



TRANSNET FREIGHT RAIL-RNC

an Operating Division of **TRANSNET SOC LTD**

[hereinafter referred to as **Transnet**]

Registration Number 1990/000900/30

REQUEST FOR QUOTATION [RFQ] No CRAC-EFQ-43277

**FOR THE ONCE OFF SUPPLY AND DELIVERY OF AC/DC DISTRIBUTION PANELS
TO BE DELIVERED AT SENTRARAND ELECTRICAL DEPOT**

ISSUE DATE: 03 NOVEMBER 2023

CLOSING DATE: 20 NOVEMBER 2023

CLOSING TIME: 10:00 AM

VALIDITY PERIOD: 180 BUSINESS WORKING DAYS (26 AUGUST 2024)

Note to the bidders:

Bidders are required to ensure that electronic bid submissions are done at least a day before the closing date to prevent issues which they may encounter due to their internet speed, bandwidth or the size of the number of uploads they are submitting. Transnet will not be held liable for any challenges experienced by bidders as a result of the technical challenges. Please do not wait for the last hour to submit. A Bidder can upload 30mb per upload and multiple uploads are permitted.

SECTION 1: SBD1 FORM**PART A****INVITATION TO BID**

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF ONCE OFF SUPPLY AND DELIVERY OF AC/DC DISTRIBUTION PANELS TO BE DELIVERED AT SENTRARAND ELECTRICAL DEPOT, A DIVISION TRANSNET SOC LTD

BID NUMBER:	CRAC-EFQ-43277	ISSUE DATE:	03.11.2023	CLOSING DATE:	20.11.2023	CLOSING TIME:	10:00AM
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DESCRIPTION **ONCE OFF SUPPLY AND DELIVERY OF AC/DC DISTRIBUTION PANELS**

BID RESPONSE DOCUMENTS SUBMISSION

Transnet has implemented a new electronic tender submission system, the e-Tender Submission Portal, in line with the overall Transnet digitalization strategy where suppliers can view advertised tenders, register their information, log their intent to respond to bids and upload their bid proposals/responses on to the system.

RESPONDENTS ARE TO UPLOAD THEIR BID RESPONSE PROPOSALS ONTO THE TRANSNET SYSTEM AGAINST EACH TENDER/RFQ SELECTED.

The Transnet e-Tender Submission Portal can be accessed as follows:

- Log on to the Transnet eTenders management platform website/Portal (transnetetenders.azurewebsites.net) (please use **Google Chrome** to access Transnet link/site free of charge);
- Click on "ADVERTISED TENDERS" to view advertised tenders;
- Click on "SIGN IN/REGISTER – for bidder to register their information (must fill in all mandatory information);
- Click on "SIGN IN/REGISTER" - to sign in if already registered;
- Toggle (click to switch) the "Log an Intent" button to submit a bid;
- Submit bid documents by uploading them into the system against each tender selected.
- No late submissions will be accepted. The bidder guide can be found on the Transnet Portal transnetetenders.azurewebsites.net

BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO		TECHNICAL ENQUIRIES MAY BE DIRECTED TO:	
CONTACT PERSON	Motsatsi Sekgoela	CONTACT PERSON	Motsatsi Sekgoela
TELEPHONE NUMBER	011 878 7031	TELEPHONE NUMBER	011 878 7031
FACSIMILE NUMBER	N/A	FACSIMILE NUMBER	N/A
E-MAIL ADDRESS	Motsatsi.Sekgoela@transnet.net	E-MAIL ADDRESS	Motsatsi.Sekgoela@transnet.net

SUPPLIER INFORMATION

NAME OF BIDDER			
POSTAL ADDRESS			
STREET ADDRESS			
TELEPHONE NUMBER	CODE		NUMBER
CELLPHONE NUMBER			
FACSIMILE NUMBER	CODE		NUMBER
E-MAIL ADDRESS			
VAT REGISTRATION NUMBER			

SUPPLIER COMPLIANCE STATUS	TAX COMPLIANCE SYSTEM PIN:		OR	CENTRAL SUPPLIER DATABASE	UNIQUE REGISTRATION REFERENCE NUMBER: MAAA
B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE	TICK APPLICABLE BOX] <input type="checkbox"/> Yes <input type="checkbox"/> No		B-BBEE STATUS LEVEL SWORN AFFIDAVIT		[TICK APPLICABLE BOX] <input type="checkbox"/> Yes <input type="checkbox"/> No
[A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE/ SWORN AFFIDAVIT MUST BE SUBMITTED FOR PURPOSES OF COMPLIANCE WITH THE B-BBEE ACT]					
1 ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?	<input type="checkbox"/> Yes <input type="checkbox"/> No [IF YES ENCLOSE PROOF]		2 ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED?		<input type="checkbox"/> Yes <input type="checkbox"/> No [IF YES, ANSWER QUESTIONNAIRE BELOW]
QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS					
<p>IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>DOES THE ENTITY HAVE A BRANCH IN THE RSA? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 1.3 BELOW.</p>					

PART B TERMS AND CONDITIONS FOR BIDDING

1. TAX COMPLIANCE REQUIREMENTS
1.1 BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS.
1.2 BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VERIFY THE TAXPAYER'S PROFILE AND TAX STATUS.
1.3 APPLICATION FOR TAX COMPLIANCE STATUS (TCS) PIN MAY BE MADE VIA E-FILING THROUGH THE SARS WEBSITE WWW.SARS.GOV.ZA.
1.4 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.
1.5 IN BIDS WHERE UNINCORPORATED CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED, EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.
1.6 WHERE NO TCS IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.

NB: FAILURE TO PROVIDE / OR COMPLY WITH ANY OF THE ABOVE PARTICULARS MAY RENDER THE BID INVALID.

SIGNATURE OF BIDDER:

.....

CAPACITY UNDER WHICH THIS BID IS SIGNED:

(Proof of authority must be submitted e.g. company resolution)

DATE: _____

SECTION 2: NOTICE TO BIDDERS

1 Responses to RFQ

Responses to this RFQ [**Quotations**] must not include documents or reference relating to any other quotation or proposal. Any additional conditions must be embodied in an accompanying letter.

2 Communication

2.1 Specific queries relating to this RFQ before the closing date of the RFQ should be submitted onto the system and to [**Motsatsi Sekgoela**] before **12:00 pm on 15 November 2023**. In the interest of fairness and transparency Transnet's response to such a query will then be made available to other bidders.

2.2 It is prohibited for Respondents to attempt, either directly or indirectly, to canvass any officer or employee of Transnet in respect of this RFQ between the closing date and the date of the award of the business.

2.3 Respondents found to be in collusion with one another will be automatically disqualified and restricted from doing business with organs of state for a specified period.

2.4 Respondents may also, at any time after the closing date of the RFQ, communicate with the **Motsatsi Sekgoela** on any matter relating to its RFQ response:

Telephone 011 878 7031

Email: Motsatsi.Sekgoela@transnet.net

2.5 All unsuccessful bidders have a right to request Transnet to furnish individual reasons for their bid not being successful. This requested must be directed to the contact person stated in the SBD 1 form

3 Legal Compliance

The successful Respondent shall be in full and complete compliance with any and all applicable national and local laws and regulations.

4 Employment Equity Act

Respondents must comply with the requirements of the Employment Equity Act 55 of 1998 applicable to it including (but not limited to) Section 53 of the Employment Equity Act.

5 Changes to Quotations

Changes by the Respondent to its submission will not be considered after the closing date and time.

6 Binding Offer

Any Quotation furnished pursuant to this Request shall be deemed to be an offer. Any exceptions to this statement must be clearly and specifically indicated.

7 Disclaimers

7.1 Respondents are hereby advised that 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 or an alternative bid;

- 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 / services which are reflected in the scope of this RFQ;
- split the award of the order/s between more than one Supplier/Service Provider should it at Transnet's discretion be more advantageous in terms of, amongst others, cost or developmental considerations;
- cancel the quotation process;
- validate any information submitted by Respondents in response to this bid. This would include, but is not limited to, requesting the Respondents to provide supporting evidence. By submitting a bid, Respondents hereby irrevocably grant the necessary consent to Transnet to do so;
- request audited financial statements or other documentation for the purposes of a due diligence exercise;
- not accept any changes or purported changes by the Respondent to the bid rates after the closing date and/or after the award of the business, unless the contract specifically provides for it;
- to cancel the contract and/request that National Treasury place the Respondent on its Database of Restricted Suppliers for a period not exceeding 10 years, on the basis that a contract was awarded on the strength of incorrect information furnished by the Respondent or on any other basis recognised in law;
- award the business to the next ranked bidder, provided that he/she is still prepared to provide the required Goods/Services at the quoted price, should the preferred bidder fail to sign or commence with the contract within a reasonable period after being requested to do so. Under such circumstances, the validity of the bids of the next ranked bidder(s) will be deemed to remain valid, irrespective of whether the next ranked bidder(s) were notified of their bid being unsuccessful. Bidders may therefore be requested to advise whether they would still be prepared to provide the required Goods/Services at their quoted price.
- Should a bidder fail to respond to a request for extension of the validity period before it expires, that bidder will be excluded from tender process.

8 Specification/Scope of Work

Supply and delivery of AC/DC Distribution Panels Kindly refer to **Annexure A** for detailed spec

9 Legal review

A Proposal submitted by a Respondent will be subjected to review and acceptance or rejection of its proposed contractual terms and conditions by Transnet's Legal Counsel, prior to consideration for an award of business.

10 Security clearance

Acceptance of this bid could be subject to the condition that the Successful Respondent, its personnel providing the goods and its subcontractor(s) must obtain security clearance from the appropriate authorities to the level of CONFIDENTIAL/ SECRET/TOP SECRET. Obtaining the required clearance is the responsibility of the Successful Respondent. Acceptance of the bid is also subject to the condition that the Successful Respondent will implement all such security measures as the safe performance of the contract may require.

11 National Treasury's Central Supplier Database

Respondents are required to self-register on National Treasury's Central Supplier Database (CSD) which has been established to centrally administer supplier information for all organs of state and facilitate the verification of certain key supplier information. Transnet is required to ensure that price quotations are invited and accepted

from prospective bidders listed on the CSD. Business may not be awarded to a respondent who has failed to register on the CSD. Only foreign suppliers with no local registered entity need not register on the CSD. The CSD can be accessed at <https://secure.csd.gov.za/>.

12 Tax Compliance

Respondents must be compliant when submitting a proposal to Transnet and remain compliant for the entire contract term with all applicable tax legislation, including but not limited to the Income Tax Act, 1962 (Act No. 58 of 1962) and Value Added Tax Act, 1991 (Act No. 89 of 1991).

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

The Tax Compliance status requirements are also applicable to foreign Respondents/ individuals who wish to submit bids.

Where Consortia / Joint Ventures / Sub-contractors are involved, each party must be registered on the Central Supplier Database and their tax compliance status will be verified through the Central Supplier Database.

Transnet urges its clients, suppliers and the general public to report any fraud or corruption to

TIP-OFFS ANONYMOUS:



Ethics Helpdesk
ethics Management Systems™

You can choose to be **Anonymous** or **Non-Anonymous** on ANY of the platforms
PLEASE RETAIN YOUR REFERENCE NUMBER



AI Voice Bot "Jack"
Speak to our AI Voice Chat Bot "JACK", you converse with him like chatting to a human, with the option to record a message and speak to an agent at anytime.



What's App
Speak to an Agent via What's App.



Speak to an Agent
Speak to an Agent via the platform with no call or data charge



Telegram
Speak to an Agent via Telegram



0800 003 056



086 551 4153



reportit@ethicshelpdesk.com



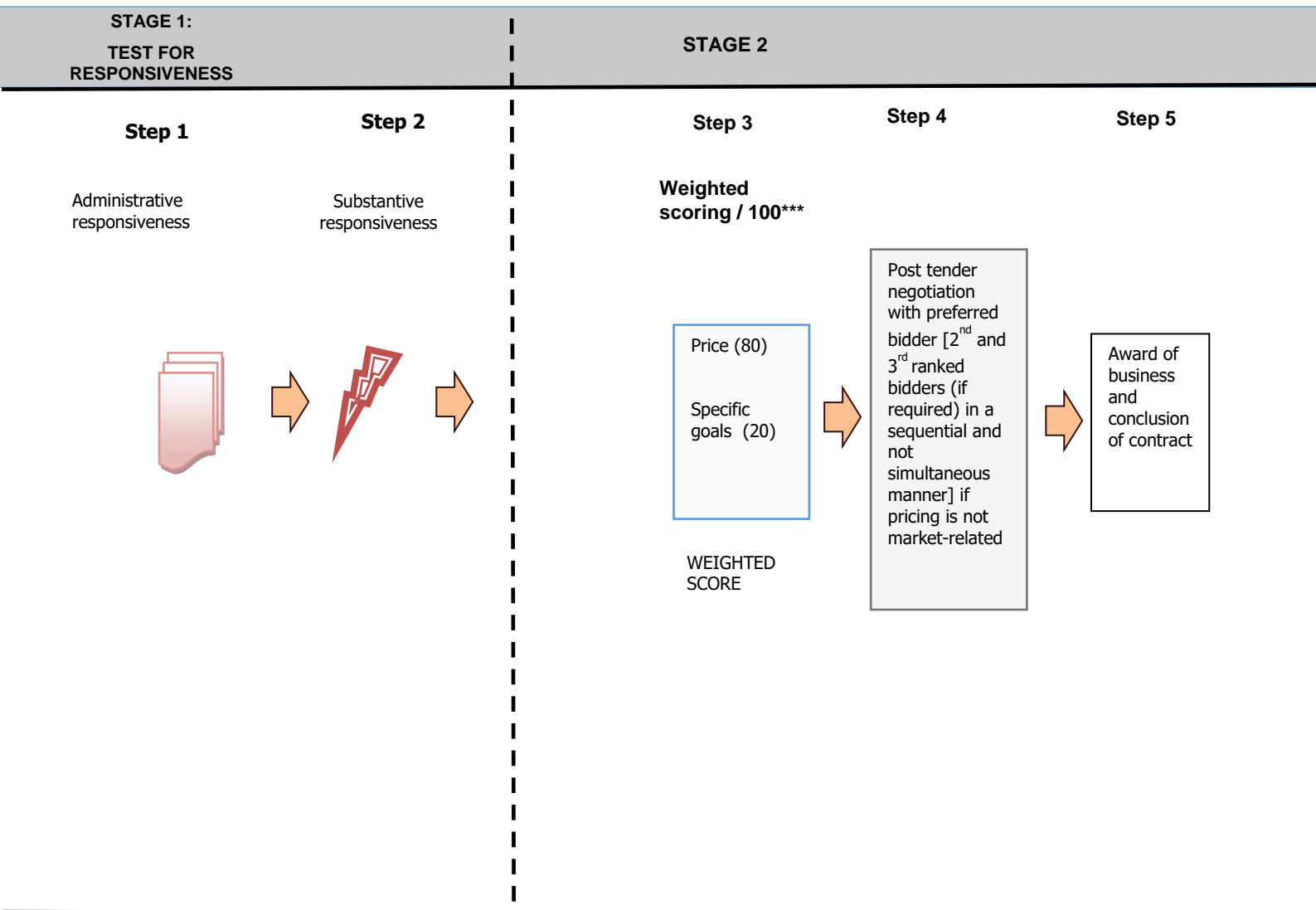
***120*0785980808#**

SECTION 3

EVALUATION METHODOLOGY, CRITERIA AND RETURNABLE DOCUMENTS

1 Evaluation Criteria

Transnet will utilise the following methodology and criteria in selecting a preferred Supplier/Service provider:



Respondent's Signature

Date & Company Stamp

1.1 STEP ONE: Test for Administrative Responsiveness

The test for administrative responsiveness will include the following:

Administrative responsiveness check	RFQ Reference
• Whether the Bid has been lodged on time	
• Whether all Returnable Documents and/or schedules [where applicable] were completed and returned by the closing date and time	<i>Section 3</i>
• Verify the validity of all returnable documents	<i>Section 3</i>
• Verify if the Bid document has been duly signed by the authorised respondent	<i>All sections</i>

The test for administrative responsiveness [Step One] must be passed for a Respondent's Proposal to progress to Step Two for further pre-qualification

1.2 STEP TWO: Test for Substantive Responsiveness to RFQ

The test for substantive responsiveness to this RFQ will include the following:

Check for substantive responsiveness	RFQ Reference
• Whether any general and legislation qualification criteria set by Transnet, have been met	<i>All sections</i>
• Whether the Bid contains a priced offer	<i>Section 4 - Quotation Form</i>
• Whether the Bid materially complies with the scope and/or specification given	<i>All Sections</i>

The test for substantive responsiveness [Step Two] must be passed for a Respondent's proposal to progress to Step Three for further evaluation

1.3 STEP THREE: Evaluation and Final Weighted Scoring

a) **Price** [Weighted score 80 points]:

Evaluation Criteria	RFP Reference
• Commercial offer	<i>Section 4</i>

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

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

Where:

Ps = Score for the Bid under consideration

Pt = Price of Bid under consideration

P_{min} = Price of lowest acceptable Bid

b) **Specific Goals** [Weighted score 20 point]

- Specific goals claim form
- Preference points will be awarded to a bidder for attaining the specific goals requirements in accordance with the table indicated in Section 7, paragraph 3.2 of the specific goals Claim Form.

1.4 STEP FOUR: Post Tender Negotiations

- Respondents are to note that Transnet may not award a contract if the price offered is not market-related. In this regard, Transnet reserves the right to engage in PTN with the view to achieving a market-related price or to cancel the tender. Negotiations will be done in a sequential manner i.e.:
 - first negotiate with the highest ranked bidder or cancel the bid, should such negotiations fail,
 - negotiate with the 2nd and 3rd ranked bidders (if required) in a sequential manner.
- In the event of any Respondent being notified of such short-listed/preferred bidder status, his/her bid, as well as any subsequent negotiated best and final offers (BAFO), will automatically be deemed to remain valid during the negotiation period and until the ultimate award of business.
- Should Transnet conduct post tender negotiations, Respondents will be requested to provide their best and final offers to Transnet based on such negotiations. Where a market related price has been achieved through negotiation, the contract will be awarded to the successful Respondent(s).

1.5 STEP FIVE: Award of business and conclusion of contract

- Immediately after approval to award the contract has been received, the successful or preferred bidder(s) will be informed of the acceptance of his/their Quotation by way of a Letter of Award. Thereafter the final contract will be concluded with the successful Respondent(s).
- Otherwise, a final contract will be concluded and entered into with the successful Bidder at the acceptance of a letter of award by the Respondent.

2 Validity Period

Transnet requires a validity period of 180 [One Hundred and eighty] **26 August 2024** Business Days from the closing date of this RFQ, excluding the first day and including the last day.

Bidders are to note that they may be requested to extend the validity period of their bid, on the same terms and conditions, if the internal evaluation process has not been finalised within the validity period. However, once the adjudication body has approved the process and award of the business to the successful bidder(s), the validity of the successful bidder(s)' bid will be deemed to remain valid until a final contract has been concluded.

3 Disclosure of contract information

Prices Quoted

Respondents are to note that, on award of business, Transnet is required to publish the tendered prices of the successful and unsuccessful Respondents *inter alia* on the National Treasury e-Tender Publication Portal, (www.etenders.gov.za), as required per National Treasury Instruction Note 01 of 2015/2016

Johannesburg Stock Exchange Debt Listing Requirements

Transnet may also be required to disclose information relating to the subsequent contract i.e. the name of the company, goods/services provided by the company, the value and duration of the contract, etc. in compliance with the Johannesburg Stock Exchange (JSE) Debt Listing Requirements.

Domestic Prominent Influential Persons (DPIP) OR Foreign Prominent Public Officials (FPPO)

Transnet is free to procure the services of any person within or outside the Republic of South Africa in accordance with applicable legislation. Transnet shall not conduct or conclude business transactions, with any Respondents without having:

- Considered relevant governance protocols;
- Determined the DPIP or FPPO status of that counterparty; and
- Conducted a risk assessment and due diligence to assess the potential risks that may be posed by the business relationship.

As per the Transnet Domestic Prominent Influential Persons (DPIP) and Foreign Prominent Public Officials (FPPO) and Related Individuals Policy available on Transnet website <https://www.transnet.net/search/pages/results.aspx?k=FPIDP#k=DPIP>, Respondents are required to disclose any commercial relationship with a DPIP or FPPO (as defined in the Policy) by completing the following section:

The below form contains personal information as defined in the Protection of Personal Information Act, 2013 (the "Act"). By completing the form, the signatory consents to the processing of her/his personal information in accordance with the requirements of the Act. Consent cannot unreasonably be withheld.						
Is the Respondent (Complete with a "Yes" or "No")						
A DPIP/FPPO			Closely Related to a DPIP/FPPO		Closely Associated to a DPIP/FPPO	
List all known business interests, in which a DPIP/FPPO may have a direct/indirect interest or significant participation or involvement.						
No	Name of Entity / Business	Role in the Entity / Business (Nature of interest/ Participation)	Shareholding %	Registration Number	Status (Mark the applicable option with an X)	
					Active	Non-Active
1						
2						
3						

Respondents declaring a commercial relationship with a DPIP or FPPO are to note that Transnet is required to annually publish on its website a list of all business contracts entered into with DPIP or FPPO. This list will include successful Respondents, if applicable.

4 Returnable Documents

Returnable Documents means all the documents, Sections and Annexures, as listed in the tables below. There are three types of returnable documents as indicated below and Respondents are urged to ensure that these documents are returned with their bids based on the consequences of non-submission as indicated below:

Mandatory Returnable Documents	<i>Failure to provide all these Mandatory Returnable Documents at the Closing Date and time of this RFQ <u>will</u> result in a Respondent's disqualification.</i>
Returnable Documents Used for Scoring	<i>Failure to provide all Returnable Documents used for purposes of scoring a bid, by the closing date and time of this bid will not result in a Respondent's disqualification. However, Bidders will receive an automatic score of zero for the applicable evaluation criterion.</i>
Essential Returnable Documents	<i>Failure to provide essential Returnable Documents <u>will</u> result in Transnet affording Respondents a further opportunity to submit by a set deadline. Should a Respondent thereafter fail to submit the requested documents, this may result in a Respondent's disqualification.</i>

All Returnable Sections, as indicated in the header and footer of the relevant pages, must be signed, stamped and dated by the Respondent.

a) Mandatory Returnable Documents

Respondents are required to submit with their bid submissions the following **Mandatory Returnable Documents**, and also to confirm submission of these documents by so indicating [Yes or No] in the tables below:

Mandatory Returnable Documents	Submitted [Yes or No]
SECTION 4 : Quotation Form priced in full	

b) Returnable Documents Used for Scoring

In addition to the requirements of section (a) above, Respondents are further required to submit with their Proposals the following **Returnable Documents Used for Scoring** and also to confirm submission of these documents by so indicating [Yes or No] in the table below:

RETURNABLE DOCUMENTS USED FOR SCORING	SUBMITTED [Yes or No]
Respondent's valid proof of evidence to claim points for compliance with Specific Goals' requirements as stipulated in Section 7 of this RFQ	
B-BBEE Certificate / Sworn- Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC guideline	
Certified copy of ID Documents of the Owners and B-BBEE Certificate / Sworn-Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC guideline	

c) Essential Returnable Documents:

Over and the above the requirements of section (a) and (b) mentioned above, Respondents are further required to submit with their Proposals the following **Essential Returnable Documents** and also to confirm submission of these documents by so indicating [Yes or No] in the table below:

ESSENTIAL RETURNABLE DOCUMENTS & SCHEDULES	SUBMITTED [Yes or No]
SECTION 1: SBD1 Form	
SECTION 5: Certificate of Acquaintance with RFQ Documents	
SECTION 6: RFQ Declaration and Breach of Law Form	
SECTION 7: Specific Goals Claim Form	
SECTION 8: Protection of Personal Information	
CSD Registration report	

5 CONTINUED VALIDITY OF RETURNABLE DOCUMENTS

The successful Respondent will be required to ensure the validity of all returnable documents, including but not limited to its valid proof of B-BBEE status, for the duration of any contract emanating from this RFQ. Should the Respondent be awarded the contract [**the Agreement**] and fail to present Transnet with such renewals as and when they become due, Transnet shall be entitled, in addition to any other rights and remedies that it may have in terms of the eventual Agreement, to terminate such Agreement immediately without any liability and without prejudice to any claims which Transnet may have for damages against the Respondent.

SECTION 4

QUOTATION FORM

I/We _____

hereby offer to supply the goods/services at the prices quoted in the Price Schedule below, in accordance with the conditions related thereto.

I/We agree to be bound by those terms and conditions in:

- the Standard RFQ Terms and Conditions for the Supply of Goods or Services to Transnet; and
- any other standard or special conditions embodied in this Request for Quotation.

I/We accept that unless Transnet should otherwise decide and so inform me/us, this Quotation [and, if any, its covering letter and any subsequent exchange of correspondence], together with Transnet's acceptance thereof shall constitute a binding contract between Transnet and me/us. I/We further agree that if, after I/we have been notified of the acceptance of my/our Quotation, I/we fail to deliver the said goods/service/s within the delivery lead-time quoted, Transnet may, without prejudice to any other legal remedy which it may have, cancel the order and recover from me/us any expenses incurred by Transnet in calling for Quotations afresh and/or having to accept any less favourable offer.

Price Schedule

I/We quote as follows for the goods/services required, on a "delivered nominated destination" to be delivered at Sentrarrand Electrical Depot, including VAT:

Item No	Description of Item	Unit	Quantity	Rate	TOTAL PRICE OF ITEM [ZAR]
1	AC/DC Distribution Panels Kindly refer to detailed spec on Annexure A	Each	3		
TOTAL PRICE, exclusive of VAT:					
VAT 15% (if applicable)					
Unconditional Discount(s)					
Total Inclusive of VAT (where applicable)					

Delivery Lead-Time from date of purchase order: _____ **[days/weeks]**

Respondents are to note that Transnet will round off final pricing scores to the nearest 2 (two) decimal places.

Notes to Pricing:

- a) Respondents are to note that if the price offered by the highest scoring bidder is not market-related, Transnet may not award the contract to that Respondent. Transnet may-
 - (i) negotiate a market-related price with the Respondent scoring the highest points or cancel the RFQ;
 - (ii) if that Respondent does not agree to a market-related price, negotiate a market-related price with the Respondent scoring the second highest points or cancel the RFQ;
 - (iii) if the Respondent scoring the second highest points does not agree to a market-related price, negotiate a market-related price with the Respondent scoring the third highest points or cancel the RFQ.

If a market-related price is not agreed with the Respondent scoring the third highest points, Transnet must cancel the RFQ.

- b) All Prices must be quoted in South African Rand, inclusive of VAT
- c) Any disbursement not specifically priced for will not be considered/accepted by Transnet.
- d) To facilitate like-for-like comparison bidders must submit pricing strictly in accordance with this price schedule and not utilise a different format. Deviation from this pricing schedule will result in a bid being disqualified.
- e) Please note that should you have offered a discounted price(s), Transnet will only consider such price discount(s) in the final evaluation stage if offered on an unconditional basis.

SECTION 5

CERTIFICATE OF ACQUAINTANCE WITH RFQ DOCUMENTS

By signing this certificate the Respondent is deemed to acknowledge that he/she has made himself/herself thoroughly familiar with, and agrees with all the conditions governing this RFQ. This includes those terms and conditions contained in any printed form stated to form part hereof, including but not limited to the documents stated below. As such, Transnet will recognise no claim for relief based on an allegation that the Respondent overlooked any such term or condition or failed properly to take it into account in calculating tendered prices or any other purpose:

1. Transnet's General Bid Conditions
2. Standard RFQ Terms and Conditions for the supply of Goods or Services to Transnet
3. Transnet's Supplier Integrity Pact
4. Non-disclosure Agreement

Note: Should a Respondent be successful and awarded the bid, they will be required to complete a Supplier Declaration Form for registration as a vendor onto the Transnet vendor master database.

Should the Bidder find any terms or conditions stipulated in any of the relevant documents quoted in the RFQ unacceptable, it should indicate which conditions are unacceptable and offer alternatives by written submission on its company letterhead, attached to its submitted Bid. Any such submission shall be subject to review by Transnet's Legal Counsel who shall determine whether the proposed alternative(s) are acceptable or otherwise, as the case may be. A material deviation from the Standard terms or conditions could result in disqualification.

Bidders accept that an obligation rests on them to clarify any uncertainties regarding any bid to which they intend to respond, before submitting the bid. The Bidder agrees that he/she will have no claim or cause of action based on an allegation that any aspect of this RFQ was unclear but in respect of which he/she failed to obtain clarity.

The bidder understands that his/her Bid will be disqualified if this Certificate of Acquaintance with RFQ documents included in the RFQ as a returnable document, is found not to be true and/ or complete in every respect.

SIGNED at _____ on this ____ day of _____ 20__

SIGNATURE OF WITNESSES

ADDRESS OF WITNESSES

1 _____

Name _____

2 _____

Name _____

SIGNATURE OF RESPONDENT'S AUTHORISED REPRESENTATIVE: _____

NAME: _____

DESIGNATION: _____

SECTION 6

RFQ DECLARATION AND BREACH OF LAW FORM

NAME OF ENTITY: _____

We _____ do hereby certify that:

1. Transnet has supplied and we have received appropriate responses to any/all questions [as applicable] which were submitted by ourselves for RFQ Clarification purposes;
2. We have received all information we deemed necessary for the completion of this Request for Quotation [**RFQ**];
3. We have been provided with sufficient access to the existing Transnet facilities/sites and all relevant information relevant to the Supply of the Goods as well as Transnet information and Employees, and have had sufficient time in which to conduct and perform a thorough due diligence of Transnet's operations and business requirements and assets used by Transnet. Transnet will therefore not consider or permit any pre- or post-contract verification or any related adjustment to pricing, service levels or any other provisions/conditions based on any incorrect assumptions made by the Respondent in arriving at his Bid Price.
4. At no stage have we received additional information relating to the subject matter of this RFQ from Transnet sources, other than information formally received from the designated Transnet contact(s) as nominated in the RFQ documents;
5. We have complied with all obligations of the Bidder/Supplier as indicated in the Transnet Supplier Integrity Pact which includes but are not limited to ensuring that we take all measures necessary to prevent corrupt practices, unfairness and illegal activities in order to secure or in furtherance to secure a contract with Transnet;
6. We are satisfied, insofar as our entity is concerned, that the processes and procedures adopted by Transnet in issuing this RFQ and the requirements requested from Bidders in responding to this RFQ have been conducted in a fair and transparent manner;
7. We declare that a family, business and/or social relationship **exists / does not exist** [delete as applicable] between an owner / member / director / partner / shareholder of our entity and an employee or board member of Transnet including any person who may be involved in the evaluation and/or adjudication of this Bid;
8. We declare that an owner / member / director / partner / shareholder of our entity **is / is not** [delete as applicable] an employee or board member of the Transnet;
9. In addition, we declare that an owner / member / director / partner / shareholder/employee of our entity **has / has not been** [delete as applicable] a former employee or board member of Transnet in the past 10 years. I further declare that if they were a former employee or board member of Transnet in the past 10 years that they **were/were not** involved in the bid preparation or had access to the information related to this RFQ; and
10. If such a relationship as indicated in paragraph 7, 8 and/or 9 exists, the Respondent is to complete the following section:

FULL NAME OF OWNER/MEMBER/DIRECTOR/
PARTNER/SHAREHOLDER/EMPLOYEE:

ADDRESS:

Indicate nature of relationship with Transnet:

[Failure to furnish complete and accurate information in this regard will lead to the disqualification of a response and may preclude a Respondent from doing future business with Transnet]. Information provided in the declarations may be used by Transnet and/or its affiliates to verify the correctness of the information provided.

11. We declare, to the extent that we are aware or become aware of any relationship between ourselves and Transnet [other than any existing and appropriate business relationship with Transnet] which could unfairly advantage our entity in the forthcoming adjudication process, we shall notify Transnet immediately in writing of such circumstances.

BIDDER'S DISCLOSURE (SBD4)

12 PURPOSE OF THE FORM

12.1 Any person (natural or juristic) may make an offer or offers in terms of this invitation to bid. In line with the principles of transparency, accountability, impartiality, and ethics as enshrined in the Constitution of the Republic of South Africa and further expressed in various pieces of legislation, it is required for the bidder to make this declaration in respect of the details required hereunder.

12.2 Where a person/s are listed in the Register for Tender Defaulters and / or the List of Restricted Suppliers, that person will automatically be disqualified from the bid process.

13 Bidder's declaration

13.1 Is the bidder, or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest¹ in the enterprise, employed by the state?

YES/NO

13.1.1. If so, furnish particulars of the names, individual identity numbers, and, if applicable, state employee numbers of sole proprietor/ directors / trustees / shareholders / members/ partners or any person having a controlling interest in the enterprise, in table below.

¹ the power, by one person or a group of persons holding the majority of the equity of an enterprise, alternatively, the person/s having the deciding vote or power to influence or to direct the course and decisions of the enterprise.

Full Name	Identity Number	Name of State institution

13.2 Do you, or any person connected with the bidder, have a relationship with
any person who is employed by the procuring institution?

YES/NO

13.2.1. If so, furnish particulars:

.....
.....

13.3 Does the bidder or any of its directors / trustees / shareholders / members /
partners or any person having a controlling interest in the enterprise have any
interest in any other related enterprise whether or not they are bidding for this
contract?

YES/NO

13.3.1. If so, furnish particulars:

.....
.....

14 DECLARATION

I, the undersigned, (name)..... in submitting the accompanying
bid, do hereby make the following statements that I certify to be true and complete in every respect:

14.1 I have read and I understand the contents of this disclosure;

14.2 I understand that the accompanying bid will be disqualified if this disclosure is found not to be true
and complete in every respect;

14.3 The bidder has arrived at the accompanying bid independently from, and without consultation,
communication, agreement or arrangement with any competitor. However, communication between
partners in a joint venture or consortium² will not be construed as collusive bidding.

² Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital,
efforts, skill and knowledge in an activity for the execution of a contract.

- 14.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications, prices, including methods, factors or formulas used to calculate prices, market allocation, the intention or decision to submit or not to submit the bid, bidding with the intention not to win the bid and conditions or delivery particulars of the products or services to which this bid invitation relates.
- 14.5 The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.
- 14.6 There have been no consultations, communications, agreements or arrangements made by the bidder with any official of the procuring institution in relation to this procurement process prior to and during the bidding process except to provide clarification on the bid submitted where so required by the institution; and the bidder was not involved in the drafting of the specifications or terms of reference for this bid.
- 14.7 I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

I CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 12, 13 and 14 ABOVE IS CORRECT.

I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS OF PARAGRAPH 6 OF PFMA SCM INSTRUCTION 03 OF 2021/22 ON PREVENTING AND COMBATING ABUSE IN THE SUPPLY CHAIN MANAGEMENT SYSTEM SHOULD THIS DECLARATION PROVE TO BE FALSE.

BREACH OF LAW

12. We further hereby certify that *I/we **have/have not been*** [delete as applicable] 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. This includes the imposition of an administrative fine or penalty.

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.

SIGNED at _____ on this ____ day of _____ 20__

For and on behalf of _____ duly authorised hereto	AS WITNESS:
Name:	Name:
Position:	Position:
Signature:	Signature:
Date:	Registration No of Company/CC _____
Place:	Registration Name of Company/CC _____

SECTION 7: SPECIFIC GOALS POINTS CLAIM FORM

This preference form must form part of all bids invited. It contains general information and serves as a claim for preference points for specific goals Contribution. Transnet will award preference points to companies who provide valid proof of evidence of as per the table below.

NB: BEFORE COMPLETING THIS FORM, BIDDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF SPECIFIC GOALS, AS PRESCRIBED IN THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT, 2000.

1. GENERAL CONDITIONS

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

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

1.2 The value of this bid is estimated to not exceed R50 000 000 (all applicable taxes included) and therefore the 80/20 preference point system shall be applicable. Despite the stipulated preference point system, Transnet shall use the lowest acceptable bid to determine the applicable preference point system in a situation where all received acceptable bids are received outside the stated preference point system.

1.3 The 80/20 preference point system will be applicable to this tender.

1.4 Preference points for this bid shall be awarded for:

- (a) Price;
- (b) B-BBEE Status Level of Contribution.
- (c) Any other specific goal determined in Transnet preferential procurement policy.

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

	POINTS
PRICE	80
SPECIFIC GOALS B-BBEE and, >50% Black Youth Owned Entities	20
Total points for Price and Specific Goals must not exceed	100

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

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

2. DEFINITIONS

- (a) **"all applicable taxes"** includes value-added tax, pay as you earn, income tax, unemployment insurance fund contributions and skills development levies;
- (b) **"B-BBEE"** means broad-based black economic empowerment as defined in section 1 of the Broad-Based Black Economic Empowerment Act;
- (c) **"B-BBEE status level of contributor"** means the B-BBEE status received by a measured entity based on its overall performance using the relevant scorecard contained in the Codes of Good Practice on Black Economic Empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act;
- (d) **"bid"** means a written offer in a prescribed or stipulated form in response to an invitation by an organ of state for the supply/provision of services, works or goods, through price quotations, advertised competitive bidding processes or proposals;
- (e) **"Broad-Based Black Economic Empowerment Act"** means the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- (f) **"EME"** means an Exempted Micro Enterprise as defines by Codes of Good Practice under section 9 (1) of the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- (g) **"functionality"** means the ability of a bidder to provide goods or services in accordance with specification as set out in the bid documents;
- (h) **"Price"** includes all applicable taxes less all unconditional discounts.
- (i) **"Proof of B-BBEE Status Level of Contributor"** means:
 - 1) B-BBEE status level certificate issued by an unauthorised body or person;
 - 2) A sworn affidavit as prescribed by the B-BBEE Codes of Good Practice;
 - 3) Any other requirement prescribed in terms of the B-BBEE Act.
- (j) **"QSE"** means a Qualifying Small EEnterprise in terms of a Codes of Good Practice under section 9 (1) of the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- (k) **"rand value"** means the total estimated value of a contract in South African currency, calculated at the time of bid invitations, and includes all applicable taxes and excise duties.
- (l) **"Specific goals"** means targeted advancement areas or categories of persons or groups either previously disadvantaged or falling within the scope of the Reconstruction and Development Programme identified by Transnet to be given preference in allocation of procurement contracts in line with section 2(1) of the PPPFA.

3. POINTS AWARDED FOR PRICE

3.1 THE 80/20 PREFERENCE POINT SYSTEMS

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

80/20

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

Where

P_s = Points scored for comparative price of bid under consideration

Pt = Comparative price of bid under consideration

Pmin = Comparative price of lowest acceptable bid

In terms of Transnet Preferential Procurement Policy (TPPP) and Procurement Manuals, the following preference points must be awarded to a bidder who provides the relevant required evidence for claiming points

3.2

Selected Specific Goal	Number of points allocated (20)
B-BBEE Level of contributor – Level 1 or 2	10
>50% Black Youth Owned Entities	10
Non-Compliant and/or B-BBEE Level 3-8 contributors	0

4. EVIDENCE REQUIRED FOR CLAIMING SPECIFIC GOALS

4.1 In terms of Transnet Preferential Procurement Policy (TPPP) and Procurement Manuals, preference points must be awarded to a bidder for providing evidence in accordance with the table below:

Specific Goals	Acceptable Evidence
B-BBEE	B-BBEE Certificate / Sworn- Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC guideline
>50% Black Youth Owned Entities	Certified copy of ID Documents of the Owners and B-BBEE Certificate / Sworn- Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC guideline

4.2 The table below indicates the required proof of B-BBEE status depending on the category of enterprises:

Enterprise	B-BBEE Certificate & Sworn Affidavit
Large	Certificate issued by SANAS accredited verification agency
QSE	Certificate issued by SANAS accredited verification agency Sworn-Affidavit signed by the authorised QSE representative and attested by a Commissioner of Oaths confirming annual turnover and black ownership (only black-owned QSEs - 51% to 100% Black owned) [Sworn- affidavits must substantially comply with the format that can be obtained on the DTI's website at www.dti.gov.za/economic_empowerment/bee_codes.jsp .]
EME ³	Sworn-Affidavit signed by the authorised EME representative and attested by a Commissioner of Oaths confirming annual turnover and black ownership Certificate issued by CIPC (formerly CIPRO) confirming annual turnover and black ownership Certificate issued by SANAS accredited verification agency only if the EME is being measured on the QSE scorecard

4.3 A trust, consortium or joint venture (including unincorporated consortia and joint ventures) must submit a consolidated B-BBEE Status Level verification certificate for every separate bid.

- 4.4 Tertiary Institutions and Public Entities will be required to submit their B-BBEE status level certificates in terms of the specialized scorecard contained in the B-BBEE Codes of Good Practice.
- 4.5 A person will not be awarded points for B-BBEE status level if it is indicated in the bid documents that such a bidder intends sub-contracting more than 25% of the value of the contract to any other enterprise that does not qualify for at least the points that such a bidder qualifies for, unless the intended sub-contractor is an EME that has the capability and ability to execute the sub-contract.
- 4.6 A person awarded a contract may not sub-contract more than 25% 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 sub-contracted to an EME that has the capability and ability to execute the sub-contract.
- 4.7 Bidders are to note that the rules pertaining to B-BBEE verification and other B-BBEE requirements may be changed from time to time by regulatory bodies such as National Treasury or the DTI. It is the Bidder's responsibility to ensure that his/her bid complies fully with all B-BBEE requirements at the time of the submission of the bid.

5. BID DECLARATION

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

6. B-BBEE STATUS LEVEL OF CONTRIBUTION CLAIMED IN TERMS OF PARAGRAPHS 6.1

- 6.1 B-BBEE Status Level of Contribution: . =

6.2

(Points claimed in respect of paragraph 6.1 must be in accordance with the table reflected in table 3.2 and must be substantiated by relevant proof of B-BBEE status level of contributor.

7. SUB-CONTRACTING

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

(*Tick applicable box*)

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

- 7.1.1 If yes, indicate:

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

(*Tick applicable box*)

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

- v) Specify, by ticking the appropriate box, if subcontracting with any of the enterprises below:

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

Any QSE		
---------	--	--

8. DECLARATION WITH REGARD TO COMPANY/FIRM

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

8.2 VAT registration number:.....

8.3 Company registration number:.....

8.4 TYPE OF COMPANY/ FIRM

- ☐ Partnership/Joint Venture / Consortium
- ☐ One person business/sole propriety
- ☐ Close corporation
- ☐ Company
- ☐ (Pty) Limited

[TICK APPLICABLE BOX]

8.5 DESCRIBE PRINCIPAL BUSINESS ACTIVITIES

.....

.....

8.6 COMPANY CLASSIFICATION

- ☐ Manufacturer
- ☐ Supplier
- ☐ Professional service provider
- ☐ Other service providers, e.g. transporter, etc.

[TICK APPLICABLE BOX]

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

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

- i) The information furnished is true and correct;
- ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;
- iii) In the event of a contract being awarded as a result of points claimed as shown in paragraph 6.1, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claims are correct;
- iv) If specific goals have been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the purchaser may, in addition to any other remedy it may have-
 - (a) disqualify the person from the bidding process;
 - (b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;
 - (c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
 - (d) if the successful bidder subcontracted a portion of the bid to another person without disclosing it, Transnet reserves the right to penalise the bidder up to 10 percent of the value of the contract;
 - (e) recommend that the bidder or contractor, its shareholders and directors, or only

the shareholders and directors who acted on a fraudulent basis, be restricted by the National Treasury from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and

- (f) forward the matter for criminal prosecution.

WITNESSES

1.
2.

.....

SIGNATURE(S) OF BIDDERS(S)

DATE:

ADDRESS

.....

SECTION 8

PROTECTION OF PERSONAL INFORMATION

1. The following terms shall bear the same meaning as contemplated in Section 1 of the Protection of Person information act, No.4 of 2013.("POPIA"):

consent; data subject; electronic communication; information officer; operator; person; personal information; processing; record; Regulator; responsible party; special information; as well as any terms derived from these terms.
2. Transnet will process all information by the Respondent in terms of the requirements contemplated in Section 4(1) of the POPIA:

Accountability; Processing limitation; Purpose specification; Further processing limitation; Information quality; Openness; Security safeguards and Data subject participation.
3. The Parties acknowledge and agree that, in relation to personal information that will be processed pursuant to this RFQ, the Responsible party is "Transnet" and the Data subject is the "Respondent". Transnet will process personal information only with the knowledge and authorisation of the Respondent and will treat personal information which comes to its knowledge as confidential and will not disclose it, unless so required by law or subject to the exceptions contained in the POPIA.
4. Transnet reserves all the rights afforded to it by the POPIA in the processing of any of its information as contained in this RFQ and the Respondent is required to comply with all prescripts as detailed in the POPIA relating to all information concerning Transnet.
5. In responding to this bid, Transnet acknowledges that it will obtain and have access to personal information of the Respondent. Transnet agrees that it shall only process the information disclosed by Respondent in their response to this bid for the purpose of evaluating and subsequent award of business and in accordance with any applicable law.
6. Transnet further agrees that in submitting any information or documentation requested in this RFQ, the Respondent is consenting to the further processing of their personal information for the purpose of, but not limited to, risk assessment, assurances, contract award, contract management, auditing, legal opinions/litigations, investigations (if applicable), document storage for the legislatively required period, destruction, de-identification and publishing of personal information by Transnet and/or its authorised appointed third parties.
7. Furthermore, Transnet will not otherwise modify, amend or alter any personal data submitted by the Respondent or disclose or permit the disclosure of any personal data to any third party without the prior written consent from the Respondent. Similarly, Transnet requires the Respondent to process any personal information disclosed by Transnet in the bidding process in the same manner.
8. Transnet shall, at all times, ensure compliance with any applicable laws put in place and maintain sufficient measures, policies and systems to manage and secure against all forms of risks to any information that may be

shared or accessed pursuant to this RFQ (physically, through a computer or any other form of electronic communication).

9. Transnet shall notify the Respondent in writing of any unauthorised access to information, cybercrimes or suspected cybercrimes, in its knowledge and report such crimes or suspected crimes to the relevant authorities in accordance with applicable laws, after becoming aware of such crimes or suspected crime. The Respondent must take all necessary remedial steps to mitigate the extent of the loss or compromise of personal information and to restore the integrity of the affected personal information as quickly as is possible.
10. The Respondent may, in writing, request Transnet to confirm and/or make available any personal information in its possession in relation to the Respondent and if such personal information has been accessed by third parties and the identity thereof in terms of the POPIA. The Respondent may further request that Transnet correct (excluding critical/mandatory or evaluation information), delete, destroy, withdraw consent or object to the processing of any personal information relating to the Respondent in Transnet's possession in terms of the provision of the POPIA and utilizing Form 2 of the POPIA Regulations.
11. In submitting any information or documentation requested in this RFQ, the Respondent is hereby consenting to the processing of their personal information for the purpose of this RFQ and further confirming that they are aware of their rights in terms of Section 5 of POPIA

Respondents are required to provide consent below:

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

12. Further, the Respondent declares that they have obtained all consents pertaining to other data subject's personal information included in its submission and thereby indemnifying Transnet against any civil or criminal action, administrative fines or other penalty or loss that may arise as a result of the processing of any personal information that the Respondent submitted.
13. The Respondent declares that the personal information submitted for the purpose of this RFQ is complete, accurate, not misleading, is up to date and may be updated where applicable.

Signature of Respondent's authorised representative: _____

Should a Respondent have any complaints or objections to processing of its personal information, by Transnet, the Respondent can submit a complaint to the Information Regulator on <https://www.justice.gov.za/inforeg/>, click on contact us, click on complaints.IR@justice.gov.za

ANNEXURE A



A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

TRANSNET FREIGHT RAIL'S REQUIREMENTS FOR THE INSTALLATION OF ELECTRICAL EQUIPMENT FOR 3kV DC TRACTION SUBSTATIONS

Author	Chief Engineering Technician Technology Management	B.L. Ngobeni
Approved:	Senior Engineer Technology Management	L.O. Borchard
Authorised:	Principal Engineer Technology Management	S.E. Sibande

Three handwritten signatures in black ink, each followed by a dotted line indicating the signature area. The signatures correspond to the authors and approvers listed in the table.

Date: 02 August 2016

Circulation Restricted To:

Transnet Freight Rail – Chief Engineer Infrastructure
- Technology Management

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SECTION 1: SUBSTATION DESIGN INFORMATION
1.0 SCOPE

- 1.1 This specification covers Transnet Freight Rail's requirements for the installation of electrical equipment in 3kV DC traction substations.
- 1.2 This specification should be read with the Scope of Work specification for each site/project and the applicable equipment specifications.
- 1.3 This specification also covers the requirements for the supply of security fencing, preparation of the High Voltage (HV) outdoor yard and the erection of all structural steelwork.

2.0 STANDARDS, PUBLICATIONS AND DRAWINGS

Unless otherwise specified this specification must be read in conjunction with the current edition of the relevant SANS, and Transnet Freight Rail's specifications.

2.1 SOUTH AFRICAN NATIONAL STANDARDS (SANS)

SANS 121:	Hot dip galvanized coatings for fabricated iron or steel articles. Specifications and test methods.
SANS 156:	Moulded-case Circuit Breakers.
SANS 780:	Distribution Transformers.
SANS 1019:	Standard voltages, currents and insulation levels for electricity supply.
SANS 1091:	National Colour Standard.
SANS 1222:	Enclosures for Electrical Equipment.
SANS 1339:	Cross-Linked Polyethylene (XLPE) - Insulated Electric cables for rated voltages (3,8/6,6kV to 19/33kV)
SANS 1431:	Weldable structural steels.
SANS 1507:	Electric cables with extruded solid dielectric insulation for fixed installations. (300/500V to 1900/3,300V) Part 1
SANS 10142-1:	The wiring of premises. Part 1
SANS 61869-2:	Instrument Transformers Part 2. Current Transformers.

2.2 TRANSNET FREIGHT RAIL SPECIFICATIONS/ ENGINEERING INSTRUCTIONS

CEE.0023:	Transnet Freight Rail's requirement for the installation of low and medium voltage cables.
CEE.0045:	Painting of steel components of electrical equipment.
CEE.0099:	Specification for 3kV DC high speed circuit breakers for traction substations.
CEE.0227:	The manufacture of 3kV DC breaker cells and trucks.
BBB 0496:	3kV rectifier for traction substations.
BBB 0845:	Requirements for metal oxide surge arresters in accordance with SANS 60099-4.
BBB 1267:	Specification for Outdoor High Voltage Alternating Current Circuit Breaker in Accordance with SANS 62271-100.
BBB 1616:	450 Volt gas arrester spark gap for traction power supplies.
BBB 2502:	Requirements for battery charger for 3kV DC traction substations.

BBB 2721:	AC primary circuit breaker control panel and AC/DC distribution panel for 3kV traction substation.
BBB 3005:	3kV DC under voltage relay manufacturing specification.
BBB 3139:	Wave filters capacitors for 3kV DC traction substations.
BBB 3162:	Wave filter inductors for 3 kV DC traction substations.
BBB 3890:	Requirements for 1.8 milli Henry DC reactor for 3kV DC traction substations.
BBB4724:	Requirement for positive isolator for 3kV DC traction substations
BBB 5019:	Requirements for traction transformers for 3kV DC traction substations in accordance with SANS 60076
BBB 7842	Outdoor, High Voltage, Alternating Current Disconnectors combined with earthing switch.
BBC 0198:	Requirements for the supply of cables.
BBC 0330:	Isolation transformer.
BBD5994:	Technical Documentation Management Policy.

2.3 STATUTORY REQUIREMENTS

Occupational Health and Safety Act and Regulations, Act 85,1993

3.0 TENDERING PROCEDURES

- 3.1 Tenderers shall indicate clause-by-clause compliance with the specification as well as the relevant equipment 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.
- 3.2 The tenderer shall motivate a statement of non-compliance.
- 3.3 Tenderers shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.
- 3.4 Failure to comply with clauses 3.1, 3.2, and 3.3 could preclude a tender from consideration.

4.0 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.

5.0 ELECTRICAL SERVICE CONDITIONS

- 5.1 The incoming AC voltage can vary $\pm 5\%$ of the nominal system r.m.s voltage. Under crippled conditions the supply voltage can drop to as low as minus 15% of the nominal r.m.s voltage.
- 5.2 Frequency of the supply voltage is 50 ± 2.5 Hz.
- 5.3 The AC high voltage system shall be treated as effectively earthed unless otherwise specified.
- 5.4 The traction DC supply voltage is 3,15 kV DC nominal but can vary between 2,4kV and 3,9kV for sustained periods.
- 5.5 The 3kV DC equipment may be subjected to fault currents up to 30kA for 200 milli seconds.

6.0 GENERAL REQUIREMENTS

- 6.1 Equipment/Installations supplied shall be in terms of this specification. Deviations from the specification will not be allowed without the written consent of the Project Manager/Engineer.
- 6.2 Transnet Freight Rail reserves the right to subject material and equipment offered to test or inspection to verify compliance with the clauses of this specification, prior to adjudication or at any stage during manufacture.
- 6.3 The tenderer shall submit the layout drawings of equipment, electrical wiring schematics, and constructional designs to Transnet Freight Rail for design review.
- 6.4 The successful tenderer will be responsible for all costs caused by modifying or replacing equipment accepted by Transnet Freight Rail on the grounds of his statement of compliance and found by Transnet Freight Rail not to comply.
- 6.5 All equipment shall be adequately earthed, insulated, enclosed and interlocked to ensure the safety of staff as well as equipment.
- 6.6 The general design and layout of all equipment shall provide for easy access to all parts.
- 6.7 The equipment shall be installed in such a manner so as to limit fire damage, which may be caused by equipment failure, overheating or flashovers.
- 6.8 The substation control and protection circuits shall be designed and wired according to the fail-safe principle. Control equipment, contactors and relays shall de-energise under fault, power failure or alarm (flag) conditions.
- 6.9 No high voltage cables shall be laid in the same trench or duct as low voltage cables.

7.0 GENERAL DESIGN OF EQUIPMENT

- 7.1 This section covers substation equipment with electrical capacities between 3,0 MW and 6,0 MW.
- 7.2 The overload ratings of the rectifier units shall be:
 - 2 times full load for thirty minutes.
 - 3 times full load for one minute.
 - 3 ½ times full load for ten seconds.
- 7.3 The substation can either be a single unit or double unit substation. Each unit comprises of one set of high voltage AC switchgear, one rectifier transformer, and one rectifier assembly, connected for 6 or 12 pulse operation and protected by a AC primary circuit breaker.
- 7.4 For a double unit substation each unit shall have the overload rating as specified in clause 7.2.
- 7.5 Each substation unit shall be capable of operating independently to allow for maintenance, fault finding and servicing of the equipment.

8.0 INSULATION AND CLEARANCES FOR 3kV DC EQUIPMENT

- 8.1 All indoor equipment, which may be energised at a potential of more than 1,0kV shall be protected by, metal barriers, mesh type screens or panels.
- 8.2 The minimum clearance in air between the rectifier unit and any metal barriers, mesh type screens or panels shall not be less than 450mm.
- 8.3 All exposed electrical equipment and busbars connected between the rectifier transformer secondary and the rectifier cubicle(s), or between the rectifier cubicle(s), positive isolators, DC smoothing equipment or track breakers, which is at a potential above 1,0kV, shall be arranged so that there is a minimum clearance of 2,7 m from the lowest "live" high voltage connections and ground or the floor of the access way, unless suitably screened, or otherwise protected.
- 8.4 All nominal 1,5kV and 3kV insulation to earth shall be designed such that the complete rectifier assembly, when installed on site ready for commissioning, will successfully withstand a test voltage of 10,5kV, 50 Hz AC for one minute.
- 8.5 Where the equipment or subassemblies of the rectifier assembly is enclosed and insulated from the outer framework, the insulation between the equipment and outer framework shall withstand the test voltage of 10,5kV 50 Hz for one minute.

- 8.6 The clearance between the reactor and any metal frame shall not be less 100mm. The reactor must successfully withstand a test voltage of 10,5kV AC 50 Hz for one minute
- 8.7 The successful tenderer shall advise what precautions must be taken before undertaking the withstand insulation level voltage tests to avoid damage to the equipment.
- 8.8 Creepage distance of insulation and the required air clearances shall be as large as possible. The latter shall not be less than:
- Outdoors: 150mm between the transformer secondary busbars and any steelwork such as wall plates, screening etc.
 - Indoors: 100mm between the equipment at nominal 1,5kV or 3kV DC and negative busbars and panel steelwork, between the high voltage AC supply to the rectifier cubicles and panel steelwork, the equipment at nominal 3kV DC and negative busbars.

9.0 OUTDOOR CLEARANCES AND INSULATION LEVELS

- 9.1 The minimum safety outdoor earth clearances which shall be maintained between any live conductor or metal and earthed metal and the minimum clearances of power lines above ground are in accordance with the statutory requirements of clause 15.1 of the "Electrical Machinery Regulations" of the "Occupational Health and Safety Act and Regulations, Act 85,1993", and are tabled below: -

TABLE 1:

Highest phase-to-phase r.m.s voltage for equipment. (U_m)	24kV	36kV	48kV	72kV	100kV	145kV
Nominal system r.m.s. voltage. (U_n)	22kV	33kV	44kV	66kV	88kV	132kV
Minimum safety outdoor clearance	320mm	430mm	540mm	770mm	1000mm	1450mm
Minimum clearance of power lines above ground						
Outside security fence but within Transnet Freight Rail's reserve	5200mm	5300mm	5400mm	5700mm	5900mm	6300mm
Outside Transnet Freight Rail's reserve	5500mm	5500mm	5500mm	5700mm	5900mm	6300mm

- 9.2 In terms of Transnet Freight Rail's Electrical Safety Instructions the clearances between the nearest exposed electrical equipment and a restricted access way are tabled below: -

TABLE 2:

Highest phase-to-phase r.m.s voltage for equipment. (U_m)	24kV	36kV	48kV	72.5kV	100kV	145kV
Nominal system r.m.s. voltage. (U_n)	22kV	33kV	44kV	66kV	88kV	132kV
Restricted access way (Vertical height) *	2820mm	2930mm	3040mm	3270mm	3500mm	3950mm

*See clause 903.1.3 of "Transnet Freight Rail's Electrical Safety Instructions"

(The vertical heights in restricted access ways for the various system voltages are calculated by adding 2,5metres to the normal outdoor earth clearance for the different system voltages. Refer to Annexure 9.4 of Transnet Freight Rail's Electrical safety Instructions).

INSULATION LEVELS

- 9.2 For the medium and high voltage nominal r.m.s voltage systems on Transnet Freight Rail the recommended Insulation levels in accordance with SANS 1019 is tabled in table 3.

TABLE 3

Highest phase-to-phase r.m.s voltage for equipment. (U_m)	Nominal system r.m.s. voltage. (U_n)	Rated lightning impulse withstand voltage peak.	Rated short duration power- frequency withstand r.m.s voltage.
7,2 kV	6,6 kV	75 kV	22 kV
12 kV	11 kV	95 kV	28 kV
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 650 kV	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 3: Standard Voltages and insulation levels in accordance with SANS 1019:2008 [1]**SECTION 2: TRACTION SUBSTATION EQUIPMENT OUTDOOR YARD EQUIPMENT****10.0 METAL OXIDE SURGE ARRESTERS**

- 10.0 The contractor shall supply and install metal oxide gapless surge arresters in accordance with Transnet Freight Rail's specification BBB 0845.
- 10.1 The surge arresters shall be connected between each phase of the high voltage supply and substation main earth electrode/earth mat
- 10.2 The maximum protected distance from the main transformer bushing terminal to the surge arrester terminal shall be as indicated in table 4.

TABLE 4:

NOMINAL SYSTEM R.M.S VOLTAGE (kV)	MAXIMUM DISTANCE (Metres)
44kV	5
66kV	6
88kV	6
132kV	7

- 10.3 The neutrals of high voltage supplies are to be treated as effectively earthed unless otherwise specified.
- 10.4 For the installation of high voltage surge arresters on the main transformer, refer to Transnet Freight Rail's drawing BBB 0938
- 11.0 HIGH VOLTAGE AC DISCONNECTOR**
- The contractor shall supply and install the high voltage AC disconnecting switch in accordance with Transnet Freight Rail's specification BBB 7842.
- 12.0 HIGH VOLTAGE PRIMARY CIRCUIT BREAKER**
- The contractor shall supply and install the high voltage AC primary circuit breaker in accordance with Transnet Freight Rail's specification BBB 1267.
- 13.0 MAIN CURRENT TRANSFORMERS**
- 13.0 The main current transformers shall comply with the requirements of Transnet Freight Rail specification BBB 0937.
- 13.1 The main current transformers shall either be fitted in the high voltage bushings of the main traction transformer or shall be the freestanding post type current transformers install on the line side of the main traction transformer.
- 13.2 In the event of Eskom or Local Utility requiring three current transformers for metering purposes the successful contractor shall supply and install the additional current transformer.
- 13.3 The ratios, accuracy and burdens of the current transformers shall be in accordance with Transnet Freight Rail's Specification BBB 0937.
- 14.0 MAIN TRACTION TRANSFORMER**
- 14.1 The contractor shall be responsible for the delivery, assembling, filling of transformer oil and installation on site of the main traction transformer in accordance with Transnet Freight Rail's Specification BBB 5019.
- 15.0 AUXILIARY TRANSFORMER**
- 15.1 The contractor shall make provision for the supply of an auxiliary transformer which shall comply with the requirements of SANS.780
- 15.1.1 The auxiliary transformer shall be three phase with a minimum rating of 50kVA or higher depending on the substation requirements.
- 15.1.2 The 3 phase auxiliary transformer shall be supplied from the tertiary winding of the main traction transformer
- 15.1.3 The auxiliary transformer shall be the sealed unit type suitable for outdoor installation. Full details of the transformer shall be submitted.
- 15.2 In the case of a double unit substation one auxiliary transformer may be provided unless otherwise specified.
- 15.3 The secondary winding of the auxiliary transformer shall be star-connected.

- 15.4 The auxiliary transformer shall supply the required kVA rating without exceeding the permissible temperature rise laid down in SANS 780.
- 15.5 The nominal no-load secondary voltage of the auxiliary transformer shall be 400V three phase.
- 15.6 Off-load, externally operated tap changing gear shall be provided on the transformer, with tapplings to compensate for any change in the main transformer tapping.
- 15.7 All primary and secondary terminals, including the secondary neutral, shall be brought out through the transformer tank by means of bushing type terminals and shall be arranged for busbar/cable connections.

16.0 AUXILIARY TRANSFORMER PROTECTION

PRIMARY WINDING

- 16.0 The contractor shall make provision for overload protection of the primary winding. Refer to clause 8.8 of specification No BBB 2721.
- 16.1 The protection system shall consist of an approved type of overload relay with its associated current transformers.

16.2 SECONDARY WINDING

- 16.3 The contractor shall supply and install a three phase isolating and earthing switch for the secondary supply of the auxiliary transformer to the substation.
- 16.4 The isolating and earthing switch shall be fitted with mechanical interlocking of the key exchange type, which shall form part of the interlocking procedure for the substation. Refer to clauses 31.0 and 32.0 of this specification.

17.0 AC EARTH LEAKAGE CURRENT TRANSFORMER.

- 17.1 The contractor shall supply and install a bar primary current transformer for the AC earth leakage protection. The current transformer shall be installed on the support steel structure of the primary circuit breaker.
- 17.2 One terminal of the primary winding shall be connected to the primary circuit breaker frame and the other terminal shall be connected to the substation main earth electrode/mat. (Refer to drawing CEE-TBD-7 and BBB 3620).
- 17.3 The current transformer shall be class 10P10, ratio 50/5 or 100/5.
- 17.4 The current transformer shall be designed to withstand a test voltage of 2kV for 1 minute.

INDOOR EQUIPMENT

18.0 3kV DC RECTIFIER EQUIPMENT

- 18.1 The contractor shall supply and install 3kV DC rectifiers in accordance with Transnet Freight Rail's Specification BBB 0496.
- 18.2 Each rectifier unit and its associated control equipment shall be designed to form an independent unit.
- 18.3 The rectifier equipment shall be installed in screened bays fitted with gates.
- 18.4 The gates shall be fitted with mechanical interlocks of the key exchange type in accordance with clauses 31 and 32 of the specification.
- 18.5 The bay screens shall be constructed of approximately 25mm woven wire mesh or expanded metal fixed to tubular or angle iron frames complete with doors, pillars, gates etc.
- 18.6 The height of the screens and gates shall be similar to the height of the control panels but shall be not be less than 1,8 m.
- 18.7 In a double unit substation the rectifier units are referred to as the "A" and "B" units and shall be labelled as such.

- 18.8 It is required that each rectifier unit in a double unit substation can be isolated independently and earthed without shutting down the whole substation.
- 18.9 Individual rectifier units shall be screened from each other and from any other live common equipment. A mechanical key exchange interlocking system type in accordance with clauses 31 and 32 shall be fitted to ensure the safety of personnel working on the isolated rectifier equipment.
- 18.10 The rectifier units and bay screens shall be insulated from the floor.

19.0 3kV DC REACTOR

- 19.1 The contractor shall supply and install a 1.8 milli Henry 3kV DC air core reactor for each rectifier unit. The installation shall include the supply of all the required insulators, foundations, foundation bolts and fasteners.
- 19.2 The 3kV DC reactor shall be in accordance with Transnet Freight Rail's Specification BBB 3890.
- 19.3 The reactor shall be insulated from the substation floor by means of insulators.
- 19.4 Sufficient space shall be allowed for access to the reactor for maintenance and inspection purposes.

20.0 WAVE FILTER

- 20.1 The contractor shall supply and install the wave filter equipment in accordance with Transnet Freight Rail's specification BBB 3139 for wave filter capacitors and BBB 3162 for inductor coils.
- 20.2 A wave filter is connected in parallel with the rectifier output. The filter unit is a capacitive inductive circuit, which is tuned to resonate at specific harmonic frequencies.
- 20.3 The filter equipment shall be so designed that no individual harmonic voltage is greater than 2% of the output voltage.
- 20.4 The inductor coils shall have sufficient adjustment to compensate for change in the capacitance values due to ageing. Refer to Transnet Freight Rail's drawing BBB 3483 for assembly.
- 20.5 A 100 Ampere High Rupturing Capacity (H.R.C) fuse shall be fitted to protect the wave filter equipment.
- 20.6 The fuse holder shall be mounted on insulators.
- 20.7 The insulators shall be so designed that the flashover path is not less than 100mm and shall support the fuse at a distance of not less than 100mm from the bolts securing the base plate. The insulators shall have a minimum dry flashover value of 20kV.
- 20.8 Access to the wave filter equipment shall only be possible once the wave filter capacitors have been connected to rail, discharged and the primary circuit breaker tripped.
A 75 kilo Ohm resistor consisting of two 150 Kilo Ohm, 150 watt vitreous enamel resistors connected in parallel shall be provided for the discharging of the wave filter capacitors when the equipment is isolated and earthed.
- 20.9 The discharge resistors shall be mounted on a suitable insulation panel or bar, which shall be insulated for 3kV DC. A minimum clearance of 75mm must be provided between the terminals, and 100mm between any 3kV live portion of the equipment and earth.
- 20.10 The wave filter capacitors shall be earthed with 95mm² PVC insulated copper cables to the DC earth leakage system.
- 20.11 The wave filter equipment shall be housed in a separate explosion proof room or cubicle.

21.0 3kV DC POSITIVE ISOLATOR

- 21.1 The contractor shall supply and install the 3kV DC positive isolator in accordance with Transnet Freight Rail's specification BBB 4724.
- 21.2 The DC positive isolator metal cubicle/housing shall be insulated from the substation floor.

22.0 CONTROL PANELS

- 22.1 The contractor shall supply and install the AC primary circuit breaker control panel and the AC/DC distribution panel in accordance with Transnet Freight Rail's specification BBB 2721.

22.2 The control panels shall be insulated from the substation floor.

ELECTRONIC EQUIPMENT

22.3 The tenderer must be aware that high voltage surges and transient voltages can be induced in low voltage and control wiring due to switching and lightning. Special care shall be taken in the design and layout of the equipment to limit these voltages.

22.4 Electronic equipment shall suitably be protected against over voltages, surges and transients. Dehn type surge protection units or equivalent shall be used. Liberal use of metal oxide varistors is also encouraged.

23.0 BATTERIES

23.1 The contractor shall supply, install and commission a 53 cell 110 Volt Planté lead acid battery bank. The capacity of the battery can either be 100 Ampere hour rating, 200 Ampere hour rating or capacity dependant on the substation requirements.

The standard for the batteries shall be the 10-hour rate at 20°C. The battery shall be capable of delivering a minimum of 10 Amperes for 10 hours.

23.2 Batteries are installed in traction substations for control and protection purposes. The battery is used for the following functions:

- Tripping and closing of primary circuit breakers.
- Supply to protection relays.
- Closing and holding coil supply to DC high speed circuit breakers.
- 110 Volt supply to control panel.

24.0 BATTERY CHARGER

24.1 The contractor shall supply and install the battery charger in accordance with Transnet Freight Rail's specification BBB 2502.

24.2 The battery charger shall be insulated from the substation floor by means of "Marley" or "Lino" floor covering not less than 2mm thickness.

25.0 TRACK FEEDER HIGH SPEED CIRCUIT BREAKERS

25.1 The successful tenderer shall supply and install the required 3kV DC high speed circuit breakers in accordance with Transnet Freight Rail's specification CEE.0099 as well as with the following additional requirements:

25.2 The high-speed circuit breakers shall be of the conventional truck mounted type as commonly used by Transnet Freight Rail in the 3kV DC traction substations.

25.3 High-speed circuit breakers shall be fitted with an automatic reclosing feature, which provides for 1 (one) reclosure at 20 to 35 seconds interval. Refer to drawings CEE-TBP-35. "Connection diagram for the high speed circuit breaker and electronic control relay".
CEE-TBP-39."Circuit diagram for auto reclosure for the high speed circuit breaker.

25.4 Transnet Freight Rail shall provide the auto reclosure relays. The relays shall be wired by the contractor in accordance with the requirements of clause 25.3.

25.5 The high speed circuit breakers shall be complete in all respects. This shall include housings, rack out trucks, base rails, main and auxiliary contacts and flapper gear and any other fittings or equipment required for the correct operation of the high-speed circuit breakers.

25.6 The high-speed circuit breakers shall be racked into breaker cells, each having two fixed contacts mounted at the rear of the breaker cell. One contact is connected to the substation positive busbar and the other to a wall bushing mounted in the building outer wall.

25.7 All other items of material such as cell slabs, main busbars, earthing connections, wall bushing plates or blanking-off plates, control cables etc, shall be included in the tenderer's offer.

25.8 Transnet Freight Rail shall provide details of the wall plate frame and standard cell slabs where applicable.

- 25.9 Where access is possible to the rear of the high-speed circuit breakers (busbar chamber) access barriers shall be installed.
- 25.9.1 The barriers shall be fixed to angle iron frames with fasteners which only be removed with tools. Warning signs shall be fitted to the barriers.

26.0 MODULAR TYPE STEEL HOUSED HIGH SPEED CIRCUIT BREAKERS

- 26.1 Where tenderers offer modular type high-speed circuit breakers they shall submit full information, construction and dimensional drawings with their offer.
- 26.2 Transnet Freight Rail specification CEE.0227 shall be used as a guideline.
- 26.3 The tenderers must be fully aware that the requirements of Transnet Freight Rail's specification CEE.0099 are relevant.
- 26.4 Transnet Freight Rail reserves the right to accept or reject offers for equipment after consultation with tenderers. Transnet Freight Rail's Senior Engineer, Technology Management, shall approve all designs.
- 26.5 The modular type steel housings shall be insulated from the substation floor.

27.0 REGENERATIVE HIGH SPEED CIRCUIT BREAKER

- 27.1 At certain substations Transnet Freight Rail will require 3kV DC regenerative braking energy absorption equipment. If required the successful contractor shall supply the high speed circuit breaker for the protection of the regenerative braking equipment in accordance with Transnet Freight Rail's specification CEE.0099.

28.0 3kV DC UNDERVOLTAGE RELAY

- 28.1 The contractor shall supply and install a 3kV DC under-voltage relay with a high voltage potential divider in accordance with Transnet Freight Rail Specification BBB 3005 and shall provide the following:
- 28.2 Fibre optic technology must be used to provide galvanic isolation between the potential divider and the undervoltage relay.
- 28.3 The potential divider shall be mounted in the 3kV busbar chamber or in the high voltage compartment of the positive isolator cubicle in accordance with Transnet Freight Rail's Specification BBB 4724.
- 28.4 The potential divider shall be protected by an H.R.C fuse connected between the positive side of the 3kV DC supply and the input of the potential divider.
- 28.5 Insulation clearance shall be not less than 100mm. All normally live equipment on the potential divider shall withstand a test voltage of 10,5kV AC RMS 50 Hz for one minute to earth without breakdown.
- 28.6 If the undervoltage relay is wall mounted, an engraved warning label shall be fixed to the front of the undervoltage relay panel with the following warning:

WARNING

THE POSITIVE BUSBAR MUST BE ISOLATED AND EARTHED BEFORE WORK IS UNDERTAKEN ON THE UNDERVOLTAGE RELAY

- 28.7 The following connections shall consist of 95mm² cross-sectional area copper or copper equivalent conductors.
- Potential divider to negative busbar.
 - Resistor base plate to DC earth leakage busbar.
 - Relay metal case to DC earth leakage busbar.

SECTION 3: INSTALLATION**SUBSTATION EARTHING****29.0 INDOOR EARTHING****(REFER TO DRAWING CEE-TBD-0007)**

The successful contractor shall supply, install and comply with the following:

- 29.1. The supply and installation in the substation building of all earthing conductors for the earthing of all metal work which includes supporting frames, control panels, battery charger, positive isolator panel, track breaker cells, rectifier bay screens, chequer plates and metal bases of insulators mounted directly on the walls or floor etc.
- 29.2. The frames and bases of all items associated with the 3kV DC including the track feeder wall plates, shall be connected through the DC earth leakage relay to the negative busbar in accordance with Transnet Freight Rail's drawing CEE-TBD-0007.
- 29.3. The DC earth leakage relay and the installation thereof shall comply with the requirements specified in clause 8.6 of Transnet Freight Rail's specification BBB2721.
- 29.4. Earthing conductors which could be subjected to 3 kV DC faults caused by insulation breakdown, etc., shall be not less than 70mm² copper strap cross-sectional area or 95mm cross-sectional area PVC insulated stranded copper cable. Other earth conductors must have a minimum of 16mm² copper cross-sectional area.
- 29.5. The earthing system for the 3kV DC positive busbar chamber shall be supplied by the successful tenderer. The design of the system shall be in conjunction with Transnet Freight Rail staff.
- 29.6. The successful tenderer shall supply the portable earthing device and cables according to Transnet Freight Rail's requirements.
- 29.7. All connections to the DC earth leakage relay shall form part of a ring circuit for safety when part of the circuit is disconnected. Refer to drawing CEE-TBD-0007.
- 29.8. The earth conductors shall not be installed in such a manner as to bridge out the earth leakage relay.
- 29.9. The resistance between the DC earth leakage busbar and the substation main earth electrode/mat shall be not less than 25 ohms.
- 29.10. Holding-down bolts grouted in the floor shall not be in direct contact with reinforcing or in with the earth under the concrete floor in the substation.
- 29.11. Where mounting bolts are used for securing electrical equipment to the floor, these bolts must be insulated to prevent electrical contact with any reinforcing or floor.
- 29.11.1 The indoor substation equipment shall be earthed in groups as shown in Transnet Freight Rail's drawing CEE-TBD-0007.

30.0 OUTDOOR EARTHING**(DRAWING NO CEE-TBD-7 AND BBB 3620)**

The successful tenderer shall supply, install and comply with the following:

- 30.1 Outdoor yard earthing which includes earth spikes, trench earths, earth connections to the support steel structures and fence posts. The material used shall comply with Transnet Freight Rail's specification BBB 3059 and drawing BBB3620.
- 30.2 A rail-earth switch mounted on the gate that provides access to the outdoor yard and where applicable to the 3kV DC overhead feeder security area and provides all connections thereto.
- 30.3 In Transnet Freight Rail switchyards where the supply from the Electrical Utility is terminated on portal structures or where a flying busbar is provided the contractor shall earth these structures.
- 30.3.1 Install two 50mm² galvanised steel earth conductors, one each between the outside portal structure or flying busbar support and the gable of the substation building.

- 30.3.2 The earth conductor shall be suitably terminated and connected to the portal or flying busbar structures. A suitable bracket shall be supplied and mounted on the gable of the substation building. The earth conductors shall directly be terminated on the bracket and connected to the main earth electrode/mat.

Insulating of structures and electrical equipment.

- 30.3.3 The tenderer shall make provision for the insulating of the support steel structures for i.e. the primary circuit breaker, main current transformers and any other structure that is connected to the AC earth leakage system from the concrete foundation.
- 30.3.3.1 The insulating material shall be either the same material used for the insulating of the mast bases for the overhead track equipment or other insulating material that has been approved by Technology Management.
- 30.4. The tenderer shall make provision for the insulating of the base of the main traction transformer from the concrete plinth. Malthoid or any other approved insulation shall be used.

31.0 INTERLOCKING

GENERAL

- 31.1 The equipment for each substation shall include a mechanical interlocking system; preferably the "Castell" or other approved key type. Full details of the type offered instead of the "Castell" type shall be submitted with the tender.
- 31.2 The mechanical interlocking system must be designed to prevent access to the high voltage equipment whilst "live" and ensure that switching and isolating operations are carried out in the correct sequence.
- 31.3 All equipment shall be delivered with the necessary interlocks fitted.
- 31.4 It shall not be possible to operate the locks and release the keys in any but the correct sequence or in any position of the switches or gates, other than the fully "closed" or fully "open" position, as the case may be.
- 31.5 When a unit is switched to local condition and isolated, no remote switching from the control office shall be possible. Tenderers shall furnish full explanatory details of the arrangement whereby the foregoing provisions are met.
- 31.6 The track feeder breakers shall remain closed throughout the isolation procedure.

32.0 ISOLATING PROCEDURE

Sequence to isolate a single unit substation rectifier unit.

- 32.1 Trip high voltage AC circuit breaker.
- 32.2 Open high voltage AC disconnecting switch-key "1" released.
- 32.3 Remove key "1"- AC disconnecting switch locked in open and earthed position.
- 32.4 Use key "1" to operate auxiliary supply's three phase isolating and earthing switch - key "1" trapped - key "2" released.
- 32.5 Use key "2" to unlock DC positive isolating and earthing switch.
- 32.6 Open DC positive isolating and earthing - key "2" trapped - key "3" released. Remove key "3". DC positive isolating and earthing switch locked in open position.
- 32.7 Use key "3" to open rectifier unit bay gate (and DC smoothing reactor screen if required).
- 32.8 If a number of keys are required to open the rectifier cubicles, a key exchange system may be used.
- 32.9 Procedure is reversed to switch the rectifier unit back on load.
- 32.10 The number indicated for the keys are for single unit substations only. Where there are two units in one substation the numbers of keys for the two units shall be A1 and B1, A2, and B2, etc. It shall not be possible to exchange keys between any equipment on different units.

- 32.11 The foregoing sequence is given as a guide and may be altered to suit tenderer's equipment. The design shall be approved by Transnet Freight Rail.
- 32.12 Where the wave filter equipment is not located in the rectifier bay, the access to the equipment shall be mechanically interlocked and form part of the interlocking procedure.
- 32.13 Access to the wave filter shall only be possible once the positive isolator is earthed and the primary circuit breaker is tripped. Refer to clause 20.8
- 32.14 Any deviation from the above guideline must be approved by Transnet Freight Rail.
- 33.0 INDOOR CABLING, BUSBARS AND ASSOCIATED EQUIPMENT**
- The contractor shall supply and install the following:
- 33.1 All low voltage PVC insulated supply and control cables.
- 33.2 3kV DC copper cables and copper busbars from the Anode wall plate to the rectifier and from the rectifier equipment to the DC positive isolating switches, DC smoothing reactors, and main DC negative busbar. In the event of aluminium (grade 6063) being used the minimum size shall be 50mm x 25mm busbar.
- 33.3 Where required, the supply and fitting of hot dip galvanised anode wall plates in the wall of the substation building, at the rectifier bays. The wall plate galvanising shall comply with SANS 121.
- 33.3.1 Wall plates shall be fitted with wall bushings, one for each phase and the neutral.
- 33.3.2 Designs and drawings of the wall plate arrangement must be submitted for approval after adjudication of the tender.
- 33.4 The interconnecting busbars from the anode wall plate to the rectifier.
- 33.5 The main 3kV DC positive and negative copper busbars. Minimum dimension of busbars shall be 100mm X 10mm copper or 127mm X 12,5mm aluminium (grade 6063) busbar.
- 33.6 The 3kV DC output positive busbar system, which includes high-speed circuit breaker busbars, and where required the outgoing feeder cables between the high speed circuit breaker busbars and wall bushings.
- 33.7 Barriers in accordance with clause 8.0 where exposed busbars exist between the positive isolator and the DC track breaker positive, busbar.
- 33.8 Cables from the DC smoothing reactor or main positive busbar to the wave-filter equipment.
- 33.9 Control cables from the rectifier cubicles to their respective control panels.
- 33.10 Cables from the auxiliary equipment to the substation control panels.
- 33.11 Connections and cabling between control panels.
- 33.12 Cables between the 110V substation battery and the auxiliary DC panel (2 core, minimum 16mm²).
- 33.13 Cables (95mm² stranded copper) to the wave-filter room(s) for rail (negative) and DC earth leakage connections to wave-filter equipment.
- 33.14 Earthing cables (95mm² stranded copper) between the DC earth leakage busbar and substation negative busbar.
- 33.15 Two core 16mm² and multicore 2,5mm² cables between panel and high-speed 3kV DC circuit breakers.
- 33.16 Two core 6mm² cables between the 25A circuit breakers on the DC panel and the Electrical Supply Utility meter room. Make-off and connect at the DC panel only.
- 33.17 All other busbars and cables required for the interconnection of the substation indoor equipment.
- 33.18 Cable glands for the termination of the cables at the control panels and other equipment. Neoprene shrouds shall be fitted over the cable glands.

- 33.19 The maximum current density per square mm for open conductors shall not exceed 1.55 Ampere for copper and 1.0 Ampere for aluminium.
- 33.20 Low voltage cables for indoor use may be unarmoured.
- 33.21 All high voltage cables shall be armoured XLPE insulated and shall comply with SANS 1339 and Transnet Freight Rail specification BBC 0198. All wiring used on the 3kV DC equipment shall have nominal 3kV insulation unless the clearances comply with those laid down in clause 8.9.
- 33.22 All negative connections and terminals associated with high voltage circuits and which are accessible without first having to isolate and earth such high voltage circuits e.g. the main negative busbar, DC earth leakage relay, etc., shall be of 95mm², copper or copper equivalent cross-section. The terminals shall be painted red.
- 33.23 Notwithstanding the above clauses the contractor shall supply and install any other cables, conductors or busbars required for the successful operation of the substation.

33.24.0 BLOCK JOINTS

- 33.24.1 The contractor shall make block joints in the armouring of all the low voltage supply and control cables, which are connected between the indoor control equipment and the outdoor yard equipment.
- 33.24.2 The block joints shall be clearly visible and shall be not less than 200mm from the cable glands terminating at the outdoor equipment.
- 33.24.3 The block joints shall be sealed with a heat shrink covering to prevent the ingress of moisture.

33.25.0 CHEQUER PLATES

- 33.25.1 The contractor shall be responsible for the supply of all metal chequer plates required for covering of cable trenches inside the substation.
- 33.25.2 Earthing studs suitable for the fitting of 95mm² copper cable shall be welded to each chequer plate.

34.0 CABLES, BUSBARS AND CONNECTIONS (OUTDOOR)

The Contractor shall supply and install the following:

- 34.1 The Inter-connections cables or conductors in the High Voltage yard.
- 34.2 The high voltage AC connections which shall be solderless, concentric grip, or other approved solderless type. The connections must have adequate cross-sectional area to suit both electrical and mechanical requirements.
- 34.3 Copper busbars between separately mounted outdoor equipment. The busbars shall incorporate a degree of flexibility to avoid any overstressing of connections due to foundation movement and expansion or contraction.
- 34.4 All negative connections and terminals associated with high voltage circuits and which are accessible without first having to isolate and earth such high voltage circuits e.g. the main negative busbar shall be of 95mm², copper or copper equivalent cross-section. The terminals shall be painted red.
- 34.5 Copper busbars with removable flexible connections or “all aluminium” stranded conductor may be used interconnection conductors between the main traction transformer secondary bushings and the anode wall bushings which are fixed to the anode wall plate of the substation building.
- 34.5.1 Where “all aluminium conductors are to be installed the following sizes and number of conductors shall be installed:
- 2 X 800 mm² “all aluminium” stranded conductor per each phase for 6 MW substations, or 50mm X 25mm aluminium (grade 6063) busbar in accordance to Transnet freight rail drawing BBF1615
 - 2 X 800 mm² “all aluminium” stranded conductor per each phase for 4,5 MW substations, or 50mm X 25mm aluminium (grade 6063) busbar in accordance to Transnet freight rail drawing BBF1615.

- 2 X 500 mm² “all aluminium” stranded conductor per each phase for 3 MW substations, or 50mm X 25mm aluminium (grade 6063) busbar in accordance to Transnet freight rail drawing BBF1615.

- 34.5.2 Where two different conductor material joints are used, the Bi-Metallic plates shall be applied.
- 34.6 Conductors from the high voltage AC line aerial conductors and between the surge arresters, AC disconnecting switch, high voltage AC circuit breaker, current transformers, rectifier transformer and rectifier.
- 34.7 Cables or busbars from the rectifier transformer to the auxiliary transformer.
- 34.7.1 The auxiliary transformer shall be connected directly to the tertiary winding of the traction transformer for new installations or existing installations where tertiary windings are employed on the main traction transformer.
- 34.8 Cable from the auxiliary transformer secondary to the short-circuiting switch.
- 34.9 Control cables from the high voltage AC disconnecter, AC circuit breaker and main and auxiliary transformers to the substation control panels.
- 34.10 A multi-core 4mm² cable between the current transformers and the Electrical Supply Utility meter room. Make-off and connect at the current transformer only.
- 34.11 In the case of the Electrical Supply Utility Tee-supplies a multi-core 4mm² cable between the voltage transformers and the Electrical Supply Utility. The Electrical Supply Utility will do the cable connection.
- 34.12 In the case of the Electrical Supply Utility Duplicate Supplies one multi-core 4mm² cable between Transnet Freight Rail's high voltage AC circuit breaker and the Electrical Supply Utility meter room. (For interlocking Electrical Supply Utility M.O.D's). The cable shall have 10% spare cores.
- 34.13 A multi-core 2,5mm² cable between the tele-control remote terminals on the control panel and the electrical supply utility meter room. (For tele-control of the Electrical Supply Utility equipment). The cable shall have 10% spare cores.
- 34.14 All other cables as specified. e.g. security lighting and alarms.
- 34.15 All control cables, security and alarm cables shall be armoured cables.
- 34.16 Notwithstanding the clauses above the contractor shall be responsible for all cables, busbars and connections required for the successful operation of the 3kV DC traction substation.

35.0 LABELS AND TERMINALS

- 35.1 All labels shall be in English. All lettering shall be white on a black background. Lettering shall be a minimum of 6mm in height.
- 35.2 All labels shall be neatly secured by rivets or screws.
- 35.3 All conductors and cables shall be provided with identification tags at terminals.
- 35.4 All terminals and equipment such as switches and relays shall be suitably numbered according to the substation schematic and wiring diagrams. All terminal blocks and groups of terminal blocks shall be suitably numbered.

36.0 SUBSTATION NEGATIVE RETURN

The substations negative return system which can be in the form of the following:

- Buried XLPE insulated copper cable.
- Rail on sleepers.
- Aerial conductors.

36.1 BURIED XLPE INSULATED COPPER CABLE

- 36.1.1 The contractor shall install 2 x 500mm² single core XLPE copper cables from the substation negative busbar to the negative manhole situated near the railway line.
- 36.1.2 Transnet Freight Rail's staff will undertake the provision of the bare conductors from the negative manhole to track, as well as the rail connections.
- 36.1.3 The negative manhole to drawing CEE-TU-41 is to be supplied and installed by the contractor.
- 36.1.4 The negative return cables shall be laid, in 150mm of soft soil in a trench, at a depth of not less than 1000mm below ground level and spaced not less than 300mm between centres.
- 36.1.5 Where cables are likely to be damaged they shall be protected by concrete slabs. Refer to Transnet Freight Rail specification CEE.0023.
- 36.1.6 The cable route shall be provided with cable warning tape. Refer to Transnet Freight Rail specification CEE.0023.
- 36.1.7 The cable runs shall be marked by cable markers painted signal red. (Stores Item No 9/1503)

36.2 RAIL NEGATIVE RETURN.

- 36.2.1 Where rail is used for the negative return system Transnet Freight Rail shall supply and install the rail from the inside of the substation building to the railway track.
- 36.2.2 The rail shall be insulated from ground by means of concrete sleepers supplied by Transnet Freight Rail.
- 36.2.3 Where the rail enters the substation building it must be insulated from all concrete and brickwork to prevent stray current damage to building reinforcing or other metal. After installation the hole in the wall shall be sealed and made good by Transnet Freight Rail.
- 36.2.4 The rail shall be connected to negative output of the rectifier by means of a suitably rated busbar/cable supplied by the contractor. Transnet Freight Rail will make provision for terminations on the rail.
- 36.2.5 Transnet Freight Rail shall connect the negative return rail to the track by means of PVC insulated steel conductors.

36.3 NEGATIVE FEEDER MONITORING SYSTEM.

- 36.3.1 The contractor shall design supply and install a negative feeder monitoring system in accordance with Transnet Freight Rail specification BBB1843.
- 36.3.2 The negative feeder monitoring system shall be designed to trip the 3 kV DC track breakers in the event of the traction substation negative return circuit becoming open circuited due to cable theft of the negative return cables or other cause of failure of the negative return circuit.

36.4 AERIAL CONDUCTORS

- 36.4.1 Where aluminium conductors are installed; 2 X 800 mm² size for both 4.5 MW and 6 MW shall be used and 2 X 500 mm² for 3 MW substations.
- 36.4.2 Where aerial conductors are used for the negative return, the contractor shall provide the wall plates and wall bushings where required.
- 36.4.3 In the case of aerial conductors used for the negative return, Transnet Freight Rail shall provide the conductors and the installation.

37.0 3kV DC POSITIVE FEEDER CABLES

The positive feeder cables shall be either:

- Buried armoured medium voltage XLPE insulated cable.
- Aerial aluminium conductor

37.1 BURIED XLPE INSULATED CABLE

- 37.1.1 The contractor shall install two single core 6,6kV, 500mm² armoured medium voltage XLPE insulated cables with stranded copper conductors. The cables shall be manufactured with copper tape screen, armour and sheath in accordance with SANS 1339 and Transnet Freight Rail specification BBC 0198. The cables shall run from the high-speed circuit breaker busbar chamber to the associated track switch structure.
- 37.1.2 Tenderers are to allow for making off the cables with suitable terminations. Sufficient length of cable must be left buried at the base of the track switch structure for erection and connection to the track switch. Transnet Freight Rail will do connection to the track switch.
- 37.1.3 The medium voltage cables shall be laid in 150mm of soft soil, in a trench at a depth of not less than 1000mm below ground level and spaced not less than 300mm between centres.
- 37.1.4 Where cables are likely to be damaged they shall be protected by concrete slabs. Refer to Transnet Freight Rail specification CEE.0023.
- 37.1.5 The cable route shall be provided with cable warning tape. Refer to Transnet Freight Rail specification CEE.0023.
- 37.1.6 The cable runs shall be marked by cable markers painted white (Stores Item No 9/1539).
- 37.1.7 Should it be necessary for the cables to pass under the tracks suitable pipes will be installed by Transnet Freight Rail.
- 37.1.8 Where required, the contractor shall supply the necessary wall bushings for positive feeder cables.

37.2 AERIAL CONDUCTOR

- 37.2.1 In the case of aerial conductors used for the positive feeders, Transnet Freight Rail shall make provision for conductors and installation.
- 37.2.2 Where aerial conductors are used for the 3kV DC positive, the contractor shall provide the wall plates and wall bushings.

38.0 TRENCHING FOR OUTDOOR YARD EARTHING CONDUCTORS AND CONTROL CABLES

- 38.1 Before any trenching commences the contractor shall consult with Transnet Freight Rail staff for approval of the routing of the trenches in the outdoor yard.
- 38.2 In existing substation outdoor yards the contractor shall remove the necessary crusher stone in the outdoor yard before any excavation commences. The contractor shall restore the crusher stone after the completion of the work.
- 38.3 Trenching includes all trenches required for the installation of the earthing system and control cables.
- 38.4 The depth of trenches shall not be less than 700 millimetres.
- 38.5 With the installation of new earthing conductors and control cables at existing substations, care must be taken not to damage existing cables in the high voltage outdoor yard during trenching operations.
- 38.6 The Contractor and Transnet Freight Rail staff shall inspect the trenches before and during the installation of the earthing system and control cables.
- 38.7 Before the trenches are closed a representative from Transnet Freight Rail shall inspect the earthing system and other cabling for damage.

39.0 FOUNDATIONS.

- 39.1 The successful tenderer shall be responsible for the design and casting of foundations for the portal and support structures in the traction substation high voltage outdoor yard.
- 39.2 Notwithstanding the supply arrangements (single or double) at any particular substation, tenderers shall clearly understand that all foundations and steelwork to accommodate the supply and to cater for the traction yard are to be provided and erected by the successful tenderer.

- 39.3 Wherever there is a combined traction and 11kV/6,6kV distribution yard, a flying busbar is to be provided in Transnet Freight Rail's yard. All foundations and steelworks required to suit this arrangement, including the erection and earthing thereof shall be included in tenderer's offers.
- 39.4 The foundations in the high voltage outdoor yard shall include the following:
- Voltage Transformers if applicable.
 - Surge arresters.
 - AC disconnectors.
 - Current transformers. (If applicable)
 - Primary circuit breakers.
 - Main traction transformer.
 - Auxiliary transformers.
 - Portal lattice structures as required.
 - Any other foundations as specified.
- 39.5 The successful tenderer shall carry out his own survey in regard to soil types and their load bearing capabilities.
- 39.6 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.
- 39.7 All foundation edges shall be bevelled, and the surfaces must be float finished.
- 39.8 All support foundations shall be at the same level.
- 39.9 The design of the concrete plinth for the main traction transformer shall include a concrete gutter around the perimeter of the plinth to contain any spillage of transformer oil.
- 39.10 Provision shall be made on the plinth for skid rails. The spacing of the rails between centres shall be a minimum of 1meter. Details of the design and load bearing parameters of the skid rail system, plinth and rail shall be submitted to Transnet Freight Rail for approval.
- 39.11 The auxiliary transformer if separate shall be provided with its own concrete plinth with a concrete gutter, or may be installed on the same plinth as the main traction transformer.
- 39.12 The 28-day strength of all concrete used shall be a minimum of 20Mpa.
- 39.13 Hand mixed concrete is not acceptable, it must be mechanically mixed.
- 40.0 SUPPORT STRUCTURES**
- 40.1 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.
- 40.2 Special attention shall be taken for the prevention of corrosion of all metallic parts.
- 40.3 The bases of insulators, studs, bolts, support structures and other parts made of ferrous material associated with the electrical connections outdoors, shall be hot-dip galvanised, in accordance with SANS 121.
- 40.4 Steelwork for outdoor installation in coastal areas, i.e., within 50km of the coast, shall first be hot-dip galvanised in accordance with SANS 121, followed immediately at the galvanising plant by the application of the Sterling paint system in accordance with specification CEE.0045.
- 40.5 Steelwork for outdoor installation in inland areas, i.e., at a distance greater than 50km from the coast, shall be hot-dip galvanised to SANS 121.
- 40.6 All high voltage equipment shall be provided with hot-dipped galvanised support structures or pedestals to provide a minimum clearance of 3,6 m (up to 88kV) or 4,1 m (above 88kV) from the lowest "live" high voltage connection to finished ground level.

40.7	Structural steel shall comply with SANS 1431.
40.8	All welded joints shall be seal welded with no gaps or blowholes.
40.9	All fasteners, nuts and bolts used for the installation of substation steelwork and equipment shall be hot dipped galvanized to prevent corrosion.
41.0	FENCING
41.1	The successful tenderer shall supply and install new perimeter fencing as specified.
41.2	The successful tenderer shall make provision for the levelling of outdoor yard if required.
41.3	The fencing shall be either of the following: <ul style="list-style-type: none"> • Concrete palisade fencing in accordance to drawing CEE-TDF- 0016. • Hot dipped galvanised steel palisade fencing with the minimum requirements of: Height 2,4 metres Size and thickness of pales 40mm x 40mm x 3mm thick. Corner and intermediate posts 100mm x100mm x 3mm. Horizontal cross bars 40mmx5mm.
41.3.1	The successful tenderer shall make provision for the installation of safety barriers in the high voltage yard in accordance with Transnet Freight Rail's requirements. (Refer to Transnet Freight Rail's Engineering instruction S.016)
41.3.2	The successful tenderer shall make provision for a metal barrier screen of 25mm-wire mesh or expanded metal to be constructed around the auxiliary transformer to prevent accidental contact.
41.3.3	The successful tenderer shall cast a concrete apron of 150mm wide x 300mm under the perimeter fences of the substation. The top of the apron shall be a minimum of 100 mm above the ground level.
42.0	GATES
42.1	The contractor shall supply and install two 4.6 metre wide X 2,4 metres minimum height lockable gates in the perimeter fence to allow for: <ul style="list-style-type: none"> • Entrance to substation building and yard. • Entrance to the high voltage outdoor yard adjacent to the main transformer (s).
42.2	The frame of the substation gate shall be 80 x 60 x 5mm
42.3	Where access to the HV outdoor yard is gained between the substation building and perimeter fence, a fence the same height as the perimeter fence shall be installed. A 1000mm wide lockable gate shall form part of the fence.
42.4	Provision must be made for the fitting of a spark gaps and rail earth switch on the HV yard small gate. Refer to drawings CEE-TBD-7 and BBB3620. The spark gaps shall be provided by Transnet Freight Rail on request.
42.5	Where steel palisade fencing is used the gates shall be connected to the fence support post by means of a flexible connection to prevent electrolytic corrosion of gate hinges.
42.6	Warning notices and danger signs in accordance with Transnet Freight Rail's Electrical Safety Instructions shall be fitted to the perimeter fencing and gates. This shall be provided by Transnet Freight Rail.
43.0	CRUSHER STONE AND WEED KILLER
43.1	After completion of construction, installation of equipment, the laying of all cables and earthing conductors, a suitable weed killer approved by the Technical Officer shall be applied in HV outdoor yard.
43.2	Great care shall be exercised to avoid contaminating private property and water supplies.
43.3	After treatment with the weed killer, a 100mm layer of 25mm crusher stone shall be laid over the whole area of the Transnet Freight Rail high voltage outdoor yard (within the apron).

44.0 PAINTING

44.1 All indoor and outdoor steelwork, metal screens and barriers shall be painted in accordance with Transnet Freight Rail's Specification CEE.0045.

44.2 The finishing coats for indoor equipment shall be in accordance with SANS 1091.

Metal Bay Screens - Eau-de-Nil (H43).

Support frameworks (indoor) - Eau-de-Nil (H43).

45.0 DISTRIBUTION, LIGHTING OF SUBSTATION BUILDING AND STANDBY 400V AUXILIARY SUPPLIES

45.1 The successful tenderer shall supply and install all light fittings, plugs, conduits, distribution boards, switches, cables and other material in accordance with SANS 10142-1. Galvanised, alternatively PVC conduit and galvanised fittings shall be provided at all substations within 50km of the coast.

45.2 The contractor shall furnish a certificate of compliance for the 400V/220V AC distribution and lighting of the traction substation signed by the accredited person in terms of SANS 10142-1 and who is registered with "Electrical Contracting Board".

45.3 Complete Layout drawing showing the position/type of light fittings, position of plugs, distribution board and switches to be submitted to Transnet Freight Rail for approval.

45.4 220V AC fluorescent light fittings shall be provided. The minimum lighting requirement shall be 100 lux in terms of the "Occupational Health and Safety Act".

11KV / 6,6KV TO 400V AUXILIARY SUPPLY AND CHANGE OVER SYSTEM.

45.5 Where specified a 11kV/6,6kV to 400V distribution transformer will be installed to supply the traction substation in the event of substation failure or when the substation is taken off load.

45.5.1 The 3 phase 400V supply from the above transformer shall be connected to the control circuitry via a automatic change over switching system.

45.5.2 The change over switching system shall be mechanically and electrically interlocked.

45.5.3 Transnet Freight Rail shall supply and install a suitably rated 4core armoured cable from the 11kV/6,6kV to 400V distribution transformer to the change over switching unit.

45.5.4 A 1:1 ratio isolation transformer shall be installed between the 11kV/6.6kV to 400V distribution transformer and change over switching system.

45.5.5 The isolation transformer shall comply with specification BBC 0330.

45.5.6 The successful tenderer shall supply the isolation transformer unless otherwise specified.

EMERGENCY LIGHTING.

45.6 Fluorescent light fittings with its own battery back up supply shall be supplied for emergency lighting.

45.6.1 A minimum of three fittings shall be installed in a single unit substation and four in a double unit substation.

45.6.2 The light fittings shall be installed at the following locations:

- In single unit substations two in the main walkway between the control panels and rectifier unit. One flameproof fitting in the battery room
- In a double unit substation three in the main walkway and one flameproof fitting in the battery room.
- In additional locations where requested by the Project Manager/Engineer.

45.6.3 The light switch shall be clearly labelled "EMERGENCY LIGHTNING".

MOULDED CASE CIRCUIT BREAKERS

- 45.7 All low voltage circuits and equipment shall be protected by moulded case circuit breakers, which comply with specification SANS 156.
- SECURITY LIGHTS**
- 45.8 Where outdoor security lights are specified 400W high-pressure sodium fittings shall be installed at locations specified by the "Scope of Work".
- 46.0 COOLING AND VENTILATION**
- 46.1 Where specified, 3 phase cooling fans shall be supplied and installed in the substation building.
- 46.2 The required filters, louvres and guards shall be provided and installed.
- 47.0 BATTERY ROOM**
- 47.1 A three/single phase non-sparking extraction fan shall be installed for the battery room.
- 47.2 Only Ex non-sparking light fittings shall be installed in the battery room.
- 47.3 Light switches and plug sockets shall not be installed in the battery room.
- 47.4 No-smoking, naked flames and hand protection warning signs shall be fitted to the battery room doors.
- 47.5 A wooden stand treated with acid proof paint shall be provided for the batteries.
- 47.6 A hydrometer and logbook shall be supplied by the contractor for each installation.
- 47.7 The floor of the battery room shall be painted with acid proof paint.
- 48.0 CLEARING OF SITE**
- 48.1 All rubble which is left over as a direct result of work performed by the Contractor shall be removed from the substation building and yard and disposed of by the Contractor. The substation floors and walls shall be left in a clean condition. All cable, wire and conductor cut-offs and surplus material shall be removed from site.
- SECTION 4: SITE TESTING AND COMMISSIONING**
- 49.0 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.
- 49.1 ON-SITE TESTS**
- 49.1.1 Functional on-site tests shall be conducted on all items of equipment, circuitry and interlocking to prove the proper functioning and installation thereof.
- 49.1.2 The successful tenderer shall submit a detailed list of on-site tests for the approval of the Project Manager/Engineer at least six weeks before tests are due to commence at the first substation.
- 49.1.3 The successful tenderer shall arrange for the Project Manager/Engineer or his representative to be present to witness the on-site tests at each substation.
- 49.1.4 On-site tests and subsequent commissioning shall 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.
- 49.1.5 On-site tests shall include the following;
- Polarity tests on all CT's.
 - Ratio tests on all 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.
- The operation of both mechanical and electrical interlocking.
- Tests on primary circuit breakers and other primary equipment in accordance with manufacturer's instructions.

- 49.1.6 At the completion of the on-site tests the Project Manager/Engineer 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.
- 49.1.7 Upon rectification of defects the successful tenderer shall arrange for the Project manager/Engineer or his representative to certify satisfactory completion of on-site tests for that particular substation.
- 49.1.8 Acceptance by the Project Manager/Engineer 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.

49.2 COMMISSIONING OF EQUIPMENT

- 49.2.1 Commissioning will include the energising of equipment from the AC disconnects to the OHTE track feeder switches. The successful tenderer must prove the satisfactory operation of all equipment under live conditions.
- 49.2.2 On completion of commissioning the successful tenderer will hand the substation over to the Project Manager/Engineer in terms of the relevant instructions.
- 49.2.3 Tenderers shall allow a period of at least three days per substation between satisfactory completion of on-site tests and commissioning of equipment.
- 49.2.4 During this period the Transnet Freight Rail's Test staff will test the operation of all protective relays and circuits and set the protection relays at each substation.
- 49.2.5 The contractor shall rectify any faults found during the testing and setting of the protection relays.
- 49.2.6 The final testing of the substation must commence at least three days ahead of the contract completion date.
- 49.2.7 The commissioning of the protection equipment by Transnet Freight Rail 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.
- 49.2.8 The commissioning dates for the substations will be dependent on the availability of power supplies from the supply utility as well as Transnet Freight Rail's electrification program and will be defined by the Project Manager/Engineer.

50.0 SECTION 5: GENERAL QUALITY ASSURANCE

- 50.1 Transnet Freight Rail reserves the right to carry out inspection and tests on the equipment at the works of the supplier/manufacturer.
- 50.2 Arrangements must be made timeously for such inspections and type/routine tests in accordance with the equipment specifications are carried out before delivery of the equipment to the site.

- 50.3 Type/routine test sheets of the equipment shall be forwarded to the Project Manager.

51.0 GUARANTEE AND DEFECTS

- 51.1 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.
- 51.2 The guarantee period shall commence from the date of successful commissioning of the substation.
- 51.3 The guarantee period for all substations shall expire after a period of 12 months commencing from the date of successful completion of the contract or the date the equipment is handed over to Transnet Freight Rail whichever is the later.

51.4 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.

51.5 The cost of training shall be included in the tenderers quotation.

52.0 DRAWINGS, INSTRUCTION MANUALS AND SPARES LISTS

52.1 Drawings, instruction manuals and catalogues shall be supplied in accordance with Transnet Freight Rail specification CEE.0224.

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

52.3 The contractor shall submit details of spares required in accordance with Transnet Freight Rail's specification no. CEE.0224.

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

53.0 SPECIAL TOOLS AND/OR SERVICING AIDS

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

54.0 TRAINING

54.1 The contractor shall submit details with the tender of the training courses which will be conducted by the contractor for the training of Transnet Freight Rail 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.

55.0 PACKAGING AND TRANSPORT.

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

55.2 The contractor shall provide transport for the delivery of the equipment to the site where required.

56.0 BIBLIOGRAPHY

[1] SANS 1019: 2008 Edition 2.5 Standard voltages, currents and insulation levels for electricity supply

APPENDIX 1: LIST OF RELEVANT DRAWINGS**DRAWINGS ISSUED WITH THIS SPECIFICATION**

DRAWING NUMBER	DESCRIPTION.
CEE-TDF-0016	Concrete fencing
CEE-TBD-7	Earthing Arrangements Traction Substations.
CEE-TU-41	Negative Return Cable Terminating Box.
CEE-TCK-1	Reactor 1,84mH, 1 500 A. (For reference purposes only)
CEE-TBP-1	Wiring diagram for auto reclosure for HSCB.
CEE-TBP-39	Circuit diagram for auto reclosure for HSCB
CEE-TBP-35	Connection diagram for HSCB and electronic control relay
CEE-TBP-38	Schematic Diagram of 3kV HV Protection.
CEE-TCL-63	3kV Busbar Chamber Arrangement: Cable Feeders.
CEE-TCQ-208	DC High Speed Circuit Breaker Cell Panel (Cell slabs) (sheets 1 to 10)
CEE-TBP-33	DC Track Breaker and Truck Wiring Diagram.
BBB 0938	Surge arresters mounted on traction transformer.
BBB 3620	3kV Earthing arrangement for traction substation
BBF 1615	Busbar connection assembly



A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT SPECIFICATION

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

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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 3kV DC rectifier with its associated control equipment, 3kV DC high speed circuit breakers, 110V battery charger unit and batteries.

3.0 STANDARDS AND PUBLICATIONS.

The following publications are referred to:

3.1 IEC - INTERNATIONAL ELECTROTECHNICAL COMMISSION

- | | |
|---------------|---|
| IEC 60255-27: | Measuring relays and protection equipment Part 27: Product safety-requirements. |
| IEC 60051-1: | Direct Acting Indicating Analogue Electrical Measuring Instruments and their accessories. Part1-Definitions and general requirements common to all parts. |

3.2 SOUTH AFRICAN NATIONAL STANDARDS

- | | |
|-------------|---|
| SANS 156: | Moulded Case Circuit Breakers. |
| SANS 1091: | National colour standard. |
| SANS 1274: | Coatings applied by the powder-coating process. |
| SANS 10142: | Installation and wiring of premises. |
| SANS 60529: | Degree of protection provided by Enclosures. (IP code.) |

3.3 TRANSNET FREIGHT RAIL'S SPECIFICATIONS

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

3.4 TRANSNET FREIGHT RAIL'S DRAWINGS

- | | |
|---------------|--|
| CEE-TBD-7: | Earthing arrangement for 3kV 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 METHOD OF TENDERING

- 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 in English.
- 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:	-10°C to +55 °C.
Relative humidity:	10% to 90%
Lightning Conditions:	20 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 88V and maximum 128V)
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 and the ratios are as follows:

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 plasticised 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 ANNUNCIATOR 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 Buchholz operation.
- Aux transformer Buchholz operation (If applicable).
- Rectifier Attenuation and over temperature.
- Rectifier diode failure
- Rectifier fan failure.
- Battery undervoltage.
- 400V 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 3kV 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 3kV 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 3kV 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 it 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 3kV 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 Buchholz relay and oil and winding temperature relay alarm and trip circuits.
- 8.7.2 Provision shall be made for the auxiliary transformer Buchholz 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.
- Main transformer oil level.
- 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.
- 3kV DC busbar earth device.
- Battery under-voltage.
- Buchholz main transformer.
- Main transformer pressure relief valve.
- Buchholz 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 shut down 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 braking absorption equipment where specified.
- Single phase 230V AC supply to the main transformer connection box.
- 110V DC supply to the main transformer connection box.

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 changeover 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 150V DC voltmeter labelled "HOLDING COIL VOLTS" to indicate the holding coil supply voltage.
- 9.2.2.3 One 0 to 30A DC ampere meter labelled "HOLDING COIL AMPERES" to indicate the holding coil current.
- 9.2.2.4 One 0 to 30A 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 110V battery supply a double pole, 100 to 150A 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 110V positive (busbar) supply for the closing coil requires 80 amperes or less depending on type of track breaker.
 - The 110V negative (busbar) supply for the closing coil requires 80 amperes or less depending on type of track breaker.
 - The 110V constant voltage positive supply for the holding coil requires 5 amperes.
 - The 110V positive (busbar) supply for the holding coil requires 5 amperes.

- The 110V 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 SANS 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 85V and 140V 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 400V 3 phase AC and 110V DC supplies to the control panels.
- 11.6.1 Dehn type surge protection units or equivalent shall be provided for the 110V DC supply and shall be connected as follows:
- One unit connected between the 110V DC Positive and Negative.
 - One unit connected between the 110V DC Positive and the panel earth.
 - One unit connected between the 110V 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).
- Buchholz 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 3kV 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 diagram.
- 18.3 Approved schematic and wiring diagrams, which are supplied for maintenance and fault finding, 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.

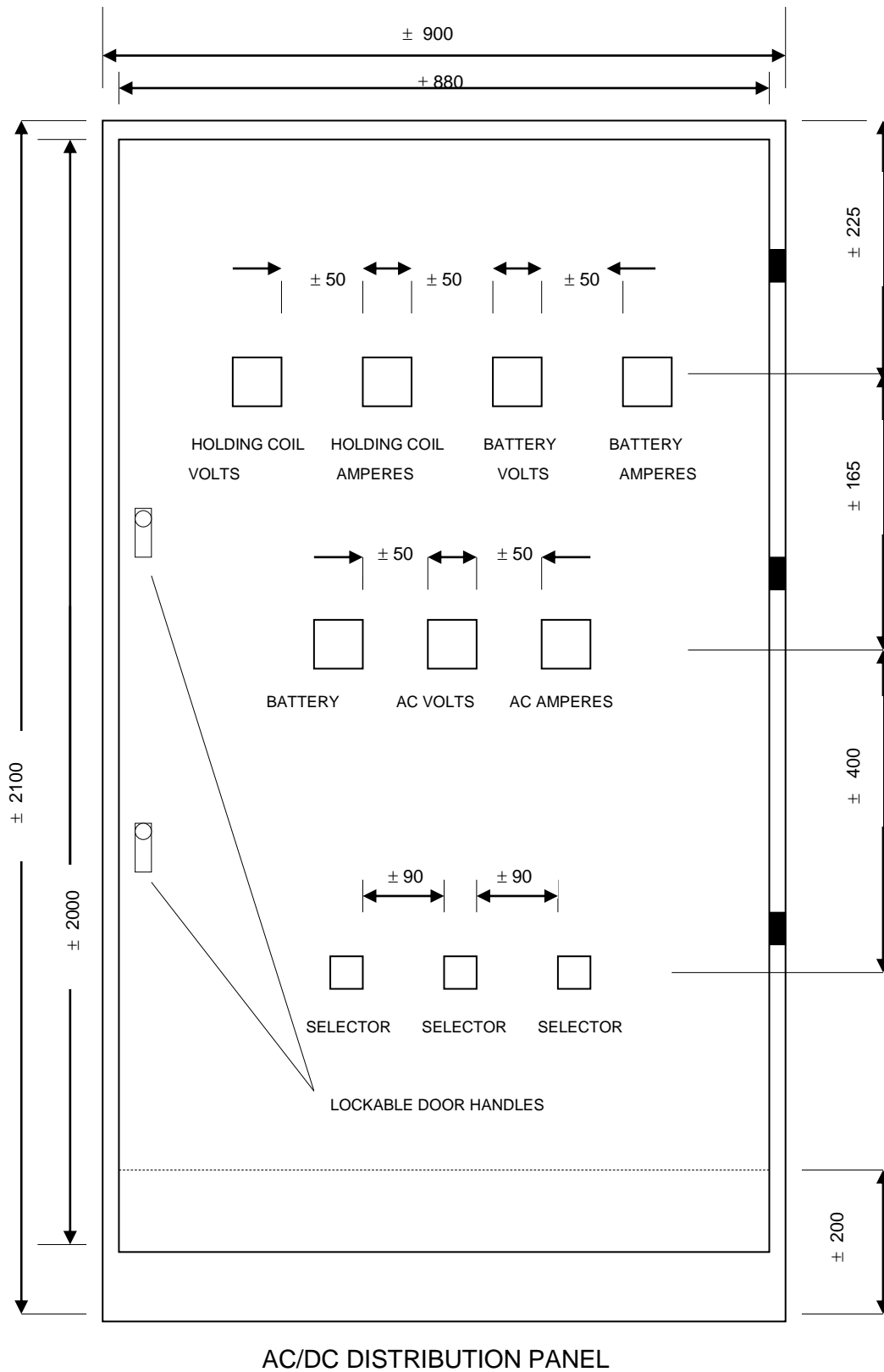
- 21.4 If urgent repairs have to be carried out by Transnet Freight Rail's staff to maintain supply during the guarantee period the contractor shall inspect such repairs to ensure that the guarantee period is not affected and should they be covered by the guarantee, reimburse Transnet Freight Rail the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

22.0 PACKAGING AND TRANSPORT.

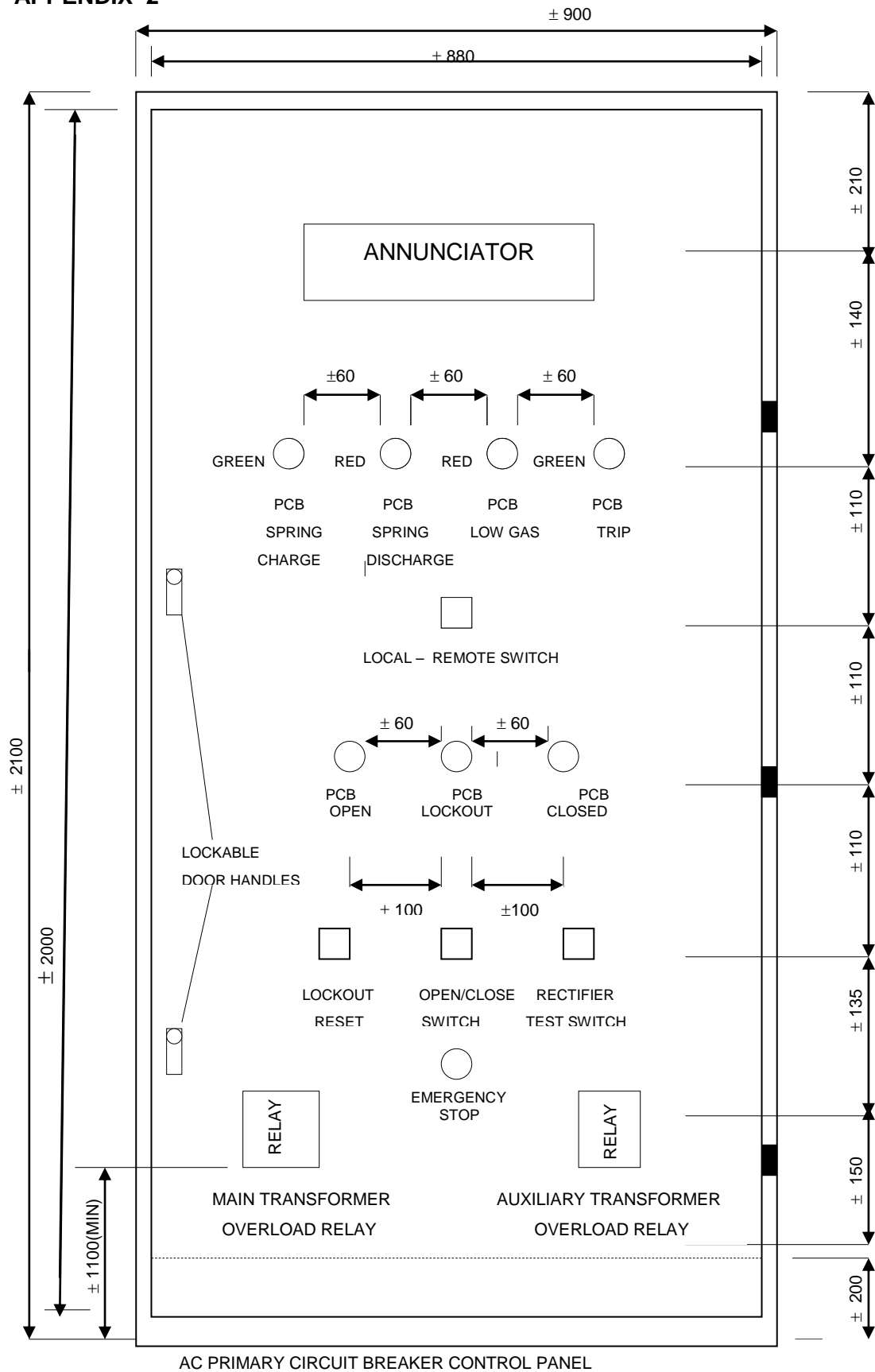
- 22.1 The tenderer shall ensure that the equipment be packed in such a manner that it will be protected during handling and transport.
- 22.2 The tenderer shall provide transport for the delivery of the equipment to the site where required.

END

23.0 APPENDIX 1



24.0 APPENDIX 2



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

25.0 APPENDIX 3**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



A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

INSTALLATION OF LOW AND MEDIUM VOLTAGE CABLES

Author: Chief Engineering Technician
Technology Management

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Date:

31 May 2012

Circulation Restricted To:

Transnet Freight Rail

Transnet and Relevant Third Parties

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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 600/1000V and 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 REQUIREMENTS

- 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 Contractor 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.