 Opening: _____ ms.

1.7 Number of operations after which breaker contact maintenance / measurement is required:

1.7.1 Under full load conditions _____

1.7.2 Under fault conditions _____

1.8 First Pole to Clear Factor _____

1.9 DC control voltage: _____ V

TRANSNET
freight rail

TECHNOLOGY MANAGEMENT

SPECIFICATION

AC PRIMARY CIRCUIT BREAKER CONTROL PANEL AND AC/DC DISTRIBUTION PANEL FOR 3kV TRACTION SUBSTATION

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Date: 21st September 2009

Circulation Restricted To:

Transnet Freight Rail – Chief Engineer Infrastructure
- Technology Management

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1.0 SCOPE

This specification covers Transnet Freight Rail's requirements for the design, manufacture, delivery, installation and commissioning of the high voltage AC primary circuit breaker control panel and AC/DC distribution panel for 3 kV DC traction substations. The purpose of the AC primary circuit breaker control panel and AC/DC distribution panel is to house the protective and control equipment for the suitable operation of the substation.

2.0 BACKGROUND.

3 kV DC traction substation comprises of a high voltage outdoor yard and a building housing the indoor equipment. The outdoor yard equipment consists of HV disconnects, primary circuit breakers, current and voltage transformers, and main traction - and auxiliary supply transformers. The indoor equipment comprises of a 3 kV DC rectifier with its associated control equipment, 3 kV DC high speed circuit breakers, 110 V battery charger unit and batteries.

3.0 STANDARDS AND PUBLICATIONS.

The following publications are referred to:

3.1 IEC - INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC 60255-5:	Electrical relays - 5. Insulation coordination for measuring relays and protective equipment- requirements and tests.
IEC 60529:	Degree of protection provided by Enclosures. (IP code.)
IEC 60051-1:	Direct Acting Indicating Analogue Electrical Measuring Instruments and their accessories. Part 1 - Definitions and general requirements common to all parts.

3.2 SOUTH AFRICAN NATIONAL STANDARDS

SANS 156:	Moulded Case Circuit Breakers.
SANS 1091:	National colours standard for paint.
SANS 1274:	Coatings applied by the powder-coating process.
SANS 10142:	Installation and wiring of premises.

3.3 TRANSNET FREIGHT RAIL'S SPECIFICATIONS

CEE.0224:	Drawings, catalogues, instruction manuals and spares list for electrical equipment supplied under contract.
BBB0041:	Preparation of drawings for Transnet Freight Rail Infrastructure.
BBB2502:	Requirements for battery chargers for 3 kV DC traction substations.

3.4 TRANSNET FREIGHT RAIL'S DRAWINGS

CEE-TBD-7:	Earthing arrangement for 3 kV DC traction substation.
CEE-TBK-0027:	Control circuit diagram. No-volt coil protection.

4.0 APPENDICES

The following appendices form part of this specification:

Appendix 1: Shows the recommended layout of the AC/DC Distribution Panel.

Appendix 2: Shows the recommended layout of the AC Primary Circuit Breaker Control Panel.

Appendix 3: Schedule of requirements.

5.0 TENDERING PROCEDURE

5.1 Tenderers shall indicate clause by clause compliance with this specification. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance.

5.2 The tenderer shall motivate a statement of non-compliance.

5.3 Tenderers shall submit schematics and wiring diagrams, general constructional details and principal dimensions of the panels.

5.4 Failure to comply with clauses 5.1, 5.2, and 5.3 could preclude a tender from consideration.

6.0 SERVICE CONDITIONS

The primary circuit breaker control panel and AC/DC distribution panel shall be designed and rated for continuous operation under the following conditions:

6.1 ATMOSPHERIC CONDITIONS

Altitude:	0 to 1800m above sea level.
Ambient temperature:	-5°C to +45 °C.
Relative humidity:	10% to 90%
Lightning Conditions:	12 ground flashes per square kilometre per annum.
Pollution:	Heavily salt laden or polluted with smoke from industrial sources.

6.2 MECHANICAL

The substation in which the panels will be installed is situated next to a railway line and the equipment will therefore be subjected to vibration. The design must take appropriate counter measures to ensure reliability of equipment that are sensitive.

6.3 ELECTRICAL

Nominal DC control voltage:	110 V (Minimum being 88 V and maximum128 V
Nominal AC auxiliary supply:	400 V / 230 V, 50Hz

The existing main protection current transformers are of the bushing or free standing post type.
The class of the current transformers are 10P10
The burden rating is of the order of 15VA or greater
The ratios are of the order as listed below:

Supply Voltage	Ratio
132kV	30/1 or 30/5
88kV	50/1 or 50/5
66kV	75/1 or 75/5

Equipment within the substation-building environment is subjected to electromechanical interference as well as voltage surges.

7.0 GENERAL REQUIREMENTS OF CONTROL /DISTRIBUTION PANELS.

7.1. The successful supplier shall be responsible for the design, the ratings of all, cabling, wiring, protection circuitry, sizing of contactors, relays, moulded circuit breakers, (mcb's) Isolators, fused isolators, fuse ratings, terminations and any other equipment and circuitry used.
In the event of a dispute, Transnet Freight Rail staff's shall make the final decision on technical matters.

7.2 The construction of the control/distribution panels shall be either two separate panels or a combination of both into one panel with the AC and DC circuitry separated. Refer to Appendix 1 Clauses 1.0, 2.0 and 3.0.

7.3 The control/distribution panels shall be so designed that the control switches are accessible and indicating lights, flag indicators, volt and ammeters are visible without opening the doors.

7.4 Appendix 1 and Appendix 2 show the recommended layout of the control equipment on the front door of the substation control panels.

7.5 All circuitry shall be wired in the fail to safe mode i.e. relays and contactors must be de-energised under fault conditions.

7.6 All relays, control switches, indicating lights, and control push buttons, etc. which are mounted on panel door shall be suitably labelled to clearly indicate their function. The labels shall be engraved with white lettering on a black background and permanently fixed with miniature screws, rivets or high quality adhesive.

7.7 Laminated plastised labels shall be used for labelling inside the panel and panel door. The lettering shall be either engraved or etched.

8.0 AC PRIMARY CIRCUIT BREAKER CONTROL PANEL

The panel shall be fitted with the following:

- Flag relays and associated LED Annunciator panel. (Clause 8.1)
- AC Primary circuit breaker control circuitry and equipment (Clause 8.2)
- Rectifier control circuitry and equipment. (Clause 8.3)
- Main AC thermal overload and instantaneous over current protection relays. (Clause 8.4)
- Auxiliary transformer overload protection relay. (Clause 8.7)
- AC earth leakage protection relay. (Clause 8.5)
- DC Earth leakage protection relay. (Clause 8.6)
- Main and auxiliary transformer protection circuitry. (Clause 8.7)
- Local and remote control circuitry and equipment. (Clause 8.8)
- Emergency stop button. (Clause 8.11)
- Lock out reset button and indication. (Clause 8.12)

8.1 FLAG ANNUCIATOR UNIT

8.1.1 The purpose of the flag annunciator unit is to give an alarm/indication of the status of the substation equipment and shall not be used as a tripping mechanism for any of the protection circuits or form part of the tripping circuits.

8.1.2 The design of the flag annunciator unit shall allow any input condition to trigger the flag annunciator alarm and the corresponding indicator shall illuminate.

8.1.3 All inputs shall be latchable and shall continue to indicate even after a power failure.

8.1.4 The flag annunciator alarm shall be equipped with a "Test button" which will apply power supply voltage to all inputs for test purposes.

8.1.5 The alarm annunciator system shall be supplied with a "Reset button" to clear any alarm.

8.1.6 When buzzers or flashing indicators are fitted an alarm "Accept button" shall be provided.

8.1.7 The flag relay and annunciator unit shall make provision for a minimum of 20 annunciator circuits.

8.1.8 The annunciator shall have the following minimum indications.

- Main overload.
- Main overload protection relay fault. (Watchdog facility)
- Auxiliary Overload (If applicable).
- Oil temperature.
- Winding temperature.
- DC Earth Leakage.
- AC Earth leakage.
- Main transformer Bucholz operation.
- Aux transformer Bucholz operation (If applicable).
- Rectifier Attenuation and over temperature.
- Rectifier diode failure
- Rectifier fan failure.
- Battery undervoltage.
- 400 V 3 phase auxiliary supply phase failure.
- Low SF6 gas pressure (If applicable).

8.2 AC PRIMARY CIRCUIT BREAKER CONTROL AND INDICATION

8.2.1 Provision shall be made for the following:

- Local / Remote two position switch. The switch shall have no "off" or "neutral" position
- Local indication. Open/Trip (green) and closed (Red).
- Lockout indication. (Amber)

8.3 RECTIFIER FAN CONTROL AND PROTECTION CIRCUITRY

8.3.1 Provision shall be made for the following:

- Fan motor protection circuitry.
- Fan failure circuitry (vane switch).
  The circuitry shall be fail-safe and shall provide a signal to the flag annunciator panel when the fan fails.
- Rectifier current sensing circuitry.
  The operation of the rectifier fan/fans shall be dependent on the full load current rating of the rectifier as well as the temperature of the rectifier.
  The rectifier current sensing control circuitry shall operate at 50% (adjustable) of the full load current rating of the rectifier. The current sensing circuitry shall be adjustable between 10% and 90% of full load of the rectifier.
  In order to avoid oscillatory pumping action of the fans a timing circuit shall ensure that fans remain energised for a period of at least 3 minutes after each and every start irrespective of the load condition in that time span.
- Diode supervisory circuitry.
- Fan test switch (switch on front of panel).
  A spring-loaded self-resetting switch shall be provided for the manual testing of the fan/fans.

8.4 MAIN AC THERMAL OVERLOAD AND INSTANTANEOUS OVERLOAD PROTECTION RELAYS.

8.4.1 The protection relays shall be of the type readily available on the open market.

8.4.2 The protection relays shall be in accordance to IEC 60255-5 and shall be flush mounted. Electronic protection relays shall be provided with a password system to prevent any unauthorised changing of the relay settings.

8.4.3 The protection relays shall incorporate a watchdog facility, which shall energise in the event of failure of the relay or relay functions.

8.4.4 The high voltage AC primary circuit breaker shall be provided with AC thermal overload and instantaneous overload protection on each of two phases

8.4.5 The protective elements of the relay shall be suitable for operation in conjunction with the main current transformers. The secondary current ratings are 5 ampere and 1ampere.

8.4.6 In the event of protection relay failure, the relay shall fail-safe and shall trip the AC primary circuit breaker.

8.4.7 The thermal overload protection shall be provided to permit loads not less than the specified load-rating curve of the 3 kV rectifier, which is tabled below and shall not exceed the manufacturers, declared rectifier rating.
2 x full load for 30 minutes
3 x full load for 1 minute
3.5 x full load for 10 seconds.
4.25 x full load instantaneous
Short circuit proof for 200 milli seconds

8.4.8 The operating level of the overload elements and time delay settings shall be independently adjustable.

8.4.9 For AC overload the protection relay shall have a minimum calibrating range from 3 to 6 times the full load line current of the rectifier equipment.

8.4.10 The AC overload protection shall be provided with an adjustable time delay to prevent operation as a result of inrush currents during switching of the transformer, and to provided sufficient time delay of operation to ensure that only the 3 kV DC high speed track circuit breakers operate under fault conditions.

8.5 AC EARTH LEAKAGE PROTECTION RELAY

8.5.1 An instantaneous relay for the AC earth leakage protection shall be supplied. The relay may be separate or incorporated as a function of the main overload relay.

8.5.2 The AC earth fault protection shall trip and lockout the AC primary circuit breaker in the event of any flashover or earth leakage which may occur on the outdoor AC high voltage equipment

8.5.3 The relay shall be suitable for operation in conjunction with its associated earth fault current transformer. The relay shall have a calibration range of between from 50 to 100 amperes adjustable.

8.5.4 The relay shall be fitted in the primary circuit breaker control panel.

8.6 DC EARTH LEAKAGE PROTECTION RELAY.

8.6.1 The DC earth leakage relay shall not be fitted in the control panel but on the outside of the control panel. In the case of space constraints (single unit substations) the relay may be mounted on a wall or other location, which shall be decided after consultation with Transnet Freight Rail's staff.

8.6.2 The steelwork of all 3 kV DC equipment installed in a traction substation is connected to a DC earth leakage busbar which is mounted on insulators. This busbar is connected to the substation negative (which is near earth potential) through the DC earth leakage relay by means of two 95mm² PVC insulated copper cables. In the event of a failure of the 3 kV DC insulation, the fault current flows to rail (substation negative) by way of the relay causing its operation at the calibrated current setting.

8.6.3 The DC earth leakage busbar may also be installed so that its passes through the aperture of the DC earth leakage relay. The one side of the busbar is connected to the substation negative and the steelwork of the electrical equipment is connected on the other side.

8.6.4 A suitable DC earth leakage relay shall be provided that will trip at a predetermined value in the event of failure of the 3 kV DC insulation.

8.6.5 The DC earth leakage copper busbar dimensions minimum 50x10 mm² shall be provided for. Provision shall be made for a minimum of ten 95 square mm conductor lugs.

8.6.6 The connection between the DC earth leakage primary busbar and the steelwork of the equipment inside the substation shall be made by means of 95 mm² PVC insulated conductors. (Drawing CEE-TBD-7 which shows a typical layout of the interconnections between the steelwork of the equipment and the DC earth leakage busbar.

8.6.7 The DC earth leakage relay shall be robustly constructed and protected against the ingress of dust, dirt and moisture.

8.6.8 The DC earth leakage relay shall have provision for lead-and-wire sealing to prevent unauthorised tampering with the calibration.

8.6.9 Once the DC earth leakage relay has operated it shall remain latched in the tripped position until it is manually reset.

8.6.10 The operation of the DC earth leakage relay shall be instantaneous.

8.6.11 The DC earth leakage relay shall be provided with a flag indicator and facilities for electrical remote flag indication.

8.6.12 The DC earth leakage relay shall incorporate sufficient auxiliary contacts to enable the correct operation of the circuit. The contacts shall be continuously rated to carry and make or break a 5 A, 110V inductive circuit.

8.6.13 The aperture of the magnetic core of the DC earth leakage relay shall be large enough to accommodate two 95mm² PVC insulated copper conductors, which connect the DC earth leakage busbar to substation negative. (See Engineering Instruction S.013 Issue 2).

8.6.14 The DC earth leakage relay shall be capable of operating under short-circuit conditions where the fault current could be in the order of 50 kA DC and the possible rate of rise between 3 and 6 kA per second.

8.6.15 The trip setting of the DC earth leakage relay shall be easily adjustable in the range 10 – 200 A. The trip setting shall be indicated on a dial and pointer to facilitate calibration.

8.6.16 The calibration must be stable and accurate to plus minus 10 percent of the trip setting of the DC earth leakage relay.

8.6.17 The DC earth leakage relay shall be protected from accidental damage or contact by a sturdy enclosure manufactured from a suitable transparent non-conductive material.

8.6.18 The copper busbar shall be insulated from the mounting surface by means of suitable insulators etc and provision shall be for the termination of the earthing conductors.

8.7 MAIN AND AUXILIARY TRANSFORMER GAS ACTUATED AND TEMPERATURE PROTECTION RELAYS CIRCUITRY

8.7.1 Provision shall be made for the main transformer Bucholz relay and oil and winding temperature relay alarm and trip circuits.

8.7.2 Provision shall be made for the auxiliary transformer Bucholz relay and oil / winding temperature alarm and trip circuits as required.

8.8 OVERLOAD PROTECTION FOR AUXILIARY TRANSFORMERS

8.8.1 An overload relay shall be supplied for the protection of the primary winding of the auxiliary transformer.

8.8.2 The overload protection relay shall be the Strike FP2004 or other type approved by Technology Management.

8.9 LOCAL AND REMOTE CONTROL CIRCUITRY AND INDICATION EQUIPMENT

Provision shall be made for the local and remote tripping and closing of the AC primary circuit breaker.

8.10 TRIP CONDITIONS

A trip refers to a condition where a substation may be switched back on load from local or remote in the case where the relevant fault has cleared itself.

- Main Overload.
- Auxiliary transformer overload.
- Oil Temperature.
- Rectifier over temperature.
- 400 V auxiliary supply phase failure with time delay module adjustable from 0 to 60 seconds.
- Wave filter room interlock (where fitted)

8.11 LOCKOUT CONDITIONS

A lockout refers to the condition where the AC primary circuit breaker is tripped and inhibited from being closed by either local or remote control signal. In order to bring the substation back on load the relevant failure has to be addressed and rectified from inside the substation.

- DC Earth Leakage. Complete substation lockout.
- AC Earth Leakage.
- Protection relay failure. (Watchdog)
- Rectifier first diode failure.
- Rectifier attenuation failure.
- Battery undervoltage.
- Bucholz main transformer.
- Bucholz auxiliary transformer (If applicable).
- Low SF6 gas (If applicable).
- Winding temperature.
- Rectifier fan failure.
- No volt coil protection. Refer to Transnet Freight Rail's drawing No CEE-TBK–27 for control circuitry.

8.12 EMERGENCY STOP

A mushroom head (red) latched push button shall be provided. The operation of the pushbutton shall completely shutdown and isolate the substation from all supplies by the tripping of the high voltage AC primary circuit breaker(s) and all the 3 kV DC track breakers. It shall not be possible to carry out local and remote control of the equipment until the emergency push button has been reset.

8.13 LOCK OUT RESET BUTTON AND INDICATION.

Provision shall be made for the manual reset of a lock out condition, which occurs in the substation. The reset of the lockout condition shall only be possible with the operation of the annunciator flag reset and lockout reset button.

9.0 AC/DC DISTRIBUTION PANEL

The panel shall make provision for:

- AC Distribution (400 V, 3 Phase) (Clause 9.1.)
- DC Distribution (110 V DC) (Clause 9.2)
- DC Control and supervisory circuitry and track breaker control. (Clause 9.3)

9.1 AC DISTRIBUTION. (400V, 3 PHASE)

Provision shall be for the following:

- 3 phase 15 kA short circuit rated, 415 V moulded case circuit breaker / fused isolator for the protection of the three-phase auxiliary transformer supply. The fused isolator shall be the AEG or equivalent type that has been approved by Technology Management.
- busbars protected by clear Perspex barriers shall be marked with a danger sign and "400 V."
- current transformers in the control panel for the measurement of the low voltage currents for each phase of the 400 V supply.
- ammeter and voltmeter for the measurement of the 3 phase currents and voltages.
- suitable four-way rotary selector switches for the measurement of the 3 phase currents and voltages.

9.1.1 400V 3PHASE DISTRIBUTION SUPPLY

The following 3 phase supplies are normally required but could vary for each substation. These supplies shall be individually protected by moulded case circuit breakers.

- 60 A calibrating set supply.
- Substation distribution board.
- Substation building fan.
- Battery room fan including overload protection.
- Spare supply points as required.
- 40 A supply for regenerative breaking absorption equipment where specified.

9.1.2 3 PHASE DETECTION FAILURE RELAY.

One three phase detection failure relay shall be installed in the panel. The relay shall monitor the 400 V panel supply for the following:

- Phase failure.
- Sequence reversal.
- Excessive phase unbalance.
- The relay shall have of hysteresis of not more than 5% and a reaction time of 3 seconds or better.
- An adjustable time delay setting shall be incorporated on the front of the detection relay to prevent the operation of the relay due to Eskom supply dips. The time delay adjustment shall be between 0 to 60 seconds.

9.1.3 230 V SINGLE PHASE DISTRIBUTION SUPPLY

The following single phase supplies are normally required but could vary for each substation. These supplies shall be individually protected by moulded case circuit breakers.

- Telecontrol supply.
- Eskom metering supply.
- 3 pin 230 V, 15 A socket outlet protected by earth leakage unit in accordance with SANS 10142.
- Battery charger supply.
- Substation distribution board and lights.
- Supplies to the primary circuit breaker control panel.

9.1.4 400V AUXILIARY SUPPLY CHANGE OVER SYSTEM

9.1.4.1 Unless otherwise specified a 400 V auxiliary supply change over system shall be installed in the panel to provide a continuous 400 V supply in the substation for the following situations.

- Where in a double unit substation two auxiliary transformers are installed and one unit is switched off or
- Where it is required to supply the traction substation from a standby auxiliary supply in the event of the traction substation been switched off.

9.1.4.2 The contactors for the change over system shall be mechanically and electrically interlocked.

9.1.5 INDICATING INSTRUMENTS FOR THE 400 V AC DISTRIBUTION

The panel shall be fitted with the following indicating instrument for the AC distribution auxiliary supply.

- One 0 to 400 V voltmeter with its own selector switch. The instrument shall be labelled "AC VOLTS"
- One 0 to 100 A ampere meter with its own selector switch. The instrument shall be labelled "AC AMPERES"

9.2 110 DC VOLT DISTRIBUTION

9.2.1 The 110 V DC supply shall be obtained from the substation battery bank, which is charged by a freestanding battery charger unit. Refer to Transnet Freight Rail's Specification BBB 2502 latest version. The installation of a battery charger in the AC/DC distribution panel is not acceptable.

Provision shall be made on AC/DC distribution panel for the following:

9.2.2 INDICATING INSTRUMENTS

9.2.2.1 One 0 to 150 V DC voltmeter labelled "DC VOLTS" to indicate the battery output voltage. The voltmeter shall be provided with a selector switch to be able select any of the following positions:

- DC Volts.
- Battery earth fault between battery positive and negative DC earth leakage busbar. (Frame)
- Battery earth fault between battery negative and negative DC earth leakage busbar. (Frame)

9.2.2.2 One 0 to 150 V DC voltmeter labelled "HOLDING COIL VOLTS" to indicate the holding coil supply voltage.

9.2.2.3 One 0 to 30 A DC ampere meter labelled "HOLDING COIL AMPERES" to indicate the holding coil current.

9.2.2.4 One 0 to 30 A DC ampere meter labelled "DC AMPERES" to indicate the battery output current.

9.2.2.5 One DC ampere meter labelled "BATTERY FLOAT CHARGE" to indicate the float charge to the battery. A short circuiting spring loaded switch shall be provided to protect the instrument against fault conditions i.e.

- Charging batteries at the maximum rate.
- Reverse current through the ammeter when the battery charger is disconnected.

9.3 110V DC DISTRIBUTION SUPPLY

9.3.1 The following 110 V DC supplies are normally required but could vary for each substation. These supplies shall be individually protected by moulded case circuit breakers.

- Panel lamps and switches.
- Primary circuit breaker control panel.
- 3 pin 110 V, 15 A DC socket outlet.
- Substation distribution board.
- Eskom metering.
- Telecontrol.
- 3 kV DC undervoltage relay.
- For the 110 V battery supply a double pole, 100 to 150 A DC isolator or MCB, dependant on the ampere-hour rating of the batteries shall be provided.
- Protection and control circuit supplies for regenerative braking equipment. (If specified).

9.3.2 For the track breaker control circuitry the following size mcb's shall be required:

- The 110 V positive (busbar) supply for the closing coil requires 80 amperes or less depending on type of track breaker.
- The 110 V negative (busbar) supply for the closing coil requires 80 amperes or less depending on type of track breaker.
- The 110 V constant voltage positive supply for the holding coil requires 5 amperes.
- The 110 V positive (busbar) supply for the holding coil requires 5 amperes.
- The 110 V negative (busbar) supply for the holding coil requires 5 amperes.

9.4 DC CONTROL AND SUPERVISORY CIRCUITRY AND TRACK BREAKER CONTROL.

The DC control and supervisory system shall have the following circuitry fitted:

- Battery undervoltage relay adjustable from 80 to 110 V DC.
- Lockout relay.
- Earth leakage slave relays.
- 3 kV DC High Speed Circuit Breaker control circuitry (dependant on number High Speed Circuit Breakers.)
- Selector and control switches.
- Measuring instruments for DC amperes, DC voltages, Holding coils voltage and holding coil current.

10.0 PROTECTION RELAYS

10.1 The protection relays (see clause 8.4 and 8.5) shall be flush mounted on the panel door.

11.0 CIRCUIT BREAKERS, CONTACTORS, RELAYS AND INDICATING LAMPS.

11.1 All contactors and relays shall be protected from the ingress of dirt or dust by means of suitable non-flammable dust tight covers. The relays shall have a protection rating of IP 34 as defined in IEC 60529.

11.2 All circuit breakers, contactors, relays and indicating lamps shall be readily available on the open market.

11.3 Contactors and relays shall be of the sturdiest construction and shall not be affected by vibration.

11.4 DC operated relays shall be capable of satisfactory operation between 85 Volts and 140 Volts without any damage to the relays.

11.5 AC operated relays and contactors shall be suitably rated for the auxiliary supply voltage, which could vary due to the tapping range of the main and auxiliary transformers.

11.6 The contractor shall supply and install surge protection for the 400 volt 3 phase AC and 110 volt DC supplies to the control panels.

11.6.1 Dehn type surge protection units or equivalent shall be provided for the 110 volt DC supply and shall be connected as follows:

- One unit connected between the 110 Volt DC Positive and Negative.
- One unit connected between the 110 volt DC Positive and the panel earth.
- One unit connected between the 110 volt DC Negative and the panel earth.

11.6.2 A DehnGuard MTT pole surge protection unit or equivalent shall be provided for the 400 volt three phase AC supply to the control panels.

11.7 All low voltage circuits in the panel, which require protection, shall be suitably protected by moulded case circuit breakers, which comply with the requirements of SANS 156.

11.8 The low voltage moulded case circuit breakers shall be of suitable rating and rupturing capacity.

11.9 Selector switches used for the DC voltmeter shall be of the make before break type.

12.0 ELECTRICAL MEASURING INSTRUMENTS

12.1 The type of measuring instruments shall be readily available on the open market.

12.2 All analogue electrical indication meters shall be in accordance with IEC 60051-1. The meters shall be flush mounted.

12.3 Analogue meters shall be used for the measurement of AC values and shall have a class index of 1.5. The analogue face of the meters shall not be less than 96mm x 96mm with a 90 degree display.

12.4 Analogue or digital meters may be used for the measurement of DC voltage and current.

12.5 Digital instruments shall have a display of 3.5 digits, 12 milli meters high and have an accuracy of 0.5%.

13.0 TELECONTROL

Provision is made for the closing, monitoring and tripping of the substation equipment from a Control office.
Telecontrol signals are incorporated in both the AC Primary Circuit Breaker and the AC/DC Distribution panels. Provision shall be made for the termination of the telecontrol signals to a common terminal strip. This is connected to the telecontrol panel by means of a multicore cable. Provision shall be made for the following signals:

13.1 AC PRIMARY CIRCUIT BREAKER

- Open, Close and Lockout conditions.

13.2 3 kV DC HIGH SPEED CIRCUIT BREAKERS.

- Open, Close and Lockout conditions.

13.3 TRANSFORMERS (Main and Auxiliary where applicable)

- Transformer Overload.
- Over temperature (Oil / winding).
- Bucholz operation.

13.4 EARTH FAULT CONDITIONS

- DC Earth Leakage.
- AC Earth Leakage.

13.5 RECTIFIER FAILURE

- Over temperature.
- Diode failure.
- Fan failure.

13.6 SUPPLY VOLTAGE FAILURES

- 400 V AC auxiliary supply phase failure.
- 110 V DC Failure.
- 3 kV DC undervoltage relay failure.

13.7 BATTERY

- Battery undervoltage.

13.8 MAIN OVERLOAD/AC EARTH LEAKAGE RELAY FAILURE

- Protection relay failure. (Watchdog)

14.0 WIRING AND TERMINALS.

14.1 Sufficient terminal strips shall be provided for the number of circuit breakers to be controlled.

14.2 All terminals on equipment such as switches and relays shall be suitably numbered and reflected on the substation schematics and wiring diagrams.

14.3 All terminal blocks and groups of terminal blocks shall be suitably numbered.

14.4 All wires shall be provided with identification tags at terminals and shall be marked as reflected on the panel-wiring diagram. The diagram markings and wire markings shall be the same.

14.5 Terminals shall be provided near the bottom of the panels for the connection of cables from ducts, pipes etc. The terminal strips shall be grouped together and arranged so as to facilitate the removal of connections.

14.6 Suitable terminal strips shall be provided to facilitate wiring between the various items of equipment and to the remote control station or telecontrol.

14.7 All wiring shall be carried out on the loop-in system and the looping-in shall be done at the terminal strips. "X" type wiring will not be acceptable.

14.8 The method of loop wiring from one relay to another without protection for the individual circuits is not acceptable.

14.9 The cross-sectional area of all small conductors for low voltage circuits shall be not less than that required to ensure sufficient mechanical strength. The conductors shall be stranded to ensure flexibility.

14.10 All wires and conductors for low voltage circuits shall be a minimum of 2.5 square mm with the exception of the main battery supply cables between the main battery switch and busbars, which shall be at least 16 square mm.

14.11 The conductors for the multicore telecontrol cable shall be at least 1,5 square mm per conductor. Provision shall be made for 10% spare conductors in the multicore telecontrol cable supplied.

14.12 All wires and conductors shall be routed via PVC channel trunking with a removable cover. Use should be made of trunking of sufficient capacity to easily hold the conductors and wires.

14.13 Where low voltage busbars are mounted inside panels, they must be mounted in such a manner as not to cause a hazard to maintenance staff working in the panels. These busbars shall be provided with translucent Perspex barriers to prevent accidental contact with the live busbars. The barriers shall be provided with warning signs.

14.14 Where equipment is mounted on the doors of the panels, adequate flexibility of the wiring shall be provided to eliminate any damage to the conductors.

14.15 The panels shall be provided with earthing studs for 95mm earthing cables. (CEE-TBD-7 Earthing arrangement for 3 kV DC traction substations.)

PROTECTION TEST BLOCK

14.16 A test block shall be provided for the main overload protection relays and shall be fitted in the control panel at a height of one metre from the bottom of the control

14.17 The test block shall be the PK2 or Chamberlain & Hookam type.

14.18 The test block shall form part of the circuitry from the secondary wiring of the current transformers that terminate in the control panel and the overload protection relays.

15.0 PANEL CONSTRUCTION.

15.1 The panels shall be constructed from steel sheeting of at least 2mm thickness. The panels shall be of a rigid construction with facilities for lifting purposes.

15.1.1 Only on special request will the panels be constructed from stainless steel or other rust resistant steel.

15.2 The minimum dimensions shall be:

Height	2100mm (Including metal plinth)
Width	1000mm
Depth	900 mm

Any deviation from the above dimensions shall be discussed with Transnet Freight Rail's electrical staff.

15.3 The panels shall be supplied with rigidly constructed removable gland plates fitted at least 100 mm above the metal plinth to allow for easy access to cables. All required holes shall be punched into the gland plates by the successful tenderer. Any deviation from this shall be discussed with Transnet Freight Rail.

15.4 The panels shall be provided with hinged front doors to allow easy access to the control equipment. The doors shall be fitted with a handle or panel key locks. A minimum of two keys shall be supplied with each panel.

15.5 The panels shall be fitted with dummy interior covers so as to ensure that when components are mounted, no bolts, nuts or screws are visible on the exterior of the panels.

15.6 The control panel(s) shall be powder coated in accordance with SANS 1274. The finishing colours shall be Eau-de-Nil to SANS 1091 colour No H 43 on the outside and white gloss on the inside of the panels.

15.7 The control panel shall be mounted and secure onto a 75mm high metal plinth.

15.8 The panels shall be insulated from the concrete floor to reduce stray currents flowing into the panels.

15.9 The control and protective equipment shall be mounted on or within suitable panels constructed of sheet metal and fitted with front opening hinged doors to all allow for easy access to the equipment.

15.10 The panels shall be so constructed that control switches, indicating lamps, voltmeters and ammeters as well as LED type flag indication devices are visible without opening the hinged front doors.

15.11 The layout of the control equipment fitted on or in the panels, which includes relays, contactors, busbars, terminal strips etc shall provide for easy access.

15.12 The panels shall be provided with a 230V AC light with its own standby battery supply. The light shall be switched on by means of a micro switch when the panel door is opened.

15.13 Three pin 15-ampere industrial plugs shall be supplied for both the 230V AC and 110V DC supplies.

16.0 QUALITY ASSURANCE

16.1 Transnet Freight Rail reserves the right to carry out inspection and any tests on the equipment at the works of the supplier/ manufacture.

16.2 Arrangements must be made timeously for such inspections to be carried out before delivery of the equipment to the client.

17.0 SITE TESTS AND COMMISSIONING.

17.1 The contractor shall be responsible for carrying out on-site functional tests before the commissioning of the equipment.

17.2 Acceptance by the Maintenance Engineer or the delegated staff of satisfactory completion of on-site tests in no way relieves the contractor of his obligation to rectify defects which may have been overlooked or become evident at a later stage.

17.3 Commissioning will only take place after all defects have been rectified to the satisfaction of the Maintenance Engineer or the delegated staff.

17.4 Commissioning will include the energising of equipment from the primary isolator to the track feeder circuits. The contractor must prove the satisfactory operation of equipment under live conditions.

17.5 On completion of commissioning the contractor will hand the equipment over to the Maintenance Engineer or the delegated staff in terms of the relevant engineering instructions.

18.0 DRAWINGS, INSTRUCTION MANUALS AND SPARES LISTS

18.1 Drawings, instruction manuals and spare parts catalogues shall be supplied in accordance with Transnet Freight Rail's specification CEE.0224 and BBB0041.

18.2 The tenderer shall supply three copies of an instruction/maintenance manuals, schematic and wiring diagrams.

18.3 Approved schematic and wiring diagrams, which are supplied for maintenance and faultfinding, shall be A3. (29,7cm x 42cm).

18.4 The contractor shall submit details of spares required in accordance with specification No. CEE.0224.

18.5 All spares recommended for normal maintenance purposes that are not available locally (requires importation) must be highlighted.

19.0 SPECIAL TOOLS AND/OR SERVICING AIDS

19.1 Special tools or servicing aids necessary for the efficient maintenance, repair or calibration of the equipment shall be quoted for separately.

19.2 Tenderers shall submit detailed offers for special tools and servicing aids including all specialised equipment required for the servicing and maintenance of the equipment supplied.

20.0 TRAINING

20.1 The tenderer shall submit details with the tender of the training courses, which will be conducted by the contractor for the training of Transnet Freight Rail's maintenance staff in the operation and maintenance of the equipment supplied. The courses shall include theoretical as well as practical tuition. The date and venue of this training course shall be arranged with the maintenance manager.

21.0 GUARANTEE AND DEFECTS

21.1 The contractor shall guarantee the satisfactory operation of the complete electrical installation supplied and installed by him and accept liability for maker's defects, which may appear in design, materials and workmanship.

21.2 The guarantee period for all substations shall expire after:
A period of 12 months commencing on the date of completion of the contract or the date the equipment is handed over to Transnet Freight Rail whichever is the later.

21.3 Any specific type of fault occurring three times within the guarantee period and which cannot be proven to be due to other faulty equipment not forming part of this contract e.g., faulty locomotive or overhead track equipment, etc., shall automatically be deemed an inherent defect. Such inherent defect shall be fully rectified to the satisfaction of the Maintenance manager and at the cost of the Contractor.

21.4 If urgent repairs have to be carried out by Transnet Freight Rail's staff to maintain supply during the guarantee period the contractor shall inspect such repairs to ensure that the guarantee period is not affected and should they be covered by the guarantee, reimburse Transnet Freight Rail the cost of material and labour.

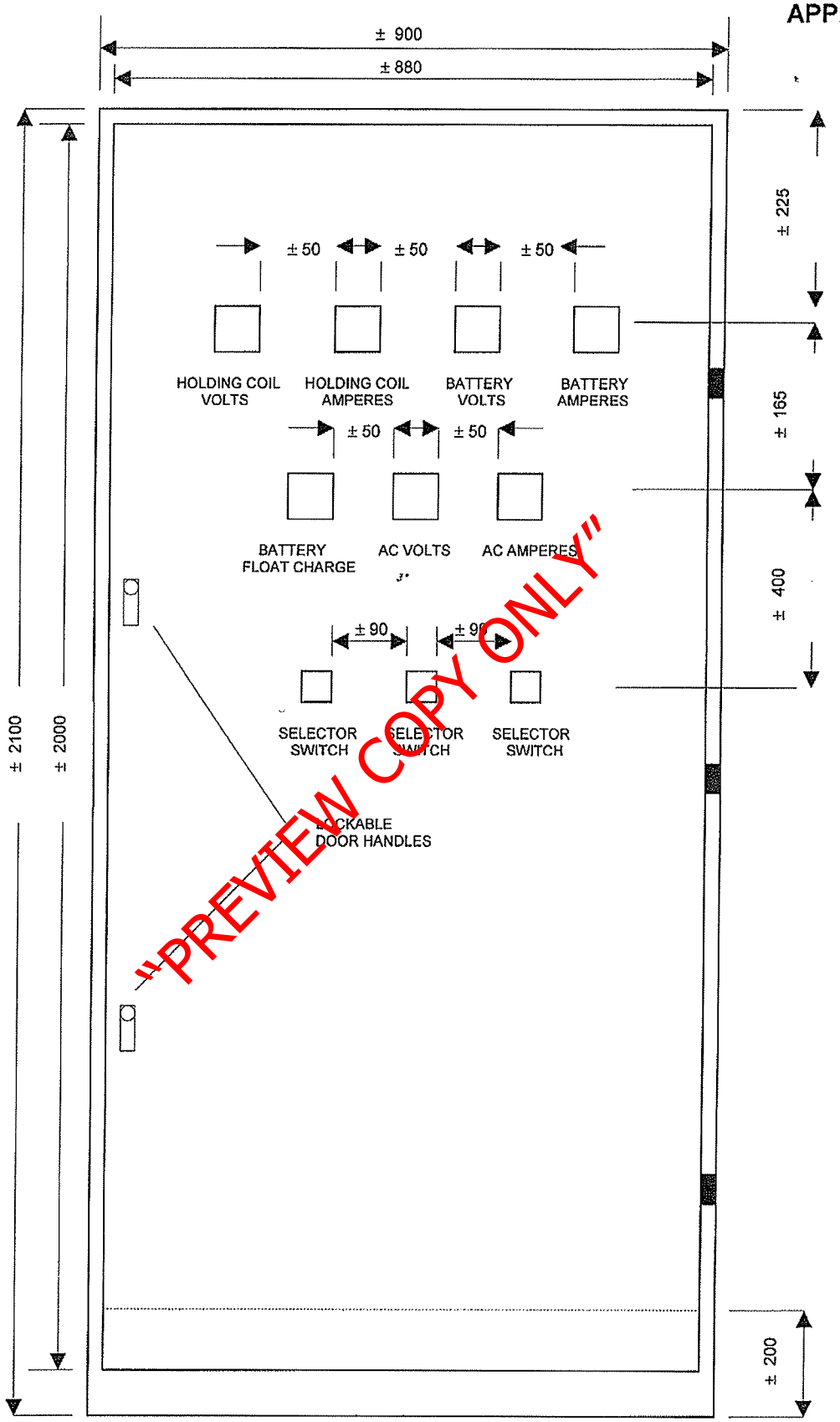
22.0 PACKAGING AND TRANSPORT.

22.1 The tenderer shall ensure that the equipment be packed in such a manner that it will be protected during handling and transport.

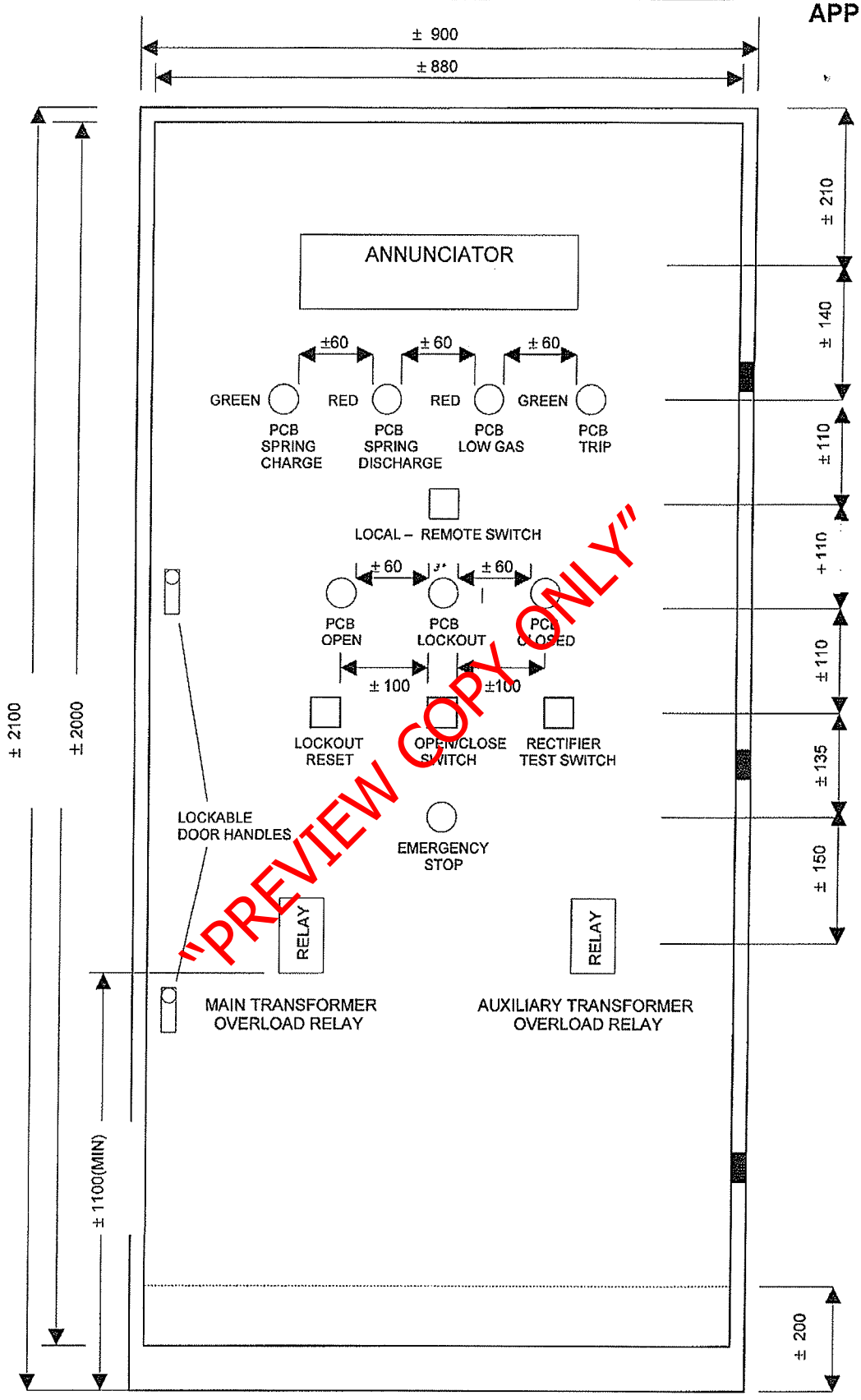
22.2 The tenderer shall provide transport for the delivery of the equipment to the site where required.

END

APPENDIX 1



AC/DC DISTRIBUTION PANEL



AC PRIMARY CIRCUIT BREAKER CONTROL PANEL

NOTE: WHERE THE ANNUNCIATOR PANEL MAKES PROVISION FOR THE SF6 LOW GAS INDICATION THE PCB LOW GAS AND PCB TRIP INDICATION LIGHTS MAY BE OMITTED

SCHEDULE OF REQUIREMENTS
(To filled in by the client)

OPTIONS OF CONTROL PANELS CONSTRUCTION.

1.0	Single AC primary circuit breaker control panel.	YES / NO
2.0	Single AC/DC distribution panel.	YES / NO
3.0	Combination of 1.0 and 2.0 into one panel.	YES / NO
4.0	Name Plate of substation to be fitted on the control panels	YES / NO

SPOORNET

A division of Transnet limited

ENGINEERING & TECHNOLOGY
TECHNOLOGY MANAGEMENT

SPECIFICATION

OUTDOOR, HIGH VOLTAGE, ALTERNATING CURRENT DISCONNECTORS COMBINED WITH EARTHING SWITCHES

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Date: 18th Oct 2004

Circulation restricted to:

Engineering &Technology: Infrastructure Maintenance
Engineering &Technology: Infrastructure Engineering
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INDEX

1.0 SCOPE

1.1 This specification covers Spoornet's requirements for the supply of outdoor, 3 phase, 50 hertz disconnectors combined with earthing switches for voltages above 1 000 V.

1.2 Equipment is required for installation at the end of overhead transmission lines to control the power supply to traction substations and step- down points and shall consist of a 3 pole disconnector to be connected to the line and provided with facilities to earth the "load" side of the circuit.

2.0 STANDARDS AND PUBLICATIONS

The following publications and documents (latest edition) are referred to herein.

2.1 SOUTH AFRICAN NATIONAL STANDARDS

SANS 121	:	Hot dip galvanized coatings for fabricated iron or steel article.
SANS 60273	:	Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000 V.
SANS 60815	:	Guide for selection of insulators in respect of polluted conditions
SANS 62271-102	:	High voltage switchgear and controlgear part 102: Alternating Current disconnectors and earthing switches

2.3 SPOORNET SPECIFICATIONS

CEE.0224	:	Drawings, catalogues, instruction manuals, spares list for electrical equipment supplied under contract.

3.0 TENDERING PROCEDURE

3.1 Tenderers shall indicate clause by clause compliance with the specification. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance.

3.2 A statement of non-compliance shall be motivated by the tenderer.

3.3 Tenderers shall complete annexure 2. "Technical data sheet."

3.4 Tenderers shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.

3.5 Failure to comply with clauses 3.1, 3.2, 3.3 and 3.4 could preclude a tender from consideration.

4.0 ANNEXURES

The following annexures form an integral part of this specification and shall be read in conjunction with it.

4.1 Annexure 1 - "Schedule of Requirements"

This annexure details the specific requirements for this application.

4.2 Annexure 2 - "Technical Data Sheet"

This annexure calls for specific technical information to be furnished with tenders.

4.2.1 This annexure is used during adjudication of tenders to assess the equipment offered.

4.2.2 Equipment described in annexure 2 shall comply with, and be supplied in terms of this specification. No changes or substitutions will be allowed without the written consent of Spoornet.

4.2.3 Acceptance of the equipment detailed in this annexure in no way relieves the tenderer of his obligation to fulfil his statement of compliance with the specification.

4.2.4 Tenderers are responsible for the accuracy of information submitted in this annexure.

5.0 SERVICE CONDITIONS

5.1 The equipment shall be designed and rated for continuous operation under the following conditions:

Altitude	:	0 to 1800m above sea level.
Ambient temperature	:	-5 °C to +45 °C
Relative humidity	:	10% to 90%
Lightning Conditions	:	12 ground flashes per square kilometre per annum.
Pollution	:	Heavily salt laden or polluted with smoke from industrial sources.

6.0 CLEARANCES

6.1 The following minimum safety clearances shall be maintained between any live conductor and earthed metal: -

Nominal phase to phase r.m.s system voltage	22kV	33kV	44kV	66kV	88Kv	132kV
Highest phase to phase r.m.s voltage for equipment.	24kV	36kV	48kV	72kV	100kV	145kV
Safety clearance	320mm	430mm	540mm	770mm	1000mm	1450mm

7.0 DISCONNECTORS COMBINED WITH EARTHING SWITCHES

This section shall be read in conjunction with SANS 62271-102

7.1 The combined AC disconnector and earthing switches shall be designed, manufactured and tested in accordance with SANS 62271-102.

7.2 Disconnectors and earthing switches shall have been type tested to verify performance and safety. Proof of these tests in the form of type test certificates shall be included in the tender documents.

7.3 The disconnectors shall be provided with a means for earthing the "load" side of the circuit, either by means of a separate earthing switch interlocked with its operating mechanism or contacts so placed that when the disconnector is in the "open" position, the "load" side is earthed.

7.4 The disconnectors shall be of the air-break type with the blades operating in a horizontal plane.

7.5 The disconnectors shall be so mounted that the phase-to-phase clearance for both the "open and earthed" and "closed" positions, shall not be less than:

22kV - 355mm
33kV - 510mm
40kV - 610mm
66kV - 890mm
88kV - 1,14metres
132 kV - 1,7metres

7.6 The operation of the disconnector shall be manual. (Dependent or independent).

7.7 The operating mechanism shall be constructed of anti-corrosive material to prevent sticking due to rust. All ferrous material shall be galvanised.

7.8 The operating handle shall be provided with suitable attachments to enable it to be locked in the up (closed) position and in the down (open and earthed) position by standard locks, supplied by Spoornet.

7.9 The operating assembly shall be fixed at a satisfactory operating height of approximately 1m from the bottom of the structure.

7.10 A mechanism shall be provided to mechanically interlock the operating handle with the associated primary circuit breaker to ensure that operation is only possible when the circuit breaker is in the "open" position.
It must, however, be possible to close the primary circuit breaker when the earthing switch is in the "earthed" position.

7.11 Electrical contacts shall be fitted to interlock the operating handle with the associated primary circuit breaker. In the event of accidental operation or movement of the operating handle the primary circuit breaker will be tripped before the main contacts of the AC disconnector starts opening.

7.12 A notice with the following inscription shall be mounted next to the operating mechanism:

"DO NOT OPERATE UNDER LOAD"

Refer to clause 11.4.2 of specification.

8.0 SUPPORT STRUCTURES

8.1 The combined AC disconnector and earthing switches shall be rigidly mounted on robust, hot-dipped galvanised supporting steel structures or pedestals in accordance with SANS 121.

8.2 The supporting steel structures or pedestals shall provide a minimum clearance of 3,6 metres (up to 88 kV) or 4,1 metres (above 88 kV) from the lowest "live" high voltage connection to finished yard level. Outline drawings submitted with tenders must indicate the actual clearances proposed.

9.0 CONNECTIONS

9.1 All high voltage connections must be of the solderless, concentric grip, or other approved solderless type, and must be of adequate cross-sectional area to suit both electrical and mechanical requirements. All connections to the disconnectors must be flexible so as not to affect smooth operation of the blade mechanism.

10.0 POST INSULATORS

This section shall be read in conjunction with SANS 60273.

10.1 All post insulators shall be designed, manufactured and tested in accordance with SANS 60273.

10.2 Unless otherwise stated in Annexure 1, creepage distances for heavy polluted atmospheres shall be in accordance SANS 60815 Clause 4.

11.0 NAMEPLATES AND LABELS

11.1 All nameplates and labels shall be in English.

11.2 In addition to the data called for in SANS 62271-102 the nameplate of each device shall indicate the Spoornet contract number.

11.3 Labels other than interchangeable labels shall be fixed by screws or rivets.

11.4 All labels shall be made of composite sandwich type plastic material of the following colour combinations:

11.4.1 Identification labels: White lettering on Black background. Letters must be of sufficient size to be clearly legible from a distance of 3 m.

11.4.2 Danger labels: White lettering on Red background. Letters must be of sufficient size to be clearly legible from a distance of 3 m.

11.5 The following is a list of approved labels referred to in the body of this specification.

On (1)
Off (0)
Open (Verb.)
Close (Verb.)
Closed
Open
Do not operate link under load.
Open and earthed.

12.0 DRAWINGS AND INSTRUCTIONS

12.1 All drawings shall be in accordance with specification CEE-0224.

12.2 The successful tenderer shall supply the following drawings and/or instructions, all of which shall be included in the tender price and be to the satisfaction of Spoornet.

12.2.1 Before delivery to site three (3) sets of detailed operating and maintenance instructions, with illustrations where necessary. These instructions shall be supplied with the "as built" drawings.

12.3 Late submission of drawings and instructions shall incur delivery penalties on the full contract price.

13.0 INSPECTION

13.1 Spoornet reserves the right by prior arrangement to inspect the equipment at any stage during manufacture.

14.0 TOOLS AND APPLIANCES

14.1 One set of any special tools and appliances required for normal operation and maintenance shall be supplied. All fittings, including holding down bolts, etc. for the complete installation of the equipment offered shall be supplied.

15.0 SPARES

15.1 Tenderers shall submit a separate quote for recommended spares for maintenance purposes.

15.2 A detailed description of each item including manufacturer's catalogue number and item number where applicable shall be furnished. Separate prices for each item shall be indicated.

15.3 The spare list shall be divided into two parts, one covering items used in a 12 month period and those likely to be used in a 10 year period.

15.4 Tenderers shall also state whether a complete range of spares is held in stock by their local representatives for subsequent purchase by Spoornet as and when required.

16.0 PACKING

16.1 The equipment shall be packed in such a manner that it will be adequately protected during handling and transport.

END

ANNEXURE 1

SCHEDULE OF REQUIREMENTS

1.0 Required for .....

2.0 Number of sets required .....

3.0 System of supply ..... kV, 50 Hz, 3 phase,.....neutral

		DISCONNECTOR	EARTHING SWITCH
4.0	Rated voltage:	.....kV	..... kV
5.0	Rated frequency:	50 Hz	50 Hz
6.0	Rated normal current:	.....A	..... . A
7.0	Rated short time withstand current:	.....kA	..... kA

8.0 Special requirements: .....

.....

.....

.....

.....

.....

END

ANNEXURE 2

TECHNICAL DATA SHEET

(To be completed by tenderers and submitted as part of their tender)

1.0 Spoornet Tender number: .....

		DISCONNECTOR	EARTHING SWITCH
2.0	Name of manufacturer.	.....	.....
3.0	Type number	.....	.....
4.0	Number of poles.	.....	.....
5.0	Indoor/Outdoor.	.....	.....
6.0	Rated voltage.	.....	.....
7.0	Rated insulation level.	.....	.....
7.1	Rated 1 minute power frequency withstand voltage.	.....	.....
7.2	Rated lightning impulse withstand voltage.	.....	.....
8.0	Rated frequency.	.....	.....
9.0	Rated normal current.	.....	.....
10.0	Rated short circuit making current.	.....	.....
11.0	Rated short time withstand current.	.....	.....
12.0	Mass of complete unit.	.....	.....
13.0	Minimum clearance in air:		
13.1	Between poles.	.....	.....
13.2	To earth.	.....	.....
13.3	For isolating distance.	.....	.....
14.0	Type of closing mechanism.	.....	.....
15.0	Height above ground of lowest HV connection.	.....	.....

ANNEXURE 2

		DISCONNECTOR	EARTHING SWITCH
16.0	Length of insulator (taut string measurement)	.....	.....
17.0	Type test certificate	.....	.....
17.1	Testing authority	.....	.....
17.2	Test number	.....	.....
18.0	Insulators		
18.1	Type test certificate number	.....	.....
18.2	Testing authority	.....	.....

END

SPOORNET

A division of Transnet limited

ENGINEERING AND TECHNOLOGY
TECHNOLOGY MANAGEMENT

SPECIFICATION

REQUIREMENTS FOR THE SUPPLY OF ELECTRIC CABLES

(Appendix to be filled in by client)

Authors:	Engineering Technician (level 1) Section: Technology Management	B.L. Ngobeni	.....
Approved:	Engineering Technician (level 3) Section: Technology Management	D.O. Schulz	.....
Authorised:	Senior Engineer Section: Technology Management	L.O. Borchard	.....

Date: 5 September 2005

Circulation restricted to:

Engineering &Technology: Infrastructure Maintenance

Engineering &Technology: Infrastructure Engineering

Engineering &Technology: Technology Management

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1.0 SCOPE

This specification covers Spoornet's requirements for cables used for:

- Medium voltage reticulation systems, distribution systems, traction substation supplies, and 3 kV DC feeder applications (3,3/3,3 kV to 19/33 kV).
- Cables used for fixed installations (300/500 V to 1900/3300 V).

2.0 STANDARDS

The following publications (latest version) are referred to herein.

2.1 SOUTH AFRICAN NATIONAL STANDARDS

SANS 97 : Electric cables - Impregnated paper insulated metal-sheathed cables for rated voltages 3,3/3,3 kV to 19/33 kV (excluding pressure assisted cables).

SANS 1339 : Electric cables – Cross-linked polyethylene (XLPE) insulated cables for rated voltages 3,8/6,6 kV to 19/33 kV.

SANS 1507 : Electric cables with extruded solid dielectric insulation for fixed installations 300/500 V to 1900/3300 V,

Part 1-General,
Part 3-PVC Distribution cables,

Part 4-XLPE distribution cables,
Part 5-Halogen free distribution cables.

3.0 APPENDIX

The following appendix forms an integral part of this specification.

3.1 Appendix 1 : Schedule of Requirements: Details of the cable to be supplied.

4.0 TENDERING PROCEDURE

4.1 Tenderers shall indicate clause-by-clause compliance with the specification. They shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance.

4.2 The tenderers shall motivate a statement of non-compliance.

4.3 The tenderer shall submit technical specifications of the cables offered.

4.4 Failure to comply with clauses 4.1, 4.2 and 4.3 could preclude a tender from consideration.

5.0 MEDIUM VOLTAGE CABLES

5.1 IMPREGNATED PAPER INSULATED.

5.1.1 Paper impregnated lead sheathed (PILC) cables used for reticulation systems and traction power supplies and other applications shall be in accordance with SANS 97.

5.1.2 The voltage range for the cables shall be between 3,3kV and 33kV.

5.1.3 The cables shall be three core with stranded copper conductors.

5.1.4 The cables shall be paper insulated, screened type, lead sheathed provided with an extruded PVC bedding.

5.1.5 The armouring shall be galvanised steel wire with outer extruded PVC over sheath over the armouring.

5.1.6 The cable shall be so manufactured that it is fully protected against the effect of electrolysis.

5.1.7 Single core cables used for 3 kV DC application shall withstand a test voltage of 10,5 kV for one minute.

5.1.8 Cables shall be suitable for laying directly in soil and concrete trenches.

5.1.9 The cables shall withstand exposure to water, corrosive conditions as well as high ultra violet conditions caused by direct sunlight.

5.1.10 The cables shall be tested in accordance with SANS 97. Type test certificates shall be submitted with the cables offered.

5.1.11 The packing, marking and sealing of cables and cable drums shall be in accordance with SANS 97.

5.2 CROSS – LINKED POLYETHYLENE INSULATED (XLPE).

5.2.1 XLPE cables used for reticulation systems, 3kV DC traction feeders and traction power supplies and other applications shall be in accordance with SANS 1339.

5.2.2 The voltage range for the cables shall be between 3,8kV and 33kV.

5.2.3 Cables shall be single or three core with stranded copper conductors.

5.2.4 The cables shall be type A (armoured) for single and three core cables.

5.2.5 Single core type A cable shall be copper tape screened, aluminium wire armoured and provided with a PVC outer sheath.

5.2.6 Single core cables shall be rated for 3,8/6,6kV.

5.2.7 Single core cables used for 3 kV DC application shall withstand a test voltage of 10,5 kV for one minute.

5.2.8 Three core type A cable shall be copper tape screened, galvanised steel wire armoured and provided with a PVC outer sheath.

5.2.9 The manufacture of the single and three core cables shall be such that the cables are fully protected against the effect electrolysis.

5.2.10 The cables shall be suitable for laying directly in soil and concrete trenches.

5.2.11 The cables shall withstand exposure to water, corrosive conditions as well as high ultra violet conditions caused by direct sunlight.

5.1.12 The cables shall be tested in accordance with SANS 1339. Type test certificates shall be submitted with the cables offered.

5.2.12 Where specified flame-retardant and halogen free cables shall be in accordance with SANS 1339.

5.2.13 The packing, marking and sealing of cables and cable drums shall be in accordance with SANS 1339.

6.0 CABLES FOR FIXED INSTALLATIONS

6.1 Unless otherwise specified single and multi-core, wire armoured, extruded PVC insulated cables shall be used for fixed installations. The cables shall be in accordance with SANS 1507 part 1 and part 3.

6.2 The voltage range is between 300/500 V to 1900/3300 V.

6.3 Cables shall have stranded annealed copper conductors.

6.4 The cables shall be marked according to SANS 1507 part 3. Core identification shall be by means of colour code or numbering of the insulation.

6.5 The cable shall be so manufactured that it is fully protected against the effect of electrolysis.

6.6 Where XLPE or halogen free cables are specified the cables shall be in accordance with SANS 1507 parts 4 and 5.

6.7 The cables shall be tested in accordance with SANS 1507 parts 3, 4 and 5. Type test certificates shall be submitted with the cables offered.

6.8 The packing, marking and sealing of cables and cable drums shall be in accordance with SANS 1507.

7.0 QUALITY ASSURANCE

7.1 Spoornet reserves the right to carry out inspection and tests on the equipment at the works of the supplier/manufacturer.

7.2 Arrangements must be made timeously for such inspections and type/routine tests in accordance with the cable specifications are carried out before delivery of the cables to the site.

8.0 INSPECTION AND TESTING

8.1 Spoornet reserves the right to carry out inspections and any tests on cables at the factory of the supplier/ manufacture.

8.2 Arrangements must be made with The Senior Engineer, Technology Management Spoornet for inspections to be carried out before delivery of the equipment.

SCHEDULE OF REQUIREMENTS

(To be completed by the client)

1.0 MEDIUM VOLTAGE CABLES

1.1 PAPER IMPREGNATED LEAD SHEATHED (PILC)

1.1.1 Rated Voltage (V): .....

1.1.2 Number of cores: .....

1.1.3 Length of cables (m): .....

1.1.4 Size of conductors (mm^2): .....

1.2 CROSS LINKED POLYETHYLENE INSULATED (XLPE)

(XLPE is recommended for 3 kV DC Applications)

1.2.2 Rated Voltage (V): .....

1.2.3 Number of cores: .....

1.2.4 Length of cables (m): .....

1.2.5 Size of conductors (mm^2): .....

1.2.6 Flame retardant (required/not required): .....

2.1 CABLES FOR FIXED INSTALLATIONS

2.1.1 Type of cable required:

- PVC Distribution cables: (Yes/ No): .....
- XLPE Distribution cables: (Yes/No): .....

2.1.2 Rated Voltage (V): .....

2.1.3 Number of cores: .....

2.1.4 Length of cables (m): .....

2.1.5 Size of conductors (mm^2): .....

END

TRANSNET
freight rail

A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

INSTALLATION OF LOW AND MEDIUM VOLTAGE CABLES

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Authorised:	Principal Engineer Technology Management	S.E. Sibande	
Date:			31 May 2012

Circulation Restricted To:

Transnet Freight Rail

Transnet and Relevant Third Parties

INDEX

1.0 SCOPE

1.1 This specification covers Transnet Freight Rail's requirements for the installation, laying, terminating, jointing, testing and commissioning of low and high voltage cables.

2.0 APPENDICES

The following appendices form an integral part of this specification and shall be read in conjunction with it

2.1 Appendix 1 - "Scope of Work" - to be completed by Transnet Freight Rail (Client).

2.2 Appendix 2 - "Schedule of Requirements" – (to be completed by Tenderer).

2.3 Appendix 3 – "Normative SANS references"

3.0 STANDARDS, PUBLICATIONS AND DRAWINGS

Unless otherwise specified this specification must be read in conjunction with the current edition of the relevant SANS, BS and Transnet Freight Rail's specifications.

3.1 British Standards

BS 5467: Electric cables – thermosetting insulated, armoured cables for voltages of 600/1000Vand 1900/3300V.

BS 6480: impregnated paper – installed lead or lead alloy sheathed electric cables of rated voltages up to and including 33 000V

3.2 South African National Standards

SANS 32: Internal and/or external protective coatings for steel tubes - Specification for hot dip galvanized coatings applied in automatic plants.

SANS 97: Electric cables - Impregnated paper-insulated metal-sheathed cables for rated voltages 3,3/3,3 kV to 19/33 kV (excluding pressure assisted cables)

SANS 121: Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods.

SANS 1339: Electric cables - Cross-linked polyethylene (XLPE) insulated cables for rated voltages 3,8/6,6 kV to 19/33 kV

SANS 10142-1: The wiring of premises Part 1: Low-voltage installations.

SANS 10142-2: The wiring of premises Part 2: Medium-voltage installations above 1 kV A.C not exceeding 22 kV A.C and up to and including 3 000 kW installed capacity.

3.3 Transnet Freight Rail Instructions

BBD 8210 - General work and works on, over, under or adjacent to a railway lines and near high voltage equipment

CEE.0012 - Method of Tendering

CEE.0045 - Painting of steel components of electrical equipment.

CEE.0089 - Drawings of electrical equipment supplied under electric light and power contracts.

Electrical Safety Instructions 2012 - High Voltage Electrical Equipment

3.4 Transnet Freight Rail Drawings

CEE PA-0105 - Precast concrete slab cover for cable protection.

CEE-PK-14 - Electrical cable route marker.

CEE-MA-307 – Route marker electrical cables.

FG 263 - Accommodation of cables in Railway formations

3.5 Statutory Requirements

Occupational Health and Safety Act and Regulations, Act 85, 1993

3.6 Any items offered in accordance with other standards will be considered at the sole discretion of Transnet Freight Rail. The tenderer shall supply full details stating where the item differs from these specifications as well as supplying a copy (in English) of the recognised standard specification(s) with which it complies.

4.0 TENDERING METHODS

4.1 Tenderer shall indicate clause by clause compliance with the specification. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance. This document can be used by tenderer to elaborate on their response to a clause.

4.2 A statement of non-compliance shall be motivated by the tenderer.

4.3 Tenderer shall complete Appendix 2 – "Schedule of requirements".

4.4 Tenderer shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.

4.5 Failure to comply with clauses 4.1, 4.2, 4.3 and 4.4 could preclude a tender from consideration.

5.0 SERVICE CONDITIONS

The equipment shall be designed and rated for installation and continuous operation under the following conditions:

Altitude:	0 to 1800m above sea level.
Ambient temperature:	-10°C to +55 °C.
Relative humidity:	10% to 90%
Lightning Conditions:	12 ground flashes per square kilometre per annum.
Pollution:	Heavily salt laden or polluted with smoke from industrial sources.

6.0 GENERAL REQUIREMNETS

6.1 The tenderer shall submit all drawings in accordance with Transnet Freight Rails Specification CEE.0089

6.2 Where joints and terminations are to be done by others, the contractor shall submit detailed instructions regarding the procedure recommended by the cable manufacturer.

6.3 The electrical installation shall conform to the requirements of SANS 10142 part 1 and 2 and shall be to the satisfaction of Transnet Freight Rail.

6.4 Galvanising where specified shall be in accordance with SANS 32 and SANS 121.

6.5 Work on the high voltage equipment shall be carried out in accordance with the Transnet Freight Rail's Safety Instructions 2012 - High Voltage Electrical Equipment.

6.6 All work done must comply with the requirements of Occupational Health and Safety Act and Regulations, Act 85, 1993

SURVEYS

6.7 The Contractor shall within 30 days after being awarded the contract carry out a pre-installation route survey which shall include digging test holes and guided by the Transnet Freight Rail's drawings to determine a suitable route.

6.8 The contractor shall determine where cables are liable to be subjected to chemical, electrolytic, mechanical or other damage and shall submit his recommendation to the Depot Maintenance Manager (Electrical) for approval.

6.9 The Contractor shall submit in triplicate plans of the cable routes selected to the Depot Maintenance Manager (Electrical) for approval. Plans may be submitted in sections as the survey progresses.

6.10 No excavation of any section of the cable route shall commence before the Contractor is in possession of the relevant approved plans and the Depot Maintenance Manager (Electrical) has authorised the commencement of work on the section concerned.

6.11 After completion of all cable laying and jointing and before commissioning of any cable the Contractor shall carry out a final "as laid" survey of the cable routes and submit plans on transparencies suitable for reproduction.

6.12 The cable route plans shall include the following information:

6.12.1 Overall length, type, size and voltage of each cable.

6.12.2 Accurate indication of the position of each cable joint by indicating two distances to each joint from permanent structures.

6.12.3 Pipes and chambers provided.

7.0 EXCAVATIONS

7.1 Excavations shall be carried out in strict compliance with the specification BBD 8210 for general work and works on, over, under or adjacent to a railway lines and near high voltage equipment.

7.2 Trenching procedure shall be programmed in advance, approved by the Depot Maintenance Manager (Electrical) and shall not be departed from except with the consent of the Depot Maintenance Manager (Electrical).

7.3 The Contractor will be advised of any known buried services such as cables, pipes, etc. in the vicinity of the cable route.

7.3.1 When trenching the contractor shall take all necessary precautions to prevent damage to underground services.

7.3.2 On encountering any uncharted service, the Contractor shall promptly advise the Depot Maintenance Manager (Electrical) who will give the necessary instructions. Additional excavations shall be paid for at scheduled rates.

7.4 Should any underground service, water mains, road pavement, drainage system, building or any other structure be damaged by the Contractor's staff, it shall be reported immediately to the Depot Maintenance Manager (Electrical), who shall arrange for the necessary repairs. The Contractor shall be responsible for the cost of repairs.

7.5 The removal of obstructions along the cable routes shall be subject to the approval of the Depot Maintenance Manager (Electrical) and shall be paid for at the agreed rates.

7.6 The Contractor shall not trench beneath any railway line without departmental supervision. Should the contractor wish to carry out such work, a minimum of 14 working days notice is required by the Depot Maintenance Manager (Electrical) to arrange for the necessary supervision. The cost of such supervision shall not be charged to the Contractor.

7.7 Excavations crossing oil pipe lines shall not commence until an authorised representative is present on site. The Depot Maintenance Manager (Electrical) shall be advised 14 days in advance when such excavations will take place.

7.7.1 Cable crossings of oil pipe lines shall only be at right angles.

7.8 Trenches across roads, access ways or foot-paths shall not be left open. If trenching, cable laying and backfilling cannot be done during the same shift, the portion of trench across the full width of the road, etc., must be temporarily backfilled and consolidated sufficiently to carry the traffic concerned without subsidence. Alternatively, adequately strong cover plates shall be laid across the trench.

7.9 Power driven mechanical excavators may be used for trenching operations. Transnet Freight Rail shall not be responsible for any damage to other Services in close proximity when using mechanical excavators.

7.10 The Contractor shall provide shuttering in places where the danger exists of the trench collapsing, and causing damage to formations or other nearby structures.

7.10.1 Shuttering shall be paid for at scheduled rates.

7.11 Trenches shall be as straight as possible and the bottom of each cable trench shall be firm and of smooth contour without sharp dips or rises which may cause tensile forces in the cable during backfilling.

7.11.1 Trenches shall have no sharp objects which may cause damage to the cable during laying or backfilling.

7.12 The unfinished depth of trenches unless otherwise stated shall be as follows:

7.12.1 HV cables and associated pilot cables = 1 000 mm.

7.12.2 LV cables and separate pilot cables = 750 mm.

7.13 The width of the trench unless otherwise stated shall be 500 mm for one or two HV cables and associated pilot cables, and shall increase by 300 mm for each additional HV cable and its associated pilot cable.

7.13.1 The width of the trench at any bend or places where cable slack is required, shall be such that the bending radius of the cables shall not be less than that specified for the particular cable as per specifications SANS 97 and SANS 1339.

7.13.2 Trenching in railway formations shall be in accordance with Transnet Freight Rail's drawing FG 263.

7.14 The material excavated from each trench shall be placed in such a manner as to prevent nuisance or damage to adjacent ditches, railway lines, drains, gateways and other properties and shall not interfere with traffic.

7.14.1 Where, owing to certain considerations, this is not possible the excavated materials shall be removed from site and be returned for refilling the trench on completion of laying.

7.15 When excavating close to railway tracks, the ballast must be covered by tarpaulins or other sheeting to prevent soiling.

7.16 Removal of accumulated water or other liquid from trenches shall be done by the Contractor at his expense. The Contractor shall provide all pumps and appliances required to carry out this operation. Water or any other liquid removed shall be disposed of without creating any nuisance or hazard.

7.17 Transnet Freight Rail reserves the right to alter any cable route or portion thereof prior to cable laying. Payment in respect of any additional work involved shall be at scheduled rates.

8.0 CABLE LAYING

8.1 GENERAL

8.1.1 All possible care shall be exercised in handling cables on site.

8.1.2 Any drum of cable showing signs of damage shall not be used.

8.1.3 The outer covering (insulation) of cables shall not be damaged in any way and cables shall not be bent at radii less than allowed by the manufacturer.

8.1.4 When cable is supplied by the contractor, the drums thereof remain the property of the Contractor and shall be removed from the site and disposed of by the contractor.

8.1.5 Cable pulling and laying shall be done manually unless otherwise approved by the Depot Maintenance Manager (Electrical). No cable shall be subjected to a tension exceeding that stipulated by the cable manufacturer.

8.2 IN TRENCHES

8.2.1 High Voltage cables shall be spaced at a minimum of 300 mm apart (centre to centre).

8.2.2 Low Voltage cables shall be spaced at a minimum of 150 mm apart (centre to centre).

8.2.3 Pilot cables shall be laid beside the associated power cables.

8.2.4 High Voltage and Low Voltage cables (and pilot cables not associated with High Voltage cable) shall be spaced at a minimum of 300 mm apart.

8.2.5 Pilot cables, when they are routed separately from their associated power cables, may be run next to one another.

8.2.6 Single core low voltage cables to be clamped in trefoil formation.

8.2.7 Where the cable cannot be laid down at the specified depth, prior authority shall be obtained from the Depot Maintenance Manager (Electrical) by the Contractor to protect the cable by means of 150 mm diameter half round concrete pipes with 50 mm concrete slab coverings or other approved methods.

8.2.8 Where cables have to be drawn around corners well lubricated skid plates shall be used. The skid plates shall be securely fixed and constantly examined during cable laying operations.

8.2.9 Suitable rollers may be used during the laying of cables.

8.2.10 Cables shall be visually inspected for damage during and after laying. Any damage shall be reported immediately to the Depot Maintenance Manager (Electrical) who will issue the necessary instructions.

8.3 IN SLEEVE PIPES

8.3.1 All cables crossing beneath roads and pavements shall be enclosed in cement or PVC pipes with a minimum internal diameter of 150mm. The Depot Maintenance Manager (Electrical) shall be advised timeously of the locations and quantity of pipes to be laid and chambers to be provided by others. Separate lengths of pipe shall be properly jointed.

8.3.2 Pipes shall maintain or exceed the specified cable spacing.

8.3.3 Only one High Voltage cable shall be laid per pipe.

8.3.4 Pipes shall extend at least 1 m on either side of the road or pavement formations and shall maintain the specified cable depth. All pipes shall be graded for water drainage: the required grade is 1:400.

8.3.5 All cables crossings underneath railway tracks shall be in pipes in accordance with Transnet Freight Rail's drawing FG 263.

8.4 IN DUCTS AND BUILDINGS

8.4.1 Concrete ducts and pipes within buildings will be provided by others.

8.4.2 Before installing cables, the ducts are to be inspected to ensure that they are suitable and clean as not to damage the cables.

8.4.3 The cables are to be neatly positioned and cross overs are to be avoided.

8.4.4 Steel checker plates over ducts will be supplied by others. The tenderer will however be required to cut all the slots for emerging cables. These slots are to be neatly cut and smoothed to avoid damage to the cable.

8.4.5 The Contractor shall supply all cable trays, racks, wooden cleats or other supports required to adequately support cables not laid in ducts.

8.4.6 Cable trays or racks shall be of reinforced glass fibre or steel suitably treated to prevent corrosion, Steel trays, racks and other supports shall be galvanised in accordance with SANS 32 and SANS 121 when used within 50 km of the sea or inland exposed conditions.

8.4.7 Where cable enters buildings sufficient measures shall be installed to ensure no moisture/water is digressing into the ducts. A sealing system based rubber modules from multi removable layers may be used.

8.5 UNDER BRIDGES AND IN TUNNELS

8.5.1 Where a cable route can only be against the concrete wall of a bridge or tunnel the cable shall be supported on:

8.5.1.1 Suitable brackets at 750 mm intervals or.

8.5.1.2 Straining wire secured at maximum 1 200 mm intervals.

8.5.2 Brackets shall be of robust design and shall be galvanised and painted in accordance with Transnet Freight Rail's specification CEE.0045.

8.5.3 The height of the cable route on the brackets or strain wire shall be determined and agreed upon on site.

8.5.4 The brackets or strain wire shall be supplied and installed by the contractor.

8.6 CROSSING OF PIPELINES AND OTHER CABLES

8.6.1 Cables shall pass beneath pipelines with a 300 mm minimum clearance between the top of any cable and the bottom of any oil pipe.

8.6.1.1 The level of any cable at an oil pipeline crossing shall be maintained for not less than 3 m on either side of the centre line of the pipeline or on either side of the centre line of the outermost pipelines where there is more than one pipeline on the same route.

8.6.2 Where cables cross communication or signal cables, at least 300 mm of fill shall be provided between the two cables. In addition a concrete slab in accordance with Transnet Freight Rail's drawing CEE PA-0105 shall be placed between the two cables parallel to the lower cable.

8.7 IN RAILWAY FORMATIONS

8.7.1 Cables to be accommodated in railway formations shall be laid in accordance with Transnet Freight Rail's drawing FG 263.

8.8 SECURED TO POLES

8.8.1 Cables to be terminated at disconnectors (isolators) mounted on wood, concrete or steel poles, shall be clamped onto such structures by means of stainless steel straps applied at such a tension that the cable or cable sheath is not damaged. Straps shall be located at intervals of not more than 1,2 m.

8.8.2 Cables shall be protected by a pipe or boxed section of galvanised steel or other approved material for a distance of 250 mm below and 600 mm above ground level, strapped or screwed to the pole at a minimum of two points and connected to the earth connection, if of steel construction.

8.8.3 Straps and pipes shall be supplied and installed by the Contractor.

8.9 EXPOSED CONDITIONS

8.9.1 Whenever cables enter buildings or tunnels, or where excavations are not permitted down banks or cuts, the exposed portion shall be suitably protected by means of concrete slabs, or suitable steel pipes or boxed sections which shall be galvanised in accordance with SANS 32 and SANS 121.

8.9.2 These pipes or boxed sections shall be firmly secured to the bank or cut, at regular intervals.

8.9.3 All such material shall be supplied and installed by the Contractor.

8.9.4 Stake routes shall only be supplied when specifically called for in Appendix 1.

9.0 CABLE TERMINATIONS

9.1 GENERAL

9.1.1 All cables shall be terminated and connected to the respective equipment, whether provided by the Contractor or by others.

9.1.2 Jumpers between cable end boxes and disconnectors shall either be short enough to be rigidly self supporting, or shall be supported on suitably placed pin insulators.

9.1.3 Termination of cables on outdoor equipment shall not be done during inclement weather conditions.

9.1.4 Both ends of each cable shall be identified by means of embossed stainless steel strips clamped around the cables. The characters shall have a minimum height of 6 mm.

9.1.5 All materials necessary for cable termination shall be provided by the Contractor.

9.1.6 The contractor shall ensure that correct phase rotation is maintained throughout.

9.1.7 Glands of cables terminating on equipment provided with frame leakage protection shall be insulated from the frame by high grade non-deteriorating, non-hygroscopic insulation, at least 2 mm thick, capable of withstanding a test voltage of 4 kV DC for one minute.

9.2 HV Cables

9.2.1 The cable armouring shall be bonded with an approved copper bond to the cable end box at one end of the cable only as directed by the Depot Maintenance Manager (Electrical). This bond shall be easily removable for testing purposes.

9.2.2 Where for any reason a cable cannot be terminated, sufficient length of cable shall be left to reach the cable end box position. The cable shall be coiled and buried or otherwise protected. The cable end of paper insulated cables shall be capped immediately with a plumbed lead seal. Other cables shall be sealed with suitable tape.

9.3 LV Cables (and Pilot Cables)

9.3.1 All cut ends of cables are to be sealed with suitable tape, or other approved means until they are ready to be terminated.

9.3.2 The cables shall terminate in compression type glands, brass or bronze, suitable for PVC SWA ECC cables.

9.3.2.1 The glands shall be fitted with neoprene shrouds or corrosion guard to prevent the ingress of moisture and dust at the point of cable entry.

10.0 CABLE JOINTS

10.1 General

10.1.1 Jointing shall be carried out strictly in accordance with the manufacturer's jointing instructions and by artisans thoroughly experienced and competent in jointing the classes of cables used. They shall be adequately supervised to ensure the highest quality of workmanship.

10.1.2 Jointing shall not be carried out during inclement weather.

10.1.3 The cores of cables shall be jointed number to number or colour to colour.

10.1.4 The joints shall not impair the anti-electrolysis characteristics of the cables.

10.1.5 The conductor bridging the armouring shall be adequate to carry the prospective earth fault current.

10.1.6 A through joint shall only be permitted after every full drum length of cable.

10.1.7 Each cable joint shall be identified by a non-corrodible label fixed securely to the top of the joint. Each label shall have stamped on it, in characters having a minimum height of 10 mm, the identification of equipment at each end of the cable concerned.

10.1.8 Transnet Freight Rail reserves the right to be present during jointing operations to familiarise themselves with any special techniques.

10.1.9 No joint shall be situated inside a cable pipe.

11.0 COVERING, BACKFILLING AND REINSTATEMENT

11.1 Filling of trenches shall not commence before the Depot Maintenance Manager (Electrical) or his authorised representative has inspected and approved the cables and cable joints in situ in the section of trench concerned.

11.2 Trenches in railway formations shall be backfilled and reinstated in accordance with Transnet Freight Rail's drawing FG 263.

11.3 All other trenches shall be backfilled and reinstated as follows:

11.3.1 Two 75 mm thick layers of soil sifted through a 6 mm mesh shall be laid directly under and over the cables respectively and consolidated by hand ramming only.

11.3.1.1 Only soil with a thermal resistivity of 1,5 degrees C.m/watt, or lower may be used for this purpose.

11.3.1.2 When necessary imported fill shall be arranged by the Contractor and paid for at scheduled rates.

11.3.1.3 The backfill material shall be free from rubble/stones or foreign material.

11.3.2 HV cables shall, where likely to be mechanically damaged as decided by the Depot Maintenance Manager (Electrical), be protected by concrete slabs (to Drawing CEE PA-0105) to be supplied and laid by the Contractor on top of the sifted soil. These slabs shall be laid close-butted, convex end to concave end, directly above each HV cable throughout the underground portion except where otherwise protected as by pipes, etc. Only unbroken cable protection slabs may be used, and only slabs actually laid will be paid for.

11.3.3 Reinforced resin protection trench covers might also be used instead of concrete slabs. These covers shall be made of material which is flame retardant, non toxic and corrosion resistant.

11.3.4 The minimum dry densities of backfilling after compaction shall be not less than 1600 kg/cubic metre.

11.3.5 All excavations made (whether for the purpose of cable laying, joint bays or trial holes) shall be back-filled in 150 mm layers, the earth in each layer being well rammed and consolidated and sufficient allowance being made for settlement. The back-filling shall be completed to the satisfaction of the Depot Maintenance Manager (Electrical). If necessary, water shall be used to obtain the specified compacted density. Any cable damaged during backfilling shall be replaced by the Contractor at his own expense.

11.3.5.1 Backfilling at pipe entries shall be such as not to stress or damage the cable during compaction from the top.

11.3.6 A continuous plastic cable warning tape, to drawing CEE-MA-307 shall be laid directly above each HV cable, 150 mm below the normal surface level and run for the full length of the cable before completing the back-filling.

11.4 The back filled trench shall be maintained in a thoroughly safe condition by the contractor for the duration of the contract.

11.5 All back filling of road crossings shall be mechanically rammed.

11.6 Final surfacing of roads shall be restored by others unless called for under "Scope of Work", Appendix 1.

11.7 Concrete cable route markers shall be provided and installed by the contractor in accordance with drawing CEE-PK-14.

11.8 Pipes shall be filled with a sand/water mixture to also have a thermal resistivity of 1,5 degrees C.m/watt or lower when dry. The sand used in the mixture shall be chemically tested not to be harmful to the cable outer sheath.

12.0 MEASUREMENTS

12.1 All measurements for payment purposes shall be made jointly by representatives of the Contractor and Transnet Freight Rail and shall be agreed upon by both parties. The Contractor shall be responsible for obtaining the Depot Maintenance Manager (Electrical)'s signed approval of such measurements.

12.2 Measurements of cable length shall be made from centre to centre of cable joints and to the cable ends and will exclude any wastage due to jointing and terminating.

12.3 When cable is drawn through pipes, only the portion remaining in the pipe will be paid for at the rates quoted for "as installed in pipes".

12.4 Determination of trench volume for measurement purposes shall be based on measured length and specified width and depth. No allowance shall be made where trenches have to be widened at the bottom to accommodate cables, cable joints and protection slabs.

12.5 The classification of different types of ground for measurement purposes shall be as follows:

12.5.1 Soft rock will be taken as broken or friable rock which can be removed by pick or mechanical excavator or paving breaker. This includes hard clay.

12.5.2 Hard rock will be taken as rock which cannot be removed by a mechanical excavator and requires drilling and blasting or splitting. This includes reinforced or plain concrete.

13.0 TESTS

13.1 The costs of all post-installation tests shall be borne by the Contractor.

13.2 The Contractor shall be responsible for remedial work necessary due to damages caused during tests.

13.3 Transnet Freight Rail reserves the right to carry out any further tests deemed necessary, using either the Contractor's instruments and equipment or its own, or both. The costs of such tests will not be charged to the Contractor.

13.4 Test instruments shall be of the accuracy class. Calibration certificates from a recognised testing authority shall be available for inspection and shall not be older than one year.

13.5 Time measurements shall be carried out using an approved digital timer.

13.6 The final commissioning site tests will be carried out by Transnet Freight Rail.

13.6.1 A suitably qualified staff member of the Contractor shall assist Transnet Freight Rail during the tests and shall carry out any remedial work where necessary.

13.7 The contractor shall notify the Depot Maintenance Manager (Electrical) in writing 4 weeks before the commissioning date and shall have carried out the following site tests before such date:

13.7.1 Prove the continuity and insulation resistance of the multicore pilot cables.

13.7.2 Verify that the insulation level between frame and earth of switchboards fitted with frame leakage protection is not reduced by the installation of the cables.

13.7.3 The following voltages withstand tests on each completed cable run:

13.7.3.1 Paper insulated cables:

(i) Rating up to 12,7/22 kV shall be tested in accordance to SANS 97.

(ii) Rating 19/33 kV shall be tested in accordance to BS 6480.

The extruded PVC impermeable serving shall withstand a test voltage of 10 kV DC between armouring and earth for 1 minute.

The insulation between armouring and lead sheath shall withstand a test voltage of 4 kV DC for 1 minute.

13.7.3.2 XLPE Insulated Cables:

All cables rated up to 19/33 kV shall be tested in accordance to SANS 1339, and cables rated up to 1,9/3,3 kV shall be tested in accordance to BS 5467.

Where a new XLPE cable is to be joined to an existing XLPE Cable, the test shall differ, in that a 4 kV DC test voltage shall be applied for one minute between the brass screens of the cores and the armouring. The outer sheath shall withstand a test voltage of 10 kV DC for 1 minute between the armouring and earth.

13.7.4 The Contractor shall submit three copies of certified test reports to the Depot Maintenance Manager (Electrical) within three weeks after completion of the tests.

14.0 GUARANTEE

14.1 All work undertaken by the Contractor shall be subject to a guarantee for a period of one year against faulty and/or inferior workmanship and material.

14.2 The guarantee period shall commence the day the installation is formally handed over to and accepted by Transnet Freight Rail.

14.3 The Contractor shall undertake to repair all faults or defects due to bad workmanship and/or faulty materials, and to replace all defective equipment or materials during the guarantee period.

14.4 Any defects that may become apparent during the guarantee period shall be rectified to the satisfaction of, and free of cost to Transnet Freight Rail.

14.5 The Contractor shall undertake work on the rectification of any defects that may arise during the guarantee period within 7 days of his being notified by Transnet Freight Rail of such defects.

14.6 Should the Contractor fail to comply with the requirements stipulated above, Transnet Freight Rail shall be entitled to undertake the necessary repair work or effect replacement of defective apparatus or materials, and the Contract shall reimburse Transnet Freight Rail the total cost of such repair or replacement, including the labour costs incurred in replacing defective material.

15.0 APPENDIX 1

SCOPE OF WORK

(To be filled by the client)

1.0 Site inspection required (Yes/No)……..

Date : .....

Time : .....

Client's Signature: ……..

16.0 APPENDIX 2

SCHEDULE OF REQUIREMENTS

(To be filled by Tenderer)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
1.0	Route surveys		complete		
2.0	Excavations in				
a)	Hard rock		/cubic metre		
b)	Soft rock		/cubic metre		
c)	Soil		/cubic metre		
3.0	Transportation of soil		/cubic metre		
4.0	Shuttering		/m		
5.0	Concrete slabs supplied and installed		each		
6.0	Plastic cable warning tape supplied and installed		/m		
7.0	150 mm dia. half round concrete pipes supplied and installed		/m		
8.0	150 mm dia. Cement or PVC pipes supplied and installed		/m		
9.0	Cutting of checker Plates		/m cut		
10.0	Backfilling of trenches with soil		/cubic metre		
11.0	Backfilling of trenches with 10:1 soil/cement mix		/cubic metre		
12.0	Importation of soil		/cubic metre		
13.0	Concrete cable route markers		each		
14.0	Reinstate tarred Surface		/cubic metre		
15.0	Reinstate concrete Surface		/cubic metre		

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
16.0	Installation of cables				
16.1	Installed in trenches				
16.1.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
16.1.2	Low Voltage Cables		/m		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core		mm sq		
16.2	Installed in sleeve pipes				
16.2.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
16.2.2	Low Voltage Cables		/m		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
16.3	Installed in ducts				
16.3.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
16.3.2	Low Voltage Cables		/m		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
17.0	Installation of cables (Special conditions)				
17.1	Cable supports				
17.1.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
17.1.2	Low Voltage Cables		/m		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
17.2	Securing cables to poles				
17.2.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
17.2.2	Low Voltage Cables		/m		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
17.3	Securing cables to concrete/tunnel walls				
17.3.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
17.3.2	Low Voltage Cables		/m		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
17.4	Installation of cables in track formations				
17.4.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
17.4.2	Low Voltage Cables		/m		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
18.0	Cable terminations complete (Supply material, terminate and connect up).				

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
18.1	XLPE cable				
18.1.1	High Voltage				
	terminations		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
18.1.2	Low Voltage				
	terminations		each		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
18.2	PILC SWA cable				
18.2.1	High Voltage				
	terminations		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
18.2.2	Low Voltage				
	terminations		each		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
19.0	Cable joints complete				
	(Supply material, terminate and connect up)				
19.1	PVC to PVC		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
19.2	XLPE to XLPE		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
19.3	PILC to PILC		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
19.4	XLPE to PILC		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				

TENDERER'S SIGNATURE.....

DATE.....

17.0 APPENDIX 3

SANS 1411 – 1:	Materials of insulated electric cables and flexible cords Part 1: Conductors.
SANS 1411 – 2:	Materials of insulated electric cables and flexible cords Part 2: Polyvinyl chloride (PVC).
SANS 1411 – 3:	Materials of insulated electric cables and flexible cords Part 3: Elastomers.
SANS 1411 – 4:	Materials of insulated electric cables and flexible cords Part 4: Cross-linked polyethylene (XLPE).
SANS 1411 – 5:	Materials of insulated electric cables and flexible cords Part 5: Halogen-free, flame-retardant materials.
SANS 1411 – 6:	Materials of insulated electric cables and flexible cords Part 6: Armour.
SANS 1411 – 7:	Materials of insulated electric cables and flexible cords Part 7: Polyethylene (PE).
SANS 1507 – 1:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 1: General.
SANS 1507 – 2:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 2: Wiring cables.
SANS 1507 – 3:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 3: PVC Distribution cables
SANS 1507 – 4:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 4: XLPE Distribution cables
SANS 1507 – 5:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 5: Halogen-free distribution cables.
SANS 10198 – 1:	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 1: Definitions and statutory requirements.
SANS 10198 – 2:	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 2: Selection of cable type and methods of installation.
SANS 10198 – 3:	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 3: Earthing systems - General provisions.
SANS 10198 – 4:	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 4: Current ratings.
SANS 10198 – 5:	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 5: Determination of thermal and electrical resistivity of soil.
SANS 10198 – 6:	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 6: Transportation and storage.
SANS 10198 – 7:	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 7: Safety precautions.

SPOORNET

(INFRASTRUCTURE)(ELECTRICAL)

THIS ISSUE CANCELS
SPECIFICATION NO.
CEE.0111.84

SPECIFICATION FOR 25KV AC TRACTION SUBSTATIONS

This specification covers Spoornet's requirements for the design, manufacture, testing, installation and commissioning of 25kV AC single phase substations for an electric traction system.

INDEX

SECTION 1: - SUBSTATION DESIGN INFORMATION

SECTION 2: - TRACTION SUBSTATION EQUIPMENT

SECTION 3: - INSTALLATION OF EQUIPMENT

SECTION 4: - TESTING AND COMMISSIONING

SECTION 1 - SUBSTATION DESIGN INFORMATION

1.0 SCOPE

1.1 This specification covers Spoornet's requirements for the design, manufacture, testing, installation and commissioning of 25kV 50 hertz AC single phase traction substations for feeding the overhead track equipment of the Spoornet's AC traction system. Adjoining the Spoornet substation yard will be an Eskom yard. The equipment in the Eskom yard, including the earth mat will be provided and installed by others.

2.0 STANDARDS

2.1 Unless otherwise specified all materials and equipment supplied shall comply with the current edition of the relevant SABS, BS, IEC or Spoornet publication where applicable.

The following publications are referred to in this specification:

2.2 South African Bureau of Standards

SABS 03-1985 - The Protection of Structures against Lightning
SABS 150 - PVC Insulated Electric Cables and Flexible Cords
SABS 156 - Moulded Case Circuit Breakers
SABS 555 - Insulating Oil for Transformers and Switchgear (uninhibited)
SABS 763 - Hot-dip Galvanised Zinc Coatings
SABS 780 - Distribution Transformers
SABS1019 - Standard Voltages, Currents and Insulation Levels for Electricity Supply
SABS1035 - Insulated Bushings
SABS1091 - National Colour Standards for Paint
SABS1222 - Enclosures for Electrical Equipment
SABS1299 - Direct Acting Indicating Electrical Measuring Instruments and their Accessories
SABS0142 - The Wiring of Premises

2.3 International Electrotechnical Commission

IEC 56 - High Voltage Alternating Current Circuit Breakers
IEC 76 - Power Transformers
IEC 129 - Alternating Current Disconnectors and Earthing Switches
IEC 354 - Loading Guide for Oil Immersed Transformers

2.4 British Standards Institution

BS 159 - Busbars and Busbar Connections
BS 162 - Electric Power Switchgear and Associated Apparatus
BS2692 - Fuses for Voltages Exceeding 1000V AC
BS2914 - Surge Diverters for Alternating Current Systems
BS3938 - Current Transformers
BS3955 - Electrical Controls for Domestic Appliances
BS4360 - Specification for Weldable Structural Steels
BS5311 - AC Circuit Breakers of Rated Voltage above 1kV

2.5 Spoornet

CEE.0224.94 - Drawings, Catalogues, Instruction Manuals and Spares
CEE 0040.83 - Manual or Motor Operated 25kV Track Sectioning Switches
CEE.0045.96 - Painting of Steel Components of Electrical Equipment
CEE.0085.84 - Self Contained Battery and Battery Charger Units

2.6 Any items offered in accordance with other standards will be considered at the sole discretion of Spoornet. The tenderer shall supply full details stating where the item differs from these specifications as well as supplying a copy (in English) of the recognised standard specification(s) with which it complies.

3.0 APPENDICES

3.1 The following appendices form an integral part of this specification:

APPENDIX 1 : Substation sites (names and locations) and degree of pollution.

APPENDIX 2 : Schedule of requirements for AC traction substations.

APPENDIX 3 : Schedule of drawings supplied by Spoornet.

4.0 DEFINITIONS

4.1 "Single unit substation" refers to a substation to be provided with one traction transformer.

4.2 "Double unit substation " refers to a substation to be provided with two traction transformers, a busbar coupler and associated equipment.

4.3 “Substation” refers to a traction substation

4.4 “Local” operation refers to a condition in which a circuit breaker can only be switched by operating the breaker controls provided in the substation.

4.5 “Remote” operation refers to a condition in which a circuit breaker can only be switched by operation of a control system from a location remote from the substation

4.6 Breaker “remain open” refers to a breaker that trips and stays in the open position and can be closed from local or remote.

4.7 A circuit breaker that is open and has an “operational inhibit” refers to a condition in which the breaker can not be closed until certain conditions return to normal. (thermal protection, undervoltage protection etc.)

4.8 "Lockout" of a circuit breaker refers to a condition where local manual reset of the control circuit is required before any attempt to close the circuit breaker can be made.

4.9 “Technical Officer” Is the person appointed by Spoornet to manage and administer the contract works.

5.0 TENDERING PROCEDURE

5.1 Tenderers shall submit a main offer in duplicate, complete in every respect in compliance with the specification.

5.2 Tenderers shall indicate clause by clause compliance or non compliance with the specification. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non compliance. This document can be used by tenderers to elaborate on their response to a clause.

5.3 A statement of non compliance shall be motivated by the tenderer.

5.4 Equipment type test certificates as specified shall be submitted with the tender. These shall be in English or a certified translation.

5.5 Tenderers shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.

6.0 GENERAL REQUIREMENTS

6.1 The primary supply voltage shall be as specified in the schedule of requirements.

6.2 The locations of the substations to be provided, as well as the differing requirements to suit any particular substation are given in Appendices 1 and 2.

6.3 Equipment / Installations supplied shall be in terms of this specification. Deviations from the specification will not be allowed without the written consent of the Technical Officer.

6.4 Spoornet reserves the right to subject material and equipment offered to test or inspection to check compliance with the clauses of this specification prior to adjudication or at any stage during manufacture.

6.5 The onus to prove compliance to the specification shall rest with the tenderer during the tender stage and with the successful tenderer once the contract has been awarded.

6.7 The successful tenderer will be responsible for all costs caused by modifying or replacing equipment accepted by Spoornet on the grounds of his statement of compliance and found by Spoornet not to comply.

6.8 Acceptance by the Technical Officer of the equipment / installation offered in no way relieves the successful tenderer of his obligation to fulfil his statement of compliance with the specification.

6.9 All equipment shall be adequately earthed, insulated, enclosed and interlocked to ensure the safety of staff (operators) as well as equipment.

6.10 Any portion of the equipment which may be likely to cause injury to staff or fire by being overloaded or failing, or by an arc set up by the equipment in operation, shall be so arranged as to prevent the possibility of injury to staff as well as preventing damage to other equipment.

7.0 SERVICE CONDITIONS

7.1 The equipment shall be designed and rated for operation under the following service conditions :-

Altitude	: 0 to 1 800m above sea level
Ambient temperature range	: Minus 5 °C to plus 50 °C
Relative humidity	: 10% to 90%
Wind pressure on equivalent projected area normal to direction of wind	: 750Pa
Lightning conditions	: 5,5 Flashes/km^2/annum

8.0 INSULATION LEVELS

8.1 Insulation levels for high voltage equipment shall be in accordance with the recommendations of SABS 1019.

8.2 Secondary equipment at 25kV (phase to earth) shall have a rated insulation level based on an equivalent 3 phase system with a highest voltage for equipment of 52kV r.m.s, i.e., a rated lightning impulse withstand voltage of 250kV peak, and a rated power frequency withstand voltage of 95kV r.m.s.

8.3 Primary equipment (voltages phase to phase r.m.s) shall have a rated insulation level based on an equivalent 3 phase system as indicated in the following table:

Nominal system voltage	66kV	88kV	132kV	220kV
Highest voltage for equipment	72,5kV	100kV	145kV	245kV
Rated lightning impulse withstand voltage	350kV	380kV	550kV	850kV
Rated power-frequency withstand voltage	140kV	150kV	230kV	360kV

9.0 CLEARANCES

9.1 The following minimum earth clearances shall be maintained between any conductor or metal normally alive and earthed metal :-

Nominal System Voltage	25kV	66kV	88kV	132kV	220kV
Outdoor	540mm	770mm	1000mm	1450mm	1850mm
Indoor	300mm	-	-	-	-

9.2 The following minimum safety clearances shall be maintained between any conductor or metal normally alive and ground surface level:-

Nominal system voltage	25kV	66kV	88kV	132kV	220kV
Within security fence	3400mm	3270mm	3500mm	3950mm	4350mm
Outside security fence but within Spoornet's reserve	5400mm	5700mm	5900mm	6300mm	6700mm
Outside Spoornet's reserve	5400mm	5700mm	5900mm	6300mm	6700mm

10.0 CREEPAGE DISTANCES

10.1 The insulators or bushings provided on all high voltage AC disconnecting switches, circuit breakers and transformers shall comply with the requirements of SABS 1035.

10.2 Secondary equipment at 25kV (phase to earth) shall have creepage distances based on an equivalent 3 phase system with a highest voltage of the system of 48kV r.m.s, i.e. 960mm and 1 200mm for normal and extremely polluted areas respectively.

10.3 Primary equipment (voltages phase to phase) shall have creepage distances based on an equivalent 3 phase system in accordance with the following table:

Nominal system voltage	66kV	88kV	132kV	220kV
Highest voltage for equipment	72,5kV	100kV	145kV	245kV
Normal or light pollution	1150mm	1600mm	2320mm	3920mm
Heavy Pollution	1660mm	2300mm	3340mm	5640mm

11.0 PREVENTION OF CORROSION

11.1 **Preparation of outdoor structural steelwork.**

11.1.1 Steelwork for outdoor installation in inland areas, i.e, at a distance greater than 20km from the coast, shall be hot-dip galvanised to SABS 763.

11.1.2 Steelwork for outdoor installation in coastal areas, i.e, within 20km of the sea, shall first be hot-dip galvanised to SABS 763, followed immediately at the galvanising plant by the application of the Sterling paint system in accordance with specification CEE.0045.

11.2 **Preparation of steel buildings.**

Where it is impractical to galvanise large areas of sheet steel, surfaces for outdoor exposure in both inland and coastal areas shall be prepared in accordance with specification CEE.0045.

11.3 **Handling and final treatment of painted steelwork.**

11.3.1 Painted steel shall be handled with care and/or suitably packed to avoid damage during transport and installation.

11.3.2 Any damage to painted surfaces shall be repaired, after installation after which a final finish coat of the paint specified in specification CEE.0045. shall be applied.

11.3.3 The following table specifies the colours to be used:

- Coastal structural support steel — Tower Grey
- Traction transformer tank — Navy light Grey (G35)
- Traction transformer conservator tank — White
- Substation building — White
- Interior of building and all outdoor enclosures — White
- Indoor equipment/control panels — Navy light Grey (G35)

12.0 **SUBSTATION OPERATIONAL PROTOCOLS**

All traction substation circuit breakers shall trip and remain open (operational inhibit) should the circuit breakers tripping power supply (110V DC) be lost completely or fall below 70% of nominal battery voltage. It shall only be possible to close the circuit breakers when the supply voltage reaches 85% of the nominal value.

12.1 **PRIMARY ISOLATOR**

12.1.1 It shall not be possible to operate the primary isolator unless the primary circuit breaker is open.

12.1.2 It shall not be possible to earth the load side of the primary isolator before the isolator blades are completely open.

12.1.3 With the isolator in the open position it shall be possible to operate the primary circuit breaker for test purposes.

12.2 **PRIMARY CIRCUIT BREAKERS**

12.2.1 The primary circuit breaker shall trip and remain open for the following events:

12.2.1.1 Inverse Definite Minimum time operation. (primary)

12.2..1.2 Transformer winding and or oil temperature.

12.2.2 The primary circuit breaker shall trip and lockout for the following events:

12.2.2.1 When the SF6 gas pressure falls to the first warning pressure value (before it reaches the safe operational threshold)

12.2.2.2 Transformer Bucholtz operation

12.2.2.3 Transformer restricted earth fault

12.2.2.4 Transformer biased differential

12.3 **SECONDARY ISOLATOR (25kV)**

12.3.1 It shall not be possible to operate the secondary isolator unless the 25kV Incomer circuit breaker is open.

12.3.2 With the isolator in the open position it shall be possible to operate 25kV Incomer circuit breaker for test purposes.

12.4 **SECONDARY CIRCUIT BREAKERS (25kV)**

12.4.1 **Incomer circuit breaker**

12.4.2 The 25kV Incomer shall trip and remain open for the following events:

12.4.2.1 When the SF6 gas pressure falls to the first warning pressure value.

12.4.2.2 Inverse Definite Minimum time operation. (secondary overcurrent)

12.4.2.3 Intertripping with the primary circuit breaker. If the primary circuit breaker is tripped by any of the transformer protection relays, then the incomer circuit breaker shall trip and shall not be able to close until the primary circuit breaker is closed.

12.4.2.4 In the case of substations connected in parallel (will be specified in the schedule of requirements), the incomer will trip and remain open, in the event of reverse current flow.

12.4.3 It shall not be possible to parallel incoming 25kV supplies through a substation busbar coupler in double unit substations. (it must not be possible to close both Incomer circuit breakers with the Busbar coupler in the closed position) Where a busbar coupler is required in a single unit substation, this feature shall be provided for future use when the incoming supply is doubled.

12.4.4 The operation of the Busbar coupler (opening or closing) shall only be possible if all the Secondary Circuit Breakers (Incomers and Track feeders) are in the open position.

12.4.5 **Track feeder circuit breakers**

12.4.6 The track feeder circuit breakers shall trip and remain open for the following events:

12.4.6.1 When the SF6 gas pressure falls to the first warning pressure value.

12.4.6.2 Operation of the thermal overload relay. The breaker shall trip and remain open (operational inhibit) until the relay resets. The auto reclose function shall not be initiated by this relay.

12.4.6.3 Impedance distance protection operation. The breaker shall trip and the single shot auto reclose sequence will be initiated. Should the breaker trip again after the auto reclose sequence, it shall remain open. (no lockout or auto reclose)

12.4.6.4 When local operation of a circuit breaker is selected any auto reclose feature provided shall be rendered inoperative.

12.4.6.5 When closing any circuit breaker from remote any auto reclose feature provided shall be rendered inoperative for a period of 30 seconds.

SECTION 2: - TRACTION SUBSTATION EQUIPMENT

13.0 **STEELWORK**

13.1 The design, supply and installation of all steel structures for the support of equipment and tensioning of conductors shall be the responsibility of the successful tenderer.

13.2 Structural steel shall comply with BS 4360.

13.3 All welded joints shall be seal welded with no gaps or blow holes.

13.4 All steelwork shall be hot-dip Galvanised to SABS 763.

13.5 A lattice type steel gantry (25kV gantry) shall be provided on which for secondary circuit breakers of the outdoor structure mounted type the following items of equipment shall be mounted:

- 25kV Isolator
- 25kV Busbar
- Lightning arrestors (for each feeder circuit)
- Auxiliary transformer
- Voltage transformer
- All Secondary Circuit Breakers (Incomer as well as the track feeders)
- All track feeder overhead feeders (500 mm^2 Aluminium) shall be made off on this structure with the span length being the distance to the Overhead track equipment switch structure which will be provided by others.

13.6 A typical layout of the above arrangement is shown on Drawings No's CEE-TDB-41 sht's 1&2 which form part of this specification.

13.7 Support steel structures for the following equipment shall be provided:

- High voltage double pole isolator.
- High voltage lightning arrestors. (structure shall be similar to that shown on Sketch No. 1 in Appendix No.3)
- Primary circuit breaker.
- High voltage Current Transformer. (structure shall be similar to that shown on Sketch No 1 in Appendix No.3)

13.8 The manufacture of any steelwork shall not take place prior to the approval by the Technical Officer of the design drawings.

13.9 Spoornet shall inspect the steelwork at the manufacturers works prior to dispatch.

14.0 **PRIMARY AND SECONDARY ISOLATORS**

14.1 Isolators and earthing switches shall comply with the requirements specified in IEC 129.

14.2 Isolators and earthing switches shall be of the air break type suitable for outdoor installation and be designed for manual operation from ground level.

14.3 The primary isolator shall be of the double pole type.

14.4 The secondary isolator shall be of the single pole type.

14.5 Interlocking shall be provided on the primary isolator to ensure that the isolator can only be opened with the primary circuit breaker in the open position.

14.6 Interlocking shall be provided on the secondary isolator to ensure that the isolator can only be opened with the incomer circuit breaker in the open position.

14.7 The primary isolator shall be provided with means to earth the load side of the isolator when in the open position.

14.8 The isolators shall be rated to suit the associated equipment.

14.9 Tenderers shall provide details of the isolators offered and the proposed method of interlocking.

15.0 LIGHTNING ARRESTERS

15.1 Lightning arresters shall comply with the requirements of BS 2914.

15.2 Heavy duty station class arresters shall be provided.

15.3 Lightning arresters shall be connected to each phase of the incoming primary supply. The supply system may be considered to be effectively earthed.

15.4 Lightning arresters rated for 39kV rms shall be provided for connection to each 25kV circuit feeding the overhead track equipment.

15.5 Lightning arresters rated for 3,3kV rms shall be provided for connection to the main transformer return current bushing.

15.6 All lightning arresters earth lug shall be connected to the substation main earth mat by means of the specified conductor.

16.0 PRIMARY CIRCUIT BREAKERS

16.1 Primary circuit breakers shall be of the SF6, gas filled type. Circuit breakers shall comply with IEC 56 in so far as that specification is applicable to the type of circuit breaker offered.

16.2 The circuit breaker shall be of the double pole type for outdoor operation.

16.3 The circuit breaker shall be suitably rated for the substation equipment's electrical rating as specified in the schedule of requirements.

16.4 The rated short-circuit breaking current shall be at least 16kA .

16.5 The operating mechanism shall be provided with shunt release for both opening and closing.

16.6 The circuit breakers shall be designed for electrical operation at 110V DC from the substation battery supply.

16.7 Tension springs shall not be used for either closing or tripping mechanisms.

16.8 The circuit breaker shall be of the trip-free type.

16.9 A visual mechanical indicating device shall be provided to show whether the circuit breaker is closed or open.

16.10 The operating mechanism shall be constructed of non-ferrous material or cadmium plated steel.

16.11 Auxiliary contacts shall be provided for operation in conjunction with the protection and other auxiliary circuits specified. At least one spare pair of normally open and one spare pair of normally closed contacts shall be provided.

16.12 The circuit breaker shall be provided with a control panel in the substation building on which are mounted the protection relays, control switches and associated equipment.

16.13 Circuit breaker control switches shall be provided on the control panel as well as on the circuit breaker mechanism. They shall return automatically to the neutral position when the handle is released after being turned to either the "close" or "trip" positions.

16.14 Local/Remote selector switches shall be provided on the control panel in the substation building as well as on the circuit breaker mechanism and shall be of the two-position type (no "off" or "neutral" position).

16.15 Mechanical operation shall be provided on the circuit breaker for any closing or trip release which is normally electrically operated.

16.16 The circuit breaker shall be provided with a no volt coil which will trip and lock out the breaker when the coil is de-energised. Drawing No. CEE-TBK-27 forming part of this specification, details control circuitry.

16.17 It shall be possible to close the circuit breaker only when the control voltage is above 85% of the nominal value, and the circuit breaker shall trip automatically when the control voltage falls to 70% of the nominal value.

16.18 A counter shall be provided on the circuit breaker to indicate the total number of operations of the breaker.

16.19 A counter shall be provided on the control panel to indicate the number of trips initiated by the protection scheme.

16.20 Tenderers shall advise the number of circuit breaker operations under full load and fault conditions, after which maintenance and/or measurement of contact wear is recommended.

17.0 TRACTION TRANSFORMER

17.1 GENERAL

17.1.1 The transformer shall comply with IEC 76.

17.1.2 The transformer shall be suitable for providing supplies to a single phase railway traction system and as such will be subjected to cyclic overloads up to 2 per unit (maximum duration 2 minutes). For thermal considerations the overall loading requirements of IEC 354 will not be exceeded. In addition the possibility exists that a high incidence of short-circuit faults will be applied to the transformer secondary terminals. Tenderers must comment on the ability of transformers offered to meet these requirements and provide this comment and the following details of transformers previously built for traction supplies with the tender :-

- User.
- Where installed.
- Date installed.
- Quantity supplied.
- MVA rating.
- Voltage ratio.
- BIL of Primary and secondary windings.
- Range of tappings.
- Location of tappings.
- In addition to the above any information relating to reliability and in-service performance should be submitted in support of the above.

17.2 TECHNICAL REQUIREMENTS

17.2.1 The following are the technical requirements of the required transformer:

Frequency	50Hz
Type	OUTDOOR
Cooling	ONAN
Rated power	20MVA
Rated voltages	As specified in schedule of requirements
Tap changer	OFF LOAD
Tapped winding	Secondary
Tapping range in 6 equal steps.	Minus 0 % Plus 15 %
Winding connections	Primary Phase to phase. Secondary Phase to earth.
Insulation	Primary and secondary fully insulated

Impedance	Limits on any tapping at 75 °C and at rated frequency expressed in percent of $\frac{(\text{Nominal Voltage})^2}{\text{MVA}}$	Max 12% Min 10%

17.2.2 Protection current transformers on the primary side shall be fitted on the transformer primary bushings for primary voltages of 88kV and less. For voltages above 88kV the primary protection current transformers will be separate units. All protection current transformers on the secondary side (25kV) shall be fitted on the transformer secondary bushings.

17.2.3 Transformer oil shall conform to SABS 555.

17.3 **ANCILLARY EQUIPMENT**

The following shall be provided :-

17.3.1 A conservator tank which shall be painted white, fitted with a silica gel dehydrating breather and an oil-level gauge and drain cock.

17.3.2 The connecting pipe to the conservator shall extend at least 50mm into the tank to form a sediment trap. All pipe connections shall have flange joints.

17.3.3 A weather-proof dial type thermometer graded in °C for registering "top oil" temperature. The instrument shall be fitted with a resettable maximum temperature indicator. Adjustable trip and alarm contacts shall be fitted to the thermometer. The contacts shall normally be set to operate at a temperature of 90 °C.

17.3.4 A single-float Buchholz relay to provide tripping facilities.

17.3.5 A thermal type overload relay to protect the transformer windings against sustained overloads. This relay shall have a load-temperature characteristic approximately the same as the transformer winding hot spot. Suitable means of compensation for variation of ambient air temperature shall be provided.

17.3.6 The relay shall be provided with trip and alarm contacts. The contacts shall normally be set to operate at 100 °C.

17.3.7 A oil drain cock, oil sampling cock and thermometer pockets on the main tank. The sampling cock shall be so arranged that a oil sampling bottle may be easily filled.

17.3.8 Two cocks, one on top and one at the lowest point on opposite sides of the main tank shall be provided, for connecting up to an oil filtering system. The cocks shall be screwed 50mm gas or metric equivalent female thread. If desired, the cock at the lowest point of the tank may be combined with the drain cock required above by the addition of a suitable fitting having a 50mm gas or metric equivalent female thread.

17.3.9 A suitable explosion vent may be provided on the main tank if considered necessary by the manufacturer, but the provision of such a vent shall not effect the efficiency of the Buchholz relay in the event of a transformer fault.

17.3.10 Bushing stems and terminals of a size to ensure sufficient mechanical strength for attaching and supporting external connections, which shall not in any case be smaller than 26mm diameter (primary and secondary). At least two earthing terminals on opposite sides of the transformer shall be fitted on the outside of the transformer tank to facilitate connection to the substation main earth mat.

17.3.11 All pipe joints and inspection covers shall be sealed using O-ring gaskets.

17.3.12 Pockets for the temperature indication probes shall be located in areas where the oil is freely circulating, thus avoiding the possibility of incorrect oil temperature measurement.

17.3.13 A separate quote for the optional supply of the following on the transformer is required:

- A "Bagged conservator" (A bag installed in the conservator tank which prevents air from coming into contact with the transformer oil)
- A Chainings UAU transformer filter system
- A on load tap changer

17.4 TANK AND COOLING RADIATORS

17.4.1 The transformer tank and its associated components shall have adequate mechanical strength and rigidity to permit the complete transformer minus cooling radiators but filled with oil, to be lifted, jacked and skidded in any direction. Welded seams shall not be covered by stiffeners.

17.4.2 The transformer tank shall have a welded top cover.

17.4.3 Transformers shall not be fitted with rollers, but shall be provided with a substantial base that is rectangular (has no protruding lugs or protrusions) and is so constructed that it can be supported on a flat concrete plinth that has a raised portion the same size as the transformer base, to prevent the possibility of water standing in contact with the transformer base. Provision shall be made on the transformer for the attachment of a tackle for the purpose of skidding. Jacking lugs shall be provided for lifting the transformer complete with oil.

17.4.4 The transformers shall be fitted with removable cooling radiators which shall be hot-dip galvanised externally. Suitable valves shall be provided so that the radiators can be removed without having to drain the oil from the transformer tank.

17.5 RATING PLATES

17.5.1 A non-corrosive metal plate shall be fixed to each transformer tank (not cooling tubes).

17.5.2 Comprehensive information shall be provided on the rating plate in respect of both electrical and mechanical aspects.

17.5.3 Details must be submitted to Spoornet for approval prior to construction.

17.6 TESTING

17.6.1 The transformer shall be tested in accordance with IEC 76, including a test with lightning impulse chopped on the tail.

17.6.2 Spoornet will conduct an out of tank inspection of the transformer prior to the transformer being tanked as well as witnessing all the routine manufacturers tests carried out at the works. The co-ordination of manufacturers testing shall be the responsibility of the successful tenderer.

17.6.3 Type test certificates of the transformer design offered shall be submitted with the tender. Should type test certificates not be available, the required tests shall be carried out, the cost of which must be included in the tender price quoted as a separate item.

17.6.4 Should the transformer offered not have a short circuit type test certificate available, a simulated computer model of this test may be submitted for Spoornet's approval, but should this model be unacceptable short circuit tests will be required and shall be conducted in accordance with IEC 76 Part 5 . An out of tank inspection shall be carried out after completion of the tests. The tests shall comprise two short circuits on each of the extreme and centre tappings. The short circuits on each tapping shall be of opposite asymmetry. Short circuit duration shall not be less than 0,5 seconds. Short circuit current shall not be less than that calculated for a fault on the secondary terminals of the transformer with rated voltage on the primary terminals from a supply of not less than 2 500MVA .

18.0 CURRENT TRANSFORMERS

18.1 Current transformers shall be of the bar-primary type and comply with BS 3938. Ratings, ratios and class of accuracy shall be determined by the protection scheme as shown on Drawing No. CEE-TBB-109. A margin of 5VA shall be provided for testing purposes.

18.2 If the primary supply voltage is 88kV and below, then the current transformers for main transformer protection shall be installed in the transformer bushings. If the primary supply voltage exceeds 88kV then only the current transformers on the secondary side of the main transformer shall be mounted in the transformer bushings, with the primary side's current transformers being of the post type.

18.3 Secondary protection current transformers shall be mounted in the transformer bushings.

18.4 Current transformers shall be installed on the load side of the associated circuit breaker. It shall be possible to remove the current transformers with the minimum of disturbance to other equipment.

18.5 Separate current transformers shall be provided for main and back-up protection on all 25kV track feeder circuit breakers.

18.6 Since the accurate measurement of harmonics in the traction supply will be necessary from time to time, current transformers offered shall be suitable for this purpose.

19.0 VOLTAGE TRANSFORMERS

19.1 Voltage transformers shall be single phase and have a ratio of 26,4kV/110V . They shall comply with the requirements of BS 3941 and be class E for protection.

19.2 Voltage transformers shall be outdoor structure mounted, oil filled type.

19.3 The return side of the primary winding shall have a bushing insulated for 3,3kV and must not be connected to the Voltage Transformer's tank.

19.4 The secondary winding shall be terminated in a cable box.

20.0 AUXILIARY POWER TRANSFORMERS

20.1 Unless otherwise stated two 16kVA 27 500V/240V single phase transformers mounted on the substation portal structure shall be provided by the successful tenderer.

20.2 The transformers shall comply with SABS 780.

20.3 The transformers and the connected equipment shall be capable of operating satisfactorily for a supply voltage varying between 27,5kV and 22,0kV. Main transformer secondary voltage under traction no-load conditions will normally be 27,5kV and auxiliary equipment shall be capable of operating continuously at this voltage.

20.4 Each transformer shall be provided with a suitably rated drop-out fuse link provided in the high voltage supply conductor.

21.0 BUSBAR COUPLER

21.1 The 25kV busbars of each unit at all double unit traction substations shall be connected together by means of a busbar coupler. A busbar coupler shall be provided in single unit substations where specified in the Schedule of Requirements.

21.2 For secondary circuit breakers of the outdoor structure mounted type, the busbar coupler shall be a motor operated 25kV AC track sectioning switch supplied in accordance with specification CEE.0040.83.

21.3 The track sectioning switch shall be rated at 1500A and the operating voltage of the switch mechanism shall be 110V DC.

22.0 SECONDARY CIRCUIT BREAKERS

GENERAL REQUIREMENTS

22.1 Secondary Circuit breakers shall be of the vacuum type. Circuit breakers shall comply with BS 5311 in so far as that specification is applicable to the type of circuit breaker offered.

22.2 Circuit breakers of a service proven design are required and full-supporting details in this respect shall be furnished with tenders. The circuit breakers shall be single pole.

22.3 Circuit breakers shall be of the outdoor structure mounted type and shall be mounted on a suitably designed structure, in the manner indicated on Drawing No's CEE-TDB-41 sht's 1 & 2

22.4 The mounting method of the circuit breaker and the operating mechanism shall be adjustable to allow for alignment.

22.5 The circuit breakers shall have a rated voltage of 44kV, and the system frequency is 50Hz.

22.6 The rated continuous current shall be at least 1 200A.

22.7 The rated short-circuited breaking current shall be 12kA at a nominal voltage of 25kV . In addition the circuit breaker shall be capable of interrupting 6kA at a recovery voltage of 44kV in the case where a short circuit between phases occurs.

22.8 Fault making current shall be 30kA peak and at least 12kA for 3 seconds.

22.9 Opening time on low impedance track faults including relay operating time shall not exceed 0,1 seconds, for track feeder circuit breakers.

22.10 Tenderers shall advise the capability of circuit breakers offered to interrupt :-

- Capacitive currents.
- Currents with a high harmonic content.

22.11 Tenderers shall advise the chopping current levels of the circuit breaker offered and what steps are taken to keep these values to a minimum.

22.12 Tenderers shall also advise whether special precautions are required to limit the effects of chopped current and to give details.

22.13 The operating mechanism shall be constructed of non-ferrous material or cadmium plated steel.

22.14 The operating voltage shall be 110V DC.

22.15 The circuit breaker operating mechanism shall be housed in a weatherproof enclosure, and shall be accessible by means of a lockable door.

22.16 The following shall be provided within the enclosure:

- A thermostatically controlled anti-condensation heater.
- A fluorescent light operated by a door switch.
- A 15A, 220V AC socket outlet in accordance with SABS 0142.

22.17 The circuit breaker mechanism shall be of the spring operated type with shunt release for both opening and closing. The closing operation shall charge the tripping spring.

22.18 It shall not be possible for the circuit breakers to close while the spring is being charged.

22.19 The spring shall be fully charged before it can be released to close the circuit breaker.

22.20 It shall be possible to charge the spring when the circuit breaker is closed and if the spring can be, and is released, the circuit breaker shall not open.

22.21 There shall not be any danger of a fully charged spring being released by vibration caused by the opening of the circuit breaker under any conditions.

22.22 A visual mechanical indicating device shall be provided to indicate the state of the spring and shall be inscribed "Spring Charged" when the mechanism is in the condition to close the circuit breaker and "Spring Free" when it is in any other condition.

22.23 Means shall be provided for charging the spring by hand.

22.24 Means shall be provided for discharging the spring when the circuit breaker is in the "open" position without the circuit breaker attempting to close.

22.25 Facilities shall be provided for locking of the local manual release of the closing spring mechanism.

22.26 The closing springs shall recharge automatically after the completion of a closing operation.

22.27 Tension springs shall not be used for either closing or tripping mechanisms.

22.28 Facilities shall be provided to permit manual slow closing of the circuit breaker for maintenance purposes.

22.29 The mechanism shall be trip-free. The contacts shall make before the breaker starts to open.

22.30 If the circuit breaker fails to latch on closing it shall trip before any significant damage can occur.

22.31 A visual mechanical indicating device shall be provided to indicate whether the circuit breaker is closed or open.

22.32 Unless the design of the circuit breaker mechanism is such that compensation for interrupter contact wear is provided automatically, a visible indication shall be provided to show when adjustment is needed. In the case of circuit breakers incorporating more than one interrupter it shall be possible to make such adjustments individually to suit the requirements of each interrupter.

22.33 Auxiliary contacts shall be provided for operation in conjunction with the protection and other auxiliary circuits specified. At least one spare pair of normally open and one spare pair of normally closed contacts shall be provided.

22.34 Local/Remote selector switches on the circuit breaker equipment shall be of the two-position type (no “off” or “neutral” position).

22.35 Circuit breaker control switches shall be arranged to return automatically to the neutral position when the handle is released after being turned to either the "close" or "trip" positions.

22.36 A counter shall be provided on each circuit breaker to indicate the total number of operations of the breaker.

22.37 A counter shall be provided on each track feeder circuit breaker control panel to indicate operations (trips) initiated by any of the track feeder protection relays.

22.38 Tenderers shall advise the number of circuit breaker operations under the following conditions, after which maintenance and/or measurement of contact wear is recommended :-

- Rated breaking capacity.
- Breaking 6kA.
- Breaking 1500A.

23.0 TRACTION substation building

23.1 The building to be provided shall be of the prefabricated steel modular type. It shall be robust, waterproof, vermin proof and of sufficiently strong construction to resist all weather conditions encountered in South Africa.

23.2 Details of a suggested design are shown on Drawing No. CEE-TEC-28. This design or variations thereof may be used but tenderers are free to offer alternatives that comply with this specifications requirements.

23.3 When a single unit substation is required, the building design shall facilitate extension to accommodate equipment for a double unit substation in the future.

23.4 Steelwork shall be treated in accordance with the prevention of corrosion requirements specified in clause 11.

23.5 The building shall have a "double-skinned" roof construction to allow a free circulation of air between the skins.

23.6 The outer skin shall be of flat sheet steel of the same thickness as the building.

23.7 The inside walls shall be thermally insulated to the equivalent of 40mm of glass-fibre. The tenderer shall give full details of the material he intends to use as well as the fixing method of the material to the walls (Glue is not acceptable). Protection against mechanical damage to the insulation shall be provided.

23.8 The building shall be large enough to accommodate all equipment that will be contained within the building with enough space for comfortable maintenance of the equipment. The following major items of equipment as called for in this specification must be accommodated within the building:

- An aluminium self-supporting ladder with a height of 1.2m.
- A wall mounted metal key box with a lid and provision for at least 20 keys as shown on Drawing CEE-TCA-92.
- Suitable brackets and/or storage for ladder, special tools and earthing apparatus.
- Suitable bracket on the wall immediately adjacent to the annex door for mounting of a fire extinguisher. (Fire extinguisher will be provided by others).
- Suitable brackets for mounting of a control selector telephone and telecommunications distribution board.
- A complete set of wiring and circuit diagrams for the substation.
- A steel cabinet / desk combination approximately 1150mm wide, 600mm deep and 000mm high. ' 1
- Telecontrol cabinets (provided by others).
- Battery tripping unit.
- Primary Circuit Breaker control panels.
- Secondary Circuit Breaker control panels.
- Low voltage distribution board.

23.9 One door is required for entrance into the building. The door shall be situated in the narrow wall opposite that which contains the ventilation fan.

23.10 It shall be possible to remove, without dismantling, any equipment contained within the building through the door provided.

23.11 The door shall be fitted with a robust locking mechanism capable of being locked by means of a stout padlock provided by Spoornet.

23.12 Door hinges shall be robust with hardened steel pins. Doors shall be fitted with a suitable stay to hold them in the open position.

23.13 A foundation and plinth of concrete for the support of the building and its equipment and for the maintenance and handling of all indoor equipment shall be provided.

23.14 The plinth shall be so designed as to eliminate the possibility of water standing in contact with the base of the building.

23.15 Tenderers shall give details of the measures they propose taking to seal the base of the building to the concrete plinth.

23.16 The finished level of the plinth shall not be less than 250mm above ground level .

23.17 The floor surfaces shall be durable non-slip and of pleasing appearance and shall not be subject to damage or marking by normal maintenance activities. In the case of a concrete floor it shall be coated with "Solidkote" or similar.

23.18 Provision shall be made for the entry of cables from the outdoor yard into the building.

23.19 The building design shall be such as to provide the necessary trunking for cable entry to all equipment which will be top entry. (no underfloor trunking)

HEATING AND VENTILATION

23.20 A ventilation fan shall be provided in the substation control equipment building. The fan shall be capable of providing 20 air changes per hour.

23.21 Whirlybird or similar ventilators suitable to ventilate the building shall be provided and installed on the roof.

23.22 The fan shall draw air from inside the building and blow to the outside through automatically closing shutter louvers.

23.23 Thermostatically controlled heaters shall be provided to prevent condensation within the building. Thermostats shall comply with BS 3955 part 2 section 2F and be to category A.

23.24 Heaters shall be robust with elements completely enclosed in a metal tube.

23.25 Heaters shall be positioned and mounted in such a manner that they are not subject to damage during normal maintenance activities.

23.26 Details of the type and rating of heaters must be supplied by tenderers.

24.0 AUXILIARY POWER SUPPLIES

24.1 All low voltage power and lighting circuits shall comply with the requirements of SABS 0142.

24.2 Under traction load conditions the substation supply voltage will have a high harmonic content and equipment supplied from the auxiliary transformer shall be capable of satisfactory operation under these conditions.

24.3 A low voltage distribution board shall be provided in the substation building. The output of the auxiliary transformers shall be connected to two 80A double pole miniature circuit breakers (MCB's) on the distribution board. The MCB's shall be withdrawable or lockable.

24.4 The output from the auxiliary transformers shall be connected to an automatic change-over contactor which must not allow the supplies to be paralleled under any circumstances.

24.5 Where only one auxiliary transformer is called for Spoornet will arrange for the supply from a second auxiliary transformer to be connected to one of the 80A MCB'S called for above.

24.6 The distribution board shall be provided with MCB'S to protect and control all lighting, heating, ventilation, socket outlets, control circuits, and supplies to the Eskom equipment. MCB'S shall comply with SABS 156.

24.7 Provision shall be made for six single MCB spare cut-outs for future additions.

24.8 The distribution board must provide for a 110V 10A DC supply and a 220V 20A AC supply to be cabled to the Eskom equipment in the Eskom yard. AC and DC circuits shall be physically separated either by means of a partition or separate distribution boards.

24.9 At least two 15A 220V 3 pin socket outlets shall be provided in the building as well as one outlet mounted in the control panels.

LIGHTING

24.10 Lighting points shall be provided in each building to provide a general level of illumination of 20 lux. Light fittings shall be of the fluorescent type.

24.11 Two outdoor fluorescent lights shall be provided on the outside of the control equipment building. One shall be mounted above the buildings door and the other shall be mounted on the long side of the building facing the track. These lights shall be controlled by light sensitive switch.

24.12 Outdoor lighting shall be provided in at least two positions to provide a general level of illumination of 20 lux in the substation yard. These lights shall be controlled from within the control equipment building. Care shall be taken to avoid glare in the eyes of train drivers and the layout must be approved by the Technical Officer.

25.0 **REQUIREMENTS FOR TELECONTROL**

25.1 Telecontrol and telemetering equipment will be provided by Spoornet.

25.2 The telecontrol equipment cabinet, the size of which is approx 1600x800x800 (hwd), will be housed in the substation control equipment building. Spoornet will deliver this cabinet to site, with the installation thereof being the responsibility of the successful tenderer.

25.3 A "Klippon" or similar terminal strip with 250 terminals shall be provided to act as the interface between the substation equipment and the telecontrol equipment. This terminal strip can be housed in one of the switchgear control panels (space permitting) or housed in a dedicated enclosure. The successful tenderer shall terminate all conductors for the telecontrol functions required on one side of this terminal strip. The successful tenderer shall supply and install the cable required to connect the telecontrol equipment cabinet (supplied by Spoornet) to the terminal strip. One side of this cable will be connected to the terminal strip with the other side being made off in the telecontrol equipment cabinet for connection by others.

25.4 The relay contacts provided in the telecontrol cabinet for remote operation of switchgear will have a maximum rating of 0,5A at 110V DC.

25.5 Indication for telecontrol purposes shall be provided by means of voltage free open and closed contacts on the switchgear.

25.6 Provision shall be made for the following principal telecontrol operations indications and alarms: -

- Open and close command function for all circuit breakers.
- Open and close indication for all circuit breakers.
- Lockout indication for all circuit breakers.
- Indication of failure of voltage transformer output (protection reference voltage).
- Indication of failure of distance protection relay supply voltage. Detection must take place at each relay.
- Indication of charger failure for DC control batteries.
- Indication of transformer pressure relief device operation.
- Indication of low gas (SF6 breakers, Primary and Secondary).

25.7 The following transducers capable of measuring true RMS values of distorted waveforms shall be provided :-

25.7.1 A current transducer to monitor each main transformer secondary current.

25.7.2 A voltage transducer to monitor each secondary busbar voltage.

25.8 The output of these transducers shall be wired to the telecontrol terminal strip.

25.9 Tenderers shall state the type and suppliers of the transducers they intend using.

25.10 Any additional telecontrol functions that might be necessary due to the supply and installation of any specialised equipment offered shall be provided.

25.11 A detailed list of telecontrol commands, indications and alarms shall be submitted for approval by the Technical Officer.

26.0 CONTROL PANELS

A control panel shall be provided for each Primary and Secondary circuit breaker provided in the substation. These control panels shall contain all the protective relays and circuit control equipment required for the operation of the associated breaker.

26.1 PANEL CONSTRUCTION

26.1.1 The panels shall be constructed of steel sheeting of not less than 2mm thickness. The panel shall be of rigid construction with facilities for lifting.

26.1.2 The panels shall of the swing frame type (access to the panel being via the front swing frame and having no rear access).

26.1.3 The panels shall be fitted with dummy interior covers so as to ensure that when components are mounted, no bolts or screws are visible on the exterior of the panel.

26.1.4 The panel shall be supplied with a gland plate which allows for cable entry from the top. The installation contractor shall punch all required holes into the gland plate on site.

26.2 EQUIPMENT INSTALLED IN THE PANELS

26.2.1 All contactors and relays shall be of liberal rating and design and of the sturdiest construction, they shall not be affected by vibration and shall be silent when energised. Contacts shall be made of silver or other approved metal to minimise damage through oxidation and shall be designed to maintain good contact under all operating conditions.

26.2.2 Relays shall be completely sealed against the ingress of dust and dirt by means of non-inflammable covers which are easily removable. The relays shall have a protection rating of IP34 as defined in SABS 1222.

26.2.3 All protection relays shall be housed in withdrawable pattern cases and shall be so designed and mounted as to make them free from equipment vibration problems.

26.2.4 All relays, contactors, links, MCB's and test terminals shall be readily accessible so that routine examination, maintenance and testing may be carried out without the need to remove bolted panels.

26.2.5 The control equipment provided shall be capable of correct operation within the voltage limits specified in BS 5311 : Part 3 : 1976. In addition the coils of all devices operated from the substation auxiliary transformer AC supply shall be capable of satisfactorily operating under the harmonic voltage conditions encountered in an AC traction system.

26.2.6 All low voltage circuits in the panel which require protection shall be suitably protected by miniature moulded case circuit breakers which comply with SABS 156. The circuit breakers shall be B-curve design.

26.2.7 All electrical conductors shall be routed in plastic channel trunking with a removable cover. This trunking must be of sufficient size to easily hold the conductors. Should trunking not be feasible, a metal rod can be brazed onto the panel onto which the conductor bundle can be attached by cable ties or some other suitable method. Conductors supports that are attached by adhesive are not acceptable.

26.2.8 Panel bus wires shall be fully insulated and shall be run separately along the panel. MCB's shall be provided to enable independent circuits to be isolated from the bus wires. Separate troughs or ducts shall be provided for the building wiring and control wiring.

26.2.9 Protection circuits shall be provided with PK2 type test blocks to enable the temporary connection of instruments, meters or test equipment without interfering with fixed wiring.

26.2.10 All wires shall be provided with identification tags at terminals and shall be marked as reflected on the panel wiring diagrams. The diagram markings and wire markings shall be the same.

26.2.11 All cables shall be marked at both ends with markings the same as that which appears on the wiring schematics and diagrams.

26.2.12 All relays, cables, terminal strips, switches, lamps, push buttons etc. which are mounted on panels, shall be labelled to clearly indicate their function.

26.2.13 An annunciator indicating panel giving visual (LED display) indication of the reason for the circuit breaker's trip shall be provided on the circuit breaker control panel.

A counter shall be provided on the control panel of each circuit breaker to indicate the number of trips initiated by the protection scheme.

26.2.14 Each protective element that causes the circuit breakers to trip shall be catered for (Bucholtz, overload, SF6 low gas, distance protection etc.). The visual alarm shall continue until the indication alarm is accepted and reset.

26.2.15 No anti condensation heaters are required inside the panels.

26.2.16 Each panel shall have and interior fluorescent lamp which will be switched by a door switch.

26.3 INDICATING INSTRUMENTS

26.3.1 All indicating instruments shall be designed, manufactured and tested in accordance with SABS 1299, and shall be flush mounted.

26.3.2 The dials of instruments shall be marked with the ratio of the associated instrument transformers.

26.3.3 The full-scale deflection of instruments shall be not less than 85mm and the scales shall be:

- Voltmeters 0 - 30kV
- Ammeters 0 - 1 500A

26.3.4 A voltmeter shall be provided to indicate the voltage of each section of the 25kV busbar.

26.3.5 An ammeter shall be provided to indicate the primary and secondary current.

27.0 **DC BATTERY AND CHARGER**

27.1 The DC control battery and charger shall comply with specification No.CEE.0085 except where special arrangements are necessary to suit the design of equipment offered. The Tenderer shall complete appendix No.2 of that specification.

27.2 The rating of the battery and charger to be installed in each substation shall be based on the burden of the equipment to be supplied.

27.3 The nominal voltage of the battery shall be 110V.

27.4 The batteries shall be of the nickel cadmium sealed type and shall comply with the requirements of CKS 455 if the capacity thereof is lower than 10 ampere hours otherwise they shall be of the non-sealed vented type.

28.0 **PROTECTION**

Drawing No. CEE-TBB-109 shows the principal protection requirements for a substation and must be read in conjunction with the following specific requirements.

28.1 Separate current transformers shall be provided for main and back-up protection on all 25kV track feeder circuit breakers.

28.2 **PRIMARY CIRCUIT BREAKER TRIPPING**

28.2.1 The following protection relays shall be provided and when operated shall cause the primary circuit breaker to trip and lockout: -

28.2.1.1 Buchholz.

28.2.1.2 Restricted earth fault on both primary and secondary windings.

28.2.1.3 Transformer percentage biased differential.

28.2.1.4 Primary circuit breakers SF6 low gas.

28.2.1.5 Traction transformer pressure relief valve.

28.2.2 The following protection relays shall be provided and when operated shall cause the primary circuit breaker to trip only, allowing reclosure from remote.

28.2.2.1 Transformer winding and oil temperature.

28.2.2.2 Inverse Definite Minimum Time (IDMT) operated from transformer primary current.

28.2.2.3 Circuit breaker tripping supply undervoltage detection.

28.3 **SECONDARY CIRCUIT BREAKER TRIPPING**

28.3.1 Secondary circuit breaker protection relays shall be circuit specific:

28.3.2 The following protection relays shall be provided and when operated shall cause the secondary circuit breaker to trip only, allowing reclosure from remote.

28.3.3 **Incomer circuit breaker**

28.3.3.1 Inverse Definite Minimum Time (IDMT) overcurrent relay.

28.3.3.2 In the case of double unit substations feeding parallel fed sections, a reverse power relay which will operate in the event of the reverse flow of power.

28.3.4 **Track feeder circuit breaker**

28.3.4.1 Distance Impedance relay with directional mho characteristics suitable for electrified railway systems (GEC Alsthom Optimho relay). A track feeder circuit breaker will normally be the only feed into a section of railway line and will therefore not be required to discriminate with other track feeder circuit breakers. The relay shall provide for instantaneous tripping up to a relay setting equivalent to an overhead equipment impedance of 64 ohms at an angle of 65° The relay characteristic shall be designed to discriminate between load and fault current conditions at high impedance settings.

28.3.4.2 Thermal overload relay to match the thermal characteristics of the overhead equipment which permits a continuous current of 780A, 950A for 5 minutes and 1 720A for 1 minute.

28.3.4.3 Single shot auto reclose relay with dead time and reclaim time independently adjustable from 5 to a total of 25 seconds. An operations counter shall be provided. The auto reclose sequence shall only be initiated by the impedance distance protection relay

28.3.4.4 Low SF6 Gas pressure detection.

28.4 **AUXILIARY TRANSFORMER PROTECTION**

Each 16KVA auxiliary transformer shall be provided with a 1 Amp dropout fuse in the primary supply conductor.

28.5 **RELAYS AND CIRCUITRY PROTECTION**

28.5.1 All circuits supplied by the auxiliary transformers shall be protected by an earth leakage relay.

28.5.2 All circuits, regardless of source of supply shall be protected by suitably rated miniature circuit breakers. (MCB's)

28.5.3 Due to the susceptibility of protection relays to damage due to poor quality of supply as well as lightning surges, the tenderer must state what measures will be implemented to safeguard this equipment.

29.0 **CONDUCTORS, CABLES, AND SMALL WIRING**

29.1 The following electrical conductors shall be used in the construction of a substation:

♦ Primary (HT) flying busbar/jumper	160 mm^2 Al (stranding 19/3.35)
♦ Secondary (25kV) overhead conductors/jumpers	500 mm^2 Al(stranding 37/4.25)
♦ Earth mat	3x30 mm Cu strap (90 mm^2)
♦ Steelwork earth mat connections cast in concrete foundations	95 mm^2 Cu equivalent ERICO cadstrap earth tails
♦ Earth connections from isolator earth blade to earth mat	95 mm^2 Cu equivalent ERICO cadstrap earth tails
♦ Earth connections from all lightning arresters to earth mat	150 mm^2 Al stranded insulated cable
♦ Neutral return overhead conductor	500 mm^2 Al (stranding 37/4.25)
♦ Auxiliary transformer and VT neutral conductors	70 mm^2 stranded Cu unarmoured cable insulated for 3,3kV
♦ Auxiliary transformer positive conductor	50 mm^2 stranded annealed Cu
♦ Earthing harness	95 mm^2 stranded annealed insulated conductor

29.2 The 25kV busbar shall be Aluminium and shall have a continuous rating of 1500A. Busbars shall comply with BS 159.

29.3 Outdoor high voltage conductors shall be of all aluminium composition. ACSR conductors are not acceptable.

29.4 All low voltage cables shall be 600/1 000 Volt PVC insulated sheathed in terms of specification SABS 150.

29.5 Cables for indoor use only may be unarmoured. Cables for outdoor use shall be armoured, and suitable for laying direct in the ground.

29.6 Small wiring and termination's shall comply with BS 162. The current ratings for the various sizes of conductors shall not be exceeded.

29.7 All instrument and control wiring shall be a minimum size of 2,5mm^2 cross-section with stranded copper conductors. Wires connected to the current transformers shall have a minimum cross-section of 4mm^2 .

SECTION 3: - INSTALLATION OF EQUIPMENT

30.0 **SUBSTATION SITES**

Details of substation site sizes and positions (orientation to track) are shown on substation layout drawings listed in Appendix 1.

30.1 SITE PREPARATION

All substation sites will be cleared i.e. shrubs, bush, stumps and debris shall be completely removed from the site. Trees shall be uprooted and removed.

30.2 SITE LEVELS

30.2.1 The site level shall be raised 500mm above the natural ground level.

30.2.2 The final level of the earthworks on site shall be at a cross fall of not less than 2% parallel to the shortest rectangular dimension of the site. The fall must be in the same direction as the prevailing fall of the natural ground level parallel to the shortest rectangular dimension.

30.2.3 The site must be flat.

30.3 MATERIAL

30.3.1 The in situ material may be used for the bottom layer in a cut to fill operation if the material can be compacted as per compaction requirements. Should this not be the case the material may not be used.

30.3.2 Material of quality G5 must be used for earthworks.

30.4 COMPACTION

30.4.1 The material shall be deposited in layers, not exceeding 300mm prior to compaction. Material shall be compacted to 95% Mod AASHTO at OMC.

30.4.2 All substation sites shall be inspected and signed off by the Technical Officer prior to any construction taking place.

30.4.3 Each substation site shall be fenced by a stock/boundary fence as well as by a security fence in accordance with the fence lines shown on the substation layout drawings listed in Appendix No. 1

30.4.4 The extent of kerbing to be installed at each substation site is shown on the substation layout drawings listed in Appendix No. 1.

30.4.5 The security fence and kerbing shall be installed in accordance with the drawing specified in Appendix 2 and shall not be installed prior to the installation of all steelwork and equipment and the making off of all overhead conductors. The technical Officer shall authorise the installation of the fencing and kerbing.

30.4.6 The stock/boundary fence shall be installed in accordance with Drawing No CCE Type 1-45. This installation shall occur simultaneously with the security fencing.

30.4.7 After completion of construction a suitable weedkiller to be approved by the Technical Officer shall be applied throughout the site within the boundaries of the small stock/boundary fence, in accordance with the manufacturers instructions. The successful tenderer shall exercise the greatest care to avoid contaminating private property.

30.4.8 After treatment with the weedkiller, a 100mm layer of 25mm crusher stone shall be laid over the whole area of the Spoornet yard (within the kerbing).

30.4.9 Access to the sites shall be by means of Spoornet maintenance roads. Should the tenderer feel that these roads are not adequate, a separate quotation for any work deemed necessary shall be submitted with the tender.

31.0 FOUNDATIONS

31.1 The successful tenderer shall be responsible for the design and installation of foundations for all the structures, equipment and buildings within the substation yard.

31.2 The successful tenderer shall carry out his own survey in regard to soil types and their load bearing capabilities.

31.3 Tenderers must ensure that provision (financial as well as time) for excavations in a range of soil types is allowed for in their tenders.

31.4 Equipment support foundations shall be finished off 200mm above the finished earth level of the yard. The design must be such as to prevent standing water.

31.5 All foundations edges shall be bevelled, and the surfaces must be float finished.

31.6 All support foundations shall be at the same level.

31.7 An earth mat conductor shall be cast in the concrete foundation for the connection of support steelwork to the earth mat. This shall be done in accordance with Drawing No. CEE-TEE-173 sht's 1-3.

31.8 This earth conductor shall be electrically connected to the foundation bolt group such that in the event of the visible earth connection being removed, a earth connection via the bolt group is maintained. This shall be done in accordance with Drawing No CEE-TEE-173 sht's 1-3.

31.9 A plastic pipe shall be cast into all concrete foundations for earth/control cabling to be taken up the structure and shall be done in accordance with Drawing No CEE-TEE-173 sht's 1-3.

31.10 If the foundation for the main traction transformer is larger than the transformer base plate, then a portion of the foundation the exact size of the base plate must be raised at least 50mm to prevent the possibility of standing water against the transformers base plate.

32.0 CONCRETE

32.1 The 28-day strength of all concrete used shall be a minimum of 20Mpa.

32.2 The successful tenderer shall arrange for sampling and testing of all concrete used, and shall submit full records to the Technical Officer. Spoornet reserves the right to undertake testing of concrete samples and the successful tenderer shall furnish test cubes if requested by the Technical Officer.

32.3 Hand mixed concrete is not acceptable, it must be mechanically mixed.

32.4 The addition of water to a concrete mix reduces the strength of that concrete very significantly and on no account shall water be added to a mix after test cubes have been taken.

32.5 There shall be a minimum of 100mm concrete cover for all steel reinforcing.

33.0 INSTALLATION OF SUBSTATION EQUIPMENT

33.1 The installation of the equipment required for the construction of the required substations will be carried out in accordance with the substation layout drawings listed in Appendix 1. These drawings will indicate the particular requirements for each substation.

33.3 All fasteners (nuts & bolts) shall be secured using flat as well as lock washers.

Requirements for the installation of substation equipment are as follows:

33.4 PRIMARY ISOLATOR

33.4.1 The primary supply conductors will be made off by the supply authority on a terminal structure which shall be supplied and installed by the successful tenderer. Tails and clamps for the connection of the primary supply to the primary isolator will be provided by the successful tenderer. These tails will probably be Wolf conductors, which must be confirmed by the Technical Officer.

33.4.2 The earth connection of the earthing blades shall be connected to the substation earth mat.

33.5 MAIN TRANSFORMER

33.5.1 The interface between the traction transformer plinth and the steel tank must be sealed using a outdoor UV resistant silicone sealer.

33.5.2 A 150mm diameter PVC pipe shall be cast into the transformer plinth to allow for the routing of control and protection cables. This pipe shall be installed based on the principles indicated on Drawing No. CEE-TEE-174 sht's 1-3. This pipe shall be positioned such that the cables enter the transformer control cable terminal box vertically.

33.5.3 The earth conductors connecting the transformer tank to the earth mat at two places shall be cast into the transformer plinth such that a minimum of the conductor is exposed, based on the principles indicated on Drawing No. CEE-TEE-174 sht's 1-3. This conductor must be cast into the plinth in such a manner as to prevent the conductor being damaged during the installation of the transformer.

33.5.4 The secondary transformer bushing that will be designated as the positive (25kV) bushing is the bushing on the left side of the transformer looking at the transformer from the secondary side.

33.5.5 The negative secondary bushing shall be connected to the substation earth mat via a lightning arrestor rated at 33kV. The lightning arrestor must be mounted on the transformer tank in close proximity to the negative bushing. The conductor to be used for this connection to the earth mat shall be similar to that specified for the earth connection of the primary isolator.

33.6 VOLTAGE TRANSFORMER

33.6.1 For secondary circuit breakers of the outdoor structure mounted type, the voltage transformers shall be mounted outdoors on the secondary switchgear gantry. (25kV gantry)

33.6.2 The live side of the primary winding shall be connected to the 25kV busbar.

33.6.3 The neutral side of the primary winding of each voltage transformer shall be connected to the overhead neutral return current conductor.

33.6.4 The secondary winding shall be connected to the appropriate circuits through MCB's.

33.7 **AUXILIARY TRANSFORMER**

33.7.1 The primary positive pole of the auxiliary transformer shall be connected on the traction transformer side of the secondary isolator and should a second auxiliary transformer connected to the 25kV supply be required, its primary positive pole shall be connected to the overhead track equipment on the load side of the track feeder switch (see Drawing No. CEE -TBB -109).

33.7.2 The auxiliary transformer connected to the main transformer side of the isolator shall be mounted on the 25kV gantry. It shall be mounted in such a manner as to allow space for the drop out fuse to be mounted and to function safely, above the auxiliary transformer.

33.7.3 The second 25kV auxiliary transformer (see schedule of requirements) shall be mounted on one leg of the overhead track equipment track switch structure. (see Drawing No. CEE-PFB-30 for typical mounting details)

33.7.4 The neutral of the primary winding of each 25kV Auxiliary transformer shall be connected to the overhead neutral return current conductor.

33.7.6 The secondary output of the auxiliary transformers shall be cabled to a distribution board in the substation building.

33.8 **SECONDARY ISOLATOR**

33.8.1 The secondary isolator shall be mounted on the 25kV gantry structure.

33.9 **SECONDARY CIRCUIT BREAKERS**

33.9.1 Secondary circuit breakers of the outdoor structure mounted type shall be mounted on the 25kV gantry structure.

33.9.2 The outdoor switchgear shall be mounted on suitably designed horizontal steel beams forming part of the 25kV gantry structure (see Drawing No's CEE-TDB-41 sht's 1 & 2)

33.9.3 The outdoor switchgear mounting arrangement shall allow for lateral and vertical adjustment to enable proper alignment of switchgear to take place.

33.9.4 The switchgear shall be mounted in such a manner as to allow an isolating gap of not less than 300mm between the circuit breaker terminals and the 25kV busbar should the jumper be removed.

33.10 **SECONDARY LIGHTNING ARRESTORS**

33.10.1 All secondary lightning arrestors shall be mounted on the 25kV gantry and shall be connected in the circuit in accordance with Drawing No. CEE-TBB-109.

33.10.2 The earth connection of all the secondary lightning arrestors shall be connected to the substation earth mat by means of the specified earthing conductor.

33.11 **25kV BUSBAR**

33.11.1 For secondary circuit breakers of the outdoor structure mounted type, the 25kV aluminium busbar shall be mounted between the two vertical legs of the 25kV gantry in such a manner as to allow for a isolating gap of 300mm between the busbar and the terminals of the secondary circuit breakers should the jumper be removed.

33.12 **BUSBAR COUPLER (DOUBLE UNIT TRACTION SUBSTATIONS)**

33.12.1 For secondary circuit breakers of the outdoor structure mounted type the busbar coupler shall be mounted on the 25kV gantry structure as shown on Drawing No. CEE-TDB-41 sht 2.

33.12.2 The installation of the busbar coupler shall be done in accordance with specification No. CEE.0040.83.

33.12.3 The jumpers used to connect the busbar coupler switch to the two busbars shall be rated at 1500A.

33.12 **SUBSTATION BUILDING**

33.12.1 The substation steel building shall be bolted to the foundation plinth and sealed to prevent the ingress of vermin.

33.12.2 The orientation of the building to the site will be shown on the substation layout drawings.

33.13 **EQUIPMENT INSTALLED IN THE SUBSTATION BUILDING**

33.13.1 The layout of the equipment installed within the building shall be in accordance with Drawing No. CEE-TEC-28.

33.13.2 All equipment installed within the substation building shall be attached to either the floor or the walls.

33.14 **CABLES**

33.14.1 Cable trenches shall have a minimum depth of 500mm measured from ground level. All trenches shall be backfilled and compacted in layers to the compaction of the surrounding yard.

33.14.2 The exact position and size of each cable in the yard shall be shown on the cable layout plan. These drawings shall be submitted for approval prior to installation.

33.14.3 Asbestos-cement cable pipes shall be installed beneath any roadway, where the crossing of a roadway by cables is required. These pipes shall be not less than 150mm in diameter and shall protrude at least 500mm on either side of the roadway. The pipes shall be graded 1:400 for water drainage.

33.14.4 All cables entering the control equipment building shall be block jointed (50mm of armouring to be removed) above the ground. The block jointing shall be done before the cables are installed into the control equipment building. The block joint shall be covered by a heatshrink sleeve.

33.14.5 All cables shall terminate in compression type glands. These glands shall be fitted with neoprene shrouds.

33.14.6 Armoured cables terminating on outdoor equipment shall have their armouring connected to earthed metal by means of a suitable gland.

33.14.7 Cables and earthing conductors connected to equipment installed on steel support structures shall be supported on the steel structure vertically and horizontally by means of a cable tray. This cable tray shall be of the O-Line GS50 Gridspan Wire Mesh type or similar with the wire mesh having a diameter of 4mm and a hot dip galvanised finish.

33.14.8 The cable trays shall be attached to the support steel in accordance with Drawing No. CEE-TDC-10.

33.14.9 Should the cable termination box of an item of equipment overhang the vertical steel support structure, the cable can be installed directly from the cable trench to the terminal box provided a hot dip galvanised steel cable support is provided. This support must either be securely attached to the terminal box or be concreted into the ground. (see Drawing No. CEE-TDC-10)

33.14.10 Cable trays for indoor installation shall be galvanised type O-line PT38 or similar.

33.14.11 The cables shall be fixed to the cable trays using UV stabilised cable ties.

33.15 **INTERCONNECTION OF EQUIPMENT**

33.15.1 Conductors between separately mounted outdoor equipment shall incorporate a degree of flexibility to avoid any stressing of these connections due to foundation movement or conductor expansion/contraction and to facilitate alignment of equipment.

33.15.2 All connections to the overhead conductors shall be made using clamps that are specifically designed and manufactured to make that particular connection (ad hoc fabricated clamps are not acceptable).

33.15.3 High conductive silicon grease shall be liberally applied to all connections.

33.15.4 All dissimilar metal connections (Cu to Al) shall be made using bi-metallic clamps that are specifically designed and manufactured to make that particular connection (ad hoc fabricated clamps are not acceptable).

33.15.5 All copper connections to steel (galvanised) shall be tinned.

33.15.6 The overhead neutral return conductor shall be insulated using disc insulators for 3,3kV.

33.15.7 The overhead track feeder conductors shall be provided between the 25kV gantry and the overhead track equipment portal structure.

33.15.8 The overhead track feeder conductors complete with insulation and fitted with suitable bi-metallic clamps for the connection of two 160 mm^2 Cu conductors (provided by others), shall be supplied and made off on the track switch portal by the contractor. Others shall do the connection of these conductors to the track switches. This forms the substation / overhead track equipment contract boundary.

33.16 **FENCING AND KERBING**

33.16.1 The boundary/stock fence, security fence and concrete kerbing shall only be installed once all major items of equipment and steelwork have been delivered and installed and all overhead conductor stringing is complete.

33.16.2 The extent of Boundary/stock fencing, security fencing as well as kerbing for each substation site is shown on the substation layout drawings listed in Appendix No. 1.

33.16.3 The security fence required shall be in accordance with the drawing as specified in Appendix 2.

33.16.4 Kerbing shall be installed in accordance with Drawing No. CEE-TEA-1.

33.17 "RETURN" CURRENT AND SUBSTATION EARTHING

33.17.1 RETURN CURRENT

33.17.1.1 It is required that the return current from the traction system shall not return to the main transformer via the substation earth. Therefore the principles set out below and indicated on Drawing No.CEE-TBD-8 shall be adhered to and adapted to suit the particular equipment offered.

33.17.1.2 An overhead return conductor shall be provided between one terminal of the main transformer secondary winding (negative bushing) and the overhead track equipment switch structure, where it will be connected to the overhead track equipment's return circuit by others. This conductor shall be insulated for at least 3,3kV.

33.17.2 SUBSTATION EARTH

33.17.2.1 A main earth mat shall be installed in Spoornet's substation yard in accordance with Drawing No. CEE-TBD-8.

33.17.2.2 The earth mat shall be a trench earth system consisting of copper conductor with a cross sectional area of 90mm^2 buried in trenches at a depth of 700mm.

33.17.2.3 Should soil conditions be such that this depth can not practically be achieved, the reduced depth shall be approved by the Technical Officer. If the trench depth is below 600mm, precast concrete slabs shall be placed 100mm above the copper earth conductor in the trench and backfilled.

33.17.2.4 All earth mat joints shall be brazed or exothermically welded.

33.17.2.5 The earth mat connections to structural support steel as called for on drawing No. CEE-TBD-8 shall be made via the copper earth connection cast into the associated foundations. The earth mat shall be brazed to the tails protruding from the support foundations at a depth of 600mm.

33.17.2.6 The earth resistivity of the earth mat shall be less than 5 ohms.

33.17.2.7 A ring earth, not forming part of the floor, with a 90mm^2 copper cross-sectional area shall be provided in the substation building. This ring earth shall electrically connect all steel modules, which the building consists of.

33.17.2.8 The fences bordering the Spoornet substation yard shall be bonded to the substation main earth mat as shown on Drawing No. CEE-TBD-8.

33.17.2.9 Substation equipment shall be connected to the earth mat in accordance with the requirements shown on Drawing No. CEE-TBD-8. The following connections shall also be connected to earth mat:-

- The earth connection of all lightning arresters
- The earth connections of the earth blades on the high voltage isolator.
- A suitable terminal to allow for the connection of the secondary switchgear earthing harness's to the earth mat.

33.17.2.10 A mast air terminal lightning protection system, hazard class A3, with an earth electrode separate from the substation earth mat shall be provided and positioned in accordance with SABS 03-1985 to provide lightning protection for the complete traction substation installation.

33.17.3 EARTHING DEVICES

33.17.3.1 Any device provided for earthing of equipment shall comprise PVC covered 65 sq. mm Cu conductors, link stick clamps to fit 500 sq. mm Al. Conductors similar to that shown on Sketch No. 2 at one end, and a clamp for clamping to the earth mat terminal at the other.

33.17.3.2 The clamps for the connection of the overhead feeder to the load side of the secondary switchgear, shall be designed such that a suitable attachment for the earthing harness is provided.

33.17.3.3 Portable earth connections adequately designed for safety in application shall be supplied. All portable earth harnesses shall be approved by the Technical officer.

33.17.3.4 In a single unit substation a portable earthing harness shall be provided for connecting all secondary switchgear outdoor bushing terminals simultaneously to the substation main earth mat.

33.17.3.5 In double unit substations two portable earthing harnesses as per the previous clause shall be provided.

33.18 NAMEPLATES AND LABELS

33.18.1 A substation nameplate shall be provided. The names of the substations shall be as specified in Appendix No. 1. The nameplate shall be manufactured in accordance with Drawing No. CEE-TEA-2.

33.18.2 Danger warning notices as per Drawing CEE TA-196 shall be supplied and fitted to the substation building access door, on each half of the substation gate, one notice on the narrow side substation fence and two notices on the long side substation fence.

33.18.3 All nameplates and labels shall be in English.

33.18.4 Labels shall be attached by screws or rivets or by a method approved by the Technical Officer.

33.18.5 All labels shall be made of composite sandwich type plastic material of the following colour combinations :-

33.18.6 Identification labels : White lettering on black background. Letters must be of sufficient size to be clearly legible.

33.18.7 Danger labels : White lettering on red background. Letters must be of sufficient size to be clearly legible.

33.18.8 The following is a list of approved labels.

- On (I)
- Off (O)
- Open (Verb.)
- Close (Verb.)
- Closed
- Open
- Trip
- Local
- Remote
- Do not operate link under load
- Open and earthed

33.18.9 Each circuit breaker and circuit breaker control panel shall be provided with labels to indicate the breaker designation and telecontrol code. Spoornet (Technical Officer) will supply these designations and telecontrol codes

33.18.10 The proposed labelling scheme must be submitted to the Technical Officer for approval prior to the manufacture of the labels.

SECTION 4: - TESTING AND COMMISSIONING

34.0 TYPE AND ROUTINE TESTING REQUIREMENTS

34.1 Type and routine tests shall be conducted on the equipment to be supplied. These tests shall be carried out at the successful tenderers expense.

34.2 Test certificates in respect of type tests conducted on identical equipment may be accepted in lieu of type tests at the discretion of Spoornet.

34.3 Delivery of equipment shall not commence before acceptance of type test certificates has been obtained from the Technical Officer.

34.4 Primary circuit breakers shall be tested in accordance with BS 5311.

34.5 Secondary circuit breakers shall be tested in accordance with BS 5311.

34.6 Primary and secondary isolators and earthing switches shall be tested in accordance with IEC 129.

34.7 High voltage fuses for protection of auxiliary transformers shall be tested in accordance with BS 2692.

34.8 Voltage transformers shall be tested in accordance with BS 3941.

34.9 Auxiliary transformers shall be tested in accordance with SABS 780.

34.10 The transformer shall be tested in accordance with IEC 76, including a test with lightning impulse chopped on the tail.

34.11 Spoornet staff will conduct an out of tank inspection of the transformer prior to the transformer being tanked as well as witnessing all the routine manufacturers tests carried out at the works. The co-ordination of manufacturers testing shall be the responsibility of the successful tenderer.

34.12 Type test certificates of the transformer design offered shall be submitted with the tender. Should type test certificates not be available, the required tests shall be carried out, the cost of which must be included in the tender price quoted as a separate item.

34.13 Should the transformer offered not have a short circuit type test certificate available, a simulated computer model of this test may be submitted for Spoornet's approval, but should this model be unacceptable short circuit tests will be required and shall be conducted in accordance with IEC 76 Part 5 . An out of tank inspection shall be carried out after completion of the tests. The tests shall comprise two short circuits on each of the extreme and centre tappings. The short circuits on each tapping shall be of opposite asymmetry. Short circuit duration shall not be less than 0,5 seconds. Short circuit current shall not be less than that calculated for a fault on the secondary terminals of the transformer with rated voltage on the primary terminals from a supply of not less than 2 500MVA .

34.14 The successful tenderer shall test all concrete used for the construction of the works and the results submitted to the Technical Officer for approval.

34.15 The following equipment shall be inspected by Spoornet staff at the place of manufacture prior to delivery to the successful tenderers works or to site:

- All structural steelwork
- The substation building
- Battery tripping unit
- All control panels

35.0 SITE TESTS AND COMMISSIONING

The successful tenderer shall be responsible for carrying out on-site tests and commissioning of all equipment supplied and installed in terms of this specification and the contractual agreement.

35.1 **ON-SITE TESTS**

35.1.1 Functional on-site tests shall be conducted on all items of equipment and circuitry to prove the proper functioning and installation thereof.

35.1.2 The successful tenderer shall submit a detailed list of on-site tests for the approval of the Technical Officer at least six weeks before tests are due to commence at the first substation.

35.1.3 The successful tenderer shall arrange for the Technical Officer or his representative to be present to witness the on-site tests at each substation.

35.1.4 The on-site tests and subsequent commissioning will not commence until all construction work has been completed. Construction staff, material and equipment shall be removed from site prior to the commencement of testing. Testing and commissioning of the substation equipment will not be allowed to take place in a construction site environment.

35.1.5 On-site tests shall include the following ;

- Polarity tests on all VT's and CT's
- Ratio tests on all VT's and CT's
- Magnetising current of all CT's
- Secondary injection of all relays
- Trip testing, all relays must be checked for correct operation.
- The functionality of all electrical circuitry must be tested.
- A power frequency voltage test on all 25kV equipment at 57kV for one minute.
- A power frequency voltage test on all small wiring at 2kV for one minute.
- A millivolt-drop test on 25kV circuits with a current of not less than 200A.
- A proof of vacuum test on vacuum circuit breakers.
- Tests on primary circuit breakers and other primary equipment in accordance with manufacturer's instructions.

35.1.6 At the completion of the on-site tests the Technical Officer or his representative, shall either sign the test sheets (supplied by the successful tenderer) as having witnessed the satisfactory completion thereof, or hand to the successful tenderer a list of defects requiring rectification.

35.1.7 Upon rectification of defects the successful tenderer shall arrange for the Technical Officer or his representative to certify satisfactory completion of on-site tests for that particular substation.

35.1.8 Acceptance by the Technical Officer of satisfactory completion of on-site tests in no way relieves the contractor of his obligation to rectify defects which may have been overlooked or become evident at a later stage.

35.2 **COMMISSIONING OF EQUIPMENT**

35.2.1 Commissioning will include the energising of equipment from the primary isolator to the track feeder circuits. The successful tenderer must prove the satisfactory operation of all equipment under live conditions .

35.2.2 On completion of commissioning the successful tenderer will hand the substation over to the Technical Officer in terms of the relevant instructions.

35.2.3 Tenderers shall allow a period of at least three days per substation between satisfactory completion of on-site tests and commissioning of equipment.

35.2.4 During this period the Spoornet's Test staff will test the operation of all protective relays and circuits and set the protection relays at each substation.

35.2.5 The successful tenderer installation staff shall be present during the testing and setting of the protection to rectify any faults found.

35.2.6 On-site testing of the first substation must therefore commence ahead of the contract completion date, by a period not shorter than a total of three days per substation.

35.2.7 The commissioning of the protection equipment by Spoornet will in no way absolve the successful tenderer from any of his responsibilities during the guarantee period. It is the successful tenderers responsibility to satisfy himself that the commissioning of the protection equipment has been carried out in a satisfactory manner and in no way compromises the proper operation of the equipment supplied in terms of the contract.

35.2.8 The commissioning dates for the substations will be dependent on the availability of power supplies from the supply utility as well as Spoornet's electrification program and will be defined by the Technical Officer.

36.0 **DRAWINGS, INSTRUCTION MANUALS AND SPARES LISTS**

Drawings, instruction manuals and spare parts catalogues shall be supplied in accordance with Spoornet specification CEE.0224.94

36.1 **DRAWINGS**

36.1.1 All as built drawings shall be supplied in electronic format. (Microstation/Acad)

36.1.2 All drawings (paper prints) shall be submitted to the Technical Officer for approval. No construction or manufacturing activity will be allowed prior to the associated drawings having been approved by the technical officer.

36.1.3 The following drawings are required for approval prior to construction and submission in as built form at the completion of the works:

- Electrical schematic diagrams
- Detailed electrical wiring diagrams
- Foundation design drawings (for all foundations)
- Structural support steelwork design drawings
- Site equipment layout plan showing equipment and conductor profiles.
- Earth mat layout plan showing position of buried conductors.
- Buried cable layout plan showing position of buried cables.
- Substation control equipment building plans.

36.1.4 A complete set (paper copies bound in book form) of the electrical schematic and detailed wiring diagrams shall be provided for each substation and shall be in the substation at the commissioning stage.

36.2 **INSTRUCTION MANUALS**

The tenderer shall supply three copies of an instruction/maintenance manual for each unique installation. (if a number of substations are of the same design only three copies of the manual will be required with the names of all the substations to which the manual applies to clearly indicated on the cover)

36.3 **SPARES LISTS**

36.3.1 The successful tenderer shall submit details of spares required in accordance with specification No. CEE.0224.94

36.3.2 All spares recommended for normal maintenance purposes that are not available locally (requires importation) must be highlighted

36.3.3 Tenderers shall however include in their offers, separate quotes for the supply of certain major items of equipment as strategic spares. Individual prices shall be given for one of each of the following items:

- 20MVA traction transformer complete
- HT traction transformer bushing
- LT traction transformer bushing
- HT primary circuit breaker complete with operating mechanism
- 25kV secondary circuit breaker complete with operating mechanism
- 27,5kV/240V 16kVA auxiliary transformer
- 26,4kV/110V Voltage Transformer

37.0 **SPECIAL TOOLS AND/OR SERVICING AIDS**

37.1 Special tools or servicing aids necessary for the efficient maintenance, repair or calibration of the equipment shall be quoted for separately.

37.2 The tenderer shall quote for the supply of SF6 gas filling equipment as well as a distance impedance relay test set.

37.3 Tenderers shall submit detailed offers for special tools and servicing aids including all specialised equipment required for the servicing and maintenance of SF6 and vacuum circuit breakers, distance impedance relay calibration and testing equipment.

38.0 **TRAINING**

The tenderer shall submit details with the tender of the training courses which will be conducted by the successful tenderer for the training of Spoornet maintenance staff in the operation and maintenance of the substation equipment with emphasis on the protection scheme. The courses shall include theoretical as well as practical tuition. The dates and venue of these training course shall be arranged with the Technical Officer.

39.0 **GUARANTEE AND DEFECTS**

39.1 The successful tenderer shall guarantee the satisfactory operation of the complete electrical installation supplied and erected by him and accept liability for makers defects which may appear in design, materials and workmanship.

39.2 The guarantee period for all substations shall expire after: -

- A period of 12 months commencing on the date of completion of the contract or the date the substation is handed over to Spoornet whichever is the later, or
- A period of 12 months commencing on the date of commissioning of the last substation, whichever is the later date.

39.3 Any specific type of fault occurring three times within the guarantee period and which cannot be proven to be due to other faulty equipment not forming part of this contract e.g., faulty locomotive or overhead track equipment, etc., shall automatically be deemed an inherent defect. Such inherent defect shall be fully rectified to the satisfaction of the Technical Officer and at the cost of the successful tenderer.

39.4 If urgent repairs have to be carried out by Spoornet staff to maintain supply during the guarantee period the successful tenderer shall inspect such repairs to ensure that the guarantee period is not affected and should such repairs be covered by the guarantee, reimburse Spoornet the cost of material and labour.

APPENDIX 1

SUBSTATION SITES (NAMES AND LOCATIONS) AND DEGREE OF POLLUTION

SUBSTATION SITE NO.	SUBSTATION NAME	X-AXIS KM POSITION	LAYOUT PLAN DRAWING No.
1	ANTRA	2.543km	CEE-TEB-177

Degree of pollution - Specify the pollution level applicable to each site. Most sites will have the same degree of pollution (average polluted area), with traction substations at the coast or in industrial areas being defined as severely polluted areas.

The X-axis km position is the position on the track to which the X-axis indicated on the layout drawing for a traction substation site must be aligned to.

APPENDIX 2

SCHEDULE OF REQUIREMENTS FOR AC TRACTION SUBSTATIONS

1.0 The Number of substations required and their Primary voltage must be specified.

1.1 The specific requirements for each traction substation must be specified eg. (No. of breakers, what type of security fence is required, extent of security fencing and kerbing, any special design considerations etc.)

1.2 The following table must be completed quantifying the major items of equipment required at each traction substation.

P.I.	P.C.B.	M.T.	S.I.	I.F.	T.F.	B.C.	A.T.	V.T
1	1	1	1	1	2	0	2	1

NOTE 1:

P.I. Primary isolator.
P.C.B. Primary circuit breaker.
M.T. Main transformer.
S.I. Secondary isolator.
I.F. Incoming feeder.
T.F. Track feeder.
B.C. Bus coupler.
A.T. Auxiliary transformer.
V.T. Voltage transformer.

APPENDIX 3

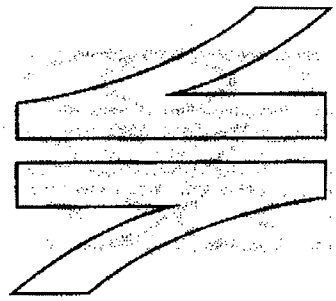
SCHEDULE OF DRAWINGS SUPPLIED BY SPOORNET

DRAWING No.	TITLE
CEE-TCA-92	Key box 25kV AC traction substation
CEE-TDB-41 sht 1	Double unit switch gantry 25kV AC traction substation
CEE-TDB-41 sht 2	Single unit switch gantry 25kV AC traction substation
CEE-TDC-10	Cable tray details in yard 25kV AC traction substation
CEE-TDF-15 sht 1	Substation security fence detail 25kV AC traction substation
CEE-TDF-15 sht 2	Gate detail for security fence 25kV AC traction substation
CEE-TDF-16	Substation Palisade fencing detail 25kV AC traction substation
CCE-TYPE 1-45	Boundary / stock fencing
CEE-TEA-1	Kerbing for substation 25kV AC traction substation
CEE-TEA-2	Traction substation nameboard
CEE-TEB-177	Antra substation yard layout - 25kV AC traction substation
CEE-TEB-178	Intshamanzi substation yard layout - 25kV AC traction substation
CEE-TEB-179	Nseleni substation yard layout - 25kV AC traction substation
CEE-TEB-180	Ekupheleni substation yard layout - 25kV AC traction substation
CEE-TEE-173 sht 1	Pipe and earth details in small foundation 25kV AC traction substation
CEE-TEE-173 sht 2	Pipe and earth details in large foundation 25kV AC traction substation
CEE-TEE-173 sht 3	Pipe and earth details for transformer plinth 25kV AC traction substation
CEE-TEC-28	Substation building detail and layout 25kV AC traction substation
CEE-TBK-27	No volt coil for circuit breakers
CEE-TBB-109	Single line diagram and protection requirements 25kV AC traction substation
CEE-TBD-8	Earthing arrangement 25kV AC traction substation
CEE-TA-196	Sign warning, electric shock hazard 25kV AC traction substation
CEE-PFB-30	Typical mounting arrangement for Aux transformer on track structures
CCE-FG-263	Details of cables in Spoornet's formation

SKETCHES

The following sketches are part of this appendix and are referred to in the specification:

SKETCH No. 1	Structural steel support for CT's and LA's
SKETCH No. 2	Earth harness clamp



SPOORNET

A division of Transnet limited

TECHNICAL

CONFIGURATION MANAGEMENT

SPECIFICATION

DRAWINGS, CATALOGUES, INSTRUCTION MANUALS AND SPARES LISTS FOR ELECTRICAL EQUIPMENT SUPPLIED UNDER CONTRACT

Circulation restricted to:

Technical

INDEX

1.0 SCOPE

This specification covers Spoornet's requirements for drawings, catalogues, and instruction manuals and spares lists of electrical equipment supplied under contract.

2.0 DEFINITIONS

2.1 "Design drawings for approval" defines those drawings, which have to be submitted to Spoornet for approval prior to manufacture of equipment.

2.2 "Installation drawings" defines those drawings, which are required for the installation of the equipment.

2.3 "As Built drawings" defines those drawings, which reflect all the various approved designs, layouts, etc., of the actual final accepted state of the equipment.

3.0 STANDARDS AND SPECIFICATIONS

3.1 The following standards and specifications are referred to:

CEE.0012: Method of Tendering

SABS 0111: Engineering Drawings.

BS 308: Engineering Drawing Practice.

NRS 002: Graphical Symbols for Electrical Diagrams.

IEC 617: Graphical Symbols for Diagrams.

ASHRAE: American Society of Heating Refrigeration Air-conditioning Engineers Standard.

3.1.1 The following Spoornet standard (Electrical) symbol drawings are listed for reference:

CEE-PA-19: Symbols for Electrical Installations.

CEE-PA-42: Symbols for Distribution and Transmission Layout.

CEE-PA-101: Symbols for Air-conditioning installations.

CEE-TA-62: Standard Electrification Symbols.

3.2 Tenderers and contractors shall ensure that they work to the latest issues and amendments of the above standards and specifications.

4.0 APPENDIX

The following appendix forms an integral part of this specification:

Appendix 1:SCHEDULE OF REQUIREMENTS

This appendix calls for specific requirements applicable to the contract.

5.0 METHOD OF TENDERING

5.1 Tendering shall be in accordance with Spoornet (Electrical) specification CEE.0012.

5.2 Tenderers shall indicate clause by clause compliance or non-compliance with the specification. This shall take the form of a separate document listing all the specification clause numbers indicating the individual statement of compliance or non-compliance.

5.3 The Schedule of Requirements, Quantities and Prices, Appendix 1 to this specification shall be fully completed by Tenderers. Failure to submit a fully completed sheet may preclude a tender from further consideration.

6.0 LANGUAGE AND UNITS OF MEASURE

Drawings and documents shall be prepared in English and the ISO unit of measure. Other offers will be considered on merit.

7.0 DRAWINGS

7.1 Drawings shall be generated in either Microstation or any CAD format, which can be read by Microstation, but offers on other media will be considered on merit.

7.2 Drawings shall be prepared in such a manner that they fully comply with the requirements of SABS 0111 and/or BS 308.

7.3 Symbols, with their explanations used on the drawings but not covered by the NRS 002, IEC 617, ASHRAE or Spoornet's symbol drawings shall be furnished i.e. then included on the drawing or supplied on a separate symbol list which is to be cross referenced to the drawing.

7.4 Where the publications referred to in clause 3.1 are at variance, the practice detailed in SABS 0111 shall take preference.

7.5 Drawings shall be prepared for ISO; "A" series size sheets and shall not be greater than A1 size except as detailed below.

7.5.1 Where under exceptional circumstances the nature of the work is such that a size A1 is impractical, then the A0 size may be used.

7.5.2 Long drawings, where necessary for wiring/circuit diagrams, cable run diagrams, track layouts, etc., shall be prepared with widths equal to the widths of the "A" series sheets as required, but preferably not exceeding the length of an A0 sheet.

7.6 All interrelated drawings shall be clearly and adequately cross-referenced.

7.7 The Contractor hereby grants to Transnet a non-exclusive licence, in accordance with the provisions of section 22 of the Copyright Act, 1978;

7.7.1 to copy any plan, diagram, drawing, specification, bill of quantities, design calculation or other similar document made by the Contractor, other than under the direction or control of Transnet, in connection with the extent of work;

7.7.2 to make free and unrestricted use thereof for its own purposes;

7.7.3 to provide copies thereof to consultants to Transnet to be used by them for the purpose of such consultations and consulting services and-

7.7.4 to provide other parties with copies thereof for the purpose of tenders invited by Transnet.

7.7.5 Such non-exclusive licence shall apply *mutatis mutandis* to any plan, diagram, drawing, specification, bill and/or schedule of quantities, design calculation or other similar document made, other than under the direction or control of Transnet, by any principal or sub-contractor of the Contractor. The provisions of this clause shall not apply to documents made, in the case of plant or equipment to be supplied, for the manufacturing process of such equipment, but only to the equipment supplied itself.

7.7.6 Transnet shall make no separate or extra payment in respect of any non-exclusive licence granted in terms hereof.

8.0 INFORMATION REQUIRED ON DRAWINGS

8.1 A title block shall be provided in the lower right hand corner of each drawing, indicating:

8.1.1 Descriptive title.

8.1.2 Contractor's drawing number.

8.1.3 Space for Spoornet's drawing number (as requested in clause 7.7).

8.1.4 Place of installation.

8.1.5 Contract / Order number.

8.1.6 Contractor's name.

8.1.7 Signature or name of approving officer (as requested in clause 8.0).

8.1.8 Approval date.

8.1.9 Issue number.

8.1.10 Projection symbol for multi view drawings, if required.

8.2 Successful Tenderers can obtain a copy of Spoornet's standard title block (Microstation or DXF formats) free of charge by contacting the Documentation Management section.

8.3 On wiring and circuit diagrams, the following shall be specified:

8.3.1 Cable and wire sizes.

8.3.2 Values of resistance.

8.3.3 Breaking capacity of switches.

8.3.4 Ratings of equipment.

8.4 On each assembly or sub-assembly drawing, the following shall be given:

8.4.1 Description of item.

8.4.2 Quantity required for assembly depicted.

8.4.3 Material manufactured from.

8.4.4 The classification of the material according to the relevant SABS specification or other specifications referred to herein.

8.4.5 The class or process of finish and/or coating.

8.4.6 Where special parts are specified, the name of the manufacturer, the size, capacity and the name or catalogue number of each part shall be furnished.

8.4.7 The mass of finished item depicted on the drawing.

8.4.8 Dimensions from a proper reference surface.

8.4.9 Dimension tolerances.

8.5 On electrification drawings, the following shall be specified:

8.5.1 Kilometre distances.

8.5.1.1 Kilometre distances of all new and existing masts measured from the preceding kilometre post.

8.5.2 Civil

8.5.2.1 The following civil information shall be shown:

8.5.2.1.1 Bridges.

8.5.2.1.2 Tunnels.

8.5.2.1.3 Pipes.

8.5.2.1.4 Culverts.

8.5.2.1.5 Subways.

8.5.2.1.6 Manholes.

8.5.2.1.7 Off track platforms.

8.5.2.1.8 Water-furrows along track.

8.5.2.1.9 Service roads that may influence electrification.

8.5.2.1.10 Level crossings.

8.5.2.1.11 All banks and cuttings.

8.5.2.1.12 Retaining walls.

8.5.2.1.13 Gradient markers and gradients.

8.5.2.1.14 Boundary fences (where relevant).

8.5.2.1.15 The beginning and ending of transition and circular curves and the radius.

8.5.2.3 On all station plans the beginning and ending of the platforms to be indicated, as well as all buildings and structures on the platform which may effect electrification. All secondary platforms/structures/obstacles, which may effect electrification, must also be shown.

8.5.2.4 All points with stock rail joints, intersection of centre lines and all ends of point positions to be shown, as well as the type of point, e.g. 1:9 LH (left hand.

8.5.3 Electrical

8.5.3.1 The following electrical information shall be shown:

8.5.3.1.1 New and existing masts and structures with appropriate sizes.

8.5.3.1.2 Span lengths.

8.5.3.1.3 Tension lengths.

8.5.3.1.4 Mast to track centres.

8.5.3.1.5 Tension type (spring or weight).

8.5.3.1.6 Transmission lines, Transnet and Eskom (Showing crossing heights above rail level).

8.5.3.1.7 Telkom lines.

8.5.3.1.8 Height gauges.

8.5.3.1.9 Power and Lighting kiosks.

8.5.3.1.10 Electrical cables nearer than 3,2m from track centre, as well as cables crossing the track.

8.5.3.2 Wire profiles showing clearances/wire heights for all transmission and telecommunication lines that cross the tracks shall be shown on the drawing at the point of crossing, in either tabular or graphic format.

8.5.3.3 *Wire profile for all bridges and tunnels shall be shown on separate drawings.*

8.5.3.4 Important information that shall be noted are:

8.5.3.4.1 Basic span.

8.5.3.4.2 Ruling contact wire height.

8.5.3.4.3 Reference to bonding drawings.

8.5.3.4.4 Wire sizes.

8.5.3.4.5 Types of structures and foundations.

8.5.3.4.6 Tables for traction and transmission line (Showing wire heights).

8.5.3.4.7 Dropper chart.

8.5.3.4.8 Overlaps.

8.5.3.4.9 Jumpers.

8.5.3.4.10 Staggering.

8.5.3.4.11 References to switching diagram drawings.

8.5.3.4.12 Any other relevant information.

8.5.4 Signal.

8.5.4.1 The following signal information shall be shown:

8.5.4.1.1 Signal gantries (showing direction of aim).

8.5.4.1.2 Independent signals (showing direction of aim).

8.5.4.1.3 Signal kiosks.

8.5.4.1.4 Telephones.

8.5.4.1.5 Signal relay rooms.

8.5.4.1.6 Radio repeater rooms.

8.5.4.1.7 Signal cables nearer than 3,2m from track centre, as well as cables crossing the track.

8.5.5 Electrification information must be clearly indicated on drawings (see also drg no CEE-TA-62 for Standard Electrification Symbols).

8.7 The successful tenderer shall obtain Spoornet's drawing numbers from the Documentation Management section of Spoornet well in advance in writing, wherein details of all relevant drawings, i.e. titles and makers numbers are quoted. Against this information Spoornet will allocate its own numbers for inclusion by the Contractor on the original drawings.

9.0 CERTIFICATION OF DRAWINGS

The contractor against a date to certify that the drawing has been checked and is correct in all respects shall approve each drawing. This also includes changes.

10.0 CHANGES TO DRAWINGS

Any drawing returned to the Contractor for changes shall be re-submitted to Spoornet within 21 days with the appropriate changes endorsed thereon.

11.0 SUBMISSION OF TENDER DRAWINGS

The Tenderer shall submit drawings of all major items of equipment with the tender. The drawings shall be sufficiently detailed (e.g. safety factors) to enable suitability of the design to be judged and to enable Spoornet to prepare a reasonably accurate estimate of the cost of maintenance.

12.0 DRAWINGS TO BE SUPPLIED BY SUCCESSFUL TENDERER

12.1 Two prints of each design drawing for approval to be submitted prior to commencement of work or manufacture of any equipment to Spoornet. This includes drawings of general layouts, cable routes, schematic diagrams, foundations, equipment etc.

12.2 Two prints of each installation and/or erection drawing to be submitted to Spoornet. This includes drawings of modular steel buildings, structures etc. and shall be delivered at the same time the delivery of the equipment commences.

12.3 The successful tenderer shall supply one complete set of approved (signed) "As Built" working drawings as well as the electronic files thereof. Drawings shall be fully dimensioned, fully detailed, clear and neat. The set shall comprise all electrical and mechanical drawings considered necessary by Spoornet and shall include drawings of all renewable parts or items. "As Built" drawings of all enclosures, structures and foundations shall also be supplied.

12.4 All relevant "As Built" drawings required shall be delivered to Spoornet within 90 days of completion of the installation and delivery of equipment.

12.5 Until all relevant drawings called for in the contract are delivered, the contract will be considered incomplete.

13.0 CATALOGUES

13.1 Tenderers shall submit a separate quotation for the supply of the itemised part catalogues when specified in the Schedule of Requirements. The size shall be A4 (297 mm x 210 mm). Consideration shall be given on merit of the supply of these catalogues electronically (PDF format).

13.2 The information contained in the catalogues shall be classified into convenient sectors and be indexed. Thumb tabs shall be provided for quick reference to sections. All apparatus shall be illustrated by means of photographs or detailed sketches on which both the parts and the catalogue numbers of the parts are clearly shown. Catalogues shall have exploded views of components for clarity where needed.

13.3 The following information shall be given in tabular form:

13.3.1 Designation of apparatus or item of equipment.

13.3.2 Description of part including information such as dimensions, sizes, resistance values, stranding, material, current ratings, etc.

13.3.3 Catalogue number.

13.3.4 Manufacturer's name.

13.3.5 "As Built" drawing and item number where applicable.

13.3.6 Quantity of parts required for each piece of apparatus.

13.3.7 Illustrating photographs or sketch number.

13.3.8 Nato registration where applicable.

13.4 In a suitable section of the catalogue the following information shall be given:

13.4.1 Index to "As Built" Drawings.

13.4.1.1 "As Built" drawing number.

13.4.1.2 Heading.

13.4.1.3 Parts shown on drawing.

13.4.2 Index to catalogue numbers.

13.4.2.1 Catalogue numbers in numerical order.

13.4.2.2 Catalogue volume number, where applicable.

13.4.2.3 Section in which part is listed.

13.4.2.4 Page number.

13.4.3 Special tools.

13.4.3.1 Designation and description of special tools.

13.4.3.2 Catalogue number.

13.5 Each volume shall be neatly bound in hard serviceable cover on which the contract numbers volume number and titles are printed. All the information in the catalogues shall be given in a clear legible manner. The catalogues shall include all items of equipment to be supplied by the successful tenderer.

13.6 *Catalogues shall be delivered before date of completion of the contract.*

14.0 INSTRUCTION MANUALS

14.1 Tenderers shall submit a separate quotation for the supply of the number of copies of instruction manuals specified in the Schedule of Requirements. The size shall be A4 (297 mm x 210 mm). Consideration shall be given on merit of the supply of these catalogues electronically (PDF format).

14.2 The successful tenderer shall submit draft instruction manuals for approval prior to final printing/compiling and delivery.

14.3 The approved instruction manuals shall be delivered before commissioning the equipment. If this cannot be met, the successful tenderer shall furnish at least three copies of preliminary instruction manuals, suitable for the use of maintenance staff, until the final instruction manuals are to hand (which shall be before the date of completion of the contract).

14.4 The construction, method of operation and purpose of all items of equipment shall be fully explained by means of descriptions and photographs, sketches, drawings or circuit diagrams showing all details.

14.5 The information contained in the instruction manuals shall be classified into convenient sections and indexed. Where multiple models are produced each model shall be described in a separate section in such a manner that models not applicable can be omitted. Where possible the sections shall be subdivided as follows:

14.5.1 Installation and commissioning.

14.5.2 General description and method of operation.

14.5.3 Maintenance and inspection.

14.5.4 Overhaul and repair of equipment.

14.5.5 Technical and maintenance data.

14.5.6 Test procedure flow charts.

14.5.7 Fault finding and trouble shooting.

14.6 The method of calibrating, setting or adjusting all equipment requiring such attention shall be described and where necessary illustrated. The necessary data shall be given in each case to enable the equipment to be checked by measurement if required.

14.7 Full step-by-step instructions regarding the servicing and repair of the equipment shall be given together with all the necessary data such as dismantling and assembling procedures, working clearances, tolerances, limits, fits, maximum permissible wear, recommended lubricants, use of special tools, insulation and winding data, spring pressures and tensions, brush data, fuse data, etc. Recommended servicing/rework/replacement of parts frequencies shall also be included in the maintenance and inspection section of the instruction manual.

14.8 Any delay in delivery of the complete supply of satisfactory instruction manuals/preliminary manuals as provided for in this clause, will subject the Contractors to a deduction from the contract sum, of a penalty as defined in the tender, counting from the specified delivery time until such time as the said manuals are delivered.

15.0 COMBINED DOCUMENTS

If desired the catalogues and instruction manuals specified in clauses 12.O and 13.O may be combined into single volumes. Tenderers shall state whether or not it is their intention to do so. In this case the delivery shall be as specified in clause 13.3, alternatively the conditions described in clause 13.8 applies.

16.0 SPARES LIST

16.1 To enable Spoornet to catalogue and timeously acquire all spares required, the following information shall be submitted before commissioning of equipment:

16.1.1 An itemised schedule of the spares (with reference to alternatives) which are recommended for normal maintenance purposes.

16.1.2 The quantity recommended to be held against each item on the spares list and where sets are supplied, the types and quantity per type to make up a set.

16.1.3 A full and complete ordering description and number of each individual spare with drawing number if relevant.

16.1.4 Where the ordering description and number differs from that of the original manufacturer's catalogue, description and number, the original manufacturer's name, description, type and ordering number shall be listed as well as all other relevant data available.

16.1.5 The national stock number - Nato - number of each spare where the particular spare was imported from a Nato country and where a national stock number was allocated.

16.2 Initially the spares list containing the above information will suffice, but this list shall not in any way replace or supersede the spare parts catalogue mentioned in clause 12.O.

17.0 PACKING OF DRAWINGS, CATALOGUES, INSTRUCTION MANUALS AND SPARES LISTS

All items shall be packed in such a way that they are received in good condition.

18.0 SUBSTITUTION

This specification replaces specification CEE.0224.94

TENDERER'S SIGNATURE: _____

DATE: _____

FOR SPOORNET:_____

GRADE: _____

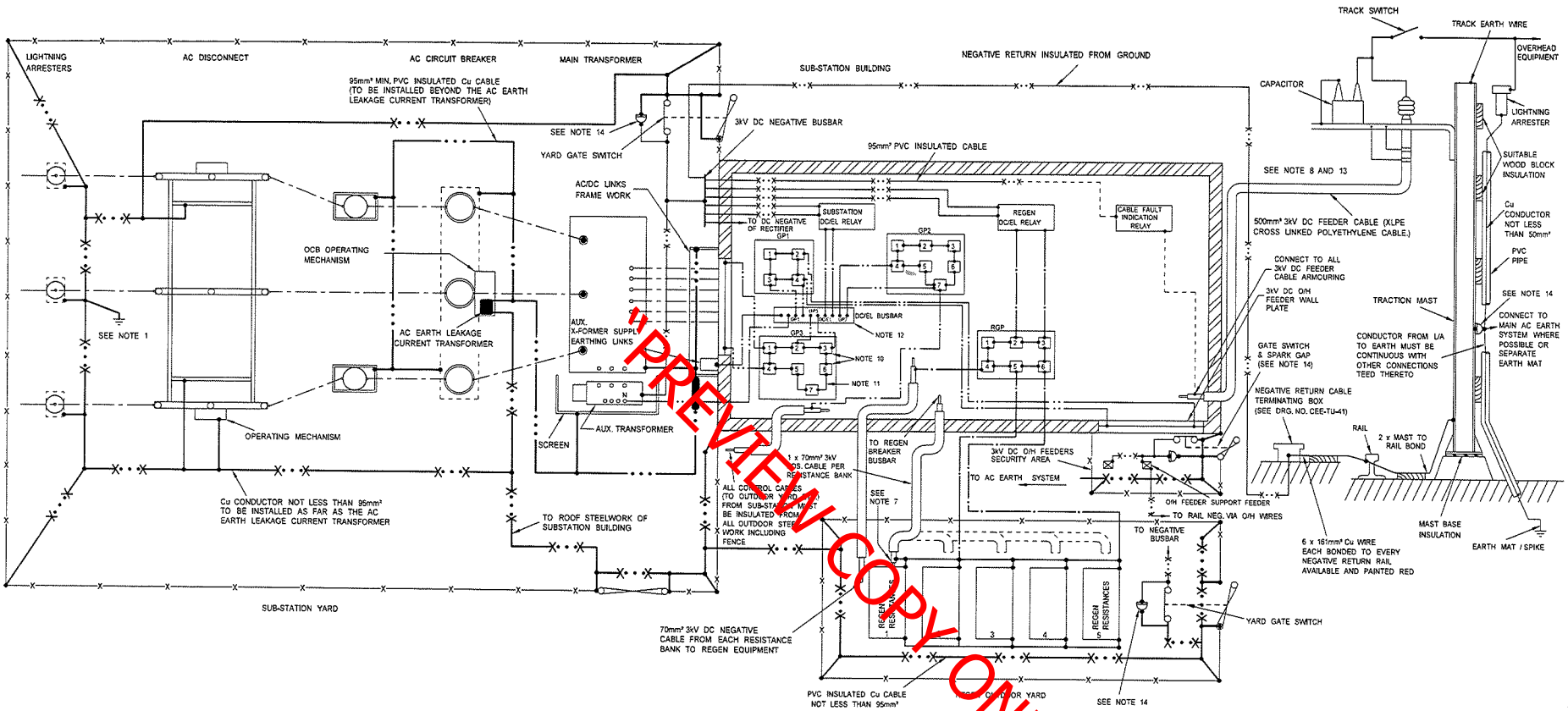
END

SCHEDULE OF REQUIREMENTS

FOR SPOORNET:_____

GRADE: _____

END



NOTES
1. DEEP EARTH OR TRENCH SYSTEM SEE CODE OF PRACTICE: EARTH SYSTEMS FOR ELECTRIC LIGHT AND POWER AND TRACTION INSTALLATIONS. ALSO TO BE CONNECTED TO SUPPLY AUTHORITY EARTH SYSTEM.
2. THE OVERALL RESISTANCE OF A LIGHTNING ARRESTER EARTH SYSTEM EITHER AC OR DC WHEN DISCONNECTED FROM THE EQUIPMENT EARTHING CIRCUITS MUST NOT EXCEED 5 OHMS.
3. THE INSTALLED EARTHING SYSTEM SHOULD BE LOCATED DIRECTLY BENEATH THE AC OR DC LIGHTNING ARRESTER OR AS CLOSE TO THIS POSITION AS POSSIBLE. UNNECESSARY BENDS IN THE DOWN LEADS FROM THE LIGHTNING ARRESTERS SHOULD BE AVOIDED.
4. ALL UNDERGROUND EARTHING CONNECTIONS MUST BE EXOTHERMIC WELDED OR CRIMPED TINNED CABLE LUGS OR BRASS CLAMPS IN ACCORDANCE TO SPECIFICATION BBB3059.
5. ALL CORNER AND GATE POSTS TO BE DIRECTLY EARTHED.
6. THE SWITCH ATTACHED TO THE SUB-STATION OUTDOOR YARD GATE, THE 3kV DC O/H FEEDER SECURITY AREA GATE AND THE REGEN RESISTANCE ENCLOSURE GATE ARE TO BE SO MOUNTED THAT THE SWITCH IS OPEN WHEN THE GATE IS CLOSED AND IS CLOSED WHEN THE YARD GATE IS OPEN.
7. CABLE ARMOURING TO BE EARTHED TO REGEN DC/EL BUSBAR AT RESISTANCE BANKS.
8. WHERE A CABLE FAULT INDICATION RELAY IS INSTALLED THE ARMOURING OF THE 3kV DC TRACK FEEDER CABLES SHALL BE BLOCK JOINTED AT THE MAST.
9. WHERE NO CABLES FAULT INDICATION RELAY IS INSTALLED THE ARMOURING OF THE 3kV DC FEEDER CABLES SHALL BE BLOCK JOINTED IN THE 3kV DC BUSBAR CHAMBER.
10. CONNECTIONS NEED NOT BE IN THE NUMERICAL ORDER AS SHOWN IN DC/EL (SUBSTATION AND REGEN) GROUPS.
11. ALL INTERCONNECTIONS OF THE EARTH LEAKAGES TO BE 95mm² OR EQUIVALENT PVC INSULATED CABLE.
12. SUBSTATION DC/EL BUSBAR SHALL BE MARKED ACCORDING TO GROUP NUMBERS FOR EASY REFERENCE.
13. FOR END BOX ASSY EARTHING DETAIL SEE DRG NO CEE-TCL-78.
14. THE SPARK GAP ASSEMBLY SHALL COMPLY TO THE ASSEMBLY DRAWING BBB0906 AND SPECIFICATION BBB1616.

LEGEND (EQUIPMENT)

GP1 - BUSBAR CHAMBER GROUP.
1. BREAKER CELL(S).
2. UNDERVOLTAGE POTENTIAL DEVIDER SUPPORT BRACKET.
3. DOOR FRAME.
4. CHEQUER PLATES WHERE APPLICABLE.
5. 3kV O/H FEEDER WALL PLATE.

GP3 - HT BAY GROUP.
1. RECTIFIER STEELWORK.
2. WAVE FILTER STEELWORK.
3. REACTOR STEELWORK.
4. POSITIVE ISOLATOR STEELWORK.
5. BAY FENCES STEELWORK.
6. FAN FRAMEWORK.
7. CHEQUER PLATES WHERE APPLICABLE.
8. ANODE WALL PLATE.

GP2 - SUBSTATION AUXILIARIES GROUP.
1. BATTERY CHARGER.
2. TELECONTROL PANEL.
3. POWER AND LIGHTING DISTRIBUTION BOX AND STEEL TUBING.
4. UNDERVOLTAGE RELAY STEEL BOX.
5. ALL STEEL ENTRY DOORS.
6. CHEQUER PLATES WHERE APPLICABLE.
7. LT CONTROL PANEL.

RGP - REGEN GROUP.
1. REGEN CONTROL PANEL.
2. BAY GATE.
3. BAY GATE EARTH LINK.
4. ALL STEEL DOORS AND FRAMES.
5. POTENTIAL DEVIDER SUPPORT BRACKET.
6. CHEQUER PLATES WHERE APPLICABLE.
7. REGEN RESISTANCE BOXES.

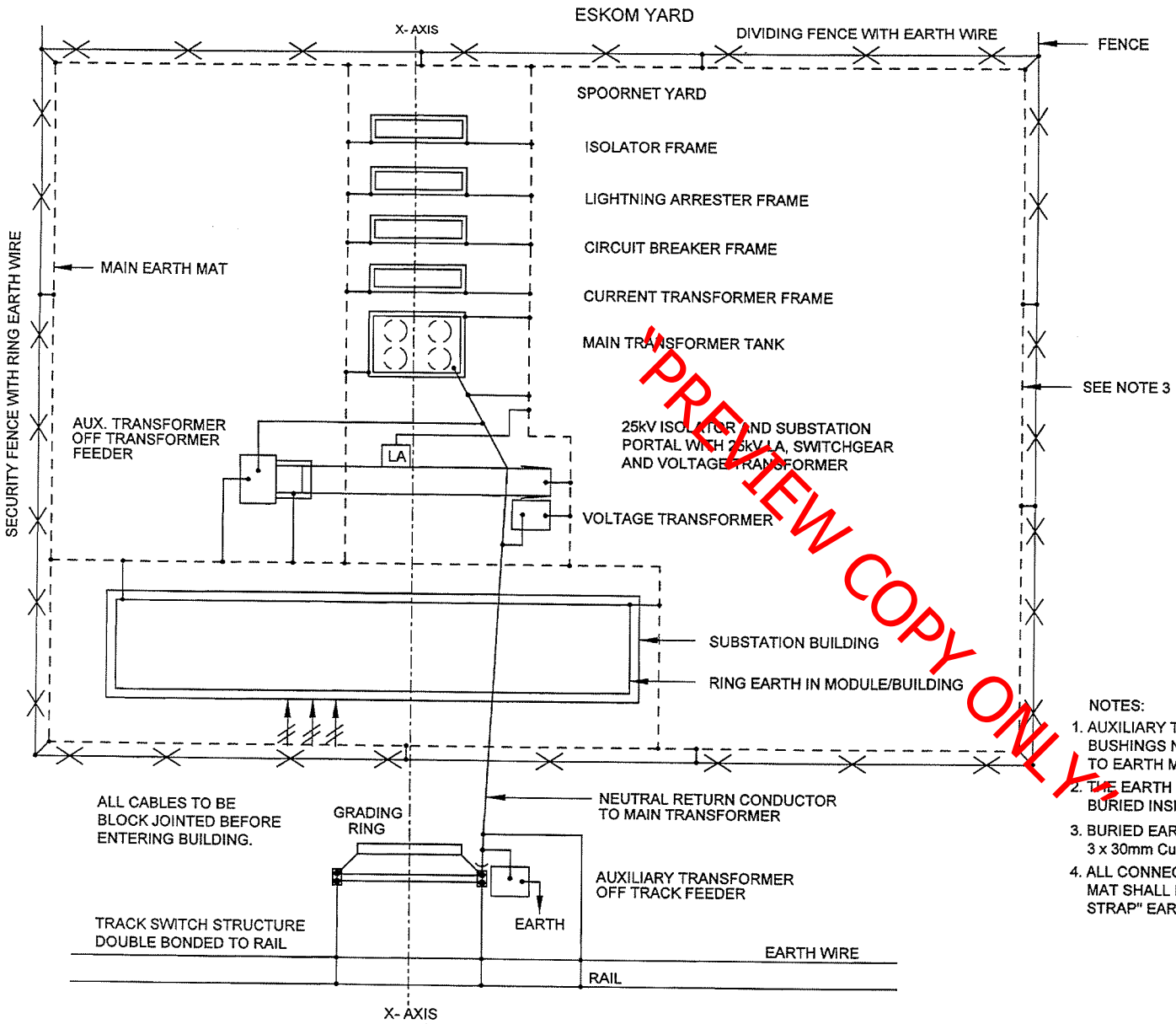
LEGEND (SYSTEMS)
- REGENERATIVE DC EARTH LEAKAGE SYSTEM
- SUBSTATION DC EARTH LEAKAGE SYSTEM
- DC NEGATIVE SYSTEM
- AC EQUIPMENT EARTH LEAKAGE SYSTEM
- AC EARTH SYSTEM
- SECURITY FENCE

AMENDMENTS		
NO	NAME	DATE
6	FM EYGELAAR	95-04-26
DRAWING REVISED. DO REF T95/025		
7	FM EYGELAAR	95-08-24
SUBSTATION DC EARTH LEAKAGE SYSTEM IN BUILDING REVISED. DO REF T95/043		
8	LO BORCHARD	98-01-24
NOTES REVISED. DO REF T98/004		
9	D O SCHULZ	2001-05-25
NOTE 14 ADDED. DO REF: CDO/1197		
10	LO BORCHARD	2008-07-31
NOTE 8 & 9 REVISED. DO REF: CDO/6236 ECP NO: BBD4921		
11	Digitally signed by Ludwig Borchard Date: 2011.02.01 12:25:54 +02'00'	
TITLE AND NOTE 4 REVISED. DO REF: CDO/7245 ECP NO: BBD8165 & BBD8634		

DO REF: J71/196	GEN TOL: LIN± - ANG± -	
DRN: D WEIDEMAN	CKD: E JURGENSEN	DATE: 73-08-20
ENG: -	T C BROOK	for CHIEF ENG
CENTRAL DRAWING OFFICE	TRANSNET freight rail	

3kV DC EARTHING ARRANGEMENT SYSTEM FOR TRACTION SUBSTATIONS

DIMENSIONS: mm
SCALE: NTS
A1
DRAWING NO CEE-TBD-7
SHEET - OF -



NOTES:

1. AUXILIARY TRANSFORMERS RETURN BUSHINGS NOT TO BE CONNECTED TO EARTH MAT.
2. THE EARTH MAT CONDUCTOR SHALL BE BURIED INSIDE THE SECURITY FENCE.
3. BURIED EARTH CONDUCTORS SHALL BE 3 x 30mm Cu STRAP.
4. ALL CONNECTIONS TO THE BURIED EARTH MAT SHALL BE MADE WITH "ERICO CAD-STRAP" EARTH TAILS (95mm² Cu. EQUIVALENT).

AMENDMENTS

NO	NAME	DATE
2	A MACPHERSON	98-07-08

REDRAWN AND REVISED
DO REF: T98/030

3	LO BORCHARD	98-10-30

DRAWING REVISED
DO REF: T98/054

4	LO BORCHARD	2003-02-26

LIGHTNING ARRESTER BETWEEN TRANSFORMER AND EARTH MAT REMOVED. NOTES REVISED.
ECP REF: 2003-031
DO REF: CDO/2392

5	LO BORCHARD	2003-03-25

MOVED MAIN EARTH MAT TO INSIDE OF SECURITY FENCE. NOTE 2 REVISED.
ECP REF: 2003-040
DO REF: CDO/2552

6		2003-08-29

TWO LIGHTNING ARRESTERS REMOVED. EARTH STRAPS ADDED TO BOTH AUX. TRANSFORMERS AND VOLTAGE TRANSFORMER.
ECP REF: 2003-067
DO REF: CDO/2914

DIMENSIONS: mm
SCALE: NTS

A3

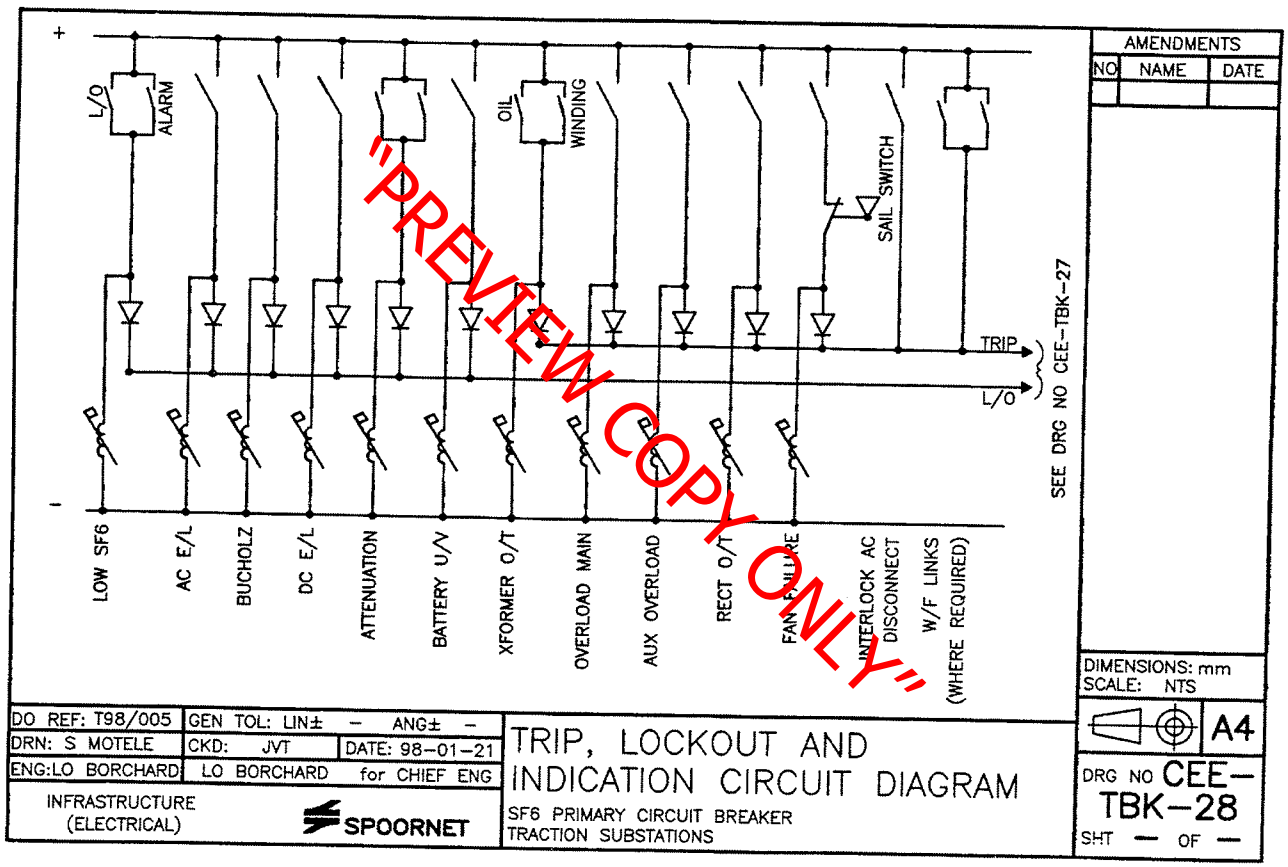
DO REF: T80/49	GEN TOL: LIN± -	ANG± -
DRN: B STEWART	CKD: H E MANTHE	DATE: 80-08-14
ENG: ————	R S MANN	for CHIEF ENG

CENTRAL DRAWING OFFICE SPOORNET

EARTHING ARRANGEMENT: 25kV AC TRACTION SUBSTATION

DRAWING NO CEE-TBD - 8

SHEET - OF -


+
-
L/O
ALARM
OIL
WINDING
SAIL SWITCH
TRIP
L/O
SEE DRG NO CEE-TBK-27
LOW SF6
AC E/L
BUCHOLZ
DC E/L
ATTENUATION
BATTERY U/V
XFORMER O/T
OVERLOAD MAIN
AUX OVERLOAD
RECT O/T
FAN FAILURE
INTERLOCK AC DISCONNECT
W/F LINKS (WHERE REQUIRED)
"PREVIEW COPY ONLY"
AMENDMENTS
NO
NAME
DATE
DIMENSIONS: mm
SCALE: NTS
A4
DRG NO CEE-TBK-28
SHT — OF —
DO REF: T98/005
GEN TOL: LIN± — ANG± —
DRN: S MOTELE
CKD: JVT
DATE: 98-01-21
ENG:LO BORCHARD
LO BORCHARD for CHIEF ENG
INFRASTRUCTURE (ELECTRICAL)
SPOORNET
TRIP, LOCKOUT AND INDICATION CIRCUIT DIAGRAM
SF6 PRIMARY CIRCUIT BREAKER
TRACTION SUBSTATIONS

3 4 4 3

freight rail

MINIMUM COMMUNAL HEALTH REQUIREMENTS IN AREAS OUTSIDE THE JURISDICTION OF A LOCAL AUTHORITY: TEMPORARY FACILITIES FOR CONTRACTOR'S PERSONNEL

1. CAMPS

1.1 Prior to the erection of any camp, the Contractor shall submit to the Employer's Deputy, for his approval, details of his proposals as to the site, water supply, sanitation, and size and type of buildings. Where the site is on private land, the Contractor shall submit the written approval for the use of the site of the relevant statutory authority and of the owner and occupier of the land (as applicable).

1.2 Camps must not be erected on land infested with field rodents.

1.3 Adequate drainage shall be provided to carry off storm and waste water.

1.4 Buildings shall be built to a neat and orderly pattern.

1.5 All buildings shall have smooth, hard, impervious floors, graded to provide effective drainage and to permit washing.

1.6 Camps shall be maintained by the Contractor at his own expense in a clean and tidy condition. The Contractor shall take such steps as the Employer's Deputy and landowner/occupier may demand to prevent the creation of a nuisance.

1.7 When so instructed by the Employer's Deputy, the Contractor shall, at his own expense, erect suitable screens between the camp and any public road, thoroughfare or railway line.

1.8 After removal of a camp, the Contractor shall, at his own expense, restore the site to its original condition to the satisfaction of the Employer's Deputy and of the landowner and occupier where the site is on private land.

2. HOUSING

2.1 Every living room shall have cross ventilation, both constant and occasional. Where only one window is provided, it shall not be in the same wall as the door.

2.2 Dimensions of living rooms shall be sufficient to allow 3.5 square metres of floor area and 11 cubic metres of air space for each person over the age of 10 years. The floor area of any living room shall not be less than 7,8 square metres.

2.3 Flat-roofed quarters shall have a minimum roof height of 3 metres above floor level. For quarters with pitched roofs, the wall height shall be not less than 2,6 metres above the floor with a minimum height above floor of 3 metres at the top of the pitch.

2.4 Doors shall not be less than 2m x 0,75m and must be halved.

2.5 Windows of each living room shall have an area not less than one twelfth of the floor area and shall be capable of opening to at least half their full area.

2.6 In areas where malaria is prevalent, doors and windows must be fitted with gauze screens.

2.7 Cooking shelters shall comprise roofed structures, three sides of which shall be enclosed by a weatherproof material, approved by the Employer's Deputy to a height of at least **1m** above ground level.

2.7.1 Sleeping quarters shall not accommodate more than 8 persons per room.

2.7.2 Pegboards shall be carried on metal or concrete supports and shall be separated by partitions not less than 0,4 metres high extending to within 150mm of the end of the bunk. Pegboards shall be removable for cleaning.

3. WATER SUPPLY AND ABLUTION FACILITIES

3.1 The Contractor shall ensure that an adequate and conveniently situated supply of potable water is provided.

3.2 Separate buildings for ablution facilities shall be provided. Where approval has been obtained for the housing of both males and females, separate facilities for each sex shall be provided. The proportion shall be 1 cubicle for 20 persons.

3.3 Waste water shall be hygienically disposed of.

4. SANITATION

4.1 Separate buildings for latrine facilities shall be provided. Where housing are provided for both males and females, separate facilities for each sex shall be provided. The proportions shall be at least one squatting seat for every 15 persons or less in the case of pit latrines, or one for every 10 persons or less in case of pail latrines.

Latrines shall be fly proof and sited at least 10 metres from any other building, and shall not face on any public road, thoroughfare, railway line or residential property. Pits shall not be less than 2,5 metres deep and sited not less than 120 metres from nearest underground water source.

4.2 Latrines shall be so constructed, situated and maintained, and night soil so disposed of as to prevent access by animals, breeding of flies, pollution of streams and domestic water supplies, and other nuisances. Where a night soil removal service is operated by a competent authority, use of such service shall be obligatory, and the use of pit latrines and atria pits will not be permitted.

4.3 At least one refuse bin of adequate size with close fitting lid shall be provided for each building. Refuse bins shall be emptied and cleaned out daily.

4.4 Labour shall be employed on camp sanitation duties on the following basis:-

4.4.1 Where the number of persons living at the camp is 20 or less - one unit.

4.4.2 For additional numbers over 20 living at the camp - one unit per 100 or part thereof.

4.5 Unless refuse is removed by a competent authority, it shall be disposed of in pits and covered over daily with a layer of earth or ash of sufficient thickness to prevent depredations by rodents and the breeding of flies.

4.6 Adequate measures shall be taken against all vermin and insects responsible for the spread of disease. Any instructions of a competent health authority shall be carried out promptly and implicitly.

4.7 Buildings and bedboards shall be treated whenever necessary with an approved insecticide.

4.8 The Contractor shall permit and facilitate inspection of the camp and structures on the site by the staff of Transnet or any other competent authority, and shall comply with any reasonable request by such staff or any other competent authority to eliminate any unsanitary condition.

4.9 Any outbreak of infectious disease shall immediately be reported telephonically and confirmed in writing to the Employer's Deputy.

4.10 The keeping of animals of any sort is not permitted.

4.11 The Contractor shall have on hand at the camp the necessary tools, disinfectants and cleaning materials to maintain and clean the sanitary facilities.

5. RATIONS

Rations, where supplied by the Contractor, shall be stored in a suitable and rodent proof building with sufficient shelving.

P02b-06 (JLH)

TRANSNET SOC LIMITED

(Registration no. 1990/000900/30)

SAFETY ARRANGEMENTS AND PROCEDURAL COMPLIANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT (ACT 85 OF 1993) AND APPLICABLE REGULATIONS

1. General

1.1 The Contractor and Transnet SOC Limited (hereinafter referred to as "Transnet") are individual employers, each in its own right, with their respective duties and obligations set out in the Occupational Health and Safety Act, Act 85 of 1993 (the Act) and applicable Regulations.

1.2 The Contractor accepts, in terms of the General Conditions of Contract and in terms of the Act, his obligations as an employer in respect of all persons in his employ, other persons on the premises or the Site or place of work or on the work to be executed by him, and under his control. He shall, before commencement with the execution of the contract work, comply with the provisions set out in the Act, and shall implement and maintain a Health and Safety Plan as described in the Construction Regulations, 2003 and as approved by Transnet, on the Site and place of work for the duration of the Contract.

1.3 The Contractor accepts his obligation to complying fully with the Act and applicable Regulations notwithstanding the omission of some of the provisions of the Act and the Regulations from this document.

1.4 Transnet accepts, in terms of the Act, its obligations as an employer of its own employees working on or associated with the site or place of work, and the Contractor and Project Manager or his deputy shall at all times, co-operate in respect of the health and safety management of the site, and shall agree on the practical arrangements and procedures to be implemented and maintained during execution of the Works.

1.5 In the event of any discrepancies between any legislation and this specification, the applicable legislation will take precedence.

2. Definitions

2.1 In this Specification any word or expression to which a meaning has been assigned in the Construction Regulations, shall have the meaning so assigned to it, unless the context otherwise indicates: -

2.2 The work included in this Contract shall for the purposes of compliance with the Act be deemed to be "**Construction Work**", which, in terms of the Construction Regulations, 2003 means any work in connection with: -

(a) the erection, maintenance, alteration, renovation, repair, demolition or dismantling of or addition to a building or any similar structure;

(b) the installation, erection, dismantling or maintenance of fixed plant where such work includes the risk of a person falling;

(c) the construction, maintenance, demolition or dismantling of any bridge, dam, canal, road, railway, runway, sewer or water reticulation system or any similar civil engineering structure; or

(d) the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work;

2.3 **"competent person"** in relation to construction work, means any person having the knowledge, training and experience specific to the work or task being performed: Provided that where appropriate qualifications and training are registered as per the South African Qualifications Authority Act, 1995 these qualifications and training shall be deemed to be the required qualifications and training;

2.4 **"contractor"** means principal contractor and "subcontractor" means contractor as defined by the Construction Regulations, 2003.

2.5 **"fall protection plan"** means a documented plan, of all risks relating to working from an elevated position, considering the nature of work undertaken, and setting out the procedures and methods applied to eliminate the risk;

2.6 **"health and safety file"** means a file, or other record in permanent form, containing the information required to be kept on site in accordance with the Act and applicable Regulations;

2.7 **"Health and Safety Plan "** means a documented plan which addresses the hazards identified and include safe work procedures to mitigate, reduce or control the hazards identified;

2.8 **"Risk Assessment"** means a programme to determine any risk associated with any hazard at a construction site, in order to identify the steps needed to be taken to remove, reduce or control such hazard;

2.9 "**the Act**" means the Occupational Health and Safety Act No. 85 of 1993.

3. Procedural Compliance

3.1 The Contractor who intends to carry out any construction work shall, before carrying out such work, notify the Provincial Director in writing if the construction work:-

(a) includes the demolition of a structure exceeding a height of 3 metres; or

(b) includes the use of explosives to perform construction work; or

(c) includes the dismantling of fixed plant at a height greater than 3m,

and shall also notify the Provincial Director in writing when the construction work exceeds 30 days or will involve more than 300 person days of construction work and if the construction work:-

(a) includes excavation work deeper than 1m; or

(b) includes working at a height greater than 3 metres above ground or a landing.

3.2 The notification to the Provincial Director shall be on a form similar to Annexure A of the Construction Regulations, 2003, also shown in Annexure 1 of this Specification. The Contractor shall ensure that a copy of the completed notification form is kept on site for inspection by an inspector, Project Manager or employee.

3.3 The Contractor shall, in accordance with the Act and applicable Regulations, make all the necessary appointments of competent persons in writing on a form similar to Annexure 2 of this Specification and deliver copies thereof to the Project Manager. Copies should also be retained on the health and safety file.

3.4 Subcontractors shall also make the above written appointments and the Contractor shall deliver copies thereof to the Project Manager.

3.5 In the case of a self-employed Contractor or any subcontractor who has the appropriate competencies and supervises the work himself, the appointment of a construction supervisor in terms of regulation 6.1 of the Construction Regulations, 2003 will not be necessary. The Contractor shall in such a case execute and sign a declaration, as in Annexure 3, by which he personally undertakes the duties and obligations of the "Chief Executive Officer" in terms of section 16(1) of the Act.

3.6 The Contractor shall, before commencing any work, obtain from the Project Manager an access certificate as in Annexure 4 executed and signed by him, permitting and limiting access to the designated site or place of work by the Contractor and any subcontractors under his control.

3.7 Procedural compliance with Act and Regulations, as above, shall also apply to any subcontractors as employers in their own right. The Contractor shall furnish the Project Manager with full particulars of such subcontractors and shall ensure that they comply with the Act and Regulations and Transnet's safety requirements and procedures.

4. Special Permits

Where special permits are required before work may be carried out such as for hotwork, isolation permits, work permits and occupations, the Contractor shall apply to the Project Manager or the relevant authority for such permits to be issued. The Contractor shall strictly comply with the conditions and requirements pertaining to the issue of such permits.

5. Health and Safety Programme

5.1 The Tenderer shall, with his tender, submit a Health and Safety Programme setting out the practical arrangements and procedures to be implemented by him to ensure compliance by him with the Act and Regulations and particularly in respect of: -

(i) The provision, as far as is reasonably practical, of a working environment that is safe and without risk to the health of his employees and subcontractors in terms of section 8 of the Act;

(ii) the execution of the contract work in such a manner as to ensure in terms of section 9 of the Act that persons other than those in the Contractor's employment, who may be directly affected by the contract work are not thereby exposed to hazards to their health and safety;

(iii) ensuring, as far as is reasonably practical, in terms of section 37 of the Act that no employee or subcontractor of the Contractor does or omits to do any act which would be an offence for the Contractor to do or omit to do.

5.2 The Contractor's Health and Safety Programme shall be based on a risk assessment in respect of the hazards to health and safety of his employees and other persons under his control that are associated with or directly affected by the Contractor's activities in performing the contract work and shall establish precautionary measures as are reasonable and practical in protecting the safety and health of such employees and persons.

5.3 The Contractor shall cause a risk assessment contemplated in clause 5.2 above to be performed by a competent person, appointed in writing, before commencement of any Construction Work and reviewed during construction. The Risk Assessments shall form part of the Health and Safety programme to be applied on the site and shall include at least the following:

(a) The identification of the risks and hazards that persons may be exposed to;

(b) the analysis and evaluation of the hazards identified;

(c) a documented Health and Safety Plan, including safe work procedures to mitigate, reduce or control the risks identified;

(d) a monitoring and review plan.

5.4 The Health and Safety Plan shall include full particulars in respect of: -

(a) The safety management structure to be instituted on site or place of work and the names of the Contractor's health and safety representatives and members of safety committees where applicable;

(b) the safe working methods and procedures to be implemented to ensure the work is performed in compliance with the Act and Regulations;

(c) the safety equipment, devices and clothing to be made available by the Contractor to his employees;

(d) the site access control measures pertaining to health and safety to be implemented;

(e) the arrangements in respect of communication of health and safety related matters and incidents between the Contractor, his employees, subcontractors and the Project Manager with particular reference to the reporting of incidents in compliance with Section 24 and General Administrative Regulation 8 of the Act and with the pertinent clause of the General Conditions of Contract forming part of the Contract and

(f) the introduction of control measures for ensuring that the Safety Plan is maintained and monitored for the duration of the Contract.

5.4 The Health and Safety programme shall be subject to the Project Manager's approval and he may, in consultation with the Contractor, order that additional and/or supplementary practical arrangements and procedures be implemented and maintained by the Contractor or that different working methods or safety equipment be used or safety clothes be issued which, in the Project Manager's opinion, are necessary to ensure full compliance by the Contractor with his obligations as an employer in terms of the Act and Regulations. The Project Manager or his deputy shall be allowed to attend meetings of the Contractor's safety committee as an observer.

5.5 The Contractor shall take reasonable steps to ensure that each subcontractor's Health and Safety Plan is implemented and maintained on the construction site: Provided that the steps taken, shall include periodic audits at intervals mutually agreed to between the them, but at least once every month.

5.6 The Contractor shall stop any subcontractor from executing any construction work, which is not in accordance with the Contractor's, and/or subcontractor's Health and Safety Plan for the site or which poses a threat to the health and safety of persons.

5.7 The Contractor shall ensure that a copy of the Health and Safety Plan is available on site for inspection by an inspector, Project Manager, agent, subcontractor, employee, registered employee organisation, health and safety representative or any member of the health and safety committee.

5.8 The Contractor shall consult with the health and safety committee or, if no health and safety committee exists, with a representative group of employees, on the development, monitoring and review of the Risk Assessment.

5.9 The Contractor shall ensure that all employees under his control are informed, instructed and trained by a competent person regarding any hazard and the related work procedures before any work commences, and thereafter at such times as may be determined in the Risk Assessment.

5.10 The Contractor shall ensure that all subcontractors are informed regarding any hazard as stipulated in the Risk Assessment before any work commences, and thereafter at such times as may be determined in the Risk Assessment.

5.11 The Contractor shall ensure that all visitors to a construction site undergoes health and safety induction pertaining to the hazards prevalent on the site and shall be provided with the necessary personal protective equipment.

6. Fall Protection Plan

6.1 In the event of the risk and hazard identification, as required in terms of clause 5.3 of this Specification, revealing risks relating to working from an elevated position the contractor shall cause the designation of a competent person, responsible for the preparation of a fall protection plan;

6.2 The Contractor shall implement, maintain and monitor the fall protection plan for the duration of Contract. The Contractor shall also take such steps to ensure the continued adherence to the fall protection plan.

6.3 The fall protection plan shall include:-

(a) A Risk Assessment of all work carried out from an elevated position;

(b) the procedures and methods to address all the identified risks per location;

(c) the evaluation of the employees physical and psychological fitness necessary to work at elevated positions;

(d) the training of employees working from elevated positions; and

(e) the procedure addressing the inspection, testing and maintenance of all fall protection equipment.

7. Hazards and Potential Hazardous Situations

The Contractor and the Project Manager shall immediately notify one another of any hazardous or potentially hazardous situations which may arise during performance of the Contract by the Contractor or any subcontractor and, in particular, of such hazards as may be caused by the design, execution and/or location and any other aspect pertaining to the contract work.

8. Health and Safety File

8.1 The Contractor shall ensure that a health and safety file is opened and kept on site and shall include all documentation required as per the Act and applicable regulations, and made available to an inspector, the Project Manager, or subcontractor upon request.

8.2 The Contractor shall ensure that a copy of the both his Health and Safety Plan as well as any subcontractor's Health and Safety Plan is available on request to an employee, inspector, contractor or the Project Manager.

8.3 The Contractor shall hand over a consolidated health and safety file to the Project Manager upon completion of the Construction Work and shall in addition to documentation mentioned in the Act and applicable Regulations include a record of all drawings, designs, materials used and other similar information concerning the completed structure.

ANNEXURE 1

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993

Regulation 3(1) of the Construction Regulations

NOTIFICATION OF CONSTRUCTION WORK

1(a) Name and postal address of principal contractor:

_____

(b) Name and tel. no of principal contractor's contact person:

_____

2. Principal contractor's compensation registration number:

_____

3.(a) Name and postal address of client:

_____

(b) Name and tel no of client's contact person or agent:

_____

4.(a) Name and postal address of designer(s) for the project:

_____

(b) Name and tel. no of designer(s) contact person:

_____

5. Name and telephone number of principal contractor's construction supervisor on site appointed in terms of regulation 6(1).

_____

6. Name/s of principal contractor's construction sub-ordinate supervisors on site appointed in terms of regulation 6(2).

_____

7. Exact physical address of the construction site or site office:

_____

8. Nature of the construction work:

_____

_____

_____

_____

_____

9. Expected commencement date: _____

10. Expected completion date: _____

11. Estimated maximum number of persons on the construction site:

_____

12. Planned number of contractors on the construction site accountable to the principle contractor:

_____

13. Name(s) of contractors already chosen.

_____
_____
_____
_____
_____
_____
_____

_____ _____

Principal Contractor **Date**

_____ _____

Client **Date**

* THIS DOCUMENT IS TO BE FORWARDED TO THE OFFICE OF THE DEPARTMENT OF LABOUR **PRIOR TO COMMENCEMENT** OF WORK ON SITE.

* **ALL PRINCIPAL CONTRACTORS** THAT QUALIFY TO NOTIFY MUST DO SO EVEN IF ANOTHER PRINCIPAL CONTRACTOR ON THE SAME SITE HAD DONE SO PRIOR TO THE COMMENCEMENT OF WORK.

ANNEXURE 2

(COMPANY LETTER HEAD)

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993 (ACT 85 OF 1993) :

SECTION/REGULATION: _____

REQUIRED COMPETENCY: _____

In terms of _____ I, _____

representing the Employer) do hereby appoint _____

As the Competent Person on the premises at _____

(physical address) to assist in compliance with the Act and the applicable Regulations.

Your designated area/s is/are as follows :-

_____

_____

_____

Date : _____

Signature :- _____

Designation :- _____

ACCEPTANCE OF DESIGNATION

I, _____ ***do hereby accept this Designation and acknowledge that I understand the requirements of this appointment.***

Date : _____

Signature :- _____

Designation :- _____

ANNEXURE 3

(COMPANY LETTER HEAD)

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993 (ACT 85 OF 1993) :

DECLARATION

In terms of the above Act I, _____ am personally assuming the duties and obligations as Chief Executive Officer, defined in Section 1 of the Act and in terms of Section 16(1), I will, as far as is reasonably practicable, ensure that the duties and obligations of the Employer as contemplated in the above Act are properly discharged.

Signature :- _____

Date : _____

ANNEXURE 4

(LETTER HEAD OF BUSINESS DIVISION OR UNIT OF TRANSNET SOC LIMITED)

SITE ACCESS CERTIFICATE

Access to : _____ (Area)
Name of Contractor/Builder :- _____
Contract/Order No.: _____

The contract works site/area described above are made available to you for the carrying out of associated works
In terms of your contract/order with (company) _____

Kindly note that you are at all times responsible for the control and safety of the Works Site, and for persons under your control having access to the site.

As from the date hereof you will be responsible for compliance with the requirements of the Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended, and all conditions of the Contract pertaining to the site of the works as defined and demarcated in the contract documents including the plans of the site or work areas forming part thereof.

Signed : _____ ***Date :*** _____

PROJECT MANAGER

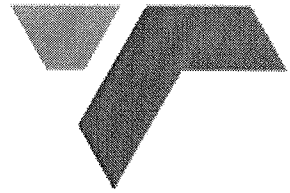
ACKNOWLEDGEMENT OF RECEIPT

Name of Contractor/Builder :- _____ ***I,*** _____ ***do hereby acknowledge and accept the duties and obligations in respect of the Safety of the site/area of Work in terms of the Occupational Health and Safety Act; Act 85 of 1993.***

Name : _____ ***Designation :*** _____

Signature : _____ ***Date :*** _____

TRANSNET



Transnet SOC Limited Registration Number 1990/00900/06

TRANSNET SPECIFICATION

E7/1 - SPECIFICATION FOR GENERAL WORK AND WORKS ON, OVER, UNDER OR ADJACENT TO RAILWAY LINES AND NEAR HIGH VOLTAGE EQUIPMENT

(This specification shall be used in network operator contracts)

Circulation Not Restricted

CONTENTS

1.0 SCOPE

1.1 This specification covers the network operator's requirements for general work and works on, over, under or adjacent to railway lines and near high voltage equipment.

2.0 DEFINITIONS

The following definitions shall apply:

"Authorised Person" - A person whether an employee of the network operator or not, who has been specially authorised to undertake specific duties in terms of Transnet' publication Electrical Safety Instructions, and who holds a certificate or letter of authority to that effect.

"Barrier" Any device designed to restrict access to "live" high-voltage electrical equipment.

"Bond" - A short conductor installed to provide electrical continuity.

"Contractor" - Any person or organisation appointed by the network operator to carry out work on its behalf.

"Contract Supervisor" - The person or juristic person appointed by the network operator from time to time as the Contract Supervisor, to administer the Contractor's performance and execution of the Works according to the powers and rights held by and obligations placed upon the Contract Supervisor in terms of the Contract.

"Dead" - Isolated and earthed.

"Electrical Officer (Contracts)" - The person appointed in writing by the Project Manager in terms of this specification as the person who shall be consulted by the Contractor in all electrical matters to ensure that adequate safety precautions are taken by the Contractor.

"Executive Officer" - The person appointed by the network operator from time to time as the Executive Officer to act according to the rights and powers held by and obligations placed upon him in terms of the Contract.

"High-Voltage" - A voltage normally exceeding 1000 volts.

"Live" - A conductor is said to be "live" when it is at a potential different from that of the earth or any other conductor of the system of which it forms a part.

"Near" - To be in such a position that a person's body or the tools he is using or any equipment he is handling may come within 3 metres of "live" exposed high-voltage electrical equipment.

"Occupation" - An authorisation granted by the network operator for work to be carried out under specified conditions on, over, under or adjacent to railway lines.

"Occupation Between Trains" - An occupation during an interval between successive trains.

"Optical Fibre Cable" - Buried or suspended composite cable containing optical fibres used in:

- telecommunication networks for transmission of digital information and
- safety sensitive train operations systems.

"Project Manager" – As defined in the special conditions of the contract. The person or juristic person appointed by the network operator from time to time as the Project Manager, to administer the Contract according to the powers and rights held by and obligations placed upon him in terms of the Contract.

"Responsible Representative" - The responsible person in charge, appointed by a contractor, who has undergone specific training (and holds a certificate) to supervise (general or direct) staff under his control who perform general work or to work on, over, under or adjacent to railway lines and in the vicinity of high-voltage electrical equipment.

"Total Occupation" - An occupation for a period when trains are not to traverse the section of line covered by the occupation.

"Work on" - Work undertaken on or so close to the equipment that the specified working clearances to the "live" equipment cannot be maintained.

"Work Permit" - A combined written application and authority to proceed with work on or near dead electrical equipment.

"Works" – The contractual intent for the work to be done as defined in the contract at a defined work site.

PART A - GENERAL SPECIFICATION

3.0 AUTHORITY OF OFFICERS OF TRANSNET

3.1 The Contractor shall co-operate with the officers of the network operator and shall comply with all instructions issued and restrictions imposed with respect to the Works which bear on the existence and operation of the network operator's railway lines and high-voltage equipment.

3.2 Without limiting the generality of the provisions of clause 3.1, any duly authorised representative of the network operator, having identified himself, may stop the work if, in his opinion, the safe passage of trains or the safety of the network operator's assets or any person is affected. **CONSIDERATIONS OF SAFETY SHALL TAKE PRECEDENCE OVER ALL OTHER CONSIDERATIONS**.

4.0 CONTRACTOR'S REPRESENTATIVES AND STAFF

4.1 The Contractor shall nominate Responsible Representatives of whom at least one shall be available at any hour for call-out in cases of emergency. The Contractor shall provide the Contract Supervisor with the names, addresses and telephone numbers of the representatives.

4.2 The Contractor guarantees that he has satisfied himself that the Responsible Representative is fully conversant with this specification and that he shall comply with all his obligations in respect thereof.

4.3 The Contractor shall ensure that all contractor staff receives relevant awareness, educational and competence training regarding safety as prescribed.

5.0 OCCUPATIONS AND WORK PERMITS

5.1 Work to be done during total occupation or during an occupation between trains or under a work permit shall be done in a manner decided by the Contract Supervisor and at times to suit the network operator requirements.

5.2 The Contractor shall organise the Works in a manner which will minimise the number and duration of occupations and work permits required.

5.3 The network operator will not be liable for any financial or other loss suffered by the Contractor arising from his failure to complete any work scheduled during the period of an occupation or work permit.

5.4 The Contractor shall submit to the Contract Supervisor, in writing, requests for occupations or work permits together with details of the work to be undertaken, at least 21 days before they are required. The network operator does not undertake to grant an occupation or work permit for any particular date, time or duration.

5.5 The network operator reserves the right to cancel any occupation or work permit at any time before or during the period of occupation or work permit. If, due to cancellation or change in date or time, the Contractor is not permitted to start work under conditions of total occupation or work permit at the time arranged, all costs caused by the cancellation shall be born by the Contractor except as provided for in clauses 5.6 to 5.8.

5.6 When the Contractor is notified less than 2 hours before the scheduled starting time that the occupation or work permit is cancelled, he may claim reimbursement of his direct financial losses caused by the loss of working time up to the time his labour and plant are employed on other work, but not exceeding the period of the cancelled occupation or work permit.

5.7 When the Contractor is notified less than 2 hours before the scheduled starting time, or during an occupation or work permit, that the duration of the occupation or work permit is reduced, he may claim reimbursement of his direct financial losses caused by the loss of working time due to the reduced duration of the occupation or work permit.

5.8 Reimbursement of the Contractor for any loss of working time in terms of clause 5.6 and 5.7, shall be subject to his claims being submitted within 14 days of the event with full details of labour and plant involved, and provided that the Contract Supervisor certifies that no other work on which the labour and plant could be employed was immediately available.

5.9 Before starting any work for which an occupation has been arranged, the Contractor shall obtain from the Contract Supervisor written confirmation of the date, time and duration of the occupation.

5.10 Before starting any work for which a work permit has been arranged, the Responsible Representative shall read and sign portion C of the Work Permit, signifying that he is aware of the work boundaries within which work may be undertaken. After the work for which the permit was granted has been completed, or when the

work permit is due to be terminated, or if the permit is cancelled after the start, the same person who signed portion C shall sign portion D of the Work Permit, thereby acknowledging that he is aware that the electrical equipment is to be made "live". The Contractor shall advise all his workmen accordingly.

6.0 SPEED RESTRICTIONS AND PROTECTION

6.1 When speed restrictions are imposed by the network operator because of the Contractor's activities, the Contractor shall organise and carry out his work so as to permit the removal of the restrictions as soon as possible.

6.2 When the Contract Supervisor considers protection to be necessary the Contractor shall, unless otherwise agreed, provide all protection including flagmen, other personnel and all equipment for the protection of the network operator's and the Contractor's personnel and assets, the public and including trains.

6.2.1 The network operator will provide training free of charge of the Contractor's flagmen and other personnel performing protection duties. The Contractor shall consult with the Contract Supervisor, whenever he considers that protection will be necessary, taking into account the minimum permissible clearances set out in the Manual for Track Maintenance (Document no. BBB0481):

- Drawing no. BE-97 Sheet 1: Horizontal Clearances: 1065mm gauge (Annexure 1 sheet 1)
- Drawing no. BE-97 Sheet 2: Vertical Clearances: 1065mm gauge (Annexure 1 sheet 2)
- Drawing no. BE-97 Sheet 3: Clearances: Platform (Annexure 1 sheet 3)
- Drawing no. BE-97 Sheet 5: Clearances: 610mm Gauge (Annexure 1 sheet 5)

6.3 The Contractor shall appoint a Responsible Representative to receive and transmit any instruction which may be given by the network operator personnel providing protection.

7.0 ROADS AND ROADS ON THE NETWORK OPERATOR'S PROPERTY

7.1 The Contractor shall take every reasonable precaution to prevent damage to any roads or bridges used to obtain access to the site, and shall select routes, use vehicles, and restrict loads so that any extraordinary traffic as may arise from the moving of plant or material to or from the site shall be limited as far as is reasonably possible.

7.2 The Contractor shall not occupy or interfere in any way with the free use of any public or private road, right-of-way, path or street unless the Contract Supervisor has obtained the approval of the road authority concerned.

8.0 CLEARANCES

8.1 No temporary works shall encroach on the appropriate minimum clearances set out in the Manual for Track Maintenance (Document no. BBB0481):

- Drawing no. BE-97 Sheet 1: Horizontal Clearances: 1065mm gauge (Annexure 1 sheet 1)
- Drawing no. BE-97 Sheet 2: Vertical Clearances: 1065mm gauge (Annexure 1 sheet 2)
- Drawing no. BE-97 Sheet 3: Clearances: Platform (Annexure 1 sheet 3)
- Drawing no. BE-97 Sheet 5: Clearances: 610mm Gauge (Annexure 1 sheet 5)

9.0 STACKING OF MATERIAL

9.1 The Contractor shall not stack any material closer than 3m from the centre line of any railway line without prior approval of the Contract Supervisor.

10.0 EXCAVATION, SHORING, DEWATERING AND DRAINAGE

10.1 Unless otherwise approved by the Contract Supervisor any excavation adjacent to a railway line shall not encroach on the hatched area shown in Figure 1.

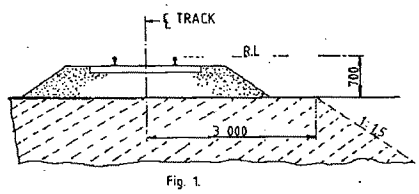


Fig. 1.

10.2 The Contractor shall provide, at his own cost any shoring, dewatering or drainage of any excavation unless otherwise stipulated elsewhere in the Contract.

10.3 Where required by the Contract Supervisor, drawings of shoring for any excavation under or adjacent to a railway line shall be submitted and permission to proceed, obtained before the excavation is commenced.

10.4 The Contractor shall prevent ingress of water to the excavation but where water does enter, he shall dispose of it as directed by the Contract Supervisor.

10.5 The Contractor shall not block, obstruct or damage any existing drains either above or below ground level unless he has made adequate prior arrangements to deal with drainage.

11.0 FALSEWORK FOR STRUCTURES

11.1 Drawings of falsework for the construction of any structure over, under or adjacent to any railway line shall be submitted to the Contract Supervisor and his permission to proceed obtained before the falsework is erected. Each drawing shall be given a title and a distinguishing number and shall be signed by a registered professional engineer certifying that he has checked the design of the falsework and that the drawings are correct and in accordance with the design.

11.2 After the falsework has been erected and before any load is applied, the Contractor shall submit to the Contract Supervisor a certificate signed by a registered professional engineer certifying that he has checked the falsework and that it has been erected in accordance with the drawings. Titles and numbers of the drawings shall be stated in the certificate. Notwithstanding permission given by the Contract Supervisor to proceed, the Contractor shall be entirely responsible for the safety and adequacy of the falsework.

12.0 PILING

12.1 The Contract Supervisor will specify the conditions under which piles may be installed on the network operator's property.

13.0 UNDERGROUND SERVICES

13.1 No pegs or stakes shall be driven or any excavation made before the Contractor has established that there are no underground services which may be damaged thereby.

13.2 Any damage shall be reported immediately to the Contract Supervisor, or to the official in charge at the nearest station, or to the traffic controller in the case of centralised traffic control.

14.0 BLASTING AND USE OF EXPLOSIVES

14.1 When blasting within 500m of a railway line, the Contractor shall observe the requirements stipulated in this specification.

14.2 No blasting shall be carried out except with the prior written permission of the Contract Supervisor and under such conditions as he may impose.

14.3 On electrified lines the Contractor shall also obtain the permission of the Electrical Officer (Contracts) before blasting, and shall give at least 21 days notice of his intention to blast. No blasting shall be done in the vicinity of electrified lines unless a member of the network operator's electrical personnel is present.

14.4 The Contractor shall arrange for the supply, transport storage and use of explosives.

14.5 The Contractor shall have labour, tools and plant, to the satisfaction of the Contract Supervisor, available on the site to clear immediately any stones or debris deposited on the track or formation by blasting, and to repair any damage to the track or formation immediately after blasting. Repairs to the track shall be carried out only under the supervision of a duly authorised representative of the network operator.

14.6 The Contractor shall notify the Contract Supervisor of his intention to blast at least 21 days before the commencement of any blasting operations.

14.7 Before any blasting is undertaken, the Contractor and the Contract Supervisor shall jointly examine and measure up any buildings, houses or structures in the vicinity of the proposed blasting to establish the extent of any existing cracking or damage to such structures, etc. The Contractor, shall, subject to the provisions stipulated in the Contract Insurance Policy, make good any deterioration of such buildings, houses, or structures, which, in the opinion of the Contract Supervisor, was directly caused by the blasting.

14.8 After completion of the blasting the Contractor shall obtain a written clearance from each landowner in

the vicinity of the blasting operations to the effect that all claims for compensation in respect of damage caused by the blasting operations to their respective properties, have been settled.

14.9 The Contractor shall provide proof that he has complied with the provisions of clauses 10.17.1 to 10.17.4 of the Explosives Regulations (Act 26 of 1956 as amended).

14.10 Blasting within 500m of a railway line will only be permitted during intervals between trains. A person appointed by the Contract Supervisor, assisted by flagmen with the necessary protective equipment, will be in communication with the controlling railway station.

Only this person will be authorised to give the Contractor permission to blast, and the Contractor shall obey his instructions implicitly regarding the time during which blasting may take place.

14.11 The flagmen described in clause14.10, where provided by the network operator, are for the protection of trains and the network operator's property only, and their presence does not relieve the Contractor in any manner of his responsibilities in terms of Explosives Act or Regulations, or any obligation in terms of this Contract.

14.12 The person described in clause 14.10 will record in a book provided and retained by the network operator, the dates and times:-

(i) when each request is made by him to the controlling station for permission to blast;

(ii) when blasting may take place;

(iii) when blasting actually takes place; and

(iv) when he advises the controlling station that the line is safe for the passage of trains.

14.13 Before each blast the Contractor shall record in the same book, the details of the blast to be carried out. The person appointed by the Contract Supervisor and the person who will do the blasting shall both sign the book whenever an entry described in clause 14.12 is made.

15.0 RAIL TROLLEYS

15.1 The use of rail trolleys or trestle trolleys on a railway line for working on high voltage equipment will be permitted only if approved by the Contract Supervisor and under the conditions stipulated by him.

15.2 All costs in connection with trolley working and any train protection services requested by the Contractor shall, be borne by the Contractor, unless otherwise agreed.

16.0 SIGNAL TRACK CIRCUITS

16.1 Where signal track circuits are installed, the Contractor shall ensure that no material capable of conducting an electrical current makes contact between rails of railway line/lines.

16.2 No signal connections on track-circuited tracks shall be severed without the Contract Supervisor's knowledge and consent.

17.0 PENALTY FOR DELAYS TO TRAINS

17.1 If any trains are delayed by the Contractor and the Contract Supervisor is satisfied that the delay was avoidable, a penalty will be imposed on the Contractor as stipulated in the contract, for the period and number of trains delayed.

18.0 SURVEY BEACONS AND PEGS

18.1 The Contractor shall not on any account move or damage any beacon, bench mark, reference mark, signal or trigonometrical station in the execution of the Works without the written approval of the Contract Supervisor.

Should the Contractor be responsible for any such occurrence, he shall report the circumstances to the Contract Supervisor who will arrange with the Director-General of Surveys for replacement of the beacon or mark at the cost of the Contractor.

18.2 The Contractor shall not move or damage any cadastral or mining beacon without the written approval of the Contract Supervisor and before it has been referenced by a registered land surveyor. Any old boundary beacon, which becomes an internal beacon on creation of new boundaries, shall not be moved without the written approval of the Contract Supervisor.

Should the Contractor move or damage any cadastral or mining beacon without authority, he shall be responsible for having it replaced, at his cost, by a land surveyor.

18.3 The Contractor shall preserve all pegs and bench marks. Such survey points shall not be removed without the written approval of the Contract Supervisor. Should any peg or benchmark be removed without authority, the Contract Supervisor will arrange for its replacement and the cost will be recovered from the Contractor. No claim will be considered for delay in replacing any such peg or bench mark. Each peg replaced shall be checked by the Contractor.

18.4 Where a new boundary has been established, beacons on the fence line shall not be disturbed, and fence posts or anchors may not be placed or excavations made within 0,6 m of any beacon without the prior written approval of the Contract Supervisor.

19.0 TEMPORARY LEVEL CROSSINGS

19.1 The Contract Supervisor may, on request of the Contractor, and if necessary for the purpose of execution of the Works, permit the construction of a temporary level crossing over a railway a line at a position approved by the Contract Supervisor and at the Contractor's cost. The period for which the temporary level crossing is permitted will be at the discretion of the Contract Supervisor.

19.2 The Contractor will provide protection and supervise the construction of the road over the track(s) and within the railway servitude at the level crossing, as well as the erection of all road signs and height gauges. All cost to be borne by the applicant.

The Contractor shall exercise extreme caution in carrying out this work, especially in respect of damage to tracks, services, overhead power and communications routes and prevent contact with "live" overhead electrical equipment.

Unless otherwise agreed, the Contractor will provide the service deviations or alterations to the network operator's track-, structure-, drainage-, electrical-, telecommunications- and train authorisation systems to accommodate the level crossing.

19.3 The Contractor shall take all necessary steps including the provision of gates, locks and, where necessary, watchmen to restrict the use of the temporary level crossing to himself and his employees, his subcontractors and their employees, the staff of the network operator and to such other persons as the Contract Supervisor may permit and of whose identity the Contractor will be advised. If so ordered by the Contract Supervisor, the Contractor shall provide persons to control road traffic using the temporary level crossing. Such persons shall stop all road traffic when any approaching train is within seven hundred and fifty (750) metres of the temporary level crossing, and shall not allow road traffic to proceed over it until the lines are clear.

19.4 The Contractor shall maintain the temporary level crossing within the railway servitude in good condition for the period it is in use. A temporary agreement with the road authority to be concluded for the maintenance of the level crossing outside the railway servitude.

19.5 When the temporary level crossing is no longer required by the Contractor, or permitted by the network operator, the Contractor shall at his own cost remove it and restore the site and the network operator's track-, structure-, drainage-, electrical-, telecommunications- and train authorisation systems to its original condition. Work over the tracks and within the railway servitude will be supervised by the network operator.

20.0 COMPLETION OF THE WORKS

20.1 On completion of the works, the Contractor shall remove all the remaining construction plant and material from the site, other than material which is the property of the network operator, and leave the site in a clean, neat and tidy condition. If material and plant is required for the liability and maintenance period the Contract supervisor must authorise it's retention on site.

21.0 PROTECTION OF PERSONS AND PROPERTY

21.1 The Contractor shall provide and maintain all lights, guards, barriers, fencing and watchmen when and where necessary or as required by the Contract Supervisor or by any statutory authority, for the protection of the Works and for the safety and convenience of the public.

Red, yellow, green or blue lights may not be used by the Contractor as they can be mistaken for signals. Red, yellow, green or white flags shall only be used for protection by the Contractor. Within the precincts of a port the Contractor shall obtain the permission of the Port Captain before installing any light.

21.2 The Contractor shall take all the requisite measures and precautions during the course of the Works to:

(i) protect the public and property of the public,

(ii) protect the property and workmen of both the network operator and the Contractor,

(iii) avoid damage to and prevent trespass on adjoining properties, and

(iv) ensure compliance with any instruction issued by the Contract Supervisor or other authorised person, and with any stipulation embodied in the contract documents which affects the safety of any person or thing.

21.3 The network operator will provide, at its own cost, protection for the safe working of trains during such operations as the Contract Supervisor may consider necessary. Protection by the network operator for any purpose whatsoever, does not absolve the Contractor of his responsibilities in terms of the Contract.

21.4 The Contractor shall take all precautions and appoint guards, watchmen and compound managers for prevention of disorder among and misconduct by the persons employed on the Works and by any other persons, whether employees or not, on the work site and for the preservation of the peace and protection of persons and property in the direct neighbourhood. Any relocation of camps because of disorder shall be at the Contractor's expense.

21.5 All operations necessary for the execution of the Works, including the provision of any temporary work and camping sites, shall be carried out so as not to cause veldt fires, ground and environmental pollution, soil erosion or restriction of or interference with streams, furrows, drains and water supplies.

If the original surface of the ground is disturbed in connection with the Works, it shall be made good by the Contractor to the satisfaction of the land owner, occupier or responsible authority.

21.6 The Contractor shall take all reasonable steps to minimise noise and disturbance when carrying out the Works, including work permitted outside normal working hours.

21.7 Dumping of waste or excess materials by the Contractor shall, in urban areas, be done under the direction and control of, and at sites made available by the local authority. Dumping outside local authority boundaries shall be done only with the express permission and under the direction and control of the Contract Supervisor.

21.8 The Contractor shall comply with environmental protection measures and specifications stipulated by the Contract Supervisor and/or local and environmental authorities.

22.0 INTERFERENCE WITH THE NETWORK OPERATOR'S ASSETS AND WORK ON OPEN LINES

22.1 The Contractor shall not interfere in any manner whatsoever with an open line, nor shall he carry out any work or perform any act which affects the security, use or safety of an open line except with the authority of the Contract Supervisor and in the presence of a duly authorised representative of the network operator.

22.2 The Contractor shall not carry out any work or operate any plant, or place any material whatsoever nearer than three metres from the centre line of any open line except with the written permission of the Contract Supervisor and subject to such conditions as he may impose.

22.3 Care must be taken not to interfere with or damage any services such as overhead wire routes, cables or pipes and optical fibre cable, except as provided for the work specified. The Contractor will be held responsible for any damage to or interruption of such services arising from any act or omission on his part or of any of his employees, or persons engaged by him on the Works. The cost of repairing, replacing or restoring the services, as well as all other costs arising from any damage to services, shall be borne by, and will be recovered from the Contractor.

22.4 Authority granted by the Contract Supervisor and the presence of an authorised representative of the network operator in terms hereof, shall not relieve the Contractor of his duty to comply with this specification.

23.0 ACCESS, RIGHTS-OF-WAY AND CAMPSITES

23.1 Where entry onto the network operator's property is restricted, permission to enter will be given only for the purpose of carrying out the Works and will be subject to the terms and conditions laid down by the network operator.

23.2 The Contractor shall arrange for campsites, workplaces and access thereto as well as for any right-of-

way over private property to the site of the Works, and for access within the boundaries of the network operator's property. The owners of private property to be traversed shall be approached and treated with tact and courtesy by the Contractor, who shall, if necessary, obtain a letter of introduction to such property owners from the Contract Supervisor.

The Contractor shall be responsible for the closing of all gates on roads and tracks used by him or his employees. Except with the prior approval of the Contract Supervisor and the owner or occupier of any private land to be traversed, the Contractor shall not cut, lower, damage, remove or otherwise interfere with any fence or gate which is either on the network operator's property or on private property and which restricts access to the Works. Where such approval has been given, the Contractor shall prevent entry of animals or unauthorised persons onto the network operator's or private property, and shall make the fences safe against trespass at the close of each day's work.

23.3 The Contractor shall take all reasonable steps to confine the movement of vehicles and plant to the approved right-of-way to minimise damage to property, crops and natural vegetation.

23.4 When access is no longer required, and before completion of the Works, the Contractor shall repair, restore or replace any fence or gate damaged during execution of the Works to the satisfaction of the Contract Supervisor and shall furnish the Contract Supervisor with a certificate signed by the owner and occupier of land over which he has gained access to a campsite, workplace and the Works, certifying that the owner and occupier have no claim against the Contractor or the network operator arising from the Contractor's use of the land. Should the Contractor be unable to obtain the required certificate, he shall report the circumstances to the Contract Supervisor.

24.0 SUPERVISION

24.1 The Contract Supervisor will provide overall technical superintendence of the Works, and may direct the Contractor in terms of the provisions of the Contract or in respect of any measures which the Contract Supervisor may require for the operations of the network operator, the safety of trains, property and workmen of the network operator, and for the safety of other property and persons. The Contractor shall carry out the directions of the Contract Supervisor. The superintendence exercised by the Contract Supervisor, including any agreement, approval, refusal or withdrawal of any approval given, shall not relieve the Contractor of any of his duties and liabilities under the Contract, and shall not imply any assumption by the network operator or by the Contract Supervisor of the legal and other responsibilities of the Contractor in carrying out the Works.

24.2 The Contract Supervisor may delegate to any deputy or other person, any of his duties or functions under the Contract. On receiving notice in writing of such delegation, the Contractor shall recognise and obey the deputy or person to whom any such duties or functions have been delegated as if he were the Contract Supervisor.

24.3 The Contractor shall exercise supervision over the Works at all times when work is performed or shall be represented by an agent having full power and authority to act on behalf of the Contractor. Such agent shall be competent and responsible, and have adequate experience in carrying out work of a similar nature to the Works, and shall exercise personal supervision on behalf of the Contractor. The Contract Supervisor shall be notified in writing of such appointment which will be subject to his approval.

24.4 The Contractor or his duly authorised agent shall be available on the site at all times while the Works are in progress to receive the orders and directions of the Contract Supervisor.

25.0 HOUSING OF EMPLOYEES

25.1 The Contractor shall, where necessary, make his own arrangements for suitable housing of his employees. Where temporary housing is permitted by the Contract Supervisor on any part of the site, the Contractor shall provide suitable sanitation, lighting and potable water supplies in terms of the requirements of the local authority or the current network operator's specification; Minimum Communal Health Requirements in Areas outside the Jurisdiction of a Local Authority - E.4B, as applicable.

25.2 Fouling the area inside or outside the network operator's boundaries shall be prevented. The Contractor will be called upon by the Contract Supervisor to dispose of any foul or waste matter generated by the Contractor.

26.0 OPTICAL FIBRE CABLE ROUTES

26.1 The Contractor shall not handle, impact, move or deviate any optical fibre cable without prior approval.

26.2 Works that in any way affect the optical fibre cable requires prior approval from the Contract Supervisor

who will determine the work method and procedures to be followed.

PART B - SPECIFICATION FOR WORK NEAR HIGH-VOLTAGE ELECTRICAL EQUIPMENT

27.0 GENERAL

27.1 This specification is based on the contents of Transnet's publication ELECTRICAL SAFETY INSTRUCTIONS, as amended, a copy of which will be made available on loan to the Contractor for the duration of the contract.

These instructions apply to all work near "live" high-voltage equipment maintained and/or operated by the network operator, and the onus rests on the Contractor to ensure that he obtains a copy.

27.2 This specification must be read in conjunction with and not in lieu of the Electrical Safety Instructions.

27.3 The Contractor's attention is drawn in particular to the contents of Part I, Sections 1 and 2 of the Electrical Safety Instructions.

27.4 The Electrical Safety Instructions cover the minimum safety precautions which must be taken to ensure safe working on or near high-voltage electrical equipment, and must be observed at all times. Should additional safety measures be considered necessary because of peculiar local conditions, these may be ordered by and at the discretion of the Electrical Officer (Contracts).

27.5 The Contractor shall obtain the approval of the Electrical Officer (Contracts) before any work is done which causes or could cause any portion of a person's body or the tools he is using or any equipment he is handling, to come within 3 metres of any "live" high-voltage equipment.

27.6 The Contractor shall regard all high-voltage equipment as "live" unless a work permit is in force.

27.7 Safety precautions taken or barriers erected shall comply with the requirements of the Electrical Officer (Contracts), and shall be approved by him before the work to be protected is undertaken by the Contractor. The Contractor shall unless otherwise agreed, bear the cost of the provision of the barriers and other safety precautions required, including the attendance of the network operator's staff where this is necessary.

27.8 No barrier shall be removed unless authorised by the Electrical Officer (Contracts).

28.0 WORK ON BUILDINGS OR FIXED STRUCTURES

28.1 Before any work is carried out or measurements are taken on any part of a building, fixed structure or earthworks of any kind above ground level situated within 3 metres of "live" high-voltage equipment, the Electrical Officer (Contracts) shall be consulted to ascertain the conditions under which the work may be carried out.

28.2 No barrier erected to comply with the requirements of the Electrical Officer (Contracts) shall be used as temporary staging or shuttering for any part of the Works.

28.3 The shuttering for bridge piers, abutments, retaining walls or parapets adjacent to or over any track may be permitted to serve as a barrier, provided that it extends at least 2,5 metres above any working level in the case of piers, abutments and retaining walls and 1,5 metres above any working level in the case of parapets.

29.0 WORK DONE ON OR OUTSIDE OF ROLLING STOCK, INCLUDING LOADING OR UNLOADING

29.1 No person may stand, climb or work, whilst on any platform, surface or foothold:

29.1.1 higher than the normal unrestricted access way, namely -

29.1.1.1 external walkways on diesel, steam and electric locomotives, steam heat vans, etc. and

29.1.1.2 walkways between coaches and locomotives.

29.1.2 of restricted access ways in terms of the Electrical Safety Instructions namely -

29.1.2.1 the floor level of open wagons

29.1.2.2 external walkways or decks of road-rail vehicles, on-track maintenance machines and material trains.

29.1.3 Unauthorised staff working on these platforms must be directly supervised by duly authorised persons in terms of clause 607.1.3 of the Electrical Safety Instructions. These persons must attend the relevant electrical safety module training. A letter of training must then be issued by an accredited training authority. A Category C Certificate of Authority must be obtained from the

local depot examining officer.

29.2 When in the above positions no person may raise his hands or any equipment he is handling above his head.

29.3 In cases where the Contractor operates his own rail mounted equipment, he shall arrange for the walkways on this plant to be inspected by the Electrical Officer (Contracts) and approved, before commencement of work.

29.4 The handling of long lengths of material such as metal pipes, reinforcing bars, etc should be avoided, but if essential they shall be handled as nearly as possible in a horizontal position below head height.

29.5 The Responsible Representative shall warn all persons under his control of the danger of being near "live" high-voltage equipment, and shall ensure that the warning is fully understood.

29.6 Where the conditions in clauses 30.1 to 30.4 cannot be observed the Electrical Officer (Contracts), shall be notified. He will arrange for suitable Safety measures to be taken. The Electrical Officer (Contracts), may in his discretion and in appropriate circumstances, arrange for a suitable employee of the Contractor to be specially trained by the network operator and at the Contractor's cost, as an Authorised Person to work closer than 3 metres from "live" overhead conductors and under such conditions as may be imposed by the senior responsible electrical engineer of the network operator.

30.0 USE OF EQUIPMENT

30.1 Measuring Tapes and Devices

30.1.1 Measuring tapes may be used near "live" high-voltage equipment provided that no part of any tape or a person's body comes within 3 metres of the "live" equipment.

30.1.2 In windy conditions the distance shall be increased to ensure that if the tape should fall it will not be blown nearer than 3 metres from the "live" high-voltage equipment.

30.1.3 Special measuring devices longer than 2 metres such as survey sticks and rods may be used if these are of non-conducting material and approved by the Responsible Electrical Engineer of the network operator, but these devices must not be used within 3 metres of "live" high-voltage equipment in rainy or wet conditions.

30.1.4 The assistance of the Electrical Officer (Contracts) shall be requested when measurements within the limits defined in clauses 31.1.1 to 31.1.3 are required.

30.1.5 The restrictions described in 31.1.1 to 31.1.3 do not apply on a bridge deck between permanent parapets nor in other situations where a barrier effectively prevents contact with the "live" high-voltage equipment.

30.2 Portable Ladders

30.2.1 Any type of portable ladder longer then 2 metres may only be used near "live" high-voltage equipment under the direct supervision of the Responsible Representative. He shall ensure that the ladder is always used in such a manner that the distance from the base of the ladder to any "live" high-voltage equipment is greater than the fully extended length of the ladder plus 3 metres. Where these conditions cannot be observed, the Electrical Officer (Contracts) shall be advised, and he will arrange for suitable safety measures to be taken.

31.0 CARRYING AND HANDLING MATERIAL AND EQUIPMENT

31.1 Pipes, scaffolding, iron sheets, reinforcing bars and other material which exceeds 2 metres in length shall be carried completely below head height near "live" high-voltage equipment. For maximum safety such material should be carried by two or more persons so as to maintain it as nearly as possible in a horizontal position. The utmost care must be taken to ensure that no part of the material comes within 3 metres of any "live" high-voltage equipment.

31.2 Long lengths of wire or cable shall never be run out in conditions where a part of a wire or cable can come within 3 metres of any "live" high-voltage equipment unless the Electrical Officer (Contracts) has been advised and has approved appropriate safety precautions.

31.3 The presence of overhead power lines shall always be taken account of especially when communications lines or cables or aerial cables, stay wires, etc. are being erected above ground level.

32.0 PRECAUTIONS TO BE TAKEN WHEN ERECTING OR REMOVING POLES, ANTENNAE, TREES ETC.

32.1 A pole may be handled for the purpose of erection or removal near high-voltage equipment under the following conditions:

(i) If the distance between the point at which the pole is to be erected or removed and the nearest "live" high-voltage equipment is more than the length of the pole plus 3 metres, the work shall be supervised by the Responsible Representative.

(ii) If the distance described in (i) is less than the length of the pole plus 3 metres, the Electrical Officer (Contracts) shall be consulted to arrange for an Authorised Person to supervise the work and to ensure that the pole is earthed where possible. The pole shall be kept in contact with the point of erection, and adequate precautions shall be taken to prevent contact with "live" high-voltage equipment.

32.2 The cost of supervision by an Authorised Person and the provision of earthing shall, unless otherwise agreed, be borne by the Contractor.

32.3 The provisions of clauses 33.1 and 33.2 shall also apply to the erection or removal of columns, antennae, trees, posts, etc.

33.0 USE OF WATER

33.1 No water shall be used in the form of a jet if it can make contact with any "live" high-voltage equipment or with any person working on such equipment.

34.0 USE OF CONSTRUCTION PLANT

34.1 "Construction plant" entails all types of plant including cranes, piling frames, boring machines, excavators, draglines, dewatering equipment and road vehicles with or without lifting equipment.

34.2 When work is being undertaken in such a position that it is possible for construction plant or its load to come within 3 metres of "live" high-voltage equipment, the Electrical Officer (Contracts) shall be consulted. He will arrange for an Authorised Person to supervise the work and to ensure that the plant is adequately earthed. The Electrical Officer (Contracts) will decide whether further safety measures are necessary.

34.3 The cost of any supervision by an Authorised Person and the provision of earthing shall, unless otherwise agreed, be borne by the Contractor.

34.4 When loads are handled by cranes, non-metallic rope hand lines shall be used, affixed to such loads so as to prevent their swinging and coming within 3 metres of "live" high-voltage equipment.

34.5 Clauses 35.1 to 35.4 shall apply *mutatis mutandis* to the use of maintenance machines of any nature.

35.0 WORK PERFORMED UNDER DEAD CONDITIONS UNDER COVER OF A WORK PERMIT

35.1 If the Responsible Representative finds that the work cannot be done in safety with the high-voltage electrical equipment "live", he shall consult the Electrical Officer (Contracts) who will decide on the action to be taken.

35.2 If a work permit is issued the Responsible Representative shall-

(i) before commencement of work ensure that the limits within which work may be carried out have been explained to him by the Authorised Person who issued the permit to him, and that he fully understands these limits.

(ii) sign portion C of the permit before commencement of work;

(iii) explain to all persons under his control the limits within which work may be carried out, and ensure that they fully understand these limits;

(iv) care for the safety of all persons under his control whilst work is in progress; and

(v) withdraw all personnel under his control from the equipment on completion of the work before he signs portion D of the work permit.

36.0 TRACTION RETURN CIRCUITS IN RAILS

36.1 DANGEROUS CONDITIONS CAN BE CREATED BY REMOVING OR SEVERING ANY BOND.

36.2 Broken rails with an air gap between the ends, and joints at which fishplates are removed under "broken bond" conditions, are potentially lethal. The rails on either side of an air gap between rail ends on electrified lines shall not be touched simultaneously until rendered safe by the network operator personnel.

36.3 The Contractor shall not break any permanent bonds between rails or between rails and any structure. He shall give the Contract Supervisor at least 7 days written notice when removal of such bonds is necessary.

36.4 No work on the track which involves interference with the traction return rail circuit either by cutting or removing the rails, or by removal of bonds shall be done unless the Electrical Officer (Contracts) is consulted. He will take such precautions as may be necessary to ensure continuity of the return circuit before permitting the work to be commenced.

37.0 HIGH-VOLTAGE ELECTRICAL EQUIPMENT NOT MAINTAINED AND/OR OPERATED BY THE NETWORK OPERATOR

Where the work is undertaken on or near high-voltage electrical equipment which is not maintained and/or operated by the network operator, the Occupational Health and Safety Act No. 85 of 1993, and Regulations and Instructions, or the Mines Health and Safety Act (Act 29 of 1996), shall apply.

Such equipment includes:-

(i) Eskom and municipal equipment;

(ii) The Contractor's own power supplies; and

(iii) Electrical equipment being installed but not yet taken over from the Contractor.

END

Contract Data

Site Information

14 **SITE INFORMATION**

14.1 The works shall be performed at the **TURFGROND 25 KV AC TRACTION SUBSTATION.**

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION BBB1267 VER 10			
REQUIREMENT FOR OUTDOOR ALTERNATING-CURRENT CIRCUIT BREAKERS FOR TARCTION AND DISTRIBUTION SUBSTATION			
Specification number			BBB 1267 VERSION 10
Item	Comply	Doesn't Comply	Comment
1.0 Scope			
1.1			
1.2			
2.0 Standards, publications and darwings			
2.1			
2.2.1 South African National Standards			
2.2.2 Transnet Freight Rail Specification			
2.2.4 Transnet Freight Rail Drawings			
3.0 Tendering procedure			
3.1			
3.2			
3.3			
3.4			
3.5			
3.6			
4.0 Appendices			
4.1			
4.2			
5.0 Service conditions			
5.1 Atmospheric Conditions			
5.1.1			
5.2 Electrical Conditions			
5.2.1			
5.2.2			
6.0 Requirements for altering current circuit breakers			
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6.34 Vacuum Circuit Breakers			
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6.35 Sulphur Hexafluoride Circuit Breakers (SF6)			
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6.35.2			
6.35.3			
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6.35.6			
6.36 Installation Levels, Creepage Distances and Clearances			
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6.36.2 Creepage Distances			
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6.36.2.3			
6.36.3 Clearances			
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6.37 Support Steelwork			
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7.0 Special Tools,Servicing aids and manuals and spares list			
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8.0 Training			
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9.0 Test Certificates			
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10.0 Guarantee and Defects			
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10.3			
11.0 Inspection			
11.1			
11.2			
12.0 Packaging and Transport			
12.1			
12.2			
13.0 Blibliography			

CLAUSE BY CLAUSE COMPLIANCE STATEMENT OF COMPLIANCE TO SPECIFICATION BBB 2721 VER. 9			
AC PRIMARY CIRCUIT BREAKER CONTROL PANEL AND AC/DC DISTRIBUTION PANEL FOR 3KV TRACTION SUBSTATION			
Specification number			BBB 2721 VERSION 9
Item	Comply	Doesn't Comply	Comment
1.0 Scope			
2.0 Backround			
3.0 Standards and publications			
3.1			
3.2			
3.3			
3.4			
4.0 Appendices			
5.0 Tendering Procedures			
5.1			
5.2			
5.3			
5.4			
6.0 Service conditions			
6.1			
6.2			
6.3			
7.0 General Requirements of control and/distribution panels			
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7.4			
7.5			
7.6			
7.7			
8.0 AC Primary Circuit Breaker Control Panel			
8.1 Flag Annuciator unit			
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8.1.2			
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8.1.5			
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8.2 AC Primary Circuit Breaker Control and Indication			
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8.3 Rectifier Fan Control and Protection Circuitry			
8.3.1			
8.4 Main Ac Thermal overload and instantaneous protection relays			
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8.5 AC Earth Leakage Protection Relay			
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8.6 DC earth Leakage Protection Relay			
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8.7 Main and auxiliary transformer gas actuated and temparature protection relays circuitry			
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8.8 Overload Protection for Auxiliary Transformer			
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8.9 Local and remote control circuitry and indication			
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9.0 AC/DC Distribution Panel			
9.1 AC Distribution (400V, 3 Phase)			
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9.2 110 DC Volt Ditribution			
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9.2.2 Indicating Instruments			
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9.2.2.3			
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9.3 110V DC Distribution Supply			
9.3.1			
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9.4 DC Contro and Supervisory circuitry and Track Breaker Control			
10.0 Protection Relays			
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11.0 Circuit breakers, Contactors, Relays and Indicationg Lamps			
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14.0 Wiring and Terminals			
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15.0 Panels Construction			
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18.0 Drawings, Instructions Manuals and Spares Lists			
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21.0 Guarantee and Defects			
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22.0 Packaging and Transport			
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CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION BBB7842 VERSION 1

OUTDOOR, HIGH VOLTAGE, ALTERNATING CURRENT DISCONNECTORS COMBINED WITH EARTHING SWITCHES.

Specification number			BBB 7842 VERSION 1
Item	**Comply**	**Doesn't Comply**	**Comment**
1.0 Scope			
1.1			
1.2			
2.0 Standards and publications			
2.1			
2.3 Spoornet Specifications			
3.0 Tendering procedure			
3.1			
3.2			
3.3			
3.4			
3.5			
4.0 Annexures			
4.1 Annexure1- Shedule of requirements			
4.2 Annexure2- Technical Data sheet			
4.2.1			
4.2.2			
4.2.3			
4.2.4			
5.0 Service conditions			
5.1			
6.0 Clearances			
6.1			
7.0 Disconnectors combined with earthing switches			
7.1			
7.2			
7.3			
7.4			
7.5			
7.6			
7.7			
7.8			
7.9			
7.10			
7.11			
7.12			
8.0 Support Structures			
8.1			
8.2			
9.0 Connections			
9.1			
10.0 Post Insulators			
10.1			
10.2			
11.0 Name plate and labels			
11.1			
11.2			
11.3			
11.4			
11.5			
12.0 Drawings and instructions			
12.1			
12.2			
12.3			
13.0 Inspection			
13.1			
14.0 Tools and appliances			
14.1			
15.0 Spares			
15.1			
15.2			
15.3			
15.4			
16.0 Packing			
16.1			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION BBC 0198 VER 1			
Requirements for the supply of electric cables			
Specification number			BBC 0198 VERSION 1
Item	**Comply**	**Doesn't Comply**	**Comment**
1.0 Scope			
2.0 Standards			
2.1			
3.0 Appendix			
3.1			
4.0 Tendering procedures			
4.1			
4.2			
4.3			
4.4			
5.0 Medium Voltage cables			
5.1			
5.2			
6.0 Cables for fixed Installations			
6.1			
6.2			
6.3			
6.4			
6.5			
6.6			
6.7			
6.8			
7.0 Quality Assurance			
7.1			
7.2			
8.0 Inspections and testing			
8.1			
8.2			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION CEE 0023.90

Installation of low and medium voltage cables

Specification number			CEE - 0023.90
Item	Comply	Doesn't Comply	Comment
1.0 Scope			
1.1			
2.0 Appendix			
2.1			
2.2			
2.3			
3.0 Standards, publications and drawings			
3.1			
3.2			
3.3			
3.4			
3.5			
3.6			
4.0 Tendering methods			
4.1			
4.2			
4.3			
4.4			
4.5			
5.0 Service conditions			
5.1			
6.0 General Requirements			
6.1			
6.2			
6.3			
6.4			
6.5			
6.6			
6.7			
6.8			
6.9			
6.10			
6.11			
6.12			
7.0 Excavations			
7.1			
7.2			
7.3			
7.4			
7.5			
7.6			
7.7			
7.8			

7.9			
7.10			
7.11			
7.12			
7.13			
7.14			
7.15			
7.16			
7.17			
8.0 Cable laying			
8.1			
8.2			
8.3			
8.4			
8.5			
8.6			
8.7			
8.8			
8.9			
9.0 Cable terminations			
9.1			
9.2			
9.3			
10.0 Cable Joints			
10.1			
11.0 Covering, backfilling and reinstatement			
11.1			
11.2			
11.3			
11.4			
11.5			
11.6			
11.7			
11.8			
12.0 Measurements			
12.1			
12.2			
12.3			
12.4			
12.5			
13.0 Tests			
13.1			
13.2			
13.3			
13.4			
13.5			
13.6			
13.7			
14.0 Guarantee			
14.1			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION CEE 0111.99			
SPECIFICATION FOR 25 KV AC TRACTION SUBSTATION			
Specification number			CEE - 0111.99
Item	Comply	Doesn't Comply	Comment
1.0 Scope			
1.1			
2.0 Standards			
2.1			
2.2			
2.3			
2.4			
2.5			
2.6			
3.0 Appendices			
3.1			
4.0 Defintions			
4.1			
4.2			
4.3			
4.4			
4.5			
4.6			
4.7			
4.8			
4.9			
5.0 Tendering Procedure			
5.1			
5.2			
5.3			
5.4			
5.5			
6.0 General Requirements			
6.1			
6.2			
6.3			
6.4			
6.5			
6.6			
6.7			
6.8			
6.9			
6.10			
7.0 Service Condition			
7.1			
8.0 Information required on drawings			
8.1			
8.2			
8.3			
9.0 Clearances			
9.1			
9.2			
10.0 Creepage distances			
10.1			
10.2			
10.3			
11.0 Prevention of corrossion			
11.1 Preparation of outdoor structural steelwork			
11.1.1			
11.1.2			
11.2 Preparation of steel building			
11.3 Handling of final teatment of painted steelwork			
11.3.1			
11.3.2			
11.3.3			
12.0 Substation Operational Protocols			
12.1 Primary Isolator			
12.1.1			
12.1.2			

12.1.3			
12.2 Primary Circuit Breakers			
12.2.1			
12..2.1.1			
12.2.1.2			
12.2.2			
12.2.2.1			
12.2.2.2			
12.2.2.3			
12.2.2.4			
12.3 Secondary isolator			
12.3.1			
12.3.2			
12.4 Secondary Circuit breakers (25KV)			
12.4.1			
12.4.2			
12.4.2.1			
12.4.2.2			
12.4.2.3			
12.4.2.4			
12.4.3			
12.4.4			
12.4.5 Track Feeder Circuit Breaker			
12.4.6			
12.4.6.1			
12.4.6.2			
12.4.6.3			
12.4.6.4			
12.4.6.5			
Section2 : Traction Substation Equipment			
13.0 Steel Work			
13.1			
13.2			
13.3			
13.4			
13.5			
13.6			
13.7			
13.8			
13.9			
14.0 Primary and secondary isolators			
14.1			
14.2			
14.3			
14.4			
14.5			
14.6			
14.7			
14.8			
14.9			
15.0 Lightning Arresters			
15.1			
15.2			
15.3			
15.4			
15.5			
15.6			
16.0 Primary Circuit Breakers			
16.1			
16.2			
16.3			
16.4			
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16.13			
16.14			
16.15			
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16.17			
16.18			
16.19			
16.20			
17.0 Traction Transformer			
17.1 General			
17.1.1			
17.1.2			
17.2 Technical Requirements			
17.2.1			
17.2.2			
17.2.3			
17.3 Ancillary Equipment			
17.3.1			
17.3.2			
17.3.3			
17.3.4			
17.3.5			
17.3.6			
17.3.7			
17.3.8			
17.3.9			
17.3.10			
17.3.11			
17.3.12			
17.3.13			
17.4 Track and Cooling Radiators			
17.4.1			
17.4.2			
17.4.3			
17.4.4			
17.5 Rating Plates			
17.5.1			
17.5.2			
17.5.3			
17.6 Testing			
17.6.1			
17.6.2			
17.6.3			
17.6.4			
18.0 Current Transformers			
18.1			
18.2			
18.3			
18.4			
18.5			
18.6			
19.0 Voltage Transfomers			
19.1			
19.2			
19.3			
19.4			
20.0 Auxiliary Power Transfomers			
20.1			
20.2			
20.3			
20.4			
21.0 Busbar Coupler			
21.1			
21.2			
21.3			
22.0 Secondary Circuit Breakers			
22.1			
22.2			
22.3			
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22.33			
22.34			
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22.36			
22.37			
22.38			
23.0 Traction Substation Building			
23.1			
23.2			
23.3			
23.4			
23.5			
23.6			
23.7			
23.8			
23.9			
23.10			
24.0 Auxiliary Power Suppliers			
24.1			
24.2			
24.3			
24.4			
24.5			
24.6			
24.7			
24.8			
24.9			
24.10			
24.11			
24.12			
25.0 Requirements For Telecontrol			
25.1			
25.2			
25.3			
25.4			
25.5			
25.6			
25.7			
25.8			
25.9			
25.10			
25.11			

25.12			
26.0 Control Panel			
26.1 Panel construction			
26.1.1			
26.1.2			
26.1.3			
26.1.4			
26.2 Equipment Installed in the panels			
26.2.1			
26.2.2			
26.2.3			
26.2.4			
26.2.5			
26.2.6			
26.2.7			
26.2.8			
26.2.9			
26.2.10			
26.2.11			
26.2.12			
26.2.13			
26.2.14			
26.2.15			
26.2.16			
26.3 Indicating Instruments			
26.3.1			
26.3.2			
26.3.3			
26.3.4			
26.3.5			
27.0 DC Battery and Charger			
27.1			
27.2			
27.3			
27.4			
27.5			
28.0 Protection			
28.1			
28.2 Primary circuit breaker tripping			
28.2.1			
28.2.1.1			
28.2.1.2			
28.2.1.3			
28.2.1.4			
28.2.1.5			
28.2.2			
28.2.2.2			
28.2.2.3			
28.3 Incomer Circuit Breaker			
28.3.1			
28.3.2			
28.3.4 Track Feeder Circuit Breaker			
28.3.4.1			
28.3.4.2			
28.3.4.3			
28.3.4.4			
28.4 Auxiliary Transformer Protection			
28.5 Relays and circuit protection			
28.5.1			
28.5.2			
28.5.3			
29.0 Conductors, Cables, and Small Wiring			
29.1			
29.2			
29.3			
29.4			
29.5			
29.6			
29.7			
Section3: Installation of Equipment			

30.0 Substation Sites			
30.1 Site Preparation			
30.2 Site Levels			
30.2.1			
30.2.2			
30.2.3			
30.3 Material			
30.3.1			
30.3.2			
30.4 Compaction			
30.4.1			
30.4.2			
30.4.3			
30.4.4			
30.4.5			
30.4.6			
30.4.7			
30.4.8			
30.4.9			
31.0 Foundations			
31.1			
31.2			
31.3			
31.4			
31.5			
31.6			
31.7			
31.8			
31.9			
31.10			
32.0 Concrete			
32.1			
32.2			
32.3			
32.4			
32.5			
33.0 Installation of substation equipment			
33.			
33.			
33.4 Primary Isolator			
33.4.1			
33.4.2			
33.5 Main Transformer			
33.5.1			
33.5.2			
33.5.3			
33.5.4			
33.5.5			
33.6 Voltage Transfomer			
33.6.1			
33.6.2			
33.6.3			
33.6.4			
33.7 Auxiliary Transformer			
33.7.1			
33.7.2			
33.7.3			
33.7.4			
33.7.6			
33.8 Secondary Isolator			
33.8.1			
33.9 Secondary Circuit Breaker			
33.9.1			
33.9.2			
33.9.3			
33.9.4			
33.10 Secondary Lightining Arrestors			
33.10.1			
33.10.2			

33.11 25KV Busbar			
33.11.1			
33.12 Busbar Couplex (Double Unit Traction Substation)			
33.12.1			
33.12.2			
33.12.3			
33.12 Substation Building			
33.12.1			
33.12.2			
33.13 Equipment Installed in the substation building			
33.13.1			
33.13.2			
33.14 Cables			
33.14.1			
33.14.2			
33.14.3			
33.14.4			
33.14.5			
33.14.6			
33.14.7			
33.14.8			
33.14.9			
33.14.10			
33.14.11			
33.15 Interconnection of equipment			
33.15.1			
33.15.2			
33.15.3			
33.15.4			
33.15.5			
33.15.6			
33.15.7			
33.15.8			
33.16 Fencing and Kerbing			
33.16.1			
33.16.2			
33.16.3			
33.16.4			
33.17 Return Current and Substation Earthing			
33.17.1 Return Current			
33.17.1.1			
33.17.1.2			
33.17.2 Substation Earth			
33.17.2.1			
33.17.2.2			
33.17.2.3			
33.17.2.4			
33.17.2.5			
33.17.2.6			
33.17.2.7			
33.17.2.8			
33.17.2.9			
33.17.2.10			
33.17.3 Earthing Devices			
33.17.3.1			
33.17.3.2			
33.17.3.3			
33.17.3.4			
33.17.3.5			
33.18 Nameplates and Labels			
33.18.1			
33.18.2			
33.18.3			
33.18.4			
33.18.5			
33.18.6			
33.18.7			
33.18.8			
33.18.9			
33.18.10			

Section4: Testing and commissioning			
34.0 Type and routine testing requirements			
34.1			
34.2			
34.3			
34.4			
34.5			
34.6			
34.7			
34.8			
34.9			
34.10			
34.11			
34.12			
34.13			
34.14			
34.15			
35.0 Site tests and commissioning			
35.1 On-site tests			
35.1.1			
35.1.2			
35.1.3			
35.1.4			
35.1.5			
35.1.6			
35.1.7			
35.1.8			
35.2 Commissioning of equipment			
35.2.1			
35.2.2			
35.2.3			
35.2.4			
35.2.5			
35.2.6			
35.2.7			
35.2.8			
36.0 Drawings, Instructions, Manuals and Spares and Lists			
36.1 Drawings			
36.1.1			
36.1.2			
36.1.3			
36.1.4			
36.2 Instructin Manual			
36.3 Spares Lists			
36.3.1			
36.3.2			
36.3.3			
37.0 Special Tools and/or Service Aid			
37.1			
37.2			
37.3			
38.0 Training			
39.0 Guarantee and Defects			
39.1			
39.2			
39.3			
39.4			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION CEE 0224

Drawings, Catalogues, Instruction manuals and spares lists for electric equipment supplied under contract

Specification number	CEE - 0224

Item	Comply	Doesn't Comply	Comment
1.0 Scope			
1.1			
2.0 Definitions			
2.1			
2.2			
3.0 Standards and Specifications			
3.1			
3.2			
4.0 appendix			
4.1			
5.0 Method of tendering			
5.1			
5.2			
5.3			
6.0 Language and units			
6.1			
7.0 Drawings			
7.1			
7.2			
7.3			
7.4			
7.5			
7.6			
7.7			
8.0 Information required on drawings			
8.1			
8.2			
8.3			
8.4			
8.5			
8.6			
8.7			
8.8			
9.0 Certification of drawings			
9.1			
10.0 Changes to drawings			
10.1			
11.0 Submission of tender drawings			
11.1			
12.0 Drawings to be supplied by successful tenderer			

12.1			
12.2			
12.3			
12.4			
12.5			
13.0 Catalogues			
13.1			
13.2			
13.3			
13.4			
13.5			
13.6			
14.0 Instruction manuals			
14.1			
14.2			
14.3			
14.4			
14.5			
14.6			
14.7			
14.8			
15.0 Combined documents			
15.1			
16.0 Spared lists			
16.1			
16.2			
17.0 Parking of Drawings, catalogues, instruction manuals and spares lists			
17.1			
18.0 Substitution			
18.1			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION CEE-TBD-0007

EARTHING ARRANGEMENT FOR 3KV DC TRACTION SUBSTATION

Specification number	CEE - TBD - 0007

Item	Comply	Doesn't Comply	Comment
1.0 Diagram			
1.1			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION CEE TBD 0008

EARTHING ARRANGEMENT 25KV AC TRACTION SUBSTATION

Specification number	CEE - TBD -0008

Item	Comply	Doesn't Comply	Comment
1.0 Diagram			
1.1			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION CEE TBK 0027

CONTROL CIRCUIT DIAGRAM NO-VOLT COIL PROTECTION

Specification number	CEE - TBK - 0027

Item	Comply	Doesn't Comply	Comment
1.0 Diagram			
1.1			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION CEE TBK 0028

Trip lock out and indication circuit diagram

Specification number	CEE - TBK - 0028

Item	Comply	Doesn't Comply	Comment
1.0 Diagram			
1.1			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO THE NEC3 ECSC GENERAL CONDITIONS OF CONTRACT

Design, Supply, Install, test and commission of PCB control panels for Turfgrond 25kV AC substation under the control of Depot Engineer Koedoespoort

ECSC NEC GENERAL CONDITIONS OF CONTRACT

Item	Comply	Doesn't Comply	Comment
1.0 Contractual Obligations			
1.0			
1.1			
1.2			
1.3			
1.4			
1.4.1			
1.4.2			
1.4.3			
1.4.5			
1.4.6			
1.4.7			
1.4.8			
1.4.9			
1.4.10			
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1.4.12			
1.4.13			
1.4.14			
1.4.15			
1.4.16			
1.4.17			
1.4.18			
1.4.19			
1.4.20			
1.4.21			
1.4.22			
Pricing Instructions			
2.1			
2.2			
2.3			
2.4			
2.5			
2.6			
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2.16			
2.17			
2.18			
2.19			
Part C3: Works Information			
3.0 Description of Work			
3.1			
3.2			
3.3			
3.4			
3.5			
3.6			
3.7			
3.8			
3.9			
3.10			
3.11			
3.12			
3.13			
3.14			
3.15			
3.16			
3.17			
4.0 Installation			
4.1			
4.2			
5.0 Drawings, Instruction Manuals and Spare Part Catalogues			
5.1			
5.2			
5.3			
5.4			
5.5			
5.6			
6.0 Site Tests			
6.1			
6.2			
6.3			
6.4			
6.5			
6.6			
6.7			
6.8			
6.9			
6.10			
7.0 Commissioning of Equipment			
7.1			
7.2			
7.3			
7.4			
7.5			
8.0 Guarantee and Defects			
8.1			

8.2			
8.3			
8.4			
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8.8			
9.0 Quality and Inspection			
9.1			
9.2			
9.3			
9.4			
10.0 Specifications			
10.1			
10.1.1			
10.1.2			
10.1.3			
10.2			
10.2.1			
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10.2.10			
10.2.11			
10.2.12			
10.3			
11.0 Constraints			
11.1			
12.0 Requirements for the programme			
12.1			
12.2			
12.3			
12.4			
12.5			
12.6			
12.7			
es and other things provided by the employer			
13.1			
13.2			
13.3			
14 Site Information			
14.1			

CLAUSE BY CLAUSE COMPLIANCE TO SPECIFICATION E4.B (NOVEMBER 1996)

MINIMUM COMMUNAL HEALTH REQUIREMENTS IN AREAS OUTSIDE THE JURISDICTION OF A LOCAL AUTHORITY: TEMPORARY FACILITIES FOR CONTRACTOR'S PERSONNEL

Specification number	E4B (NOVEMBER 1996)

Item	Comply	Doesn't Comply	Comment
1.0 CAMPS			
1.1			
1.2			
1.3			
1.4			
1.5			
1.6			
1.7			
1.8			
2.0 HOUSING			
2.1			
2.2			
2.3			
2.4			
2.5			
2.6			
2.7			
2.7.1			
2.7.2			
3 WATER SUPPLY AND ABLUTION FACILITIES			
3.1			
3.2			
3.3			
4. SANITATION			
4.1			
4.2			
4.3			
4.4			
4.4.1			
4.4.2			
4.5			
4.6			
4.7			
4.8			
4.9			
4.10			
4.11			
5. RATIONS			
5.1			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION E4E (AUGUST 2006)

SAFETY ARRANGEMENT AND PROCEDUAL COMPLIANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT (ACT 85 OF 1993) AND APPLICABLE REGULATIONS

Specification number	E4E Transnet (August 2006)

Item	Comply	Doesn't Comply	Comment
1.0 General			
1.1			
1.2			
1.3			
1.4			
1.5			
2.0 DEFINITIONS			
2.1			
2.2			
2.3			
2.4			
2.5			
2.6			
2.7			
2.8			
2.9			
3.0 Procedual Compliance			
3.1			
3.2			
3.3			
3.4			
3.5			
3.6			
3.7			
4.0 Special permits			
4.1			
5.0 Health and safety programme			
5.1			
5.2			
5.3			
5.4			
5.5			
5.6			
5.7			
5.8			
5.9			
5.10			
5.11			
6 FALL PROTECTION PLAN			
6.1			
6.2			
6.3			
7.0 Hazards and potential Hazards			
7.1			
8.0 Health and safety file			
8.1			
8.2			
8.3			
Annexure 1			
Annexure 2			
Annexure 3			
Annexure 4			

CLAUSE BY CLAUSE STATEMENT OF COMPLIANCE TO SPECIFICATION BBD 8210 VERSION 1

SPECIFICATIONS FOR WORKS ON, OVER, UNDER OR ADJUSCENT TO RAILWAY LINES AND NEAR HIGH VOLTAGE EQUIPMENT (E7/1)

Specification number	BBD 8210 VERSION 1

Item	Comply	Doesn't Comply	Comment
1.0 SCOPE			
1.1			
2.0 DEFINITIONS			
2.1			
3.0 AUTHORITY OF OFICERS OF TRANSNET			
3.1			
3.2			
4.0 CONTRACTOR'S REPRESENTATIVES AND STAFF			
4.1			
4.2			
4.3			
5.0 OCCUPATIONS AND WORK PERMITS			
5.1			
5.2			
5.3			
5.4			
5.5			
5.6			
5.7			
5.8			
5.9			
5.1			
6.0 SPEED RESTRICTIONS AND PROTECTION			
6.1			
6.2			
6.2.1			
6.3			
7.0 ROADS AND ROADS ON THE NETWORK OPERATORS PROPERTY			
7.1			
7.2			
8.0 CLEARANCES			
8.1			
9.0 STACKING OF MATERIAL			
9.1			
10.0 EXCAVATION, SHORING, DE-WATERING AND DRAINAGE			
10.1			
10.2			
10.3			
10.4			
10.5			
11.0 FALSEWORK FOR STRUCTURES			
11.1			
11.2			
12.0 PILING			
12.1			
13.0 UNDERGROUND SERVICES			
13.1			
13.2			
14.0 BLASTING AND USE OF EXPLOSIVES			
14.1			
14.2			
14.3			

14.4			
14.5			
14.6			
14.7			
14.8			
14.9			
14.10			
14.11			
14.12			
14.13			
15.0 RAIL TROLLEYS			
15.1			
15.2			
16.0 SIGNAL TRACK CIRCUITS			
16.1			
16.2			
17.0 PENALTY FOR DELAYS TO TRAINS			
17.1			
18.0 SURVEY BEACONS AND PEGS			
18.1			
18.2			
18.3			
18.4			
19.0 TEMPORARY LEVEL CROSSINGS			
19.1			
19.2			
19.3			
19.4			
19.5			
20.0 COMPLETION OF THE WORKS			
20.1			
21.0 PROTECTION OF PERSONS AND PROPERTY			
21.1			
21.2			
21.3			
21.4			
21.5			
21.6			
21.7			
21.8			
22.0 INTERFERENCE WITH THE NETWORK OPERATOR'S ASSETS AND WORK ON OPEN LINES			
22.1			
22.2			
22.3			
22.4			
23.0 ACCESS, RIGHTS-OF-WAY AND CAMPSITES			
23.1			
23.2			
23.3			
23.4			
24.0 SUPERVISION			
24.1			
24.2			
24.3			
24.4			
25.0 HOUSING OF EMPLOYEES			
25.1			
25.2			
26.0 OPTICAL FIBRE CABLE ROUTES			
26.1			
26.2			
PART B: SPECIFICATION FOR WORK NEAR HIGH VOLTAGE ELECTRICAL EQUIPMENT			

27.0 GENERAL			
27.1			
27.2			
27.3			
27.4			
27.5			
27.6			
27.7			
27.8			
28.0 WORK ON BUILDINGS OR FIXED STRUCTURES			
28.1			
28.2			
28.3			
29.0 WORK DONE ON OR OUTSIDE OF ROLLING STOCK, INCLUDING LOADING OR UNLOADING			
29.1			
29.1.1			
29.1.1.1			
29.1.1.2			
29.1.2			
29.1.2.1			
29.1.2.2			
29.1.3			
29.2			
29.3			
29.4			
29.5			
29.6			
30.0 USE OF EQUIPMENT			
30.1			
30.1.1			
30.1.2			
30.1.3			
30.1.4			
30.1.5			
30.2			
30.2.1			
31.0 CARRYING AND HANDLING MATERIAL AND EQUIPMENT			
31.1			
31.2			
31.3			
32.0 PRECAUTIONS TO BE TAKEN WHEN ERECTING OR REMOVING POLES, ANTENNAE, TREES ETC.			
32.1			
32.2			
32.3			
33.0 USE OF WATER			
33.1			
34.0 USE OF CONSTRUCTION PLANT			
34.1			
34.2			
34.3			
34.4			
34.5			
35.0 WORK PERORMED UNDER DEAD CONDITIONS UNDER COVER OF A WORK PERMIT			
35.1			
35.2			
36.0 TRACTION RETURN CIRCUITS IN RAILS			
36.1			
36.2			
36.3			
36.4			
37.0 HIGH VOLTAGE ELECTRICAL EQUIPMENT NOT MAINTAINED AND/OR OPERATED BY THE NETWORK OPERATOR			
37.1			

Summary of Cover - General

Summary of Cover - General

The Insured Parties

- Transnet SOC Limited and / or its Subsidiary Companies as Principal or Employer.
- All Contractors undertaking work for or on behalf of the Principal in execution of the Contract.
- All Subcontractor's employed by the Contractor and all other Subcontractor's (whether nominated or otherwise) engaged in the fulfillment of the Contractor.
- To the extent required by any Contract or Agreement suppliers manufacturers vendors or other persons engaged on the contract sites but only to the extent of loss damage or liability originating at the Contract Site (other than while the Property Insured is in transit) arising out of the performance of their Contract Site obligations.

Insured Contracts

All contracts undertaken by the Insured involving but not limited to Design Construction, Testing, Commission in respect of new works, geotechnical and exploratory works, capital expenditure, upgrade, modification, maintenance and/or overhaul and/or refurbishment, renovation, retrofitting or alteration and/or additions to existing facilities and/or re-profiling of track, vegetation control, rehabilitation and ballast tamping activities undertaken by the Insured or other Insured Parties acting on their behalf but excluding:

- Contracts where the contract value including the value of Free Issue Material exceeds **R100,000,000** (Exclusive of VAT).
- Contracts where the duration of the contract exceeds **36 months**.
- Contracts where the contractual Defects Liability / Maintenance period exceeds **24 months**.
- Contracts involving harbor wet risks being all work entailing or involving work in or upon water whether partially or fully submerged such as but not limited to quay walls, wharfs, seawalls, caissons, breakwaters, jetties, piers, deepening or widening and dredging of ports and other off-shore risks.
- Contracts involving construction or erection of Petrochemical Manufacturing Plant(s) such as Sasol but this exclusion shall not apply to pipelines and other works undertaken by or on behalf of Transnet Pipelines Limited.
- Contracts outside of the Republic of South Africa.
  In territories outside of South Africa it is required in terms of their Insurance Acts that insurance cover be placed with their local markets. It is therefore important that the Insurance Department be advised at feasibility stage (prior to Tender documents being issued) should any contracts, whether as Principal or Contractor, take place in any Territory outside of the Republic of South Africa.

Contract Site

Any location upon which the Insured Contract(s) is to be executed or carried out as more fully defined in the Insured Contract(s) documents together with so much of the surrounding area as may be designated for the performance of the Insured Contract(s) within the Republic of South Africa.

Principal Controlled Insurance Programme	Estimated Contract Values any one Contract inclusive of Free Issue Material
PCI Contract Works (PCI)	Up to R100 million VAT exclusive
SASRIA on Contract Works	Up to R100 million VAT exclusive
PCI Liability (PCI LIAB)	Up to R100 million VAT exclusive
PCI One Off Contract Works & Liability (PCI One Off's)	In excess of R 100 million VAT exclusive
Project Specific Insurance Contract Works & Liability (PSI Projects)	In excess of R 100 million VAT exclusive comprising multiple packages

- To extend the contract period beyond 36 months will attract an additional premium.

  (See Administrative Procedures herein).

Declaration Procedure

All Contracts up to **R100m (VAT exclusive)** including the value of Free Issue Material must be declared to **Willis South Africa** (see contact details herein) in terms of the attached declaration form marked as Annexure1 prior to commencement of the Works.

Premium Payment Procedure

The deposit premium for this cover will be paid by the TFR Insurance Department as part of Transnet's blanket cover. There will be a final premium adjustment at the end of the insurance period and TFR Insurance Department reserves the right to recoup this additional premium from the various contracts owners as per their respective declarations during the year.

Claims Reporting

- All incidents that could give rise to claim under the Principal Controlled Insurances, **HAVE TO BE** reported to **TFR Insurance Department and Willis South Africa** by means of an Incident Advice Form (Annexure 2).
- All incidents/claims must be captured on **TOMS** by the department involved.
- All incidents/claims must be registered in terms of **TFR Unique Claim Numbering System.**
- All incidents/claims must be reported to Insurers no later than **30-days** after occurrence of the incident which may give rise to a claim under the Contract Works or Liability insurance.

Failing this, all benefits in terms of the Policy shall be voidable from date of occurrence. It is essential that this condition is brought to the attention of Contractors in Tender/Contract Documents.

Summary of Cover

Contract Works Insurance

Contract Works Insurance

Synopsis of Cover

Accidental physical loss of or damage to the works or materials for incorporation in the works:

- During dismantling of property in connection with the Insured Contracts.
- Whilst in transit, including loading and unloading, or whilst temporarily stored at any premises en route to or from The Contract Site within the Republic of South Africa;
- During the preparation of The Contract Site and thereafter until the Property Insured has been officially accepted by the Employer and becomes his responsibility by means of a Notice of Completion Certificate or similar evidence of legal transfer of risk in the whole or permanent works under the Insured Contract to the Employer;
- Where testing and commissioning of Property Insured is conducted by the Employer "completion" for purposes of this insurance to occur only after successful completion of all testing and commissioning of the whole of the permanent works under the Insured Contract;
- Where the permanent property insurance arranged by the Employer indemnify the Insured for completed portions of the Property Insured prior to completion of the whole of the permanent works under the Insured Contract, this insurance in respect of such completed portions of the Property Insured shall cease except as provided below;
- Work uncompleted or outstanding in terms of any certificate of completion, certificate of handover or similar document shall continue to be insured until its completion and the inception of the Contractual Defects Liability or Maintenance Period (as may be described in the Insured Contract) for such uncompleted or outstanding work where after the provision hereafter shall apply in respect of such work;
- During the Contractual Defects Liability or Maintenance Period (as may be described in the Insured Contract) pertaining to any part of the permanent works but only in respect of loss or damage:

  i) arising from a cause occurring prior to commencement of such period of maintenance or defects liability period

  ii) arising from any act or omission of the Insured their Servants, Agents, Suppliers or Subcontractors in pursuance of the Insured's obligations.

  for which the Insured Contractor is responsible under the Contract.

Contract Period Limitation

Maximum Contract period	36 months
Maximum Defects Liability / Maintenance Period	24 Months

Limits of indemnity (VAT exclusive)

Contract Works (Any One Contract) including Free Issue Material	R100,000,000
Costs & Expenses (Damage & No Damage)	R10,000,000
Surrounding Property	R50,000,000
Surrounding Property – Worked Upon	R50,000,000
Surrounding Property – Watercraft	R50,000,000
Fire Brigade/Public Authority	R10,000,000
Removal to Gain Access	R10,000,000
Documentation	R500,000
Public Authority Reinstatement	R10,000,000
Claims Preparation Costs	R1,000,000
Road Reserve/Servitude Indemnity	R10,000,000
Leak Search Cost	R1,000,000 in the aggregate
Maximum testing / commissioning period	90 days
Borrowing of Plant	R1,000,000 in the aggregate
Maximum un-sealed / un-primed base course limitation	5,000 metres
Maximum open trench limitation	5,000 metres

Deductibles (VAT exclusive)

The deductible (excess) is the amount which the Contractor and/or Sub-Contractor is responsible for and this obligation must be reflected in the Tender and/or Contract Documents and the responsibility for same made clear. The deductibles apply to each and every occurrence and in respect of all Contracts.

The deductibles are:

Loss or damage due to storm, rain, tempest, wind, flood, theft, malicious damage, subsidence, collapse, earthquake, testing or commissioning	R25,000
Loss or damage arising from any other cause	R15,000
Costs & Expenses (No Damage)	R25,000
Loss or damage to Surrounding Property	R75,000
Loss or damage to Documentation	R5,000
Road Reserve / Servitude	R250,000

All Contracts Entailing Trenching and / or Layer Works

The following additional deductibles apply over and above the aforestated deductibles: - i.e. in excess of 1,000 metres

Up to a maximum of 3,000metres	20% of loss / minimum R50,000
Up to a maximum of 5,000metres	20% of loss / minimum R100,000

It is essential that this is brought to the attention of Contractor's. Where this restriction is not practical, specific arrangements for cover can be made with underwriters. They will, however, require detailed underwriting information and an additional premium may be charged.

Property Insured

The actual Contract Works and all material intended for incorporation into the Works (*including Free Issue Material* the value of which has to be included in the Contract Value declared*) and Temporary Works.

* **Note:** Where Transnet for the purposes of the Contract issues materials 'free of charge' to the Contractor such materials shall be and remain the property of the Transnet. Free Issue Material shall mean any material provided by or on Transnet's behalf which is to be used in the provision of the Service or incorporated into the Contract.

** **Note:** Temporary Works shall mean all constructional aids, equipment, structures or works (not being part of the permanent works) used or intended for use on the Contract and which :-

a) do not comprise mobile plant;
b) are not intended to be removed from The Contract Site on completion of the Contract (other than scaffolding shuttering and formwork as well as construction equipment specially designed and/or constructed for an Insured Contract and which is not intended for immediate re-use on another Contract); or
c) have no residual value at the completion of the Contract (other than scrap value) solely due to their specialised nature.

Main Exceptions/Exclusions

- The amount of the policy deductible.
- Loss or damage of money or the like.
- Aircraft, waterborne vessels or craft.
- Construction plant, tools or equipment.
- Losses by disappearance / shortage discovered by taking of routine inventory.
- Defective material workmanship design plan or specification (but resultant damage covered).
- Cost of re-design, improvement, betterment or alteration.
- Consequential loss, liquidated damages or penalties for delay in connection with guarantee or performance or efficiency.
- Air transit (unless in territorial limits).
- Ocean transit or whilst in storage thereafter (unless immediately inspected by an independent party after offloading from vessel).
- During the Contractual Defects Liability or Maintenance Period (as may be described in the Insured Contract) pertaining to any part of the permanent works but only in respect of loss or damage:
  - i) arising from a cause occurring prior to commencement of such period of maintenance or defects liability period
  - ii) arising from any act or omission of the Insured his Servants or Agents, in the course of the work carried out in pursuance of the Insured's obligations with regard to maintenance under the Contract.
- Wear, tear, gradual deterioration rust, corrosion or oxidation and normal up-keep.
- Electrical or mechanical breakdown or explosion to machinery or plant which has operated under load conditions prior to commencement of the Insured Contract or in respect of new machinery or plant which has occurred after a Testing / Commissioning Period of 90-days.
- Damage to any unsealed / unprimed or base course in excess of limitations as stated in the policy.
- Damage to any open trench in excess of the limitations as stated in the policy.
- War, asbestos and nuclear risks.
- Sinking (whether partial or in whole) of any watercraft arising out of or in consequence of any work undertaken below the load line (international load line / plimsoll line).
- Loss or damage due to normal actions of the sea (as defined in the policy).

Cover Limitations

Unsealed / Unprimed Base Course

- Unsealed / unprimed base course – cover limited to a maximum of 5,000 metres.

Open Trench

- Open trench – cover limited to a maximum indemnity of 5,000 metres.

It is essential that the above limitations are brought to the attention of Contractor's. Where this restriction is not practical, specific arrangements for cover can be made with Underwriters. They will, however, require detailed underwriting information and an additional premium may be charged.

Used Plant – Basis of Loss Settlement

Insured property which has operated under service conditions prior to attachment of cover:-

- Up to 5 years - cost of repair / reinstatement / replacement.
- In excess of 5 years - agreed value (calculated on basis of each life year (or part thereof) on present day New Replacement Value reduced proportionally over 20 years subject to residual of 20%)

Summary of Cover

Contractors Public Liability Insurance

Contractors Public Liability Insurance

Insured Contracts

All contracts undertaken by the Insured involving but not limited to Design Construction, Testing, Commission in respect of new works, geotechnical and exploratory works, capital expenditure, upgrade, modification, maintenance and/or overhaul and/or refurbishment, renovation, retrofitting or alteration and/or additions to existing facilities and/or re-profiling of track, chemical vegetation control, vegetation rehabilitation and ballast tamping activities undertaken by the Insured or other Insured Parties acting on their behalf but excluding:

- Contracts where the contract value including the value of Free Issue Material exceeds

  R100,000,000 (Exclusive of VAT).
- Contracts where the duration of the contract exceeds 36 months.
- Contracts where the contractual Defects Liability / Maintenance period exceeds 24 months.
- Contracts involving harbor wet risks being all work entailing or involving work in or upon water whether partially or fully submerged such as but not limited to quay walls, wharfs, seawalls, caissons, breakwaters, jetties, piers, deepening or widening and dredging of ports and other off-shore risks.
- Contracts involving construction or erection of Petrochemical Manufacturing Plant(s) such as Sasol but this exclusion shall not apply to pipelines and other works undertaken by or on behalf of Transnet Pipelines Limited.
- Contracts outside of the Republic of South Africa.
  In territories outside of South Africa it is required in terms of their Insurance Acts that insurance cover be placed with their local markets. It is therefore important that the Willis South Africabe advised at feasibility stage (prior to Tender documents being issued) should any contracts, whether as Principal or Contractor, take place in any Territory outside of the Republic of South Africa.
- Limited to a maximum contract period of 36 months followed by a maximum Defects Liability / Maintenance period of 24 months.

Synopsis of Cover

Legal Liability to pay as compensation for and in consequence of:

- Death of or injury to or illness or disease contracted by any person.
- Loss of / or physical damage to tangible property.

Occurring during the period of insurance and arising out of or in connection with the performance of the Insured Contract(s).

Limits of Indemnity

Contractors Public Liability	R25,000,000 any one occurrence / unlimited for the Period of Insurance
Removal of Support	R25,000,000 unlimited for the Period of Insurance
Statutory Legal Defence Costs	R25,000,000 any one occurrence
Arrest / Assault / Defamation	R25,000,000 any one occurrence
Emergency Medical Expenses	R25,000,000 any one occurrence
Prevention of Access	R25,000,000 any one occurrence
Trespass / Nuisance	R25,000,000 any one occurrence
Claims Preparation Costs	R2,500,000 any one occurrence

Deductibles

The deductible (excess) is the amount which the Contractor and/or Sub-Contractor is responsible for and this obligation must be reflected in the Tender and/or Contract Documents and the responsibility for same made clear. The deductibles apply to each and every occurrence and in respect of all Contracts.

The deductibles are:

Loss of or damage to public utilities	R25,000
Spread of fire or burning of fire breaks	R50,000
Loss of or damage to any other property	R25,000
Loss of or damage to property arising from removal of support	R50,000
Loss of or damage arising out of vegetation control including but not limited to the use of pesticides	R50,000

Main Exceptions/Exclusions

- The amount of the policy deductible.
- Death or injury to own employees.
- Motor vehicle liabilities under legislation or as defined in Multilateral Motor Vehicles Accident Fund No. 93 of 1989 as amended.
- Claims in connection with ownership or use of aircraft or watercraft.
- Property belonging to the Insured or in his care custody and control (as defined in the Policy).
- Property forming part of Contract Works.
- Liquidated damages or penalties for delays or in respect of performance or efficiency guarantees.
- The cost of making good faulty workmanship materials design plan or specification in any part of the Property insured.
- Gradual pollution and contamination.
- Sudden unintended and unforeseen seepage, pollution or contamination including the cost of removing, nullifying or cleaning up in respect of both ocean and harbour going watercraft outside of dry dock.
- After completion and handover (inclusive of the contractual Defects / Maintenance period).
- Punitive damages.
- Ownership hiring or leasing of any airport or airstrip.
- War, asbestos and nuclear risks.

Cover Limitation

Indemnity for removal of support is limited to **R25,000,000**.

If a higher limit of indemnity is required, TFR Insurance Department and Willis South Africa needs to be advised and underwriting information will need to be provided in advance (i.e. prior to Tender stage) and this will entail an additional premium.