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TRANSNET FREIGHT RAIL, a division of

TRANSNET SOC LTD

Registration Number 1990/000900/30

[hereinafter referred to as **Transnet**]

REQUEST FOR QUOTATION [RFQ] NO: CRAC-KGG-12310

SUPPLY, INSTALL, COMMISION AND TESTING OF INDOOR/OUTDOOR SUBSTATION EQUIPMENT.

REQUIRED AT SWARTGROND SUBSTATION

ISSUE DATE : 23 OCTOBER 2013

BRIEFING SESSION VENUE: NO: SWARTGROND SUBSTATION (NORTHWEST PROVINCE)

BRIEFING SESSION DATE: 31 OCTOBER 2013 @ 10:00

CLOSING DATE : 12 NOVEMBER 2013

CLOSING TIME : 10:00

OPTION DATE : 06 FEBRUARY 2014

FOR DIRECTION/SITE CONTACT MAKHANYA MPHATSOANE ON (011 950 1230/071 856 6688)

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Section 1

NOTICE TO BIDDERS

Quotations which must be completed as indicated in Section 2 of this RFQ are to be submitted as follows:

METHOD: Post and/or courier]

CLOSING VENUE: THE SECRETARY, TRANSNET ACQUISITION COUNCIL GROUND FLOOR TENDER BOX INYANDA HOUSE 1, 21 WELLINGTON ROAD, PARKTOWN, JOHANNESBURG, 2001

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 Broad-Based Black Economic Empowerment [B-BBEE]

Transnet fully endorses and supports the Government's Broad-Based Black Economic Empowerment Programme and it would therefore prefer to do business with local business enterprises who share these same values. Transnet will accordingly allow a "preference" to companies who provide a valid B-BBEE Verification Certificate. All procurement transactions will be evaluated accordingly.

2.1 B-BBEE Scorecard and Rating

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

- Functionality is included at a pre-qualification stage with a prescribed percentage threshold .
- Proposals will be evaluated on price which will be allocated 80 or 90 points and preference which will be allocated 20 or 10 points, dependent on the value of the Goods or Services.
- The 80/20 preference point system applies where the acquisition of the Goods or Services will be less than R1 000 000.00.
- If the 80/20 preference point system is stipulated and all Bids received exceed R1 000 000.00, the RFQ will be cancelled.
- The 90/10 preference point system applies where acquisition of the Goods or Services will exceed R1 000 000.00
- If the 90/10 preference point system is stipulated and all Bids received are equal to or below R1 000 000.00, the RFQ will be cancelled.
- In this RFQ, Transnet will apply **80/20 / 90/10** preference point system prescribed in the PPPFA.

In compliance with the Government Gazette No 34612, Notice No. 754 dated 23 September 2011, as from 1 October 2011 valid B-BBEE Verification Certificates must be issued by:

(i) Verification Agencies accredited by the South African National Accreditation System [SANAS]; or

(ii) Registered Auditors approved by the Independent Regulatory Board of Auditors [**IRBA**], in accordance with the approval granted by the Department of Trade and Industry.

Enterprises will be rated by such agencies based on the following:

a) Large Enterprises [i.e. annual turnover greater than R35 million]:

- Rating level based on all seven elements of the B-BBEE scorecard

b) Qualifying Small Enterprises – QSE [i.e. annual turnover between R5 million and R35 million]:

- Rating based on any four of the elements of the B-BBEE scorecard

c) Exempted Micro Enterprises – EME [i.e. annual turnover less than R5 million]:

In accordance with B-BBEE Codes of Good Practice [Statement 000, Section 4], any enterprise with an annual total revenue of R 5 million or less qualifies as an EME.

- Automatic rating of B-BBEE Level 4 irrespective of race or ownership
- Black ownership greater than 50% or Black Women ownership greater than 50% automatically qualify as B-BBEE Level 3

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

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

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

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

*[Refer clause**Error! Reference source not found.** below for Returnable Documents required]*

3 Communication

Quotations are requested from interested respondents to supply the above mentioned to Transnet Freight Rail.

On or after 23 October 2013 RFQ documents may be inspected at and are obtainable from the office of Transnet freight Rail, Tender advice centre, ground floor, Inyanda House 1, 21 Wellington Road.

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Respondents are warned that a response will be liable for disqualification should any attempt be made by a Respondent either directly or indirectly to canvass any officer(s) or employee of Transnet in respect of this RFQ between the closing date and the date of the award of the business.

A Respondent may, however, before the closing date and time, direct any written enquiries relating to the RFQ to the following Transnet employee:

Name: Tshiamo Motitswe

Email: Tshiamo.motitswe@transnet.net

Telephone: 011 584 11 44

Respondents may also, at any time after the closing date of the RFQ, communicate with the Secretariat of the Transnet Acquisition Council on any matter relating to its RFQ response:

Name	Prudence Nkabinde
Telephone	011 544 9486
Email	Prudence.nkabinde@transnet.net

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A non-refundable tender fee of R150.00 (inclusive of Vat) is applicable per tender (listed below). Payment is to be made to Transnet Freight Rail, Standard Bank Account number 203158598, Branch code 004805. The deposit slip must reflect the tender number CRAC-KGG-12310 and the Company Name. Receipt/s to be presented prior to collection of the tender/s.

NOTE: This amount is not refundable.

Tenders in duplicate must reach the Chairperson, TRANSNET Freight Rail Acquisition Council, Ground floor, tender box, Inyanda House 1, 21 Wellington Road, Parktown before the closing hour on 12 November 2013, and must be enclosed in a sealed envelope which must have inscribed on the outside: CRAC-KGG-12310:Supply, install, commission and testing of indoor/outdoor Swartgrond substation equipment.

4 Tax Clearance

The Respondent's original valid Tax Clearance Certificate must accompany the Quotation. Failure to provide this document with the RFQ submission will result in disqualification.

5 VAT Registration

The valid VAT registration number must be stated here: _____ *[if applicable]*.

6 Legal Compliance

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

7 Changes to Quotations

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

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8 Pricing

All prices must be quoted in South African Rand on a fixed price basis, excluding VAT.

9 Prices Subject to Confirmation

Prices quoted which are subject to confirmation will not be considered.

10 Negotiations

Transnet reserves the right to undertake post-tender negotiations with selected Respondents or any number of short-listed Respondents.

11 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.

12 Disclaimers

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

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

In addition, Transnet reserves the right to exclude any Respondent from the bidding process who has been convicted of a serious breach of law during the preceding 5 [five] years, including but not limited to breaches of the Competition Act 89 of 1998. Respondents are required to indicate below whether or not they have been found guilty of a serious breach of law during the past 5 [five] years:

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

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

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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.

13 EVALUATION CRITERIA

Essential documents

Letter of good standing (workman's compensation)

Company safety plan

Prequalification criteria (Mandatory documents)

Compliance to specification in line with a scope of work

Delivery period

Experience in related field

CATEGORY: COMMECIAL (SCORING MATRIX)

Competitive pricing

B-BBEE

B-BBEE certificate and scorecard

Transnet will utilise the following criteria [not necessarily in this order] in choosing a Supplier/Service Provider, if so required:

- Administrative responsiveness - Completeness of response and returnable documents
- Substantive responsiveness – Prequalification criteria, if any, must be met and whether the Bid materially complies with the scope and/or specification given

Technical threshold of 60%: Compliance to specification, delivery period, Experience in related field,

- Companies who do not meet the criteria will be disqualified, and the ones who qualify will be further evaluated.
- Weighted evaluation based on 80/20 or 90/10 preference point system as indicated in paragraph 2:
  - Pricing and price basis [firm] - whilst not the sole factor for consideration, competitive pricing and overall level of unconditional discounts[1] will be critical
  - B-BBEE status of company

[1] *Only unconditional discounts will be taken into account during evaluation. A discount which has been offered conditionally will, despite not being taken into account for evaluation purposes, be implemented when payment is affected.*

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Preference points will be awarded to a bidder for attaining the B-BBEE status level of contribution in accordance with the table below:

B-BBEE Status Level of Contributor	Number of points (90/10 system)	Number of points (80/20 system)
1	10	20
2	9	18
3	8	16
4	5	12
5	4	8
6	3	6
7	2	4
8	1	2
Non-compliant contributor	0	0

14 Validity Period

Transnet desires a validity period of 90 [ninety] days from the closing date of this RFQ.

This RFQ is valid until _____.

15 Banking Details

BANK: _____

BRANCH NAME / CODE: _____

ACCOUNT HOLDER: _____

ACCOUNT NUMBER: _____

16 Company Registration

Registration number of company / C.C. _____

Registered name of company / C.C. _____

17 Disclosure of Prices Quoted

Respondents must indicate here whether Transnet may disclose their quoted prices and conditions to other Respondents:

YES ☐ NO ☐

18 Returnable Documents

Returnable Documents means all the documents, Sections and Annexures, as listed in the tables below.

a) Respondents are required to submit with their Quotations the **mandatory Returnable Documents**, as detailed below.

Failure to provide all these Returnable Documents at the Closing Date and time of this RFQ will result in a Respondent's disqualification. Respondents are therefore urged to ensure that all these Documents are returned with their Quotations.

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All Sections, as indicated in the footer of each page, must be signed, stamped and dated by the Respondent. Please confirm submission of these mandatory Returnable Documents by so indicating [Yes or No] in the table below:

Returnable Documents	Submitted [Yes or No]
SECTION 2 : Quotation Form	
- Original valid Tax Clearance Certificate [Consortia / Joint Ventures / Sub-contractors must submit a separate Tax Clearance Certificate for each party]	
ANNEXURE ..... : Technical Submission/Questionnaire	

b) In addition to the requirements of section (a) above, Respondents are further required to submit with their Quotations the following **essential Returnable Documents** as detailed below.

Failure to provide all these Returnable Documents may result in a Respondent's disqualification. Respondents are therefore urged to ensure that all these documents are returned with their Quotations.

All Sections, as indicated in the footer of each page, must be signed, stamped and dated by the Respondent. Please confirm submission of these essential Returnable Documents by so indicating [Yes or No] in the table below:

Returnable Documents	Submitted [Yes or No]
SECTION 1 : Notice to Bidders	
- Valid B-BBEE Verification Certificate [RSA Large Enterprises and QSEs] Note: failure to provide a valid B-BBEE Verification Certificate at the closing date and time of the tender will result in an automatic score of zero being allocated for B-BBEE scorecard	
- Valid B-BBEE certificate from auditor, accounting officer or SANAS accredited Verification Agency [RSA EMEs] Note: failure to provide a valid B-BBEE Verification Certificate at the closing date and time of the tender will result in an automatic score of zero being allocated for B-BBEE scorecard	
- In the case of Joint Ventures, a copy of the Joint Venture Agreement or written confirmation of the intention to enter into a Joint Venture Agreement	
- SECTION 3 : Standard Terms and Conditions of Contract for the Supply of Services to Transnet	
SECTION 4 : Vendor Application Form	
- Original cancelled cheque or bank verification of banking details	
- Certified copies of IDs of shareholder/directors/members [as applicable]	
- Certified copy of Certificate of Incorporation [CM29/CM9 name change]	
- Certified copy of share certificates [CK1/CK2 if C.C.]	
- Entity's letterhead	
- Certified copy of VAT Registration Certificate [RSA entities only]	

Returnable Documents	Submitted [Yes or No]
- Certified copy of valid Company Registration Certificate [if applicable]	
- A signed letter from Respondent's auditor or accountant confirming most recent annual turnover figures	
ANNEXURE A – B-BBEE Preference Points Claim Form	

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Section 2

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 Terms and Conditions for the Supply of Goods or Services to Transnet [Section 3 hereof]; and
- any other standard or special conditions mentioned and/or 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 required, on a "delivered nominated destination" basis, excluding VAT:

Item No	Description of Goods	Unit of Measure	Quantity	Unit Price (ZAR)	Total Price (ZAR)
1	Supply, install, commission and testing of outdoor/indoor Swartgrond substation equipment.				

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

Notes to Pricing:

a) All Prices must be quoted in South African Rand, exclusive of VAT

b) 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 could result in a bid being disqualified.

c) 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

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TECHNOLOGY MANAGEMENT

SPECIFICATION

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

Authors:	Grade: Engineering Technician. Section: Technology Management.	D. O Schulz
Approved:	Grade: Senior Engineer Section: Technology Management.	L.O. Borchard.
Authorised:	Grade: Principle Engineer. Section: Technology Management.	W.A. Coetzee.

Date: 21st September 2009

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1.0 SCOPE

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

2.0 BACKGROUND.

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

3.0 STANDARDS AND PUBLICATIONS.

The following publications are referred to:

3.1 IEC - INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

3.2 SOUTH AFRICAN NATIONAL STANDARDS

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

3.3 TRANSNET FREIGHT RAIL'S SPECIFICATIONS

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

3.4 TRANSNET FREIGHT RAIL'S DRAWINGS

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

4.0 APPENDICES

The following appendices form part of this specification:

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

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

Appendix 3: Schedule of requirements.

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5.0 TENDERING PROCEDURE

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

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

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

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

6.0 SERVICE CONDITIONS

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

6.1 ATMOSPHERIC CONDITIONS

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

6.2 MECHANICAL

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

6.3 ELECTRICAL

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

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

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

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

7.0 GENERAL REQUIREMENTS OF CONTROL /DISTRIBUTION PANELS.

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

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

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

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

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

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

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

8.0 AC PRIMARY CIRCUIT BREAKER CONTROL PANEL

The panel shall be fitted with the following:

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

8.1 FLAG ANNUCIATOR UNIT

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

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

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

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

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

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

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

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8.1.8 The annunciator shall have the following minimum indications.

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

8.2 AC PRIMARY CIRCUIT BREAKER CONTROL AND INDICATION

8.2.1 Provision shall be made for the following:

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

8.3 RECTIFIER FAN CONTROL AND PROTECTION CIRCUITRY

8.3.1 Provision shall be made for the following:

- Fan motor protection circuitry.
- Fan failure circuitry (vane switch).
  The circuitry shall be fail-safe and shall provide a signal to the flag annunciator panel when the fan fails.
- Rectifier current sensing circuitry.
  The operation of the rectifier fan/fans shall be dependant 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.

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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 60255-6 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 pheses

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

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

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

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

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

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

8.5 AC EARTH LEAKAGE PROTECTION RELAY

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

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

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

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

8.6 DC EARTH LEAKAGE PROTECTION RELAY.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

8.7.2 Provision shall be made for the auxiliary transformer Buchotz 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.

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

8.9 LOCAL AND REMOTE CONTROL CIRCUITRY AND INDICATION EQUIPMENT

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

8.10 TRIP CONDITIONS

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

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

8.11 LOCKOUT CONDITIONS

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

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

8.12 EMERGENCY STOP

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

8.13 LOCK OUT RESET BUTTON AND INDICATION.

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

9.0 AC/DC DISTRIBUTION PANEL

The panel shall make provision for:

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

9.1 AC DISTRIBUTION. (400V, 3 PHASE)

Provision shall be for the following:

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

9.1.1 400V 3PHASE DISTRIBUTION SUPPLY

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

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

9.1.2 3 PHASE DETECTION FAILURE RELAY.

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

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

9.1.3 230 V SINGLE PHASE DISTRIBUTION SUPPLY

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

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

9.1.4 400V AUXILIARY SUPPLY CHANGE OVER SYSTEM

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

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

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

9.1.5 INDICATING INSTRUMENTS FOR THE 400 V AC DISTRIBUTION

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

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

9.2 110 DC VOLT DISTRIBUTION

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

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

9.2.2 INDICATING INSTRUMENTS

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

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

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

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

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

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

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

9.3 110V DC DISTRIBUTION SUPPLY

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

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

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

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

9.4 DC CONTROL AND SUPERVISORY CIRCUITRY AND TRACK BREAKER CONTROL.

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

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

10.0 PROTECTION RELAYS

10.1 The protection relays (see clause 8.4 and 8.6) shall be flush mounted on the panel door.

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11.0 CIRCUIT BREAKERS, CONTACTORS, RELAYS AND INDICATING LAMPS.

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

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

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

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

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

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

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

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

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

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

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

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

12.0 ELECTRICAL MEASURING INSTRUMENTS

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

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

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

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

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

13.0 TELECONTROL

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

13.1 AC PRIMARY CIRCUIT BREAKER

- Open, Close and Lockout conditions.

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13.2 3 kV DC HIGH SPEED CIRCUIT BREAKERS.

- Open, Close and Lockout conditions.

13.3 TRANSFORMERS (Main and Auxiliary where applicable)

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

13.4 EARTH FAULT CONDITIONS

- DC Earth Leakage.
- AC Earth Leakage.

13.5 RECTIFIER FAILURE

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

13.6 SUPPLY VOLTAGE FAILURES

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

13.7 BATTERY

- Battery undervoltage.

13.8 MAIN OVERLOAD/AC EARTH LEAKAGE RELAY FAILURE

- Protection relay failure. (Watchdog)

14.0 WIRING AND TERMINALS.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

PROTECTION TEST BLOCK

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

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

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

15.0 PANEL CONSTRUCTION.

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

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

15.2 The minimum dimensions shall be:

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

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

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

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

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

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

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

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

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

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

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

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

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

16.0 QUALITY ASSURANCE

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

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

17.0 SITE TESTS AND COMMISSIONING.

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

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

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

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

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

18.0 DRAWINGS, INSTRUCTION MANUALS AND SPARES LISTS

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

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

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

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

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

19.0 SPECIAL TOOLS AND/OR SERVICING AIDS

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

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

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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

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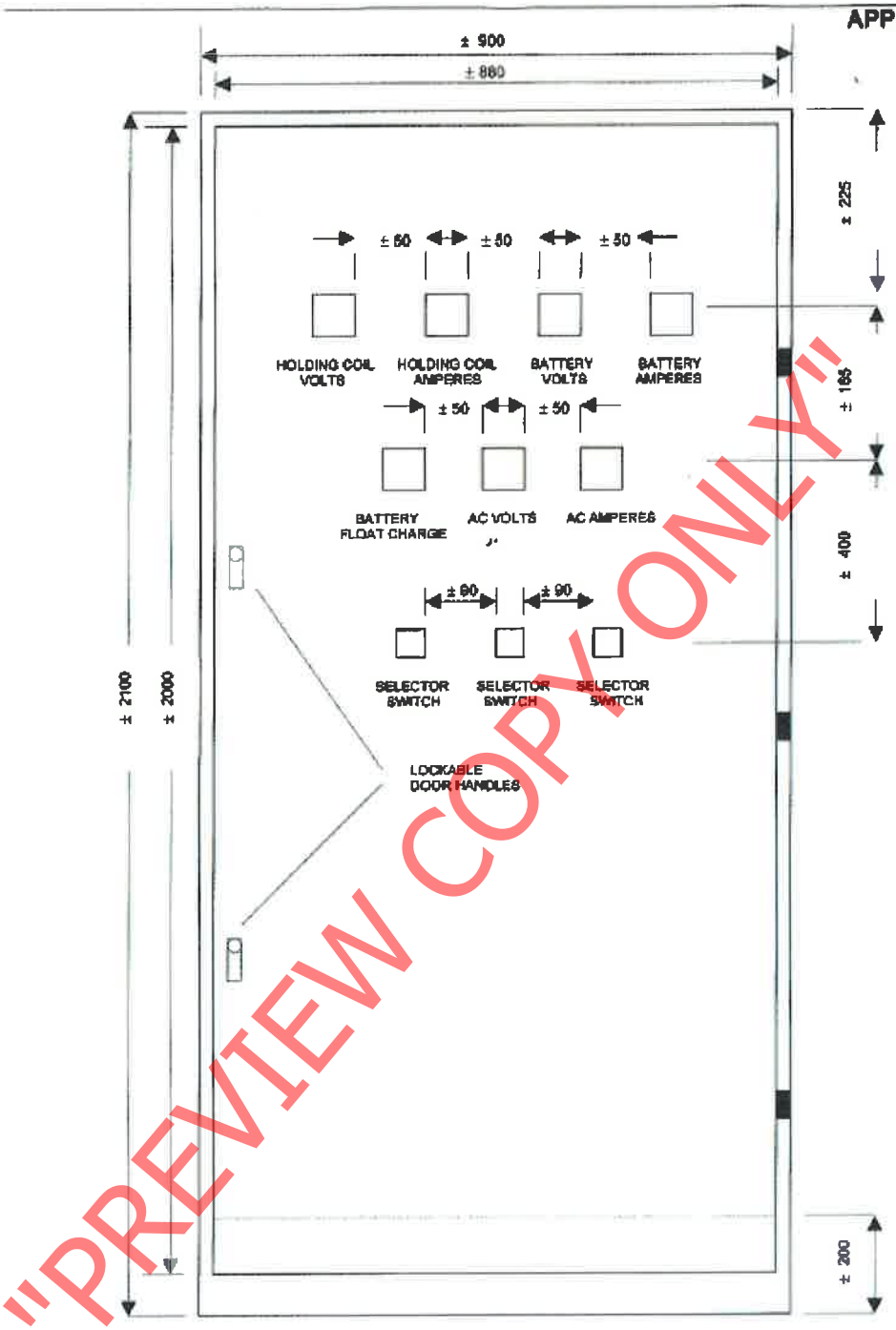

AC/DC DISTRIBUTION PANEL

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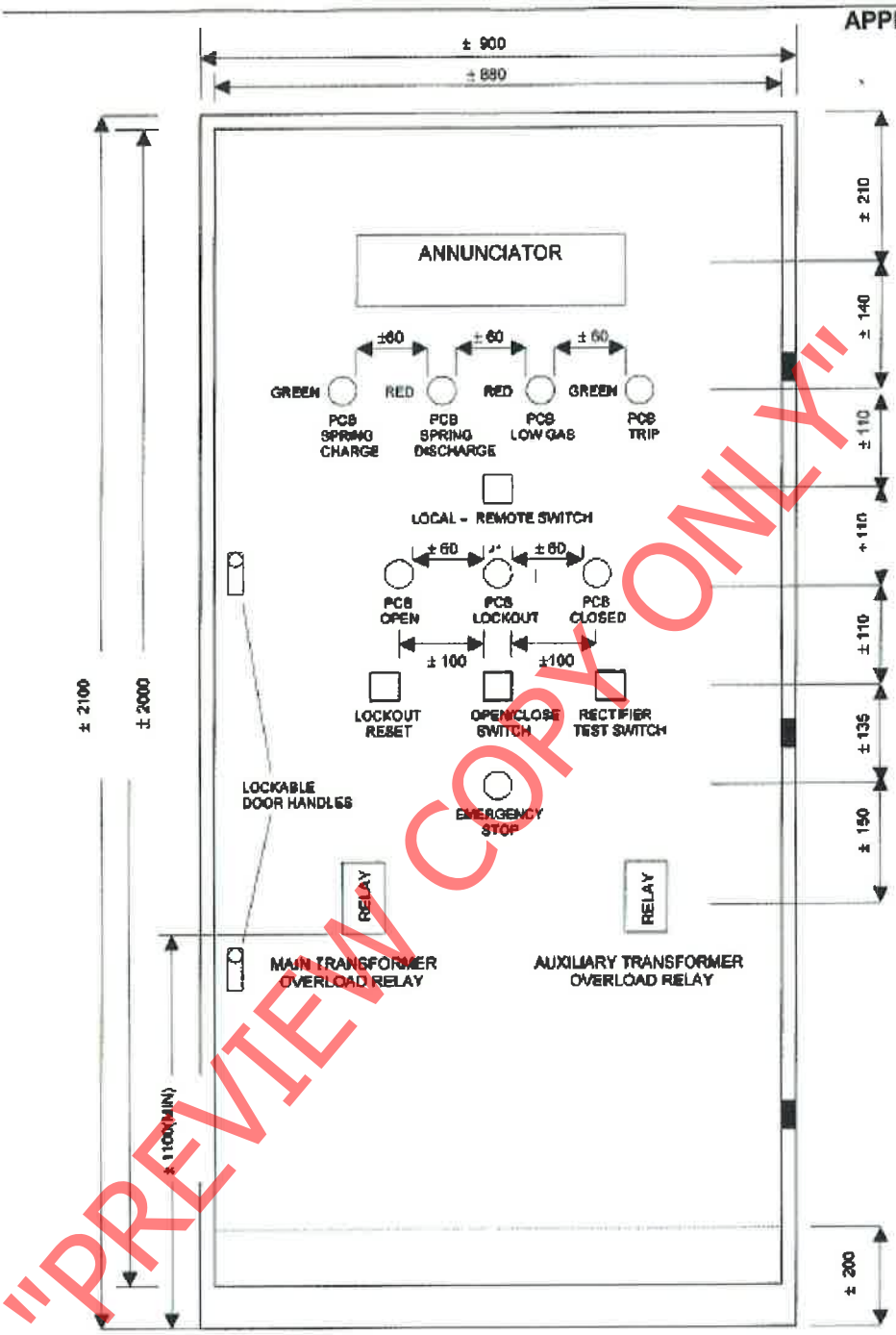
APPENDIX 2



AC PRIMARY CIRCUIT BREAKER CONTROL PANEL

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

Respondent's Signature

Date & Company Stamp

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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

TRANSNET

BBB 3059 Version 2

TRANSNET
freight rail

A Division of Transnet Limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

3 KV DC TRACTION SUBSTATION EARTHING SYSYTEM FOR HIGH VOLTAGE OUTDOOR YARDS

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		Date:	27 August 2010

Circulation Restricted To:

Transnet Freight Rail

Transnet and Relevant Third Parties

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1.0 SCOPE

1.1 This specification specifies Transnet freight rail's requirements for the design, supply, installation and testing of the earthing systems for new and existing 3kV DC traction substations.

1.2 This specification must be read in conjunction with Transnet freight rail's drawings BBB 3620 and CEE-TBD-7.

2.0 STANDARDS AND PUBLICATIONS

2.1 Unless otherwise specified all materials and equipment supplied shall comply with the applicable and latest editions of SANS and Transnet Freight Rail's publications.

2.2 The following publications (latest editions) are referred to in this specification:

2.2.1 SOUTH AFRICAN NATIONAL STANDARDS

SANS 1063	Earth rods, couplers and connections.
SANS 1507 -1-3	Electric cables with extruded solid dielectric insulation for fixed installations. (300/500V to 1900/3300V).
SANS 2063	Thermal spraying - Metallic and other inorganic coatings - Zinc, aluminium and their alloys.
SANS 10199	The design and installation of earth electrodes.

2.2.2 TRANSNET FREIGHT RAIL

CEE.0177	Code of Practice: Earth systems for electric light and power and traction installations.

TRANSNET FREIGHT RAIL'S DRAWINGS.

BBB 3620	3kV DC earthing arrangement system for high voltage outdoor yards.
CEE-TBD-7	3kV DC earthing arrangement system of traction substation.

3.0 METHOD OF TENDERING

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

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

3.3 Tenderers shall 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, 3.3 could preclude a tender from consideration.

4.0 DEFINITIONS

Definitions are in accordance with SANS 10199.

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4.1 EARTH ELECTRODE

One or more conductive parts embedded in the earth for the purpose of making effective electrical contact with the general mass of the earth, and to act as a path for the discharge of either lightning currents or fault currents.

4.2 EARTHED

So connected to the general mass of earth as to ensure at all times an immediate discharge of electrical energy without danger.

4.3 EARTHING SYSTEM

A system intended to provide at all times, by means of one or more earth electrodes, a low impedance path for the immediate discharge of electrical energy without danger into the general mass of earth.

5.0 EARTHING SYSTEMS OF TRACTION SUBSTATIONS

The earth leakage protection consists of an AC earth leakage and a DC earth leakage system as described below:

5.1 AC EARTH LEAKAGE SYSTEM

The AC earth leakage system is used to detect flashovers on high voltage HV outdoor yard equipment. The equipment in the outdoor yard is insulated from the substation earth mat and connected in parallel through a current transformer to earth mat. (Minimum resistance to earth mat is 10 Ohms). The output of the current transformer feeds to an earth leakage relay, which will trip and lock out the primary circuit breaker when operated.

5.2 DC EARTH LEAKAGE SYSTEM

The DC earth leakage system is used to detect 3kV DC and 380V AC insulation failures. The steelwork and panels inside the traction substation are bonded to a DC earth leakage busbar, which is insulated from earth mat. (Minimum resistance to earth mat is 25 Ohms). The DC earth leakage busbar is connected to the substation negative busbar through a DC earth leakage relay.

Operation of this relay will isolate the complete substation from all sources of supply and lock out the primary circuit breaker and all the 3kV DC high speed circuit breakers.

6.0 SERVICE CONDITIONS

6.1 ATMOSPHERIC CONDITIONS:

Altitude	:	0 to 1600m above sea level.
Ambient temperature	:	-10° to +50 °C.
Relative humidity	:	10% to 90% percent
Lightning Conditions	:	12 ground flashes per square kilometre per annum.
Pollution	:	Heavily salt laden or polluted with smoke from industrial sources.

6.2 SOIL CONDITION:

The soil resistivity can vary from 10 Ohmmeter to more than 5,000 Ohmmeter. Earth value enhancement methods will have to be used, where necessary to obtain the desired value of 5 Ohms or less.

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6.3 **CORROSION:**

Buried conductors will be exposed to both severe galvanic and chemical corrosion. There is a high level of stray current in the vicinity of 3kV DC traction substations which will reduce the life of the earthing system.

7.0 **TECHNICAL REQUIREMENTS**

7.1 The design and installation of Transnet Freight Rail's earthing system for outdoor yards shall be in accordance with Transnet Freight Rail's drawings BBB 3620 and CEE-TBD-7.

7.2 A 5-second fault current duration shall be used for the rating of the earthing system. The earth down conductors and earth tails shall be able to withstand 6.2 kA for 5 seconds when exothermically welded. The rated AC fault level for 3kV DC traction substations shall be taken to be 16kA.

7.3 Deviation of the design shall be submitted to the project manager for approval.

8.0 **EARTHING LAYOUT**

8.1 The following electrical equipment in the outdoor yard shall be bonded directly to earth mat.

- The support steel structures for the surge arresters at the Eskom supply side.
- All high voltage surge arresters.
- The high voltage AC disconnects.
- Voltage transformer steel structures where applicable.
- Main Current transformers on Eskom side of primary circuit breaker in high voltage (HV) yard.
- The perimeter fence posts and gates.
- Substation metal roof.

8.2 The following electrical equipment forms part of the AC earth leakage system and shall be connected via a current transformer to earth.

- Main traction transformer.
- Primary circuit breaker.
- Main current transformers between primary circuit breaker and main traction transformer.
- The Auxiliary transformer's barrier screen.

8.3 The following electrical equipment is connected directly to the substation negative busbar.

- The auxiliary transformer tank.
- All spark gaps.

8.4 The following outdoor electrical equipment is connected directly to the DC earth leakage relay busbar.

- The Anode wall plate (Wall Bushings).
- The auxiliary transformer neutral point.
- AC / DC motorised link framework and structure where fitted.
- The auxiliary transformer short circuiting switch fitted on substation wall in the outdoor yard.

9.0 MATERIALS TO BE USED.

EARTHING

9.1 Only copper rods of at least 70 mm² shall be used for earth electrodes in accordance to SANS 1063.

The length of the rods will be dependant on the application:

- Earth electrodes (earth spikes). Minimum length of 1.5 meters shall be used.
- Down conductors, earth tails and interconnecting conductors. Rods of varying lengths may be used.

9.2 The minimum size of cable/conductor used for the earthing system shall be 95 mm² copper.

9.3 For the installation or replacement of the main earth mat/earth electrode, Copper conductor of at least 16mm diameter shall be used and shall be buried at least 1,5 meters below the ground. The earth mat shall cover an area of at least 1,5 square metre.

9.4 The earth mat shall be provided with a test point connection for test purposes. This test point shall protrude a minimum of 100mm above ground level and shall be protected by means of a metal pipe or metal housing.

9.5 The location of the earth mat/earth spike shall be as close as possible to the main surge arresters support structures.

AC EARTH LEAKAGE SYSTEM

9.6 PVC insulated 95 mm² copper cable shall be used where insulated earthing conductors are required for the interconnecting of the high voltage equipment on the AC earth leakage system.

9.7 The resistance between the outdoor yard steelwork connected to AC earth leakage system and main earth electrode shall be a minimum of 10 Ohms.

10.0 INSTALLATION OF EARTHING SYSTEM.

10.1 EARTHING SURVEY

10.1.1 For new installations the contractor shall carry out an earthing survey in accordance with the method as described in specification CEE.0177 or SANS 10199 to determine the type of earthing system required. The contractor shall be required to submit a separate quotation for the survey.

10.1.2 For existing substations the contractor shall carry out earth resistance tests to establish the condition of the existing earth mat/earth spike and shall replace such earth mat/earth spike where required.

10.2 TRENCHING

10.2.1 Before any trenching commences the contractor shall consult with Transnet Freight Rail staff for approval with regard to the routing of the trenches in the outdoor yard.

10.2.2 Trenching shall include all trenches required for the installation of the earthing system.

10.2.3 The perimeter fence trenching shall be as close as possible to the perimeter fence on the inside of the HV yard.

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10.2.4 The depth of trenches shall be at least 700 millimetres. Care must be taken not to damage existing cables in the high voltage outdoor yard during trenching operations.

10.2.5 Before the trenches are closed a representative from Transnet Freight Rail shall inspect the earthing system for correct installation procedure.

10.3 INSTALLATION PROCEDURES

10.3.1 Earth electrodes shall be driven into the ground in the perimeter fence trench at the corners of the outdoor yard and in between the corners.

10.3.2 In the case of double unit substations the number of earth electrodes between the corner electrodes shall be determined in consultation with Transnet Freight Rail.

10.3.3 The depth of the earth electrodes driven into the ground shall be such that the top of the earth electrode shall be a minimum of 700 mm below the surface of the ground.

10.3.4 The earthing of the support steel structures for the surge arresters, AC disconnects, voltage transformers (where installed) and current transformers shall be in accordance with Transnet Freight Rail's drawing BBB 3620.

10.3.5 The surge arresters base shall be connected directly to earth matispike.

10.3.6 Where surge arresters are fitted on the main transformer provision shall be made to install an earth electrode in close proximity to the transformer. The earth electrode shall be connected directly to the earth system as shown in drawing BBB3620.

10.3.7 All underground connections which include connections to the earth electrodes, the joints in the copper plated steel rods, connections to the perimeter fence posts, support steel structures and the connection to the new or existing earth mat shall be exothermic welded or crimped by means of tinned lugs or by means of brass clamping system.

10.3.8 Where exothermic welding cannot be carried out, galvanised or stainless steel grade S304 studs, nuts, tinned cable lugs and any other approved means may be used for the termination of the earthing conductors to the fence posts, surge arresters down leads, metal structure and other electrical equipment.

10.3.9 Exothermic welded joints and steel components exposed to corrosion shall be sealed with a durable waterproofing compound i.e. Bitumen, Denso tape or Noxide.

10.3.10 All crimped connections that are above ground level must be filled with an anti corrosive compound.

10.3.11 Where the exothermic welding is carried out on galvanised surfaces of the support steel structures, the galvanising must be removed and the surface cleaned. After completion of the exothermic weld, the surface area on the support steel structure where the galvanising was removed shall be treated in accordance with the requirements of SANS 2063.

10.3.12 Exothermic joints shall be hammer tested on recommendation of the manufacturer to ensure that the mechanical strength of the joints are adequate. The exothermic weld is tapped by a hammer and by sound it is determined whether the joints are solid or that there are voids in the joint.

10.3.13 Where two earthing conductors run parallel to each other, exothermic parallel joints shall be installed every 1,5 metres on all straight sections between these conductors.

10.4 CERTIFICATION OF CONTRACTORS (EXOTHERMIC WELDING)

10.4.1 Only Contractors who are certified and accredited by the exothermic welding industry shall be used for the installation.

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10.5 CRUSHER STONE

NEW SUBSTATIONS

10.5.1 After completion of construction, installation of equipment, the laying of all cables and earthing conductors, a suitable weed killer approved by Transnet Freight Rail's Project Manager shall be applied in the outdoor yard unless otherwise specified.

10.5.2 The successful tenderer shall exercise the greatest care to avoid contaminating private property.

10.5.3 After treatment with the weed killer, a 100mm layer of 25mm to 37mm crusher stone shall be laid over the whole area of the Transnet Freight Rail high voltage outdoor yard (within the apron).

EXISTING SUBSTATIONS

10.5.4 The contractor shall remove the necessary crusher stone before any excavation commences.

10.5.5 The contractor shall restore the crusher stone to its original condition once the installation work has been completed.

10.5.6 The contractor shall supply any additional crusher stone required to restore the trenched areas to original condition.

11.0 SPECIAL TOOLS (OPTIONAL)

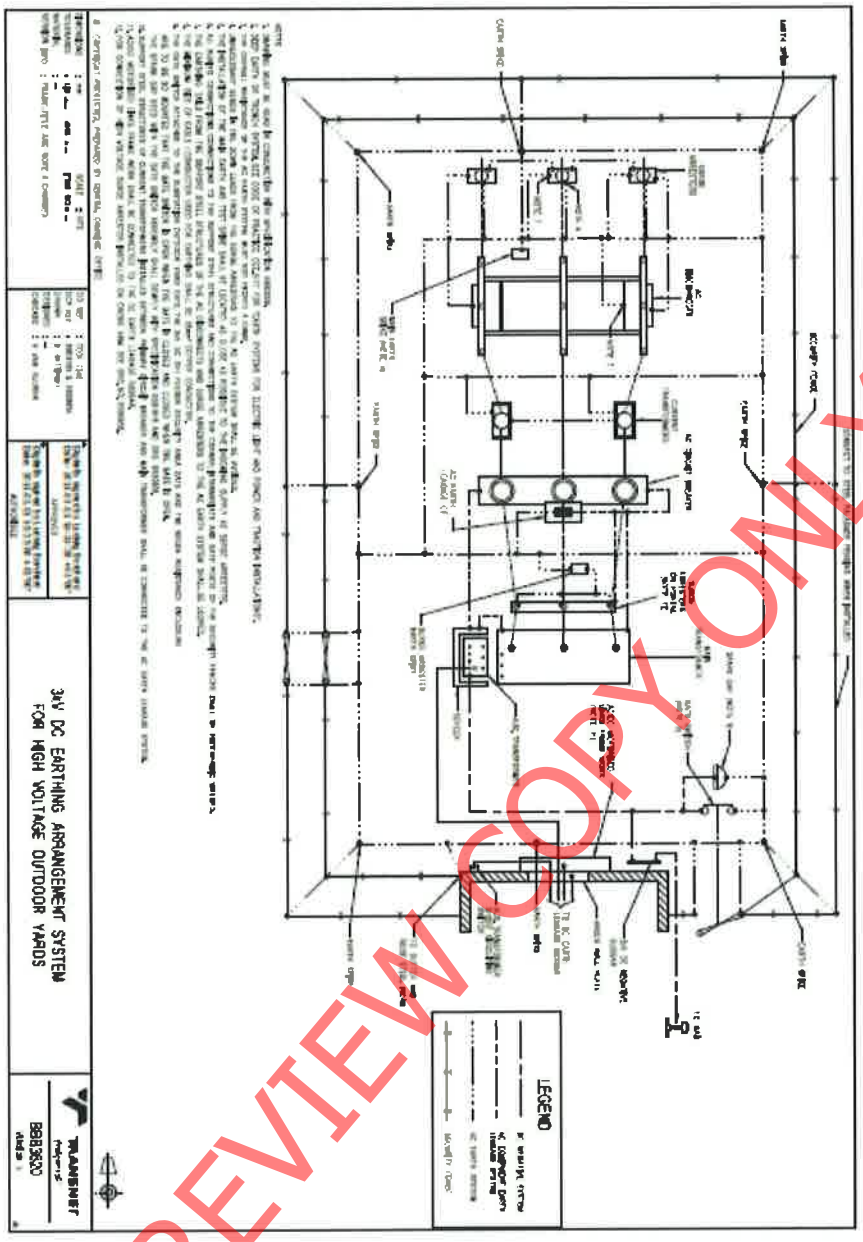
11.1 Tenderers shall furnish quotations for the special bending equipment, crimping tools and exothermic welding moulds required for the installation of the earthing system.

11.2 The price shall form a separate part of the quotation.

12.0 TESTS AND ACCEPTANCE

12.1 The contractor shall perform resistance measurement tests, which shall be witnessed by a representative of Transnet Freight Rail. The resistance measurements shall be entered into the substation station log book.

12.2 In the event of any dispute, Transnet Freight Rail reserves the right to make the final decision on the acceptance of the earthing system.



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TECHNOLOGY MANAGEMENT.

SPECIFICATION.

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

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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, BS 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 60044-1:	Instrument Transformers Part 1. Current Transformers.

2.2 TRANSNET FREIGHT RAIL SPECIFICATIONS/ ENGINEERING INSTRUCTIONS

CEE.0023:	Laying of cables.
CEE.0045:	Painting of steel components of electrical equipment.
CEE.0099:	Specification for 3kV DC high speed circuit breakers for traction substations.
CEE.0224:	Drawings, catalogues, instruction manuals and spares lists for electrical equipment supplied under contract.
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.

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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 filter 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.
BBB 5019:	Requirements for traction transformers for 3kV DC traction substations in accordance with BS 171 and IEC 60076-1.
BBB 7842	Outdoor, High Voltage, Alternating Current Disconnectors combined with earthing switch.
BBC 0198:	Requirements for the supply of cables.
BBC 0330:	Isolation transformer.

2.3 STATUTORY REQUIREMENTS

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

3.0 TENDERING PROCEDURE

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:	-5°C to +45 °C.
Relative humidity:	10% to 90%
Lightning Conditions:	12 ground flashes per square kilometre per annum.
Pollution:	Heavily salt laden or polluted with smoke from industrial sources.

5.0 ELECTRICAL SERVICE CONDITIONS

5.1 The incoming AC voltage can vary ±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.

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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.

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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_s)	22kV	33kV	44kV	66kV	88kV	132kV
Minimum safety outdoor clearance	300mm	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_s)	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 (Um)	Nominal system r.m.s. voltage. (U_{sm})	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

10.1 The contractor shall supply and install metal oxide gapless surge arresters in accordance with Transnet Freight Rail's specification BBB 0845.

10.2 The surge arresters shall be connected between each phase of the high voltage supply and substation main earth electrode/earth mat

10.3 The maximum protected distance from the main transformer bushing terminal to the surge arrester terminal shall be as indicated in table 4.

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TABLE 4:

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

10.4 The neutrals of high voltage supplies are to be treated as effectively earthed unless otherwise specified.

10.5 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 1287

13.0 MAIN CURRENT TRANSFORMERS

13.1 The main current transformers shall comply with the requirements of Transnet Freight Rail specification BBB 0937.

13.2 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.

13.3 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.

13.4 The ratios, accuracy and burdens of the current transformers shall be in accordance with Transnet Freight Rail's Specification BBB 0937.as specified:

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.

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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 tappings 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

16.1 The contractor shall make provision for overload protection of the primary winding. Refer to clause 8.8 of specification No BBB 2721.

16.2 The protection system shall consist of an approved type of overload relay with its associated current transformers.

16.3 SECONDARY WINDING

16.4 The contractor shall supply and install a three phase isolating and earthing switch for the secondary supply of the auxiliary transformer to the substation.

16.5 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

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.

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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.

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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 Plante 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.

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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 breaking 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 undervoltage 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 8BB2721.

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.

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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 provide 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 (mechanical)

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 by 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 Not withstanding 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.

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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 4,5 MW substations, or 50mm X 25mm aluminium (grade 6063) busbar in accordance to Transnet freight rail drawing 88F1615.
- 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 88F1615.

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 disconnector, 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 Not withstanding 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 substation 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 or the negative return cables or other cause of failure of the negative return circuit.

36.4 AERIAL CONDUCTORS

36.3.1 Where aerial conductors are used for the negative return, the contractor shall provide the wall plates and wall bushings where required.

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36.3.2 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.

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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:

- 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 4.8 metre wide X 2,4 metres minimum height lockable gates in the perimeter fence to allow for:

- Entrance to substation building and yard.
- Entrance to the high voltage outdoor yard adjacent to the main transformer (s).

42.2 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.

42.3 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.

42.4 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.

42.5 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 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.

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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.

SECTION 5: GENERAL

50.0 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 diagrams.

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

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APPENDIX 1

DRAWINGS ISSUED WITH THIS SPECIFICATION

DRAWING NUMBER	AMENDMENT	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

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BBB 7842 Version 1

SPOORNET

A division of Transnet limited

ENGINEERING & TECHNOLOGY
TECHNOLOGY MANAGEMENT

SPECIFICATION

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

Author:	Engineering Technician Technology Management	D.O. Schulz	.....
Approved:	Senior Engineer Technology Management	L.O.Borchard	.....
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Date: 18th Oct 2004

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1.0 SCOPE

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

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

2.0 STANDARDS AND PUBLICATIONS

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

2.1 SOUTH AFRICAN NATIONAL STANDARDS

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

2.3 SPOORNET SPECIFICATIONS

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

3.0 TENDERING PROCEDURE

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

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

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

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

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

4.0 ANNEXURES

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

4.1 Annexure 1 - "Schedule of Requirements"

This annexure details the specific requirements for this application.

4.2 Annexure 2 - "Technical Data Sheet"

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

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

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

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

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

5.0 SERVICE CONDITIONS

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

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

6.0 CLEARANCES

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

Nominal phase to phase r.m.s system voltage	22kV	33kV	44kV	66kV	88Kv	132kV
Highest phase to phase r.m.s voltage for equipment	24kV	36kV	48kV	72kV	100kV	145kV
Safety clearance	320mm	430mm	540mm	770mm	1000mm	1460mm

7.0 DISCONNECTORS COMBINED WITH EARTHING SWITCHES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

"DO NOT OPERATE UNDER LOAD"

Refer to clause 11.4.2 of specification.

8.0 SUPPORT STRUCTURES

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

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

9.0 CONNECTIONS

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

10.0 POST INSULATORS

This section shall be read in conjunction with SANS 60273.

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

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

11.0 NAMEPLATES AND LABELS

11.1 All nameplates and labels shall be in English.

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

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

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

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

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

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

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

12.0 DRAWINGS AND INSTRUCTIONS

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

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

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

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

13.0 INSPECTION

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

14.0 TOOLS AND APPLIANCES

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

15.0 SPARES

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

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

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

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

16.0 PACKING

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

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ANNEXURE 1

SCHEDULE OF REQUIREMENTS

1.0 Required for .....

2.0 Number of sets required .....

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

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

8.0 Special requirements: .....

.....

.....

.....

.....

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ANNEXURE 2

TECHNICAL DATA SHEET

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

1.0 Spoornet Tender number: .....

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

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ANNEXURE 2

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

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freight rail

A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

INSTALLATION OF LOW AND MEDIUM VOLTAGE CABLES

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	
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 600/1000Vand 1900/3300V.

BS 6480: impregnated paper – installed lead or lead alloy sheathed electric cables of rated voltages up to and including 33 000V

3.2 South African National Standards

SANS 32: Internal and/or external protective coatings for steel tubes - Specification for hot dip galvanized coatings applied in automatic plants.

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

SANS 121: Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods

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

SANS 10142-1: The wiring of premises Part 1: Low-voltage installations.

SANS 10142-2: The wiring of premises Part 2: Medium-voltage installations above 1 kV A.C not exceeding 22 kV A.C and up to and including 3 000 kW installed capacity.

3.3 Transnet Freight Rail Instructions

BBD 8210 - General work and works on, over, under or adjacent to a railway lines and near high voltage equipment

CEE.0012 - Method of Tendering

CEE.0045 - Painting of steel components of electrical equipment.

CEE.0089 - Drawings of electrical equipment supplied under electric light and power contracts.

Electrical Safety Instructions 2012 - High Voltage Electrical Equipment

3.4 Transnet Freight Rail Drawings

CEE PA-0105 - Precast concrete slab cover for cable protection.

CEE-PK-14 - Electrical cable route marker.

CEE-MA-307 – Route marker electrical cables.

FG 263 - Accommodation of cables in Railway formations

3.5 Statutory Requirements

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

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

4.0 TENDERING METHODS

4.1 Tenderer shall indicate clause by clause compliance with the specification. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance. This document can be used by tenderer to elaborate on their response to a clause.

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

4.3 Tenderer shall complete Appendix 2 – "Schedule of requirements".

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

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

5.0 SERVICE CONDITIONS

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

Altitude:	0 to 1800m above sea level.
Ambient temperature:	-10°C to +55 °C.
Relative humidity:	10% to 90%
Lightning Conditions:	12 ground flashes per square kilometre per annum.
Pollution:	Heavily salt laden or polluted with smoke from industrial sources.

6.0 GENERAL REQUIREMNETS

6.1 The tenderer shall submit all drawings in accordance with Transnet Freight Rails Specification CEE.0089

6.2 Where joints and terminations are to be done by others, the contractor shall submit detailed instructions regarding the procedure recommended by the cable manufacturer.

6.3 The electrical installation shall conform to the requirements of SANS 10142 part 1 and 2 and shall be to the satisfaction of Transnet Freight Rail.

6.4 Galvanising where specified shall be in accordance with SANS 32 and SANS 121.

6.5 Work on the high voltage equipment shall be carried out in accordance with the Transnet Freight Rail's Safety Instructions 2012 - High Voltage Electrical Equipment.

6.6 All work done must comply with the requirements of Occupational Health and Safety Act and Regulations, Act 85, 1993

SURVEYS

6.7 The Contractor shall within 30 days after being awarded the contract carry out a pre-installation route survey which shall include digging test holes and guided by the Transnet Freight Rail's drawings to determine a suitable route.

6.8 The contractor shall determine where cables are liable to be subjected to chemical, electrolytic, mechanical or other damage and shall submit his recommendation to the Depot Maintenance Manager (Electrical) for approval.

6.9 The Contractor shall submit in triplicate plans of the cable routes selected to the Depot Maintenance Manager (Electrical) for approval. Plans may be submitted in sections as the survey progresses.

TRANSNET

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.

TRANSNET

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.

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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.

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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.

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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.

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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.

TRANSNET

13.7.3.2 XLPE Insulated Cables:

All cables rated up to 19/33 kV shall be tested in accordance to SANS 1339, and cables rated up to 1,9/3,3 kV shall be tested in accordance to BS 5467.

Where a new XLPE cable is to be joined to an existing XLPE Cable, the test shall differ, in that a 4 kV DC test voltage shall be applied for one minute between the brass screens of the cores and the armouring. The outer sheath shall withstand a test voltage of 10 kV DC for 1 minute between the armouring and earth.

13.7.4 The Contractor shall submit three copies of certified test reports to the Depot Maintenance Manager (Electrical) within three weeks after completion of the tests.

14.0 GUARANTEE

14.1 All work undertaken by the Contractor shall be subject to a guarantee for a period of one year against faulty and/or inferior workmanship and material.

14.2 The guarantee period shall commence the day the installation is formally handed over to and accepted by Transnet Freight Rail.

14.3 The Contractor shall undertake to repair all faults or defects due to bad workmanship and/or faulty materials, and to replace all defective equipment or materials during the guarantee period.

14.4 Any defects that may become apparent during the guarantee period shall be rectified to the satisfaction of, and free of cost to Transnet Freight Rail.

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

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

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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: .....

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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		

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CEE-0023 ISS 2012

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				

TRANSNET

CEE-0023 ISS 2012

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		

TRANSNET

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).				

TRANSNET

CEE-0023 ISS 2012

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		

Respondent's Signature

Date & Company Stamp

TRANSNET

CEE-0023 ISS 2012

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.....

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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.

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CEE 045 of 2002/1

SPOORNET
A division of Transnet limited

TECHNICAL
RAILWAY ENGINEERING
SPECIFICATION

PAINTING OF STEEL COMPONENTS OF ELECTRICAL EQUIPMENT

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Date: 27 February 2002

Circulation restricted to:
Technical: Maintenance (Infrastructure)
Technical: Maintenance

Respondent's Signature

Date & Company Stamp

TRANSNET

CEE 045 of 2002/1

SPOORNET
A division of Transnet limited

TECHNICAL RAILWAY ENGINEERING SPECIFICATION

PAINTING OF STEEL COMPONENTS OF ELECTRICAL EQUIPMENT

Circulation restricted to:
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1.0 SCOPE

This specification covers the surface preparation, paint systems and painting of steel components of electrical equipment.

2.0 REFERENCES AND GLOSSARY

The following standards and specifications are referred to herein:

2.1 South African Bureau of Standards: -

SABS 064 : Code of Practice for the Preparation of Steel Surfaces for Coating.
SABS 1091 : National Colour Standards for Paint.

2.2 Trade names :

OptiDegreaser
OptiPrime^{Aqua}
Noxyde

2.3 Classification of level of surface degradation:

RE1 – 0.05% of surface rusted
RE2 – 0.5% of surface rusted
RE3 – 1.0% of surface rusted
RE4 – 3.0% of surface rusted
RE5 – 8.0% of surface rusted

3.0 METHOD OF TENDERING

3.1 Tenderers shall indicate clause by clause compliance or non-compliance with the specification. This shall take the form of a separate document listing all the specification clause numbers indicating the individual statement of compliance or non-compliance. Tenderers to elaborate on their response to a clause can use this document.

4.0 SURFACE PREPARATION

4.1 NON-GALVANISED STEELWORK

4.1.1 New Steelwork

SURFACE PREPARATION (Read: NOTES and SPECIAL INSTRUCTIONS)	PRODUCT REQUIREMENTS & APPLICATION (See Variations for Specific Environmental Conditions)
➢ Sandblast to a standard of Sa2 to remove mill scale and/or flash rust ➢ Remove dust with clean compressed air (Check air for oil contamination)	➢ Apply a stripe coat to edges, bolts, crevices, nuts and rivets. ➢ Apply one thick coat of Noxyde to the entire structure with contrasting color. ➢ Apply a final thick coat of Noxyde at a consumption rate of minimum 400g/m^2

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4.1.2 Previously Coated Steelwork

4.1.2.1 COATING START FAILING TO A LEVEL OF RE 2

➢ Test for adhesion (refer to supplier) ➢ Degrease thoroughly with OptiDegreaser ➢ Hydro Blast complete substrate using a rotating nozzle and minimum 250 bar at the nozzle	➢ Apply a stripe coat to edges, bolts, nuts and rivets and fill crevices. ➢ Apply one coat of Noxyde to entire substrate in a contrasting color

4.1.2.2 COATING FAILURE AND RUSTING TO A LEVEL OF RE 4

➢ Remove all visible traces of rust by mechanical means ST2 (chip/grind/sand) OR shotblasting /spotblasting) ➢ Degrease thoroughly with OptiDegreaser ➢ Hydro Blast complete substrate using a rotating nozzle and minimum 250 bar at the nozzle.	➢ Apply a thick coat of Noxyde to the de-rusted areas, edges, bolts, nuts and rivets and fill crevices ➢ Apply one coat of Noxyde at a consumption rate of minimum 400g/m^2 to the entire substrate using a contrasting color.

4.1.2.3 BITUMEN COATED

➢ Remove all visible rust and loosely adhering bitumen coating by means of chipping and scraping (ST2) ➢ Degrease thoroughly with OptiDegreaser ➢ Hydro Blast complete substrate using a rotating nozzle and minimum 250 bar at the nozzle.	➢ Apply a thick coat of Noxyde to the de-rusted areas, edges, bolts, nuts and rivets and fill crevices ➢ Apply two coats of Noxyde at a consumption rate of minimum 400g/m^2 per coat to the complete substrate using contrasting colors

4.1.2.4 BADLY RUSTED STEEL WITH PITTING & CRUST FORMATION TO RE 5

➢ 1.Degrease thoroughly with OptiDegreaser ➢ 2.Hydro Blast complete substrate using a spinner tip and minimum 250 bar at the nozzle ➢ Shotblast/sandblast complete substrate giving particular attention to bolts nuts rivets and crevices Sa2 ➢ 4.Dedust	➢ Apply a first thick coat of Noxyde to the entire substrate ➢ Apply a stripe coat to edges, bolts, nuts and rivets and fill crevices using a contrasting color ➢ Apply a final coat of Noxyde at a consumption rate of minimum 400g/m^2

4.2 GALVANISED STEELWORK

4.2.1 NEW AND WEATHERED GALVANISING WITH A SMOOTH GLOSSY FINISH

➢ Degrease thoroughly with OptiDegreaser ➢ Rinse down with copious quantities of potable water	➢ Apply one thin coat of OptiPrime$^{4/66}$ (100 micron wet/35 micron dry) ➢ Apply a stripe coat of Noxyde to edges, bolts, nuts and rivets and fill crevices ➢ Apply two coats of Noxyde at a consumption rate of minimum 400g/m^2 per coat to the complete substrate using contrasting colors

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4.2.2 WEATHERED GALVANISING

4.2.2.1 White rust (zinc oxide)

➢ Degrease thoroughly using OptiDegreaser – ensure that all traces of "white rust" are removed ➢ Rinse down with copious quantities of potable water	➢ Apply one thin coat Noxyde ➢ Apply a stripe coat of Noxyde to edges, bolts, nuts and rivets and fill crevices ➢ Apply a final coat of Noxyde at a consumption rate of minimum 400g/m^2 per coat to the complete substrate using a contrasting color

4.2.2.2 Combination of red rust (iron oxide) and white rust (zinc oxide)

➢ Remove all traces of red rust ➢ Degrease thoroughly using OptiDegreaser – ensure that all traces of "white rust" are removed ➢ Rinse down with copious quantities of potable water	➢ Apply a thick coat of Noxyde to the de-rusted areas, edges, bolts, nuts and rivets and fill crevices ➢ Apply a final coat of Noxyde at a consumption rate of minimum 400g/m^2 per coat to the complete substrate using a contrasting color

NOTES and SPECIAL INSTRUCTIONS:		
1 Sand or Grit-blasting a) Always use clean, non-recycled grit b) Always use fine or extra fine grit c) Always use oil free air d) Always use a moisture trap e) Dedust	2 Degreasing: a) Use only OptiDegreaser b) Dilute according to instructions – see data sheet c) Always follow up with hydro-blasting to remove all chemical residues	3 Hydro-blasting: a) Always use clean potable water b) Use a rotating nozzle and ensure a pressure of minimum 250 bar at the nozzle c) Remove ALL traces of dirt and any form of salt contamination and residues of the degreasing agent d) Concentrate in crevices and other similar "collection" areas

5. PRODUCT APPLICATION

5.1 METHOD OF APPLICATION

OptiPrime™	Noxyde
Temperature-Min 5 °C Relative humidity-Max 80% R.H ➢ Apply by brush, lacquer roller or airless spray using a no. 11 nozzle ➢ Apply one thin coat only - 100 micron wet = 35 micron dry (DFT) ➢ Small parts can be dipped - dilute with 10% water for dipping	Temperature-Min. 8 °C, Max. 55 °C Relative Humidity-Max 80% R.H. ➢ Apply by brush, roller or airless spray ➢ For airless spray applications refer to "Tips for airless spraying of Noxyde"

5.2DRYING TIME AND OVERCOAT PERIODS

➢ Do not overcoat within 12 hours ➢ Wash down with clean potable water (100 bar) before over coating to remove dust or any other form of intermediate contamination	➢ Drying time is dependant on ambient conditions and can vary from a few minutes (in dry windy conditions) to a few hours (in humid shaded conditions) ➢ Overcoat as soon as possible to avoid contamination of previous coat ➢ Wash down with clean potable water (100 - 150 bar) before over coating if danger of contamination exists or if left more than 4 hours before over coating

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5.3 CURING TIME

n/a	➢ 7 - 14 days to "full cure". During this period the product is prone to mechanical damage - the longer time it is allowed to cure, the tougher it becomes

5.4 DRY FILM THICKNESS (DFT) READINGS

35 micron	➢ Severe coastal & marine environments (in the spray zone) – TWO stripe coats & overall minimum DFT of 400 micron ➢ Normal coastal environment (1.5 km from the coast line) - a single stripe coat & overall minimum DFT of 400 micron ➢ Non coastal high rainfall areas, in the immediate vaccinate of rivers, dams, lakes, etc., and in industrial areas with high levels of chemical pollution - a single stripe coat & overall minimum DFT of 400 micron ➢ Dry non aggressive environments - a single stripe coat & overall minimum DFT of 250 micron NOTE: DFT readings can only be taken after 72 hours

5.5 Notwithstanding the above requirements, all surfaces shall be cleaned according to the appropriate method described in SABS 064 for the particular surface to be cleaned, the contamination to be removed and the primer to be applied.

5.6 Blast cleaning of components shall be in accordance with clause 4.3 of SABS 064 to a degree of cleanliness of at least Sa 2 for inland exposure components and Sa 2 ½ for coastal exposure components. See Table 1 of SABS 064 for the appropriate profile.

5.7 Sheet metal that cannot be blast cleaned shall be cleaned by pickling according to clause 4.6 of SABS 064.

5.8 Components that will be powder coated shall be cleaned and prepared by the surface conversion process according to clause 5 of SABS 064 to a medium weight classification of table 2 of that specification.

5.9 Oil and accumulated dirt on steel components where no rusting is present shall be removed according to clause 3 of SABS 064.

6.0 PAINT SYSTEM

A choice of two systems is available to suit the contractors equipment.

6.1 Noxyde paint system

1st coat: OptiPrime^{Aqua}

Wet film thickness: 100 micrometers. Dry film thickness: 35 micrometers.

2nd coat: Noxyde Topcoat

Dry film thickness: 165 micrometers @ 400g/m^2.

6.1.1 Paint application:

6.1.1.1 The primer and paint is normally applied by brush at supply viscosity (no reducer required).

6.1.1.2 The practical spreading rate of the primer and paint is a function of the ambient temperature, wind velocity and the application technique, but will generally fall in the range of 400g/m^2 in low to mild corrosive areas, and 500g/m^2 in severely corrosive areas.

6.1.1.3 Once the applied coat of primer/paint is touch dry, the next coat of paint may be applied.

6.1.1.4 If painted steelwork is to be bolted onto structures, it is imperative that the paint has been allowed to hard dry before the steelwork is bolted onto structures. This is to prevent the soft paint being damaged when tightening the bolts securing the steelwork to the structures.

6.2 Powder Coating System.
The powder-coating process shall be in accordance with SABS 1274 type 4: Corrosion-resistant coatings for interior use and using the thermosetting type high gloss coatings.

7.0 COATINGS AND WORKMANSHIP

7.1 All specified coatings shall be applied according to the relevant specification and the manufacturer's instructions shall be followed.

7.2 Coatings shall not be applied under conditions that may be detrimental to the effectiveness of the coating or the appearance of the painted surface.

7.3 When examined visually, the finished products shall have a uniform appearance and shall show no sign of damage. Damaged areas shall be repaired coat for coat to obtain the desired finish.

TENDERER'S SIGNATURE.....

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CEE.0183 Issue 2002

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TECHNICAL

RAILWAY ENGINEERING

SPECIFICATION CONTROL PAGE

HOT DIP GALVANISING AND PAINTING OF ELECTRIFICATION STEELWORK

Statement of authorisation:

There is no SABS specification available for similar material / equipment and as far as can be ascertained no other specification / standard suitably covers Spoornet requirements. The specification has been compiled in a manner, which shall favour / encourage local manufacture of material/equipment to a maximum degree.

Author:	Chief Engineering Technician Configuration management	Jan C van Tonder
Approved:	Senior Technologist Railway Engineering	HA Slier
Authorised:	Senior Engineer Railway Engineering	L O Borchard

Date: January 2002

This page is for control purposes only and shall not be issued with the specification.

Respondent's Signature

Date & Company Stamp

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CEE.0183 Issue 2002

SPOORNET

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TECHNICAL

RAILWAY ENGINEERING

SPECIFICATION

HOT DIP GALVANISING AND PAINTING OF ELECTRIFICATION STEELWORK

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1.0 SCOPE

1.1 This specification covers the hot dipped galvanising and painting of electrification steelwork.

1.2 The extent of work includes galvanising and painting of steelwork consisting of universal column masts with welded on bases up to 14 m in length and small part steelwork consisting of channel, angle and flat iron fittings, welded assemblies and tubular cantilevers.

2.0 REFERENCES

2.1 The following publications (latest edition) are referred to herein:

SABS 763: Hot Dipped Galvanising.

SABS 1091: National Colour Standards for Paint.

3.0 METHOD OF TENDERING

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

3.2 The Schedule of Requirements, Quantities and Prices, Appendix 1 to this specification shall be fully completed by Tenderers. Failure to submit a fully completed sheet may preclude a tender from further consideration.

4.0 APPENDICES

The following appendices form an integral part of this specification:

Appendix 1: Schedule of Requirements, Quantities and Prices.

5.0 GALVANISING OF STEELWORK

5.1 The steelwork must be cleaned and hot dip galvanised to SABS 763 except for the following:

5.1.1 No ammonium chloride salts shall be used on withdrawal from the molten zinc.

5.2 After galvanising no passivation must take place. Quenching may be done with clean water. No sodium dicromate must be used.

5.3 All surface contamination of zinc oxide (zinc ash) must be removed by means of brushing.

6.0 PRIMER COATING

6.1 The hot dip galvanising shall be followed as soon, as is practical by the painting procedures as specified hereunder:

6.1.1 Prior to painting, all steelwork shall be cleaned with a solvent cleaner and washed down with clean water to remove all traces of solvent. The solvent cleaner used must be compatible with zinc (similar to Galv Clean).

6.1.2 The primer coating, a two-component polyamide cured epoxy primer e.g.: PLASCOGUARD GEHOPPENS PRIMER or equivalent shall be applied to a dry film thickness of 75 microns. Application shall be in accordance with the manufacturers

instructions.

6.1.3 The primer coating shall be allowed to cure for a minimum period of 48 hours before handling to facilitate coating of the rest of the surfaces as well as the application of the intermediate coat.

6.1.4 A coat of a two-component high-build micaceous iron oxide pigmented polyamide cured re-coatable epoxy e.g.: SIGMACOVER CM MIOCOAT or equivalent shall be applied to a wet film thickness of 75-85 microns. Application shall be in accordance with manufacturers instructions.

6.1.5 A further 48 hours period must be allowed for curing of the primer coatings before handling the steelwork for transportation purposes.

6.2 All care must be exercised during handling to prevent damage of the painted surfaces.

6.3 Loading of steelwork must be done in such a way to limit damage of surfaces to a minimum during transit.

6.4 Only non-metallic slings should be used, preferably nylon or cotton material.

6.5 Spoornet reserves the right to inspect the premises where this work is carried out at any time during the duration of galvanising and primer painting.

6.6 Spoornet shall inspect all steelwork at the Tenderers premises before dispatch of any such steelwork.

7.0 TOP COATING

7.1 The topcoat shall be applied directly after erection of the steelwork in accordance with procedures hereunder:

7.1.1 Damage of the primed surfaces shall be repaired, after erection, by the application of one or more coats of a two component high build micaceous iron oxide pigmented polyamide cured re-coatable epoxy coating e.g.: SIGMACOVER CM MIOCOAT or equivalent until the original film thickness is obtained.

7.1.2 A topcoat of a two-component aliphatic isocyanate cured acrylic finish e.g.: SIGMADUR GLOSS or equivalent shall be applied according to the paint manufacturers instructions to a minimum dry film thickness of 50 microns. The topcoat shall be determined by whether steelwork is for Spoornet or the South African Rail Commuter Corporation.

7.1.2.1 For Spoornet the colour shall be French Grey (SABS 1091: Code H30).

7.1.2.2 For the South African Rail Commuter Corporation the colour shall be Medium Sea Grey (SABS 1091: Code G24).

8.0 QUALITY

8.1 The tenderer shall submit a copy of a Quality Plan to be implemented during the process. The Quality Plan shall include stages for preparation of metalwork prior to galvanising, for the galvanising and for the painting process.

8.2 The Quality Plan shall furthermore make provision for the customer's requirements for inspection and acceptance points and witnessing of tests to establish whether requirements of SABS 763 in so far as preparation of steelwork prior to galvanising, galvanising and painting requirements as per this specification are complied with.

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9.0 SUBSTITUTION

7.1 This instruction replaces Specification CEE.0183.95.

7.2 All clauses have been revised to suit latest requirements e.g.: removal of the Complies/Does not complies reference.

TENDERER'S SIGNATURE: _____

DATE: _____

FOR SPOORNET: _____

GRADE: _____

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Appendix

SCHEDULE OF REQUIREMENTS, QUANTITIES AND PRICES

1.0

END

FOR SPOORNET: _____

GRADE: _____

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CEE.0224 Issue 2002

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TECHNICAL

CONFIGURATION MANAGEMENT

SPECIFICATION CONTROL PAGE

DRAWINGS, CATALOGUES, INSTRUCTION MANUALS AND SPARES LISTS FOR ELECTRICAL EQUIPMENT SUPPLIED UNDER CONTRACT

Statement of authorisation:
There is no SABS specification available for similar material / equipment and as far as can be ascertained no other specification / standard suitably covers Spoornet requirements. The specification has been compiled in a manner which shall favour / encourage local manufacture of material / equipment to a maximum degree.

Author:	Chief Engineering Technician *Documentation management*	J C van Tonder
Approved:	Senior Engineer Railway Engineering	L O Borchard
Authorised:	Senior Technologist *Configuration Management*	J H Hancock

Date: January 2002

This page is for control purposes only and shall not be issued with the specification.

Respondent's Signature

Date & Company Stamp

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CEE.0224 Issue 2002

SPOORNET

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TECHNICAL

CONFIGURATION MANAGEMENT

SPECIFICATION

DRAWINGS, CATALOGUES, INSTRUCTION MANUALS AND SPARES LISTS FOR ELECTRICAL EQUIPMENT SUPPLIED UNDER CONTRACT

Circulation restricted to:

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1.0 SCOPE

This specification covers Spoornet's requirements for drawings, catalogues, and instruction manuals and spares lists of electrical equipment supplied under contract.

2.0 DEFINITIONS

2.1 "Design drawings for approval" defines those drawings, which have to be submitted to Spoornet for approval prior to manufacture of equipment.

2.2 "Installation drawings" defines those drawings, which are required for the installation of the equipment.

2.3 "As Built drawings" defines those drawings, which reflect all the various approved designs, layouts, etc., of the actual final accepted state of the equipment.

3.0 STANDARDS AND SPECIFICATIONS

3.1 The following standards and specifications are referred to:

CEE.0012: Method of Tendering

SABS 0111: Engineering Drawings.

BS 308: Engineering Drawing Practice.

NRS 002: Graphical Symbols for Electrical Diagrams.

IEC 617: Graphical Symbols for Diagrams.

ASHRAE: American Society of Heating Refrigeration Air-conditioning Engineers Standard.

3.1.1 The following Spoornet standard (Electrical) symbol drawings are listed for reference:

CEE-PA-19: Symbols for Electrical Installations.

CEE-PA-42: Symbols for Distribution and Transmission Layout.

CEE-PA-101: Symbols for Air-conditioning installations.

CEE-TA-62: Standard Electrification Symbols.

3.2 Tenderers and contractors shall ensure that they work to the latest issues and amendments of the above standards and specifications.

4.0 APPENDIX

The following appendix forms an integral part of this specification:

Appendix 1:SCHEDULE OF REQUIREMENTS

This appendix calls for specific requirements applicable to the contract.

5.0 METHOD OF TENDERING

5.1 Tendering shall be in accordance with Spoornet (Electrical) specification CEE.0012.

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

5.3 The Schedule of Requirements, Quantities and Prices, Appendix 1 to this specification shall be fully completed by Tenderers. Failure to submit a fully completed sheet may preclude a tender from further consideration.

6.0 LANGUAGE AND UNITS OF MEASURE

Drawings and documents shall be prepared in English and the ISO unit of measure. Other offers will be considered on merit.

7.0 DRAWINGS

7.1 Drawings shall be generated in either Microstation or any CAD format, which can be read by Microstation, but offers on other media will be considered on merit.

7.2 Drawings shall be prepared in such a manner that they fully comply with the requirements of SABS 0111 and/or BS 308.

7.3 Symbols, with their explanations used on the drawings but not covered by the NRS 002, IEC 617, ASHRAE or Spoornet's symbol drawings shall be furnished i.e. then included on the drawing or supplied on a separate symbol list which is to be cross referenced to the drawing.

7.4 Where the publications referred to in clause 3.1 are at variance, the practice detailed in SABS 0111 shall take preference.

7.5 Drawings shall be prepared for ISO; "A" series size sheets and shall not be greater than A1 size except as detailed below.

7.5.1 Where under exceptional circumstances the nature of the work is such that a size A1 is impractical, then the AO size may be used.

7.5.2 Long drawings, where necessary for wiring/circuit diagrams, cable run diagrams, track layouts, etc., shall be prepared with widths equal to the widths of the "A" series sheets as required, but preferably not exceeding the length of an A0 sheet.

7.6 All interrelated drawings shall be clearly and adequately cross-referenced.

7.7 The Contractor hereby grants to Transnet a non-exclusive licence, in accordance with the provisions of section 22 of the Copyright Act, 1978;

7.7.1 to copy any plan, diagram, drawing, specification, bill of quantities, design calculation or other similar document made by the Contractor, other than under the direction or control of Transnet, in connection with the extent of work;

7.7.2 to make free and unrestricted use thereof for its own purposes;

7.7.3 to provide copies thereof to consultants to Transnet to be used by them for the purpose of such consultations and consulting services and-

7.7.4 to provide other parties with copies thereof for the purpose of tenders invited by Transnet.

7.7.5	Such non-exclusive licence shall apply *mutatis mutandis* to any plan, diagram, drawing, specification, bill and/or schedule of quantities, design calculation or other similar document made, other than under the direction or control of Transnet, by any principal or sub-contractor of the Contractor. The provisions of this clause shall not apply to documents made, in the case of plant or equipment to be supplied, for the manufacturing process of such equipment, but only to the equipment supplied itself.
7.7.6	Transnet shall make no separate or extra payment in respect of any non-exclusive licence granted in terms hereof.
8.0	**INFORMATION REQUIRED ON DRAWINGS**
8.1	A title block shall be provided in the lower right hand corner of each drawing, indicating:
8.1.1	Descriptive title.
8.1.2	Contractor's drawing number.
8.1.3	Space for Spoornet's drawing number (as requested in clause 7.7).
8.1.4	Place of installation.
8.1.5	Contract / Order number.
8.1.6	Contractor's name.
8.1.7	Signature or name of approving officer (as requested in clause 8.0).
8.1.8	Approval date.
8.1.9	Issue number.
8.1.10	Projection symbol for multi-view drawings, if required.
8.2	Successful Tenderers can obtain a copy of Spoornet's standard title block (Microstation or DXF formats) free of charge by contacting the Documentation Management section.
8.3	On wiring and circuit diagrams, the following shall be specified:
8.3.1	Cable and wire sizes.
8.3.2	Values of resistance.
8.3.3	Breaking capacity of switches.
8.3.4	Ratings of equipment.
8.4	On each assembly or sub-assembly drawing, the following shall be given:
8.4.1	Description of item.
8.4.2	Quantity required for assembly depicted.
8.4.3	Material manufactured from.
8.4.4	The classification of the material according to the relevant SABS specification or other specifications referred to herein.

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8.4.5	The class or process of finish and/or coating.
8.4.6	Where special parts are specified, the name of the manufacturer, the size, capacity and the name or catalogue number of each part shall be furnished.
8.4.7	The mass of finished item depicted on the drawing.
8.4.8	Dimensions from a proper reference surface.
8.4.9	Dimension tolerances.
8.5	On electrification drawings, the following shall be specified:
8.5.1	Kilometre distances.
8.5.1.1	Kilometre distances of all new and existing masts measured from the preceding kilometre post.
8.5.2	Civil
8.5.2.1	The following civil information shall be shown:
8.5.2.1.1	Bridges.
8.5.2.1.2	Tunnels.
8.5.2.1.3	Pipes.
8.5.2.1.4	Culverts.
8.5.2.1.5	Subways.
8.5.2.1.6	Manholes.
8.5.2.1.7	Off track platforms.
8.5.2.1.8	Water-furrows along track.
8.5.2.1.9	Service roads that may influence electrification.
8.5.2.1.10	Level crossings.
8.5.2.1.11	All banks and cuttings.
8.5.2.1.12	Retaining walls.
8.5.2.1.13	Gradient markers and gradients.
8.5.2.1.14	Boundary fences (where relevant).
8.5.2.1.15	The beginning and ending of transition and circular curves and the radius.
8.5.2.3	On all station plans the beginning and ending of the platforms to be indicated, as well as all buildings and structures on the platform which may effect electrification. All secondary platforms/structures/obstacles, which may effect electrification, must also be shown.
8.5.2.4	All points with stock rail joints, intersection of centre lines and all ends of point positions to be shown, as well as the type of point, e.g. 1:9 LH (left hand.

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8.5.3	Electrical
8.5.3.1	The following electrical information shall be shown:
8.5.3.1.1	New and existing masts and structures with appropriate sizes.
8.5.3.1.2	Span lengths.
8.5.3.1.3	Tension lengths.
8.5.3.1.4	Mast to track centres.
8.5.3.1.5	Tension type (spring or weight).
8.5.3.1.6	Transmission lines, Transnet and Eskom (Showing crossing heights above rail level).
8.5.3.1.7	Telkom lines.
8.5.3.1.8	Height gauges.
8.5.3.1.9	Power and Lighting kiosks.
8.5.3.1.10	Electrical cables nearer than 3,2m from track centre, as well as cables crossing the track.
8.5.3.2	Wire profiles showing clearances/wire heights for all transmission and telecommunication lines that cross the tracks shall be shown on the drawing at the point of crossing, in either tabular or graphic format.
8.5.3.3	*Wire profile for all bridges and tunnels shall be shown on separate drawings.*
8.5.3.4	Important information that shall be noted are:
8.5.3.4.1	Basic span.
8.5.3.4.2	Ruling contact wire height.
8.5.3.4.3	Reference to bonding drawings.
8.5.3.4.4	Wire sizes.
8.5.3.4.5	Types of structures and foundations.
8.5.3.4.6	Tables for traction and transmission line (Showing wire heights).
8.5.3.4.7	Dropper chart.
8.5.3.4.8	Overlaps.
8.5.3.4.9	Jumpers.
8.5.3.4.10	Staggering.
8.5.3.4.11	References to switching diagram drawings.
8.5.3.4.12	Any other relevant information.
8.5.4	Signal.
8.5.4.1	The following signal information shall be shown:

TRANSNET

8.5.4.1.1 Signal gantries (showing direction of aim).

8.5.4.1.2 Independent signals (showing direction of aim).

8.5.4.1.3 Signal kiosks.

8.5.4.1.4 Telephones.

8.5.4.1.5 Signal relay rooms.

8.5.4.1.6 Radio repeater rooms.

8.5.4.1.7 Signal cables nearer than 3,2m from track centre, as well as cables crossing the track.

8.5.5 Electrification information must be clearly indicated on drawings (see also drg no CEE-TA-62 for Standard Electrification Symbols).

8.7 The successful tenderer shall obtain Spoornet's drawing numbers from the Documentation Management section of Spoornet well in advance in writing, wherein details of all relevant drawings, i.e. titles and makers numbers are quoted. Against this information Spoornet will allocate its own numbers for inclusion by the Contractor on the original drawings.

9.0 CERTIFICATION OF DRAWINGS

The contractor against a date to certify that the drawing has been checked and is correct in all respects shall approve each drawing. This also includes changes.

10.0 CHANGES TO DRAWINGS

Any drawing returned to the Contractor for changes shall be re-submitted to Spoornet within 21 days with the appropriate changes endorsed thereon.

11.0 SUBMISSION OF TENDER DRAWINGS

The Tenderer shall submit drawings of all major items of equipment with the tender. The drawings shall be sufficiently detailed (e.g. safety factors) to enable suitability of the design to be judged and to enable Spoornet to prepare a reasonably accurate estimate of the cost of maintenance.

12.0 DRAWINGS TO BE SUPPLIED BY SUCCESSFUL TENDERER

12.1 Two prints of each design drawing for approval to be submitted prior to commencement of work or manufacture of any equipment to Spoornet. This includes drawings of general layouts, cable routes, schematic diagrams, foundations, equipment etc.

12.2 Two prints of each installation and/or erection drawing to be submitted to Spoornet. This includes drawings of modular steel buildings, structures etc. and shall be delivered at the same time the delivery of the equipment commences.

12.3 The successful tenderer shall supply one complete set of approved (signed) "As Built" working drawings as well as the electronic files thereof. Drawings shall be fully dimensioned, fully detailed, clear and neat. The set shall comprise all electrical and mechanical drawings considered necessary by Spoornet and shall include drawings of all renewable parts or items. "As Built" drawings of all enclosures, structures and foundations shall also be supplied.

TRANSNET

12.4 All relevant "As Built" drawings required shall be delivered to Spoornet within 90 days of completion of the installation and delivery of equipment.

12.5 Until all relevant drawings called for in the contract are delivered, the contract will be considered incomplete.

13.0 CATALOGUES

13.1 Tenderers shall submit a separate quotation for the supply of the itemised part catalogues when specified in the Schedule of Requirements. The size shall be A4 (297 mm x 210 mm). Consideration shall be given on merit of the supply of these catalogues electronically (PDF format).

13.2 The information contained in the catalogues shall be classified into convenient sectors and be indexed. Thumb tabs shall be provided for quick reference to sections. All apparatus shall be illustrated by means of photographs or detailed sketches on which both the parts and the catalogue numbers of the parts are clearly shown. Catalogues shall have exploded views of components for clarity where needed.

13.3 The following information shall be given in tabular form:

13.3.1 Designation of apparatus or item of equipment.

13.3.2 Description of part including information such as dimensions, sizes, resistance values, stranding, material, current ratings, etc.

13.3.3 Catalogue number.

13.3.4 Manufacturer's name.

13.3.5 "As Built" drawing and item number where applicable.

13.3.6 Quantity of parts required for each piece of apparatus.

13.3.7 Illustrating photographs or sketch number.

13.3.8 Nato registration where applicable.

13.4 In a suitable section of the catalogue the following information shall be given:

13.4.1 Index to "As Built" Drawings.

13.4.1.1 "As Built" drawing number.

13.4.1.2 Heading.

13.4.1.3 Parts shown on drawing.

13.4.2 Index to catalogue numbers.

13.4.2.1 Catalogue numbers in numerical order.

13.4.2.2 Catalogue volume number, where applicable.

13.4.2.3 Section in which part is listed.

13.4.2.4 Page number.

TRANSNET

13.4.3 Special tools.

13.4.3.1 Designation and description of special tools.

13.4.3.2 Catalogue number.

13.5 Each volume shall be neatly bound in hard serviceable cover on which the contract numbers volume number and titles are printed. All the information in the catalogues shall be given in a clear legible manner. The catalogues shall include all items of equipment to be supplied by the successful tenderer.

13.6 *Catalogues shall be delivered before date of completion of the contract.*

14.0 INSTRUCTION MANUALS

14.1 Tenderers shall submit a separate quotation for the supply of the number of copies of instruction manuals specified in the Schedule of Requirements. The size shall be A4 (297 mm x 210 mm). Consideration shall be given on merit of the supply of these catalogues electronically (PDF format).

14.2 The successful tenderer shall submit draft instruction manuals for approval prior to final printing/compiling and delivery.

14.3 The approved instruction manuals shall be delivered before commissioning the equipment. If this cannot be met, the successful tenderer shall furnish at least three copies of preliminary instruction manuals, suitable for the use of maintenance staff, until the final instruction manuals are to hand (which shall be before the date of completion of the contract).

14.4 The construction, method of operation and purpose of all items of equipment shall be fully explained by means of descriptions and photographs, sketches, drawings or circuit diagrams showing all details.

14.5 The information contained in the instruction manuals shall be classified into convenient sections and indexed. Where multiple models are produced each model shall be described in a separate section in such a manner that models not applicable can be omitted. Where possible the sections shall be subdivided as follows:

14.5.1 Installation and commissioning.

14.5.2 General description and method of operation.

14.5.3 Maintenance and inspection.

14.5.4 Overhaul and repair of equipment.

14.5.5 Technical and maintenance data.

14.5.6 Test procedure flow charts.

14.5.7 Fault finding and trouble shooting.

14.6 The method of calibrating, setting or adjusting all equipment requiring such attention shall be described and where necessary illustrated. The necessary data shall be given in each case to enable the equipment to be checked by measurement if required.

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14.7 Full step-by-step instructions regarding the servicing and repair of the equipment shall be given together with all the necessary data such as dismantling and assembling procedures, working clearances, tolerances, limits, fits, maximum permissible wear, recommended lubricants, use of special tools, insulation and winding data, spring pressures and tensions, brush data, fuse data, etc. Recommended servicing/rework/replacement of parts frequencies shall also be included in the maintenance and inspection section of the instruction manual.

14.8 Any delay in delivery of the complete supply of satisfactory instruction manuals/preliminary manuals as provided for in this clause, will subject the Contractors to a deduction from the contract sum, of a penalty as defined in the tender, counting from the specified delivery time until such time as the said manuals are delivered.

15.0 COMBINED DOCUMENTS

If desired the catalogues and instruction manuals specified in clauses 12.0 and 13.0 may be combined into single volumes. Tenderers shall state whether or not it is their intention to do so. In this case the delivery shall be as specified in clause 13.3, alternatively the conditions described in clause 13.8 applies.

16.0 SPARES LIST

16.1 To enable Spoornet to catalogue and timeously acquire all spares required, the following information shall be submitted before commissioning of equipment:

16.1.1 An itemised schedule of the spares (with reference to alternatives) which are recommended for normal maintenance purposes.

16.1.2 The quantity recommended to be held against each item on the spares list and where sets are supplied, the types and quantity per type to make up a set.

16.1.3 A full and complete ordering description and number of each individual spare with drawing number if relevant.

16.1.4 Where the ordering description and number differs from that of the original manufacturer's catalogue, description and number, the original manufacturer's name, description, type and ordering number shall be listed as well as all other relevant data available.

16.1.5 The national stock number - Nato - number of each spare where the particular spare was imported from a Nato country and where a national stock number was allocated.

16.2 Initially the spares list containing the above information will suffice, but this list shall not in any way replace or supersede the spare parts catalogue mentioned in clause 12.0.

17.0 PACKING OF DRAWINGS, CATALOGUES, INSTRUCTION MANUALS AND SPARES LISTS

All items shall be packed in such a way that they are received in good condition.

18.0 SUBSTITUTION

This specification replaces specification CEE.0224.94

TRANSNET

CEE.0224 Issue 2002

TENDERER'S SIGNATURE: _____

DATE: _____

FOR SPOORNET: _____

GRADE: _____

TRANSNET

CEE.0224 Issue 2002

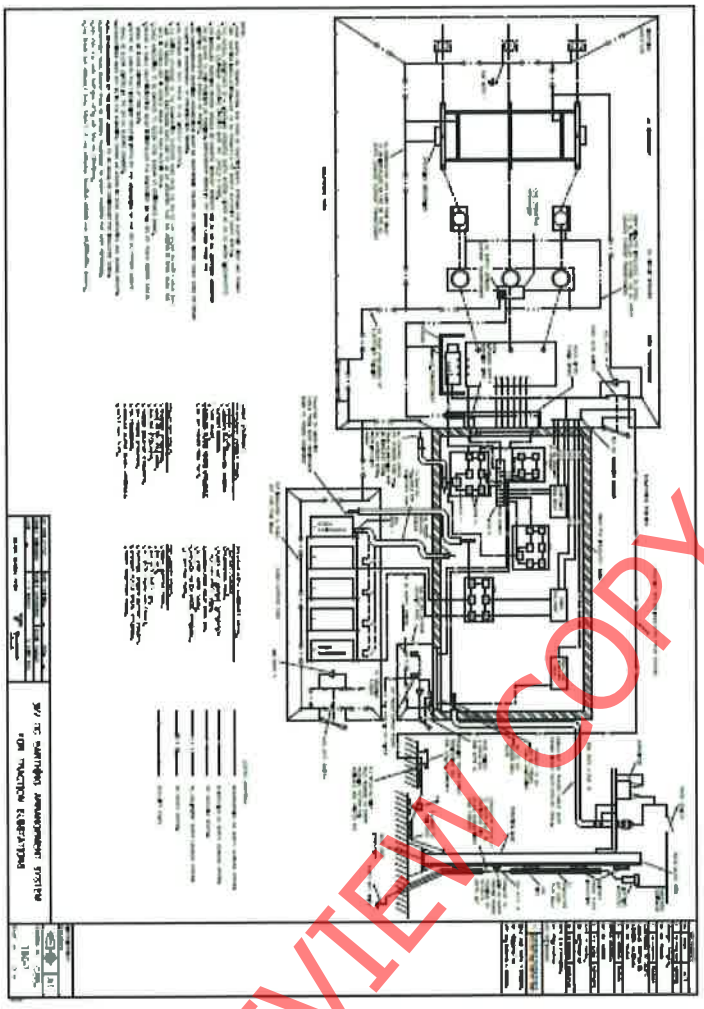
Appendix 1

SCHEDULE OF REQUIREMENTS

FOR SPOORNET: _____

GRADE: _____

END



Respondent's Signature

Date & Company Stamp

TRANSNET

BBB0845 Version 4

TRANSNET
freight rail

TECHNOLOGY MANAGEMENT.

SPECIFICATION.

REQUIREMENTS FOR METAL OXIDE SURGE ARRESTERS WITHOUT GAPS FOR TRACTION AND POWER DISTRIBUTION SUBSTATIONS IN ACCORDANCE WITH SANS 60099-4

Author:	Chief Engineering Technician. Section: Technology Management	D.O Schulz	
Approved:	Senior Engineer. Section: Technology Management	L. O. Borchard	
Authorised:	Principle Engineer Section: Technology Management	W. A. Coetzee	pp

Date: 21st September 2009

Circulation Restricted To:

Transnet Freight Rail - Chief Engineer Infrastructure
- Technology Management

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1.0 SCOPE

This documents presents information and requirements for metal oxide surge arresters of the station class to be installed at Transnet Freight Rail's traction substations and distribution substations.

2.0 INFORMATION ON SYSTEM

2.1 Nominal frequency is 50 HZ.

2.2 Maximum duration of the earth fault is less than 1 second (Solidly earthed).

2.3 Short-circuit current of the system at the arrester location is lower than 10 kA.

2.4 Transnet Freight Rail's traction substations and power distributions systems are considered to be effectively earthed.

2.5 An earth fault factor equal to 0.8x√ 3 for solidly earthed neutral systems was used to calculate the ratings of the surge arresters which will be suitable for the different nominal r.m.s voltage systems supplying Transnet Freight Rail's traction substations and distributions substations.

3.0 STANDARDS

3.1 Unless otherwise specified all materials and equipment supplied shall comply with the current edition of the relevant SANS or Transnet Freight Rail's publication where applicable.

3.2 The following publications are referred to in this specification:

3.2.1 SOUTH AFRICAN NATIONAL STANDARDS

SANS 1019: Standard voltages, currents and insulating levels for electrical supply.

4.0 INFORMATION ON SERVICE CONDITIONS

4.1 NORMAL CONDITIONS

See conditions in clause 4.4.1 SANS 60099-4

4.2 ABNORMAL CONDITIONS

The surge arrester shall be designed for the following ambient conditions:

Altitude:	0 to 1800m above sea level
Ambient temperature:	minus10 °C to plus 45 °C
Relative humidity:	10% to 90%.
Atmosphere:	Heavy polluted environment: salt laden, industrial and locomotive fumes, and severe dust conditions.

5.0 INSULATION LEVELS

INSULATION LEVELS

For the medium and high voltage nominal r.m.s voltage systems on Transnet Freight Rail the recommended insulation levels is tabled in table 1 below

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Highest phase-to-phase r.m.s voltage for equipment. (Um)	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 1: Standard Voltages and insulation levels in accordance with SANS 1019:2008 [1]

6.0. INFORMATION ON THE ARRESTER DUTY

6.1 Selection of surge arresters for the traction substations and distribution substations shall be in accordance with tables No's 2 and shall not compromise the recommended impulse levels as shown in table No 1

6.2 The arrester will be connected between phase and earth.

6.3 The equipment, which will be protected, is:

- Transformer directly connected to line via overhead conductors.
- Rectifier units (Diodes, Capacitors, etc.).

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7.0 SCHEDULE OF SURGE ARRESTER RATINGS FOR EFFECTIVELY EARTHED SYSTEMS.

Table 2 shown below is representative of the parameters of surge arresters employed for protection. Minor deviations from the table are permissible but information concerning these deviations must be supplied to Technology Management for acceptance.

TABLE 2

Nominal system r.m.s. voltage	6,6 kV	11kV	22 kV	33 kV	44 kV	66 kV	88 kV	132 kV	220 kV
Rated voltage of surge arrester. Ur	6,0 kV	12 kV	21kV	36 kV	42 kV	60 kV	84 kV	120 kV	198 kV
Continuous operating voltage of surge arrester Uc	4,8 kV	9.6 kV	16.8 kV	28.8 kV	33.6 kV	48 kV	67 kV	96 kV	158 kV
Nominal discharge current (8/20 µ s)	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA
High current (4/10µs)	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA
Line discharge class	2	2	2	2	2	2	2	2	3
Pressure relief capability (0.2s)	40 kA	40 kA	40 kA	40 kA	40 kA	40 kA	40kA	40 kA	63kA
Temporary overvoltage (TOV) prestressed acc to IEC 99-4 for duration of 1 second	6,9 kV	13.8 kV	24.1kV	41.4kV	48.3kV	69kV	96kV	138kV	228 kV
Temporary overvoltage (TOV) prestressed acc to IEC 99-4 for duration of 10 seconds	6,5 kV	13.0 kV	22.8 kV	39.2 kV	45.7 kV	65 kV	91kV	130 kV	214kV
Residual voltage at steep current impulse (1/2 µ s) 10kA	17,6 kV	35.1kV	61.4 kV	105.3 kV	123 kV	176 kV	246 kV	351kV	518 kV
Residual voltage at lightning current impulse (8/20 µ s) 10kA	16 kV	31.9 kV	55.9 kV	95.8 kV	111.8kV	160 kV	223 kV	319 kV	475 kV
Residual voltage at switching current impulse (30/70 µ s)500A	12,9 kV	25.8 kV	45.2 kV	77.5 kV	90.8 kV	129 kV	181 kV	258 kV	392 kV

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

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

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8.0 REQUIREMENTS

8.1 The manufacturer shall provide a routine test report for each arrester in accordance to SANS 60099-4 clause 8.1 a, b and c.

8.2 To verify the seal integrity the manufacturer shall indicate the leakage rate of the arrester (SANS 60094-4 clause 8.1.d) and what type of leakage test method has been used. The Integrated Helium Mass Spectrometer or the Membrane method is the preferred method.

8.3 The tenderer shall provide the information as per SANS 60099-4, Annexure G, Clause G2.

8.4 Nameplate data in accordance with clause 3.1 of SANS 60099-4 shall be fitted to each arrester.

8.5 If a polymer type of arrester is presented it is preferred that the housing will consist of Fibre-reinforced Resin tube with a non-tracking Silicon shed which is UV protected.

8.6 The sealing test is only required for arresters with enclosed gas volumes and separate sealing systems.

9.0 BIBLIOGRAPHY

[1] SANS 1019: 2008. Edition 2.5

TRANSNET

BBB0845 Version 4

APPENDIX 1

SCHEDULE OF REQUIREMENTS

SURGE ARRESTER FOR SUBSTATIONS

1.0 Arresters required for substation: _____

2.0 Quantity required: _____

3.0 Nominal system voltage: _____

4.0. Surge arresters to be fitted with insulation bases: yes / no

5.0. Surge counters required for the surge arresters yes / no

Respondent's Signature

Date & Company Stamp

TRANSNET

B8B2502 Version 6

TRANSNET freight rail

TECHNOLOGY MANAGEMENT.

SPECIFICATION.

REQUIREMENTS FOR BATTERY CHARGERS FOR 3kV DC TRACTION SUBSTATIONS.

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

Date: 21st September 2009

Circulation Restricted To:

Transnet Freight Rail – Chief Engineer Infrastructure
- Technology Management

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INDEX

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1.0 SCOPE.

1.1 This specification covers the requirements for the design, manufacture and supply of battery charger units used in 3 kV DC traction substations.

2.0 GENERAL.

2.1 The equipment is required to charge a 53 cell lead acid 3 kV DC substation or tie station battery bank. The ampere-hour rating of the battery bank may vary between 100 to 250 ampere hours. The charger must be able to supply the substation or tie station load as well as float charge the battery under normal conditions.

2.2 The battery could be subjected to momentary heavy discharges from 50 amperes to 250 amperes for a period of 1 to 3 seconds. The discharge current is for the closing coils of the 3 kV DC high-speed circuit breakers. The discharge current is dependent of the model of the circuit breaker used.

2.3 In addition to charging the battery bank the charger must supply a constant voltage to the high-speed circuit breaker's holding coils. As the trip calibration of the high-speed circuit breakers is dependent on the holding coil voltage, the voltage must be maintained at 110 volts by means of a suitably tapped diode string or other means. In the event of failure of the battery charger, the diode string shall be automatically short-circuited and the holding coils of the track breakers shall be fed directly from the battery.

3.0 STANDARDS.

The following latest editions of the following publications are referred to herein.

3.1 SOUTH AFRICAN NATIONAL STANDARDS

SANS 1091:	National colours standards for paint.
SANS 1274:	Coatings applied by the powder-coating process.
SANS 1652:	Battery chargers – Industrial type

3.2 TRANSNET FREIGHT RAIL.

BBB0041:	Preparation of drawings for Transnet Freight Rail Infrastructure.
CEE.0045:	Painting of steel components of electrical equipment.
CEE.0224:	Drawings, catalogues, instruction manuals and spares lists for electrical equipment supplied under contract.

4.0 DEFINITIONS

4.1 **BOOST CHARGE:** A partial charge, generally at a high rate, for a short period. It is also known as a fast charge or a quick charge.

4.2 **FLOAT CHARGE:** A constant voltage charge ideally sufficient to maintain a cell or battery in a fully charged state.

4.3 **EQUALISING CHARGE:** An extended charge applied to correct relative density imbalance amongst the cells of a battery.

4.4 **INITIAL CHARGE:** An increased charge for new or uncharged battery cells.

5.0 TENDERING PROCEDURE

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

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

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

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

6.0 SERVICE CONDITIONS.

The battery charger shall be designed to operate under the following service conditions.

6.1	Altitude:	0 – 1800 meters above sea level.
6.2	Ambient Temperature Range:	-10°C to +45°C.
6.3	Relative Humidity:	10% to 90%
6.4	Lightning Conditions:	12 Ground flashes per square kilometre per annum.

7.0 ELECTRICAL REQUIREMENTS

7.1 INPUT VOLTAGE.

7.1.2 The charger must be capable of working off an auxiliary supply with a poor waveform, as a result of thyristor controlled locomotives, line switching and lightning induced surges. A total harmonic voltage distortion figure of 27% must be catered for.

7.1.3 Appendix 1 shows the Quality of Supply characteristics of a typical 230 Volt AC auxiliary supply of a 3 kV DC traction substation.

7.1.4 The battery charger output shall be fitted with low pass filtering to reduce the effect of harmonic frequencies and ripple on the battery and load circuits.

7.2 The following input supplies are available at the 3 kV DC traction substations.

1. Single phase 230 volts AC ± 10% (r.m.s)
2. Three phase 400 volts AC ± 10% (r.m.s)
3. Frequency 60Hz ± 2Hz.

7.3 OUTPUTS.

7.3.1 The charger must be capable of driving varying loads and be unaffected by sudden changes in load current and transients generated by the load.

7.3.2 With no battery connected to the output, the charger must be capable of withstanding a short-circuit across its terminals, without any resultant component damage.

7.3.3 The conductors of the battery charger output must be rated to carry the maximum load current continuously. For a 100 ampere hour battery bank, 35 milli meter square conductors are recommended to make provision for short circuit ratings.

7.3.4 Upon switch on, the charger must incorporate a soft start feature, so that at no time either the DC output current or voltage exceeds their full load values.

7.3.5 The charger outputs shall be voltage and current limited for "float" and "boost" charging.

7.4 OUTPUT PARAMETERS.

The following parameters shall be complied with:

7.4.1 SYSTEM DC VOLTAGE.

7.4.1.1 The nominal voltage shall be 110 volts.

7.4.1.2 The charging battery voltage shall be 110volts to 119.26volts for the automatic mode. (2.25volts per cell).

TRANSNET

7.4.1.3 The charging battery voltage shall be 110 volts to 127.2 volts for the boost mode. (2.35 volts to 2.40 volts per cell)

7.4.2 TOTAL CURRENT

7.4.2.1 The output current shall be 30 ampere (current limit in the automatic mode)

7.4.2.2 The current shall be 5 ampere to 25 ampere in the boost mode.

7.4.3 LINE REGULATION

7.4.3.1 The line regulation shall be a maximum of 0.75% when the input varies ± 10%.

7.4.4 RIPPLE VOLTAGE

7.4.4.1 For all output current up to 100% battery charger capacity into a resistive load: The maximum peak to peak ripple voltage at the charger output terminals (with resistive load coupled to the output terminals instead of the battery) shall not exceed 5% of the nominal battery voltage.

7.4.4.2 The peak to peak ripple voltage shall be measured at nominal input voltage.

7.4 .5 RIPPLE CURRENT

7.4.5.1 The maximum peak to peak ripple (AC) voltage measured across the shunt for the total current shall not exceed 5% of the nominal battery voltage.

7.4.5.2 The peak to peak ripple current shall be measured at nominal input voltage.

7.4.5.3 The maximum superimposed r.m.s value of the AC component shall always have a positive value even if it is very small i.e. 100 milli ampere. The AC ripple shall be limited to 5% of the ampere hour rating capacity expressed in amps for example 5 ampere or less for a 100 ampere hour battery bank.

7.4.5.4 The battery charger shall meet the requirement that the charging current never becomes negative (discharge) in value.

7.4.6 DC OUTPUT CHARGE VOLTAGE

7.4.6.1 The DC output voltage must remain within ± 1% of the respective value for boost and float modes and within 5% for initial charge mode.

7.4.7 FLOAT MODE

7.4.7.1 The output voltage shall be pre-set at 2.25 volts per cell but adjustable by ± 5%. For 53 cells the float voltage shall be 119.25 volts adjustable. The values shall be within 1% in the automatic mode.

7.4.8 BOOST MODE

7.4.8.1 The output voltage shall be pre-set at between 2.35 volts to 2.40 volt – 5% per cell, adjustable. For 53 cells the boost voltage shall be set at 124.55 volts. (2.35 volts per cell) to 127.2 volts (2.40 volts per cell). The boost voltage shall remain within 1% of the required boost voltage. In automatic operational mode the battery charger shall revert back to float charge mode when the boost charge cycle is completed.

7.4.9 MANUAL BOOST MODE

7.4.9.1 A push button is required to switch the charger to "boost mode" manually. The battery charger shall revert back to float charge mode when the boost charge cycle is completed i.e. when the set boost voltage is reached. (124.55 volts to 127.2 volts). An additional push button shall be provided to be able to cancel the boost mode when required.
An adjustable 0-4 hour timer shall be installed to automatically switch off the manual boost in the event of the manual boost mode not being switched off by the technical staff.
After the boost mode has being switched off, the charger shall remain in the trickle charge mode for a period of not less 30 minutes before changing back to automatic boost mode if the battery voltage has not reached the required float voltage.

TRANSNET

NON-DISCLOSURE AGREEMENT

entered into by and between

TRANSNET SOC LTD

Registration Number 1990/000900/30

and

_____

Registration Number _____

RFQ Number: CRAC-KGG-12310

TABLE OF CONTENTS

THIS AGREEMENT is made between

Transnet SOC Ltd [**Transnet**] [Registration No. 1990/000900/30]

whose registered office is at 49th Floor, Carlton Centre, 150 Commissioner Street, Johannesburg 2001,

and

_____ **[the Company]** [Registration No _____]

whose registered office is at _____

_____

WHEREAS

Transnet and the Company wish to exchange Information [as defined below] and it is envisaged that each party may from time to time receive Information relating to the other in respect thereof. In consideration of each party making available to the other such Information, the parties jointly agree that any dealings between them shall be subject to the terms and conditions of this Agreement which themselves will be subject to the parameters of the Bid Document.

IT IS HEREBY AGREED

1 INTERPRETATION

In this Agreement:

1.1 **Agents** mean directors, officers, employees, agents, professional advisers, contractors or sub-contractors, or any Group member;

1.2 **Bid** or **Bid Document** means Transnet's Request for Information [**RFI**] Request for Proposal [**RFP**] or Request for Quotation [**RFQ**], as the case may be;

1.3 **Confidential Information** means any information or other data relating to one party (the **Disclosing Party**) and/or the business carried on or proposed or intended to be carried on by that party and which is made available for the purposes of the Bid to the other party (the **Receiving Party**) or its Agents by the Disclosing Party or its Agents or recorded in agreed minutes following oral disclosure and any other information otherwise made available by the Disclosing Party or its Agents to the Receiving Party or its Agents, whether before, on or after the date of this Agreement, and whether in writing or otherwise, including any information, analysis or specifications derived from, containing or reflecting such information but excluding information which:

a) is publicly available at the time of its disclosure or becomes publicly available (other than as a result of disclosure by the Receiving Party or any of its Agents contrary to the terms of this Agreement); or

b) was lawfully in the possession of the Receiving Party or its Agents (as can be demonstrated by its written records or other reasonable evidence) free of any restriction as to its use or disclosure prior to its being so disclosed; or

c) following such disclosure, becomes available to the Receiving Party or its Agents (as can be demonstrated by its written records or other reasonable evidence) from a source other than the Disclosing Party or its Agents, which source is not bound by any duty of confidentiality owed, directly or indirectly, to the Disclosing Party in relation to such information;

1.4 **Group** means any subsidiary, any holding company and any subsidiary of any holding company of either party; and

1.5 **Information** means all information in whatever form including, without limitation, any information relating to systems, operations, plans, intentions, market opportunities, know-how, trade secrets and business affairs whether in writing, conveyed orally or by machine-readable medium.

2 CONFIDENTIAL INFORMATION

2.1 All Confidential Information given by one party to this Agreement (the **Disclosing Party**) to the other party (the **Receiving Party**) will be treated by the Receiving Party as secret and confidential and will not, without the Disclosing Party's written consent, directly or indirectly communicate or disclose (whether in writing or orally or in any other manner) Confidential Information to any other person other than in accordance with the terms of this Agreement.

2.2 The Receiving Party will only use the Confidential Information for the sole purpose of technical and commercial discussions between the parties in relation to the Bid or for the subsequent performance of any contract between the parties in relation to the Bid.

2.3 Notwithstanding clause 2.1 above, the Receiving Party may disclose Confidential Information:

a) to those of its Agents who strictly need to know the Confidential Information for the sole purpose set out in clause 2.2 above, provided that the Receiving Party shall ensure that such Agents are made aware prior to the disclosure of any part of the Confidential Information that the same is confidential and that they owe a duty of confidence to the Disclosing Party. The Receiving Party shall at all times remain liable for any actions of such Agents that would constitute a breach of this Agreement; or

b) to the extent required by law or the rules of any applicable regulatory authority, subject to clause 2.4 below.

2.4 In the event that the Receiving Party is required to disclose any Confidential Information in accordance with clause 2.3b) above, it shall promptly notify the Disclosing Party and cooperate with the Disclosing Party regarding the form, nature, content and purpose of such disclosure or any action which the Disclosing Party may reasonably take to challenge the validity of such requirement.

2.5 In the event that any Confidential Information shall be copied, disclosed or used otherwise than as permitted under this Agreement then, upon becoming aware of the same, without prejudice to

any rights or remedies of the Disclosing Party, the Receiving Party shall as soon as practicable notify the Disclosing Party of such event and if requested take such steps (including the institution of legal proceedings) as shall be necessary to remedy (if capable of remedy) the default and/or to prevent further unauthorised copying, disclosure or use.

2.6 All Confidential Information shall remain the property of the Disclosing Party and its disclosure shall not confer on the Receiving Party any rights, including intellectual property rights over the Confidential Information whatsoever, beyond those contained in this Agreement.

3 RECORDS AND RETURN OF INFORMATION

3.1 The Receiving Party agrees to ensure proper and secure storage of all Information and any copies thereof.

3.2 The Receiving Party shall keep a written record, to be supplied to the Disclosing Party upon request, of the Confidential Information provided and any copies made thereof and, so far as is reasonably practicable, of the location of such Confidential Information and any copies thereof.

3.3 The Company shall, within 7 (seven) days of receipt of a written demand from Transnet:

a) return all written Confidential Information (including all copies); and

b) expunge or destroy any Confidential Information from any computer, word processor or other device whatsoever into which it was copied, read or programmed by the Company or on its behalf.

3.4 The Company shall on request supply a certificate signed by a director as to its full compliance with the requirements of clause 3.3b) above.

4 ANNOUNCEMENTS

4.1 Neither party will make or permit to be made any announcement or disclosure of its prospective interest in the Bid without the prior written consent of the other party.

4.2 Neither party shall make use of the other party's name or any information acquired through its dealings with the other party for publicity or marketing purposes without the prior written consent of the other party.

5 DURATION

The obligations of each party and its Agents under this Agreement shall survive the termination of any discussions or negotiations between the parties regarding the Bid and continue thereafter for a period of 5 (five) years.

6 PRINCIPAL

Each party confirms that it is acting as principal and not as nominee, agent or broker for any other person and that it will be responsible for any costs incurred by it or its advisers in considering or pursuing the Bid and in complying with the terms of this Agreement.

7 ADEQUACY OF DAMAGES

Nothing contained in this Agreement shall be construed as prohibiting the Disclosing Party from pursuing any other remedies available to it, either at law or in equity, for any such threatened or actual breach of this Agreement, including specific performance, recovery of damages or otherwise.

8 PRIVACY AND DATA PROTECTION

8.1 The Receiving Party undertakes to comply with South Africa's general privacy protection in terms of the Bill of Rights (Section 14) in connection with this Bid and shall procure that its personnel shall observe the provisions of such Act (as applicable) or any amendments and re-enactments thereof and any regulations made pursuant thereto.

8.2 The Receiving Party warrants that it and its Agents have the appropriate technical and organisational measures in place against unauthorised or unlawful processing of data relating to the Bid and against accidental loss or destruction of, or damage to such data held or processed by them.

9 GENERAL

9.1 Neither party may assign the benefit of this Agreement, or any interest hereunder, except with the prior written consent of the other, save that Transnet may assign this Agreement at any time to any member of the Transnet Group.

9.2 No failure or delay in exercising any right, power or privilege under this Agreement will operate as a waiver of it, nor will any single or partial exercise of it preclude any further exercise or the exercise of any right, power or privilege under this Agreement or otherwise.

9.3 The provisions of this Agreement shall be severable in the event that any of its provisions are held by a court of competent jurisdiction or other applicable authority to be invalid, void or otherwise unenforceable, and the remaining provisions shall remain enforceable to the fullest extent permitted by law.

9.4 This Agreement may only be modified by a written agreement duly signed by persons authorised on behalf of each party.

9.5 Nothing in this Agreement shall constitute the creation of a partnership, joint venture or agency between the parties.

9.6 This Agreement will be governed by and construed in accordance with South African law and the parties irrevocably submit to the exclusive jurisdiction of the South African courts.

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TRANSNET

Appendix (i)

GENERAL BID CONDITIONS - SERVICES

[February 2013]

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1 DEFINITIONS

Where the following words or phrases are used in this Agreement, such words or phrases shall have the meaning assigned thereto in this clause, except where the context clearly requires otherwise:

1.1 **Bid** shall mean a Respondent's tendered response / proposal to a Transnet RFP or RFQ;

1.2 **Bid Document(s)** shall mean a reference to a Request for Proposal or Request for Quotation;

1.3 **Day** shall mean any day other than a Saturday, Sunday or public holiday;

1.4 **Respondent(s)** shall mean a respondent/bidder to a Bid Document;

1.5 **RFP** shall mean Request for Proposal;

1.6 **RFQ** shall mean Request for Quotation;

1.7 **RFX** shall mean RFP or RFQ, as the case may be;

1.8 **Services** shall mean the services required by Transnet as specified in its Bid Document;

1.9 **Service Provider** shall mean the successful Respondent;

1.10 **Tax Invoice** shall mean the document as required by Section 20 of the Value-Added Tax Act, 89 of 1991, as may be amended from time to time;

1.11 **Transnet** shall mean Transnet SOC Ltd, a State Owned Company; and

1.12 **VAT** shall mean Value-Added Tax in terms of the Value-Added Tax Act, 89 of 1991, as may be amended from time to time.

2 GENERAL

All Bid Documents and subsequent contracts and orders shall be subject to the following general conditions as laid down by Transnet and are to be strictly adhered to by any Respondent to this RFX.

3 SUBMISSION OF BID DOCUMENTS

3.1 A Bid, which shall hereinafter include reference to an RFP or RFQ, shall be submitted to Transnet no later than the closing date and time specified in accordance with the directions issued in the Bid Documents. Late Bids will not be considered.

3.2 Bids shall be delivered in a sealed envelope in accordance with the instructions indicated in the Bid Documents with the Bid number and subject marked on the front of the envelope.

3.3 The Respondent's return address must be stated on the reverse side of the sealed envelope.

4 USE OF BID FORMS

4.1 Where special forms are issued by Transnet for the submission of Bids, Respondents are required to submit their Bids by completion of the appropriate sections on such official forms and not in other forms or documents bearing their own terms and conditions of contract. Non-compliance with this condition may result in the rejection of a Bid.

4.2 Respondents must note that the original Bid forms must be completed for submission and not a reprocessed copy thereof.

4.3 Only if insufficient space has been allocated for a particular response may a Respondent submit additional information under separate cover using its company's letterhead. This must be duly cross-referenced in the RFX.

5 BID FEES

5.1 A non-refundable fee may be charged for Bid Documents, depending on the administrative cost of preparing and issuing such Bid Documents.

5.2 Only Respondents that have paid the Bid fee and provided proof of payment when submitting their Bid will be considered.

6 VALIDITY PERIOD

6.1 Respondents must hold their Bid valid for acceptance by Transnet at any time within the requested validity period after the closing date of the RFX.

6.2 Respondents may be requested to extend their validity period for a specified additional period. In such instances, Respondents will not be allowed to change any aspect of their Bid, unless they are able to demonstrate that the proposed change(s) is as a direct and unavoidable consequence of Transnet's extension of the validity period.

7 SITE VISIT / BRIEFING SESSION

Respondents may be requested to attend (i) a site visit where it is considered necessary to view the site prior to the preparation of Bids, or (ii) an RFX briefing session when Transnet deems it necessary to provide Respondents with additional information relevant to the compilation of their Bids. When such visits or sessions are indicated as compulsory in the Bid Document, Respondents are obliged to attend these meetings as failure to do so will result in their disqualification.

8 CLARIFICATION BEFORE THE CLOSING DATE

Should clarification be required on any aspect of the RFX before the closing date, the Respondent must direct such queries to the contact person identified in the Bid Document.

9 COMMUNICATION AFTER THE CLOSING DATE

After the closing date of a Bid [i.e. during the evaluation period] the Respondent may only communicate with the Secretary of the relevant Acquisition Council.

10 UNAUTHORISED COMMUNICATION ABOUT BIDS

Where Bids are submitted to the Secretary of an Acquisition Council, Respondents may at any time communicate with the Secretary on any matter relating to its Bid but, in the absence of written authority from the Secretary, no communication on a question affecting the subject of a Bid shall take place between Respondents or other potential service providers or any member of the Acquisition Council or official of Transnet during the period between the closing date for the receipt of the Bid and the date of the notification of the successful Respondent(s). A Bid, in respect of which any such unauthorised communication has occurred, could be disqualified.

11 RETURNABLE DOCUMENTS

All returnable documents listed in the RFX Documents must be submitted with Respondent's Bid. Failure to submit mandatory returnable schedules / documents will result in disqualification. Failure to submit other schedules / documents may result in disqualification.

12 DEFAULTS BY RESPONDENTS

12.1 If the Respondent, after it has been notified of the acceptance of its Bid fails to:

a) enter into a formal contract when called upon to do so within such period as Transnet may specify; or

b) accept an order in terms of the Bid;

c) furnish satisfactory security when called upon to do so for the fulfilment of the contract; or

d) comply with any condition imposed by Transnet,

Transnet may, in any such case, without prejudice to any other legal remedy which it may have, proceed to accept any other Bid or, if it is necessary to do so, call for Bids afresh, and may recover from the defaulting Respondent any additional expense incurred by Transnet in calling for new offers or in accepting a less favourable offer.

12.2 If any Respondent, who has submitted a Bid and/or concluded a contract with Transnet [hereinafter referred to as the **Service Provider**], or in the capacity of agent or subcontractor who has been associated with such Bid or contract:

a) has withdrawn such Bid after the advertised date and hour for the receipt of Bids; or

b) has, after having been notified of the acceptance of its Bid, failed or refused to sign a contract when called upon to do so in terms of any condition forming part of the Bid Documents; or

c) has carried out any contract resulting from such Bid in an unsatisfactory manner or has breached any condition of such contract; or

d) has offered, promised or given a bribe in relation to the obtaining or the execution of such contract; or

e) has acted in a fraudulent or improper manner or in bad faith towards Transnet or any government department or towards any public body, company or person; or

f) has made any misleading or incorrect statement either

(i) in the affidavit or certificate referred to in clause 18 *[Notice to Unsuccessful Respondents]*; or

(ii) in any other document submitted as part of its Bid submission

and is unable to prove to the satisfaction of Transnet that

- it made the statement in good faith honestly believing it to be correct; and
- before making such statement, it took all reasonable steps to satisfy itself of its correctness; or

g) caused Transnet damage, or to incur costs in order to meet the Service Provider's requirements which could not be recovered from the Service Provider;

h) has litigated against Transnet in bad faith;

i) has been found guilty by a court of law, tribunal or other administrative body of a serious breach of any law, during the preceding 5 [five] years;

j) has been included as a company or person prohibited from doing business with the public sector on National Treasury's database of Restricted Suppliers or Register of Bid Defaulters;

then a Bid from any such Respondent shall be disqualified and the person, enterprise or company [including any directors] shall, subject to clause 12.3 below, be disqualified from bidding for any Transnet business through its "blacklisting" process.

12.3 Any person or enterprise or company against whom a decision to blacklist has been taken, may make representations to the Chief Financial Officer of Transnet SOC Ltd, whose decision shall be final.

12.4 Any disqualification [**Blacklisting**] imposed upon any person or enterprise or company, may also apply to any other enterprise under the same or different names of disqualified persons or enterprise or company [or associates thereof] and may also be applied to any agent or employee of the person or enterprise or company concerned.

13 CURRENCY

All monetary amounts referred to in a Bid response must be in Rand, the currency of the Republic of South Africa [**ZAR**], save to the extent specifically permitted in the RFX.

14 PRICES SUBJECT TO CONFIRMATION

14.1 Prices which are quoted subject to confirmation will not be considered.

14.2 Firm prices quoted for the duration of any resulting order and/or contract will receive precedence over prices which are subject to fluctuation if this is in Transnet's best interests.

15 ALTERATIONS MADE BY THE RESPONDENT TO BID PRICES

All alterations made by the Respondent to its Bid price(s) prior to the submission of its Bid Documents must be done by deleting the incorrect figures and words where required and by inserting the correct figures and words against the items concerned. All such alterations must be initialled by the person who signs the Bid Documents. Failure to observe this requirement may result in the particular item(s) concerned being excluded in the matter of the award of the business.

16 EXCHANGE AND REMITTANCE

16.1 The Respondent should note that where the whole or a portion of the contract or order value is to be remitted overseas, Transnet shall, if requested to do so by the Service Provider, effect payment overseas directly to the foreign principal of such percentage of the contract or order value as may be stipulated by the Respondent in its Bid Documents.

16.2 It is Transnet's preference to enter into Rand-based agreements. Transnet would request, therefore, that the Respondent give favourable consideration to obtaining forward exchange cover on the foreign currency portion of the Agreement at a cost that is acceptable to Transnet to protect itself against any currency rate fluctuation risks for the duration of any resulting contract or order.

16.3 The Respondent who desires to avail itself of the aforementioned facility must at the time of bidding furnish the information called for in the *Exchange and Remittance* section of the Bid Documents and also furnish full details of the principals to whom payment is to be made.

16.4 The South African Reserve Bank's approval is required before any foreign currency payments can be made to or on behalf of Respondents.

16.5 Transnet will not recognise any claim for adjustment of the order and/or contract price if the increase in price arises after the date on which agreement on an overall Rand contract has been reached.

16.6 Transnet reserves the right to request a pro-forma invoice/tax invoice in order to ensure compliance with the contract and Value-Added Tax Act no. 89 of 1991 [**VAT Act**].

17 ACCEPTANCE OF BID

17.1 Transnet does not bind itself to accept the lowest priced or any Bid.

17.2 Transnet reserves the right to accept any Bid in whole or in part.

17.3 Upon the acceptance of a Bid by Transnet, the parties shall be bound by these General Bid Conditions and any contractual terms and/or any schedule of "Special Conditions" or otherwise which form part of the Bid Documents.

17.4 Where the Respondent has been informed by Transnet per fax message or email of the acceptance of its Bid, the acknowledgement of receipt transmitted shall be regarded as proof of delivery to the Respondent.

18 NOTICE TO UNSUCCESSFUL RESPONDENTS

Unsuccessful Respondents shall be advised in writing that their Bids have not been accepted as soon as possible after the closing date of the Bid. On award of business to the successful Respondent all unsuccessful Respondents shall be informed of the name of the successful Respondent and of the reason as to why their Bids have not been successful.

19 TERMS AND CONDITIONS OF CONTRACT

19.1 The Service Provider shall adhere to the Terms and Conditions of Contract issued with the Bid Documents, together with any schedule of "Special Conditions" or otherwise which form part of the Bid Documents.

19.2 Should the Respondent find any conditions unacceptable, it should indicate which conditions are unacceptable and offer amendments/ alternatives by written submission on its company letterhead. Any such submission shall be subject to review by Transnet's Legal Counsel who shall determine whether the proposed amendments/ alternative(s) are acceptable or otherwise, as the case may be.

20 CONTRACT DOCUMENTS

20.1 The contract documents will comprise these General Bid Conditions, the Terms and Conditions of Contract and any schedule of "Special Conditions" which form part of the Bid Documents.

20.2 The abovementioned documents together with the Respondent's Bid response will constitute the contract between the parties upon receipt by the Respondent of Transnet's letter of award / intent, subject to all additional amendments and/or special conditions thereto as agreed to by the parties.

20.3 Should Transnet inform the Respondent that a formal contract will be signed, the abovementioned documents together with the Respondent's Bid response [and, if any, its covering letter and any subsequent exchange of correspondence] as well as Transnet's Letter of Intent, shall constitute a binding contract until the final contract is signed.

21 LAW GOVERNING CONTRACT

The law of the Republic of South Africa shall govern the contract created by the acceptance of a Bid. The *domicilium citandi et executandi* shall be a place in the Republic of South Africa to be specified by the Respondent in its Bid at which all legal documents may be served on the Respondent who shall agree to submit to the jurisdiction of the courts of the Republic of South Africa. A foreign Respondent shall, therefore, state in its Bid the name of its authorised representative in the Republic of South Africa who is empowered to sign any contract which may be entered into in the event of its Bid being accepted and to act on its behalf in all matters relating to the contract.

22 IDENTIFICATION

If the Respondent is a company, the full names of the directors shall be stated in the Bid. If the Respondent is a close corporation, the full names of the members shall be stated in the Bid. If the Respondent is a partnership or an individual trading under a trade name, the full names of the partners or of such individual, as the case may be, shall be furnished.

23 CONTRACTUAL SECURITIES

23.1 The successful Respondent, when called upon to do so, shall provide security to the satisfaction of Transnet for the due fulfilment of a contract or order. Such security shall be in the form of an advanced payment guarantee [**APG**] and/or a performance bond [**Performance Bond**], as the case may be, to be furnished by an approved bank, building society, insurance or guarantee corporation carrying on business in South Africa.

23.2 The security may be applied in whole or part at the discretion of Transnet to make good any loss or damage which Transnet may incur in consequence of a breach of the contract or any part thereof.

23.3 Such security, if required, shall be an amount which will be stipulated in the Bid Documents.

23.4 The successful Respondent shall be required to submit to Transnet or Transnet's designated official the specified security document(s) within 30 [thirty] Days from the date of signature of the contract. Failure to return the securities within the prescribed time shall, save where prior extension has been granted, entitle Transnet without notice to the Service Provider to cancel the contract with immediate effect.

23.5 Additional costs incurred by Transnet necessitated by reason of default on the part of the Service Provider in relation to the conditions of this clause 23 will be for the account of the Service Provider.

24 DELETION OF ITEMS TO BE EXCLUDED FROM BID

The Respondent must delete items for which it does not wish to tender.

25 VALUE-ADDED TAX

25.1 In respect of local Services, i.e. Services to be rendered in the Republic of South Africa, the prices quoted by the Respondent are to be exclusive of VAT which must be shown separately at the standard rate on the Tax Invoice.

25.2 In respect of foreign Services rendered:

a) the invoicing by a South African Service Provider on behalf of its foreign principal rendering such Service represents a Service rendered by the principal; and

b) the Service Provider's Tax Invoice(s) for the local portion only [i.e. the "commission" for the Services rendered locally] must show the VAT separately.

26 IMPORTANT NOTICE TO RESPONDENTS REGARDING PAYMENT

26.1 Method of Payment

a) The attention of the Respondent is directed to the Terms and Conditions of Contract which set out the conditions of payment on which Bid price(s) shall be based.

b) However, in addition to the aforegoing the Respondent is invited to submit offers based on alternative methods of payment and/or financing proposals.

c) The Respondent is required to give full particulars of the terms that will be applicable to its alternative offer(s) and the financial merits thereof will be evaluated and taken into consideration when the Bid is adjudicated.

d) The Respondent must, therefore, in the first instance, tender strictly in accordance with clause 26.1a) above. Failure to comply with clause 26.1a) above may preclude a Bid from further consideration.

NOTE: The successful Respondent [the **Service Provider**], where applicable, shall be required to furnish a guarantee covering any advance payments, as set out in clause 23 above *[Contractual Securities]*.

26.2 Conditional Discount

Respondents offering prices which are subject to a conditional discount applicable for payment within a specific period are to note that the conditional period will be calculated from the date of receipt by Transnet of the Service Provider's month-end statement reflecting the relevant Tax Invoice(s) for payment purposes, provided the conditions of the order or contract have been fulfilled and the Tax Invoice is correct in all respects in terms of the contract or order. Incomplete and/or incorrect Tax Invoices shall be returned and the conditional discount period will be recalculated from the date of receipt of the correct documentation.

27 DELIVERY REQUIREMENTS

27.1 Period Contracts

It will be a condition of any resulting contract/order that the delivery period embodied therein will be governed by the provisions of the Terms and Conditions of Contract.

27.2 Progress Reports

The Service Provider may be required to submit periodical progress reports with regard to the delivery of the Services.

27.3 Emergency Demands as and when required

If, due to unforeseen circumstances, the rendering of the Services covered by the Bid are required at short notice for immediate delivery, the Service Provider will be given first right of refusal for such business. If it is unable to meet the desired critical delivery period, Transnet reserves the right to purchase such services as may be required to meet the emergency outside the contract if immediate delivery can be offered from any other source. The "*Total or Partial Failure to Perform the Scope of*

Services" section in the Terms and Conditions of Contract will not be applicable in these circumstances.

28 SPECIFICATIONS AND COPYRIGHT

28.1 Specifications

The Respondent should note that, unless notified to the contrary by Transnet or a designated official by means of an official amendment to the Bid Documents, it is required to tender for the Services strictly in accordance with the specifications supplied by Transnet.

28.2 Copyright

Copyright in plans, drawings, diagrams, specifications and documents compiled by the Service Provider for the purpose of contract work shall be governed by the *Intellectual Property Rights* section in the Terms and Conditions of Contract.

29 BIDS BY OR ON BEHALF OF FOREIGN RESPONDENTS

29.1 Bids submitted by foreign principals may be forwarded directly by the principals or by its South African representative or agent to the Secretary of the Acquisition Council or to a designated official of Transnet according to whichever officer is specified in the Bid Documents.

29.2 In the case of a representative or agent, written proof must be submitted to the effect that such representative or agent has been duly authorised to act in that capacity by the principal. Failure to submit such authorisation by the representative or agent shall disqualify the Bid.

29.3 When legally authorised to prepare and submit Bids on behalf of their principals not domiciled in the Republic of South Africa, representatives or agents must compile the Bids in the names of such principals and sign them on behalf of the latter.

29.4 South African representatives or agents of a successful foreign Respondent must when so required enter into a formal contract in the name of their principals and must sign such contract on behalf of the latter. In every such case a legal Power of Attorney from their principals must be furnished to Transnet by the South African representative or agents authorising them to enter into and sign such contract.

a) Such Power of Attorney must comply with Rule 63 [Authentication of documents executed outside the Republic for use within the Republic] of the Uniform Rules of Court: Rules regulating the conduct of the proceedings of the several provincial and local divisions of the Supreme Court of South Africa.

b) The Power of Attorney must be signed by the principal under the same title as used in the Bid Documents.

c) If a Power of Attorney held by the South African representative or agent includes matters of a general nature besides provision for the entering into and signing of a contract with Transnet, a certified copy thereof should be furnished.

d) The Power of Attorney must authorise the South African representative or agent to choose the *domicilium citandi et executandi* as provided for in the Terms and Conditions of Contract.

29.5 If payment is to be made in South Africa, the foreign Service Provider [i.e. the principal, or its South African agent or representative], must notify Transnet in writing whether, for payment by electronic funds transfer [**EFT**]:

a) funds are to be transferred to the credit of the foreign Service Provider's account at a bank in South Africa, in which case the name and branch of such bank shall be furnished; or

b) funds are to be transferred to the credit of its South African agent or representative, in which case the name and branch of such bank shall be furnished.

30 CONFLICT WITH BID DOCUMENT

Should a conflict arise between these General Bid Conditions and the Bid Document issued, the conditions stated in the Bid Document shall prevail.

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TRANSNET

Appendix (ii)

STANDARD TERMS AND CONDITIONS OF CONTRACT FOR THE PROVISION OF SERVICES TO TRANSNET [February 2013]

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1 INTRODUCTION

When an Agreement is entered into between Transnet SOC Ltd [**Transnet]** and the appointed supplier of Services to Transnet [**the Service Provider]**, these Standard Terms and Conditions of Contract, the technical specifications for the Services, a Work Order including such special conditions as may be applicable, and any terms in the associated Bid Documents, exclusively govern the provision of Services by the Service Provider to Transnet.

2 DEFINITIONS

Where the following words or phrases are used in the Agreement, such words or phrases shall have the meaning assigned thereto in this clause, except where the context clearly requires otherwise:

2.1 **AFSA** means the Arbitration Foundation of South Africa;

2.2 **Agreement** means the Agreement and its associated schedules and/or annexures and/or appendices, including the Work Order(s), specifications for the Services and such special conditions as shall apply to the Agreement, together with the General Tender Conditions and any additional provisions in the associated bid documents tendered by the Service Provider [as agreed in writing between the Parties], which collectively and exclusively govern the provision of Services by the Service Provider to Transnet;

2.3 **Background Intellectual Property** means all Intellectual Property introduced and required by either Party to give effect to their obligations under the Agreement owned in whole or in part by or licensed to either Party or their affiliates prior to the Commencement Date or developed after the Commencement Date otherwise pursuant to the Agreement;

2.4 **Business Day(s)** means Mondays to Fridays between 07:30 and 16:00, excluding public holidays as proclaimed in South Africa;

2.5 **Commencement Date** means [●], notwithstanding the signature date of the Agreement;

2.6 **Confidential Information** means any information or other data, whether in written, oral, graphic or in any other form such as in documents, papers, memoranda, correspondence, notebooks, reports, drawings, diagrams, discs, articles, samples, test results, prototypes, designs, plans, formulae, patents, or inventor's certificates, which a Party discloses or provides to the other Party [intentionally or unintentionally, or as a result of one Party permitting the representative of the other Party to visit any of its premises], or which otherwise becomes known to a Party, and which is not in the public domain and includes, without limiting the generality of the term:

a) information relating to methods of operation, data and plans of the disclosing Party;

b) the contents of the Agreement;

c) private and personal details of employees or clients of the disclosing Party or any other person where an onus rests on the disclosing Party to maintain the confidentiality of such information;

d) any information disclosed by either Party and which is clearly marked as being confidential or secret;

e) information relating to the strategic objectives and planning of the disclosing Party relating to its existing and planned future business activities;

f) information relating to the past, present and future research and development of the disclosing Party;

g) information relating to the business activities, business relationships, products, services, customers, clients and Subcontractors of the disclosing Party where an onus rests on the disclosing Party to maintain the confidentiality of such information;

h) information contained in the software and associated material and documentation belonging to the disclosing Party;

i) technical and scientific information, Know-How and trade secrets of a disclosing Party including inventions, applications and processes;

j) Copyright works;

k) commercial, financial and marketing information;

l) data concerning architecture, demonstrations, tools and techniques, processes, machinery and equipment of the disclosing Party;

m) plans, designs, concepts, drawings, functional and technical requirements and specifications of the disclosing Party;

n) information concerning faults or defects in goods, equipment, hardware or software or the incidence of such faults or defects; and

o) information concerning the charges, Fees and / or costs of the disclosing Party or its authorised Subcontractors, or their methods, practices or service performance levels actually achieved;

2.7 **Copyright** means the right in expressions, procedures, methods of operations or mathematical concepts, computer program codes, compilations of data or other material, literary works, musical works, artistic works, sound recordings, broadcasts, program carrying signals, published editions, photographic works, or cinematographic works of the copyright owner to do or to authorise the doing of certain acts specified in respect of the different categories of works;

2.8 **Default** means any breach of the obligations of either Party [including but not limited to fundamental breach or breach of a fundamental term] or any Default, act, omission, negligence or statement of either Party, its employees, agents or Subcontractors in connection with or in relation to the subject of the Agreement and in respect of which such Party is liable to the other;

2.9 **Deliverable(s)** means any and all works of authorship, products and materials developed, written, prepared, assembled, integrated, modified or provided by the Service Provider in relation to the Services;

2.10 **Designs** mean registered Designs and/or Design applications and will include the monopoly right granted for the protection of an independently created industrial design including designs dictated essentially by technical or functional considerations as well as topographies of integrated circuits and integrated circuits;

2.11 **Fee(s)** shall mean the agreed Fees for the Services to be purchased from the Service Provider by Transnet, as detailed in the Work Order(s), issued in accordance with the Agreement, as amended by mutual agreement between the Parties and in accordance with the provisions of the Agreement from time to time;

2.12 **Foreground Intellectual Property** means all Intellectual Property developed by either Party pursuant to the Agreement;

2.13 **Intellectual Property** means Patents, Designs, Know-How, Copyright and Trade Marks and all rights having equivalent or similar effect which may exist anywhere in the world and includes all future additions and improvements to the Intellectual Property;

2.14 **Know-How** means all Confidential Information of whatever nature relating to the Intellectual Property and its exploitation as well as all other Confidential Information generally relating to Transnet's field of technology, including technical information, processing or manufacturing techniques, Designs, specifications, formulae, systems, processes, information concerning materials and marketing and business information in general;

2.15 **Materials** means the Deliverables, the Service Provider Materials and the Third Party Materials;

2.16 **Parties** mean the Parties to the Agreement together with their subsidiaries, divisions, business units, successors-in-title and their assigns;

2.17 **Party** means either one of these Parties;

2.18 Patents mean registered Patents and Patent applications, once the latter have proceeded to grant, and includes a right granted for any inventions, products or processes in all fields of technology;

2.19 **Permitted Purpose** means any activity or process to be undertaken or supervised by Personnel or employees of one Party during the term of the Agreement, for which purpose authorised disclosure of the other Party's Confidential Information or Intellectual Property is a prerequisite in order to enable such activity or process to be accomplished;

2.20 **Personnel** means any partner, employee, agent, consultant, independent associate or supplier, Subcontractor and the staff of such Subcontractor, or other authorised representative of either Party;

2.21 **Purchase Order(s)** means official orders issued by an operating division of Transnet to the Service Provider for the provision of Services;

2.22 **Service(s)** means [●], the Service(s) provided to Transnet by the Service Provider, pursuant to the Work Order(s) in terms of the Agreement;

2.23 **Service Level Agreement** or **SLA** means the processes, deliverables, key performance indicators and performance standards relating to the Services to be provided by the Service Provider;

2.24 **Subcontract** means any contract or agreement or proposed contract or agreement between the Service Provider and any third party whereby that third party agrees to provide to the Service Provider the Services or any part thereof;

2.25 **Subcontractor** means the third party with whom the Service Provider enters into a Subcontract;

2.26 **Service Provider Materials** means all works of authorship, products and materials [including, but not limited to, data, diagrams, charts, reports, specifications, studies, inventions, software, software development tools, methodologies, ideas, methods, processes, concepts and techniques] owned by, or licensed to, the Service Provider prior to the Commencement Date or independently developed by the Service Provider outside the scope of the Agreement at no expense to Transnet, and used by the Service Provider in the performance of the Services;

2.27 **Tax Invoice** means the document as required by Section 20 of the Value-Added Tax Act, 89 of 1991, as may be amended from time to time;

2.28 **Third Party Material** means software, software development tools, methodologies, ideas, methods, processes, concepts and techniques owned by, or licensed to a third party and used by the Service Provider in the performance of the Services;

2.29 **Trade Marks** mean registered Trade Marks and trade mark applications and includes any sign or logo, or combination of signs and/or logos capable of distinguishing the goods or services of one undertaking from those of another undertaking;

2.30 **VAT** means Value-Added Tax chargeable in terms of the Value-Added Tax Act, 89 of 1991, as may be amended from time to time; and

2.31 **Work Order(s)** means a detailed scope of work for a Service required by Transnet, including timeframes, Deliverable, Fees and costs for the supply of the Service to Transnet, which may be appended to the Agreement from time to time.

3 INTERPRETATION

3.1 Clause headings in the Agreement are included for ease of reference only and do not form part of the Agreement for the purposes of interpretation or for any other purpose. No provision shall be construed against or interpreted to the disadvantage of either Party hereto by reason of such Party having or being deemed to have structured or drafted such provision.

3.2 Any term, word, acronym or phrase used in the Agreement, other than those defined under the clause heading "Definitions" shall be given its plain English meaning, and those terms, words, acronyms, and phrases used in the Agreement will be interpreted in accordance with the generally accepted meanings accorded thereto.

3.3 A reference to the singular incorporates a reference to the plural and *vice versa*.

3.4 A reference to natural persons incorporates a reference to legal persons and *vice versa*.

3.5 A reference to a particular gender incorporates a reference to the other gender.

4 NATURE AND SCOPE

4.1 The Agreement is an agreement under the terms and conditions of which the Service Provider will arrange for the provision to Transnet of the Services which meet the requirements of Transnet, the delivery of which Services is controlled by means of Purchase Orders to be issued by Transnet and executed by the Service Provider, in accordance with the Agreement.

4.2 Such Purchase Orders shall be agreed between the Parties from time to time, subject to the terms of the relevant Work Order(s).

4.3 Each properly executed Purchase Order forms an inseparable part of the Agreement as if it were fully incorporated into the body of the Agreement.

4.4 During the period of the Agreement, both Parties can make written suggestions for amendments to the Work Order(s), in accordance with procedures set out in clause 28 *[Amendment and Change Control]* below. A Party will advise the other Party within 14 [fourteen] Business Days, or such other period as mutually agreed, whether the amendment is acceptable.

4.5 Insofar as any term, provision or condition in the Work Order(s) conflicts with a like term, provision or condition in the Agreement and/or a Purchase Order, or where the Agreement is silent on the matter, the term, provision or condition in this Master Agreement shall prevail, unless such term or provision or condition in this Master Agreement has been specifically revoked or amended by mutual written agreement between the Parties.

4.6 Time will be of the essence and the Service Provider will perform its obligations under the Agreement in accordance with the timeframe(s) [if any] set out in the relevant schedule, save that the Service Provider will not be liable under this clause if it is unable to meet such obligation within the time required as a direct result of any act or omission by Transnet and it has used its best endeavours to advise Transnet of such act or omission. In the event of such delay, any time deadlines detailed in the relevant schedule shall be extended by a period equal to the period of that delay.

5 AUTHORITY OF PARTIES

5.1 Nothing in the Agreement will constitute or be deemed to constitute a partnership between the Parties, or constitute or be deemed to constitute the Parties as agents or employees of one another for any purpose or in any form whatsoever.

5.2 Neither Party shall be entitled to, or have the power or authority to enter into an agreement in the name of the other; or give any warranty, representation or undertaking on the other's behalf; or create any liability against the other or bind the other's credit in any way or for any purpose whatsoever.

6 WARRANTIES

6.1 The Service Provider warrants to Transnet that:

a) it has full capacity and authority to enter into and to perform the Agreement and that the Agreement is executed by a duly authorised representatives of the Service Provider;

b) it will discharge its obligations under the Agreement and any annexure, appendix or schedule hereto with all due skill, care and diligence;

c) it will be solely responsible for the payment of remuneration and associated benefits, if any, of its Personnel and for withholding and remitting income tax for its Personnel in conformance with any applicable laws and regulations;

d) it will procure licences for Transnet in respect of all Third Party Material detailed in the Work Order(s), and will procure the right for Transnet to take such copies [in whole or in part] of such Third Party Materials as it may reasonably require for the purposes of back-up for archiving and disaster recovery; and

e) the use or possession by Transnet of any Materials will not subject Transnet to any claim for infringement of any Intellectual Property Rights of any third party.

6.2 The Service Provider warrants that it will perform its obligations under the Agreement in accordance with the Service Levels as defined in the relevant schedule. Transnet may at its discretion audit compliance with the Service Levels, provided that any such audit is carried out with reasonable prior notice and in a reasonable way so as not to have an adverse effect on the performance of the Services. Without prejudice to clause 6.3 below, in the event that the Service Provider fails to meet the Service Levels, Transnet may claim appropriate service credits or invoke a retention of Fees as detailed in the relevant schedule and/or Work Order.

6.3 The Service Provider warrants that for a period of 90 [ninety] days from Acceptance of the Deliverables they will, if properly used, conform in all material respects with the requirements set out in the relevant schedule. The Service Provider will at its expense remedy any such non-conformance as soon as possible but in any event within 30 [thirty] days of notification by

Transnet. In the event that the Service Provider fails or is unable to remedy such non-conformance within such time-scale, Transnet will be entitled to employ a third party to do so in place of the Service Provider and any excess charges or costs incurred by Transnet as a result shall be paid by the Service Provider.

6.4 The Service Provider will remedy any defect within 30 [thirty] days of being notified of that defect by Transnet in writing.

6.5 The Service Provider will not be liable to remedy any problem arising from or caused by any modification made by Transnet to the Deliverables, or any part thereof, without the prior approval of the Service Provider.

6.6 The Service Provider shall advise Transnet of the effects of any steps proposed by Transnet pursuant to clause 6.5 above, including but not limited to any cost implications or any disruption or delay in the performance of the Services. The Parties agree that any changes to the Services, including the charges for the Services or any timetables for delivery of the Services, will be agreed in accordance with the change control procedure, as set out in clause 28 *[Amendment and Change Control]*.

6.7 The Service Provider warrants that:

a) it has, using the most up-to-date software available, tested for [and deleted] all commonly known viruses in the Materials and for all viruses known by the Service Provider at the date of the relevant Work Order; and

b) at the time of delivery to Transnet, the Materials do not contain any trojan horse, worm, logic bomb, time bomb, back door, trap door, keys or other harmful components.

The Service Provider agrees that, in the event that a virus is found, it will at its own expense use its best endeavours to assist Transnet in reducing the effect of the virus and, particularly in the event that a virus causes loss of operational efficiency or loss of data, to assist Transnet to the same extent to mitigate such losses and to restore Transnet to its original operating efficiency.

6.8 The Service Provider undertakes to comply with South Africa's general privacy protection in terms of Section 14 of the Bill of Rights in connection with the Agreement and shall procure that its Personnel shall observe the provisions of Section 14 [as applicable] or any amendments and re-enactments thereof and any regulations made pursuant thereto.

6.9 The Service Provider warrants that it has taken all reasonable precautions to ensure that, in the event of a disaster, the impact of such disaster on the ability of the Service Provider to comply with its obligations under the Agreement will be reduced to the greatest extent possible, and that the Service Provider shall ensure that it has appropriate, tested and documented recovery arrangements in place.

6.10 In compliance with the National Railway Safety Regulator Act, 16 of 2002, the Service Provider shall ensure that the Services, to be supplied to Transnet under the terms and conditions of the Agreement, comply fully with the specifications as set forth in Schedule 1 hereto, and shall thereby adhere [as applicable] to railway safety requirements and/or regulations. Permission for the engagement of a Subcontractor by the Service Provider [as applicable] shall be subject to a review of the capability of the proposed Subcontractor to comply with the specified railway safety requirements and/or regulations. The Service Provider and/or its Subcontractor shall grant Transnet access, during the term of the Agreement, to review any safety-related activities, including the coordination of such activities across all parts of its organisation.

7 TRANSNET'S OBLIGATIONS

7.1 Transnet undertakes to promptly comply with any reasonable request by the Service Provider for information, including information concerning Transnet's operations and activities, that relates to the Services as may be necessary for the Service Provider to perform the Services, but for no other purpose. However, Transnet's compliance with any request for information is subject to any internal security rules and requirements and subject to the observance by the Service Provider of its confidentiality obligations under the Agreement.

7.2 The Service Provider shall give Transnet reasonable notice of any information it requires in accordance with clause 7.1 above.

7.3 Subject to clause 13 *[Service Provider's Personnel]*, Transnet agrees to provide the Service Provider or its Personnel such access to and use of its facilities as is necessary to allow the Service Provider to perform its obligations under the Agreement.

8 GENERAL OBLIGATIONS OF THE SERVICE PROVIDER

8.1 The Service Provider shall:

a) respond promptly to all complaints and enquiries from Transnet;

b) inform Transnet immediately of any dispute or complaint arising in relation to the provision of the Services;

c) conduct its business in a professional manner that will reflect positively upon the Service Provider and the Service Provider's Services;

d) keep full records clearly indicating all transactions concluded by the Service Provider relating to the performance of the Services and keep such records for at least 5 [five] years from the date of each such transaction;

e) obtain, and at all times maintain in full force and effect, any and all licences, permits and the like required under applicable laws for the provision of the Services and the conduct of the business and activities of the Service Provider;

f) observe and ensure compliance with all requirements and obligations as set out in the labour and related legislation of South Africa, including the Occupational Health and Safety Act, 85 of 1993;

g) comply with all applicable environmental legislation and regulations, and demonstrate sound environmental policies, management and performance; and

h) ensure the validity of all renewable certifications, including but not limited to its Tax Clearance Certificate and B-BBEE Verification Certificate, for the duration of the Agreement. Should the Service Provider fail to present Transnet with such renewals as they become due, Transnet shall be entitled, in addition to any other rights and remedies that it may have in terms of the Agreement, to terminate the Agreement forthwith without any liability and without prejudice to any claims which Transnet may have for damages against the Service Provider.

8.2 The Service Provider acknowledges and agrees that it shall at all times:

a) render the Services and perform all its duties with honesty and integrity;

b) communicate openly and honestly with Transnet and demonstrate a commitment to performing the Services timeously, efficiently and to the required standards;

c) endeavour to provide the highest possible standards of service and professionalism, with a reasonable degree of care and diligence;

d) use its best endeavours and make every diligent effort to meet agreed deadlines;

e) treat its own Personnel, as well as all Transnet's officers, employees, agents and consultants, with fairness and courtesy and respect for their human rights;

f) practice and promote its own internal policies aimed at prohibiting and preventing unfair discrimination [as further referred to in clause 22 – *Equality and Diversity*];

g) treat all enquiries from Transnet in connection with the Services with courtesy and respond to all enquiries promptly and efficiently. Where the Service Provider is unable to comply with the provisions of this clause, the Service Provider will advise Transnet of the delay and the reasons therefor and will keep Transnet informed of progress made regarding the enquiry;

h) when requested by Transnet, provide clear and accurate information regarding the Service Provider's own policies and procedures, excluding Know-How and other Confidential Information, except where a non-disclosure undertaking has been entered into between the Parties;

i) not allow a conflict of interest to develop between its own interests [or the interests of any of its other customers] and the interests of Transnet;

j) not accept or offer, nor allow, induce or promote the acceptance or offering of any gratuity, enticement, incentive or gift that could reasonably be regarded as bribery or an attempt to otherwise exert undue influence over the recipient;

k) not mislead Transnet or its officers, employees and stakeholders, whether by act or omission;

l) not otherwise act in an unethical manner or do anything which could reasonably be expected to damage or tarnish Transnet's reputation or business image; and

m) immediately report to Transnet any unethical, fraudulent or otherwise unlawful conduct of which it becomes aware in connection with Transnet or the provision of Services.

9 FEES AND EXPENSES

9.1 In consideration of the provision of the Services, Transnet will pay to the Service Provider the Fees detailed in the relevant schedule or Work Order.

9.2 Transnet will not be invoiced for materials used in the provision of the Services save for those materials [if any] set out in the Work Order and accepted by Transnet or in any relevant Work Order [which will be invoiced to Transnet at cost].

9.3 Unless otherwise agreed in a schedule or Work Order, Transnet will reimburse to the Service Provider all reasonable and proper expenses incurred directly and solely in connection with the provision of the Services, provided that all such expenses:

a) are agreed by Transnet in advance;

b) are incurred in accordance with Transnet's standard travel and expenses policies;

c) are passed on to Transnet at cost with no administration fee; and

d) will only be reimbursed if supported by relevant receipts.

9.4 All Tax Invoices relating to Fees, out of pocket expenses and, if applicable, travel and accommodation costs, will provide the detail for each of the Personnel carrying out the Services and incurring the expenses, and the Tax Invoice will, where appropriate, include VAT as a separate item.

10 INVOICING AND PAYMENT

10.1 Transnet shall pay the Service Provider the amounts stipulated in the relevant schedule or Work Order, subject to the terms and conditions of the Agreement.

10.2 Transnet shall pay such amounts to the Service Provider, upon receipt of a valid and undisputed Tax Invoice together with the supporting documentation as specified in the Work Order appended hereto, once the undisputed Tax Invoices, or such portion of the Tax Invoices which are undisputed become due and payable to the Service Provider for the provision of the Services, in terms of clause 10.4 below.

10.3 All Fees and other sums payable under the Agreement are exclusive of VAT, which will be payable at the applicable rate.

10.4 Unless otherwise provided for in the Work Order(s) appended to the Agreement, Tax Invoices shall be submitted together with a month-end statement. Payment against such month-end statement shall be made by Transnet within 30 [thirty] days after date of receipt by Transnet of the statement together with all undisputed Tax Invoices and supporting documentation.

10.5 Where the payment of any Tax Invoice, or any part thereof which is not in dispute, is not made in accordance with this clause 10, the Service Provider shall be entitled to charge interest on the outstanding amount, at The Standard Bank of South Africa's prime rate of interest in force, for the period from the due date of payment until the outstanding amount is paid.

11 FEE ADJUSTMENTS

11.1 Fees for Services rendered in terms of the Agreement shall be subject to review as indicated in the Work Order(s) annexed hereto from time to time.

11.2 No less than 2 [two] months prior to any proposed Fee adjustment, the Parties shall commence negotiations for Fees for the next period or as otherwise indicated and appended hereto.

11.3 Should Transnet and the Service Provider fail to reach an agreement on Fees for the successive period, either Party shall be entitled to submit this matter to dispute resolution in accordance with clause 25 of this Master Agreement *[Dispute Resolution]*.

12 INTELLECTUAL PROPERTY RIGHTS

12.1 **Title to Confidential Information**

a) Transnet will retain all right, title and interest in and to its Confidential Information and Background Intellectual Property and the Service Provider acknowledges that it has no claim of any nature in and to the Confidential Information and Background Intellectual Property that is proprietary to Transnet. For the avoidance of doubt, all the Service Provider's Background Intellectual Property shall remain vested in the Service Provider.

b) Transnet shall grant to the Service Provider an irrevocable, royalty free, non-exclusive licence to use Transnet's Background Intellectual Property only for the Permitted Purpose. This license shall not permit the Service Provider to sub-license to other parties.

c) The Service Provider shall grant to Transnet an irrevocable, royalty free, non-exclusive licence to use the Service Provider's Background Intellectual Property for the Permitted Purpose. This licence shall not permit Transnet to sub-license to other parties.

d) The Service Provider shall grant Transnet access to the Service Provider's Background Intellectual Property on terms which shall be *bona fide* negotiated between the Parties for the purpose of commercially exploiting the Foreground Intellectual Property, to the extent that such access is required.

12.2 **Title to Intellectual Property**

a) All right, title and interest in and to Foreground Intellectual Property prepared, conceived or developed by the Service Provider, its researchers, agents and employees shall vest in Transnet and the Service Provider acknowledges that it has no claim of any nature in and to the Foreground Intellectual Property. The Service Provider shall not at any time during or after the termination or cancellation of the Agreement dispute the validity or enforceability of such Foreground Intellectual Property, or cause to be done any act or anything contesting or in any way impairing or tending to impair any part of that right, title and interest to any of the Foreground Intellectual Property and shall not counsel or assist any person to do so.

b) Transnet shall be entitled to seek protection in respect of the Foreground Intellectual Property anywhere in the world as it shall decide in its own absolute discretion and the Service Provider shall reasonably assist Transnet in attaining and maintaining protection of the Foreground Intellectual Property.

c) Where the Foreground Intellectual Property was created by the Service Provider or its researchers, agents and employees and where Transnet elects not to exercise its option to seek protection or decides to discontinue the financial support of the prosecution or maintenance of any such protection, Transnet shall notify the Service Provider who shall have the right of first refusal to file or continue prosecution or maintain any such applications and to maintain any protection issuing on the Foreground Intellectual Property.

d) No consideration shall be paid by Transnet to the Service Provider for the assignment of any Foreground Intellectual Property from the Service Provider to Transnet, over and above the sums payable in terms of the Agreement. The Service Provider undertakes to sign all documents and do all things as may be necessary to effect, record and perfect the assignment of the Foreground Intellectual Property to Transnet.

e) Subject to anything contrary contained in the Agreement and/or the prior written consent of Transnet [which consent shall not be unreasonably be withheld or delayed], the Service Provider shall under no circumstances be entitled as of right, or to claim the right, to use Transnet's Background Intellectual Property and/or Foreground Intellectual Property.

12.3 **Title to Improvements**

Any improvements, developments, adaptations and/or modifications to the Foreground Intellectual Property, and any and all new inventions or discoveries, based on or resulting from the use of Transnet's Background Intellectual Property and/or Confidential Information shall be exclusively owned by Transnet. The Service Provider shall disclose promptly to Transnet all such improvements, developments, adaptations and/or modifications, inventions or discoveries. The

Service Provider hereby undertakes to sign all documents and do all things as may be necessary to effect, record and perfect the assignment of such improvements, developments, adaptations and/or modifications, inventions or discoveries to Transnet and the Service Provider shall reasonably assist Transnet in attaining, maintaining or documenting ownership and/or protection of the improved Foreground Intellectual Property.

12.4 **Unauthorised Use of Confidential Information**

The Service Provider shall not authorise any party to act on or use in any way any Confidential Information belonging to Transnet whether or not such party is aware of such Confidential Information, and shall promptly notify Transnet of the information if it becomes aware of any party so acting, and shall provide Transnet the information with such assistance as Transnet reasonably requires, at Transnet's cost and expense, to prevent such third party from so acting.

12.5 **Unauthorised Use of Intellectual Property**

a) The Service Provider agrees to notify Transnet in writing of any conflicting uses of, and applications of registrations of Patents, Designs and Trade Marks or any act of infringement, unfair competition or passing off involving the Intellectual Property of Transnet of which the Service Provider acquires knowledge and Transnet shall have the right, as its own option, to proceed against any party infringing its Intellectual Property.

b) It shall be within the sole and absolute discretion of Transnet to determine what steps shall be taken against the infringer and the Service Provider shall co-operate fully with Transnet, at Transnet's cost, in whatever measure including legal action to bring any infringement of illegal use to an end.

c) The Service Provider shall cooperate to provide Transnet promptly with all relevant ascertainable facts.

d) If proceedings are commenced by Transnet alone, Transnet shall be responsible for all expenses but shall be entitled to all damages or other awards arising out of such proceedings. If proceedings are commenced by both Parties, both Parties will be responsible for the expenses and both Parties shall be entitled to damages or other awards arising out of proceedings.

13 SERVICE PROVIDER'S PERSONNEL

13.1 The Service Provider's Personnel shall be regarded at all times as employees, agents or Subcontractors of the Service Provider and no relationship of employer and employee shall arise between Transnet and any Service Provider Personnel under any circumstances regardless of the degree of supervision that may be exercised over the Personnel by Transnet.

13.2 The Service Provider warrants that all its Personnel will be entitled to work in South Africa or any other country in which the Services are to be performed.

13.3 The Service Provider will ensure that its Personnel comply with all reasonable requirements made known to the Service Provider by Transnet concerning conduct at any Transnet premises or any other premises upon which the Services are to be performed [including but not limited to security regulations, policy standards and codes of practice and health and safety requirements]. The Service Provider will ensure that such Personnel at all times act in a lawful and proper manner in accordance with these requirements.

13.4 Transnet reserves the right to refuse to admit or to remove from any premises occupied by or on behalf of it, any Service Provider Personnel whose admission or presence would, in the reasonable opinion of Transnet, be undesirable or who represents a threat to confidentiality or security or whose presence would be in breach of any rules and regulations governing Transnet's Personnel, provided that Transnet notifies the Service Provider of any such refusal [with reasons why]. The reasonable exclusion of any such individual from such premises shall not relieve the Service Provider from the performance of its obligations under the Agreement.

13.5 The Service Provider agrees to use all reasonable endeavours to ensure the continuity of its Personnel assigned to perform the Services. If any re-assignment by the Service Provider of those Personnel is necessary, or if Transnet advises that any such Personnel assigned are in any respect unsatisfactory, including where any such Personnel are, or are expected to be or have been absent for any period, then the Service Provider will promptly supply a replacement of equivalent calibre and experience, and any such replacement shall be approved by Transnet prior to commencing provision of the Services, such approval not to be unreasonably withheld or delayed.

14 LIMITATION OF LIABILITY

14.1 Neither Party excludes or limits liability to the other Party for:

a) death or personal injury due to negligence; or

b) fraud.

14.2 The Service Provider shall indemnify and keep Transnet indemnified from and against liability for damage to any Transnet property [whether tangible or intangible] or any other loss, costs or damage suffered by Transnet to the extent that it results from any act of or omission by the Service Provider or its Personnel in connection with the Agreement. The Service Provider's liability arising out of this clause 14.2 shall be limited to a maximum amount payable in respect of any one occurrence or a series of related occurrences in a single calendar year, such amount to be agreed in writing by the Parties.

14.3 Subject always to clauses 14.1 and 14.2 above, the liability of either the Service Provider or Transnet under or in connection with the Agreement, whether for negligence, misrepresentation, breach of contract or otherwise, for direct loss or damage arising out of each Default or series of related Defaults shall not exceed 100% [one hundred per cent] of the Fees paid under the schedule or Work Order to which the Default(s) relates.

14.4 Subject to clause 14.1 above, and except as provided in clauses 14.2 and 14.3 above, in no event shall either Party be liable to the other for indirect or consequential loss or damage or including indirect or consequential loss of profits, business, revenue, goodwill or anticipated savings of an indirect nature or loss or damage incurred by the other Party as a result of third party claims.

14.5 If for any reason the exclusion of liability in clause 14.4 above is void or unenforceable, either Party's total liability for all loss or damage under the Agreement shall be as provided in clause 14.3 above.

14.6 Nothing in this clause 14 shall be taken as limiting the liability of the Service Provider in respect of clause 12 *[Intellectual Property Rights]* or clause 16 *[Confidentiality]*.

15 INSURANCES

15.1 Without limiting the liability of the Service Provider under the Agreement, the Service Provider shall take out insurance in respect of all risks for which it is prudent for the Service Provider to insure against, including any liability it may have as a result of its activities under the Agreement for theft, destruction, death or injury to any person and damage to property. The level of insurance will be kept under review by Transnet, on an annual basis, to ensure its adequacy, provided that any variation to the level of such insurance shall be entirely at the discretion of the Service Provider.

15.2 The Service Provider shall arrange insurance with reputable insurers and will produce to Transnet evidence of the existence of the policies on an annual basis within 30 [thirty] days after date of policy renewals.

15.3 Subject to clause 15.4 below, if the Service Provider fails to effect adequate insurance under this clause 15, it shall notify Transnet in writing as soon as it becomes aware of the reduction or inadequate cover and Transnet may arrange or purchase such insurance. The Service Provider shall promptly reimburse Transnet for any premiums paid provided such insurance protects the Service Provider's liability. Transnet assumes no responsibility for such insurance being adequate to protect all of the Service Provider's liability.

15.4 In the event that the Service Provider receives written notice from its insurers advising of the termination of its insurance cover referred to in clause 15.1 above or if the insurance ceases to be available upon commercially reasonable terms, the Service Provider shall immediately notify Transnet in writing of such termination and/or unavailability, whereafter either the Service Provider or Transnet may terminate the Agreement on giving the other Party not less than 30 [thirty] days prior written notice to that effect.

16 CONFIDENTIALITY

16.1 The Parties hereby undertake the following, with regard to Confidential Information:

a) not to divulge or disclose to any person whomsoever in any form or manner whatsoever, either directly or indirectly, any Confidential Information of the other, without the prior written consent of such other Party, other than when called upon to do so in accordance with a statute, or by a court having jurisdiction, or by any other duly authorised and empowered authority or official, in which event the Party concerned shall do what is reasonably possible to inform the other of such a demand and each shall assist the other in seeking appropriate relief or the instituting of a defensive action to protect the Confidential Information concerned;

b) not to use, exploit, permit the use of, directly or indirectly, or in any other manner whatsoever apply the Confidential Information, disclosed to it as a result of the Agreement, for any purpose whatsoever other than for the purpose for which it is disclosed or otherwise than in strict compliance with the provisions in the Agreement;

c) not to make any notes, sketches, drawings, photographs or copies of any kind of any part of the disclosed Confidential Information, without the prior written consent of such other Party, except when reasonably necessary for the purpose of the Agreement, in which case such copies shall be regarded as Confidential Information;

d) not to de-compile, disassemble or reverse engineer any composition, compilation, concept application, item, component de-compilation, including software or hardware disclosed and shall not analyse any sample provided by Transnet, or otherwise determine the composition or structure or cause to permit these tasks to be carried out except in the performance of its obligations pursuant to the Agreement;

e) not to exercise less care to safeguard Transnet Confidential Information than the Party exercises in safeguarding its own competitive, sensitive or Confidential Information;

f) Confidential Information disclosed by either Party to the other or by either Party to any other party used by such Party in the performance of the Agreement, shall be dealt with as "restricted" or shall be dealt with according to any other appropriate level of confidentiality relevant to the nature of the information concerned, agreed between the Parties concerned and stipulated in writing for such information in such cases;

g) the Parties shall not make or permit to be made by any other person subject to their control, any public statements or issue press releases or disclose Confidential Information with regard to any matter related to the Agreement, unless written authorisation to do so has first been obtained from the Party first disclosing such information;

h) each Party shall be entitled to disclose such aspects of Confidential Information as may be relevant to one or more technically qualified employees or consultants of the Party who are required in the course of their duties to receive the Confidential Information for the Permitted Purpose provided that the employee or consultant concerned has a legitimate interest therein, and then only to the extent necessary for the Permitted Purpose, and is informed by the Party of the confidential nature of the Confidential Information and the obligations of the confidentiality to which such disclosure is subject and the Party shall ensure such employees or consultants honour such obligations;

i) each Party shall notify the other Party of the name of each person or entity to whom any Confidential Information has been disclosed as soon as practicable after such disclosure;

j) each Party shall ensure that any person or entity to which it discloses Confidential Information shall observe and perform all of the covenants the Party has accepted in the Agreement as if such person or entity has signed the Agreement. The Party disclosing the Confidential Information shall be responsible for any breach of the provisions of the Agreement by the person or entity; and

k) each Party may by written notice to the other Party specify which of the Party's employees, officers or agents are required to sign a non-disclosure undertaking.

16.2 The duties and obligations with regard to Confidential Information in this clause 16 shall not apply where:

a) a Party can demonstrate that such information is already in the public domain or becomes available to the public through no breach of the Agreement by that Party, or its Personnel; or

b) was rightfully in a Party's possession prior to receipt from the other Party, as proven by the first-mentioned Party's written records, without an infringement of an obligation or duty of confidentiality; or

c) can be proved to have been rightfully received by a Party from a third party without a breach of a duty or obligation of confidentiality; or

d) is independently developed by a Party as proven by its written records.

16.3 This clause 16 shall survive termination for any reason of the Agreement and shall remain in force and effect from the Commencement Date of the Agreement and 5 [five] years after the termination of the Agreement. Upon termination of the Agreement, all documentation furnished to the Service Provider by Transnet pursuant to the Agreement shall be returned to Transnet including, without limitation all corporate identity equipment including dyes, blocks, labels, advertising matter, printing matter and the like.

17 TOTAL OR PARTIAL FAILURE TO PERFORM THE SCOPE OF SERVICES

Should the Service Provider fail or neglect to execute the work or to deliver any portion of the Service, as required by the terms of the Agreement or Work Order, Transnet may cancel the Agreement or Work Order in so far as it relates to the unexecuted work or rejected portion of the Service, and, in such event, the provision of any remaining commitment shall remain subject in all respects to these conditions.

18 TERM AND TERMINATION

18.1 Notwithstanding the date of signature hereof, the Commencement Date if the Agreement is [●] and the duration shall be for a [●] [[●]] year period, expiring on [●], unless:

a) the Agreement is terminated by either Party in accordance with the provisions incorporated herein or in any schedules or annexures appended hereto, or otherwise in accordance with law or equity; or

b) the Agreement is extended at Transnet's option for a further period to be agreed by the Parties.

18.2 Either Party may terminate the Agreement forthwith by notice in writing to the other Party where the other Party has committed a material Default and, where such Default is capable of remedy, has failed to remedy such Default within 30 [thirty] days of receiving notice specifying the Default and requiring its remedy.

18.3 Either Party may terminate the Agreement forthwith by notice in writing to the other Party when the other Party is unable to pay its debts as they fall due or commits any act or omission which would be an act of insolvency in terms of the Insolvency Act, 24 of 1936 [as may be amended from time to time], or if any action, application or proceeding is made with regard to it for:

a) a voluntary arrangement or composition or reconstruction of its debts;

b) its winding-up or dissolution;

c) the appointment of a liquidator, trustee, receiver, administrative receiver or similar officer; or

d) any similar action, application or proceeding in any jurisdiction to which it is subject.

18.4 Transnet may terminate the Agreement at any time within 2 [two] months of becoming aware of a change of control of the Service Provider by notice in writing to the Service Provider. For the purposes of this clause, "**control**" means the right to direct the affairs of a company whether by ownership of shares, membership of the board of directors, agreement or otherwise.

18.5 Transnet may cancel any schedule or Work Order hereto at any time on giving the Service Provider 30 [thirty] days' written notice.

18.6 Notwithstanding this clause 18, either Party may cancel the Agreement without cause by giving 30 [thirty] days prior written notice thereof to the other Party.

19 CONSEQUENCE OF TERMINATION

19.1 Termination in accordance with clause 18 *[Term and Termination]* shall not prejudice or affect any right of action or remedy which shall have accrued or shall thereafter accrue to either Party and all provisions which are to survive the Agreement or impliedly do so shall remain in force and in effect.

19.2 On termination of the Agreement or a Work Order, the Service Provider will immediately deliver up, and procure that its Personnel will immediately deliver up to Transnet, all Deliverables and property belonging to Transnet [or, in the event of termination of a Work Order, such as is relevant to that Work Order] which may be in the possession of, or under the control of the Service Provider, and certify to Transnet in writing that this has been done.

19.3 To the extent that any of the Deliverables and property referred to in clause 19.2 above are in electronic form and contained on non-detachable storage devices, the Service Provider will provide Transnet with unencrypted copies of the same on magnetic media and will irretrievably destroy and delete copies so held.

19.4 In the event that the Agreement is terminated by the Service Provider under clause 18.2 *[Term and Termination]*, or in the event that a Work Order is terminated by Transnet under clause 18.5 *[Term and Termination]*, Transnet will pay to the Service Provider all outstanding Fees [apportioned on a *pro rata* basis] relating to the work undertaken by the Service Provider up until the date of such termination. Transnet will also pay the costs of any goods and materials ordered by the Service Provider in relation to the such work for which the Service Provider has paid or is legally obliged to pay, in which case, on delivery of such goods or materials, the Service Provider will promptly deliver such goods and materials to Transnet or as it may direct.

19.5 The provisions of clauses 1 *[Definitions]*, 6 *[Warranties]*, 12 *[Intellectual Property Rights]*, 14 *[Limitation of Liability]*, 16 *[Confidentiality]*, 19 *[Consequence of Termination]*, 25 *[Dispute Resolution]* and 29 *[Governing Law]* shall survive termination or expiry of the Agreement.

19.6 If either Party [**the Defaulting Party**] commits a material breach of the Agreement and fails to remedy such breach within 30 [thirty] Business Days of written notice thereof, the other Party [hereinafter **the Aggrieved Party**], shall be entitled, in addition to any other rights and remedies that it may have in terms of the Agreement, to terminate the Agreement forthwith without any liability and without prejudice to any claims which the Aggrieved Party may have for damages against the Defaulting Party.

19.7 Should:

a) the Service Provider effect or attempt to effect a compromise or composition with its creditors; or

b) either Party be provisionally or finally liquidated or placed under judicial management, whether provisionally or finally; or

c) either Party cease or threaten to cease to carry on its normal line of business or default or threaten to default in the payment of its liabilities generally, or commit any act or omission which would be an act of insolvency in terms of the Insolvency Act, 24 of 1936 [as may be amended from time to time];

then the other Party shall be entitled, but not obliged, to terminate the Agreement on written notice, in which event such termination shall be without any liability and without prejudice to any claims which either Party may have for damages against the other.

20 ASSIGNMENT

Neither Party may assign the benefit of the Agreement or any interest hereunder except with the prior written consent of the other. Further, in the event that Transnet wishes to assign or novate the Agreement to any third party, the Service Provider agrees that it shall not unreasonably withhold or delay its consent to such assignment or novation and that it shall only be entitled to recover from Transnet any reasonable legal costs incurred by it as a direct result of such assignment or novation.

21 FORCE MAJEURE

21.1 Neither Party shall have any claim against the other Party arising from any failure or delay in the performance of any obligation of either Party under the Agreement caused by an act of *force majeure* such as acts of God, fire, flood, war, strike, lockout, industrial dispute, government action, laws or regulations, riots, terrorism or civil disturbance, defaults, delays or discontinuance on the part of independent contractors, suppliers, or other circumstances or factors beyond the reasonable control of either Party, and to the extent that the performance of obligations of either Party hereunder is delayed by virtue of the aforegoing, any period stipulated for any such performance shall be reasonably extended.

21.2 Each Party will take all reasonable steps by whatever lawful means that are available, to resume full performance as soon as practicable and will seek agreement to modification of the relevant provisions of the Agreement in order to accommodate the new circumstances caused by the act of *force majeure*. If a Party fails to agree to such modifications proposed by the other Party within 90 [ninety] days of the act of *force majeure* first occurring, either Party may thereafter terminate the Agreement with immediate notice.

22 EQUALITY AND DIVERSITY

22.1 The Service Provider will not victimise, harass or discriminate against any employee of either Party to the Agreement or any applicant for employment with either Party to the Agreement due to their gender, race, disability, age, religious belief, sexual orientation or part-time status. This provision applies, but is not limited to employment, upgrading, work environment, demotion, transfer, recruitment, recruitment advertising, termination of employment, rates of pay or other forms of compensation and selection for training.

22.2 Both Parties to the Agreement undertake that they will not, and shall procure that its employees, agents and Subcontractors will not breach any applicable discrimination legislation and any amendments and re-enactments thereof.

23 NON-WAIVER

23.1 Failure or neglect by either Party, at any time, to enforce any of the provisions of the Agreement, shall not, in any manner, be construed to be a waiver of any of that Party's rights in that regard and in terms of the Agreement.

23.2 Such failure or neglect shall not, in any manner, affect the continued, unaltered validity of the Agreement, or prejudice the right of that Party to institute subsequent action.

24 PARTIAL INVALIDITY

If any provision of the Agreement shall be held to be invalid, illegal or unenforceable, or shall be required to be modified, the validity, legality and enforceability of the remaining provisions shall not be affected thereby.

25 DISPUTE RESOLUTION

25.1 Should any dispute of whatsoever nature arise between the Parties concerning the Agreement, the Parties shall try to resolve the dispute by negotiation within 10 [ten] Business Days of such dispute arising.

25.2 If the dispute has not been resolved by such negotiation, either of the Parties may refer the dispute to AFSA and notify the other Party accordingly, which proceedings shall be held in Johannesburg.

25.3 Such dispute shall be finally resolved in accordance with the rules of AFSA by an arbitrator or arbitrators appointed by AFSA.

25.4 This clause constitutes an irrevocable consent by the Parties to any proceedings in terms hereof, and neither of the Parties shall be entitled to withdraw from the provisions of this clause or claim at any such proceedings that it is not bound by this clause 25.

25.5 This clause 25 is severable from the rest of the Agreement and shall remain in effect even if the Agreement is terminated for any reason.

25.6 This clause 25 shall not preclude either Party from seeking urgent relief in a court of appropriate jurisdiction, where grounds for urgency exist.

26 ADDRESSES FOR NOTICES

26.1 The Parties to the Agreement select the physical addresses and facsimile numbers, as detailed hereafter, as their respective addresses for giving or sending any notice provided for or required in terms of the Agreement, provided that either Party shall be entitled to substitute such other address or facsimile number, as may be, by written notice to the other:

a) **Transnet**

(i) For legal notices: [●]
Fax No. [●]
Attention: Legal Counsel

(ii) For commercial matters: [●]
Fax No. [●]
Attention: [●]

b) **The Service Provider**

(i) For legal notices: [●]
Fax No. [●]
Attention: [●]

(ii) For commercial matters: [●]

Fax No. [●]

Attention: [●]

26.2 Any notice shall be addressed to a Party at its physical address or delivered by hand, or sent by facsimile.

26.3 Any notice shall be deemed to have been given:

a) if hand delivered, on the day of delivery; or

b) if posted by prepaid registered post, 10 [ten] days after the date of posting thereof; or

c) if faxed, on the date and time of sending of such fax, as evidenced by a fax confirmation printout, provided that such notice shall be confirmed by prepaid registered post on the date of dispatch of such fax, or, should no postal facilities be available on that date, on the next Business Day.

27 WHOLE AND ONLY AGREEMENT

27.1 The Parties hereby confirm that the Agreement constitutes the whole and only agreement between them with regard to the subject matter of the Agreement.

27.2 The Parties hereby confirm that the Agreement replaces all other agreements which exist or may have existed in any form whatever between them, with regard to the subject matter dealt with in the Agreement, including any annexures, appendices, schedules or Work Order(s) appended hereto.

28 AMENDMENT AND CHANGE CONTROL

28.1 Any requirement for an amendment or change to the Agreement or to a Work Order shall only be valid if it is in writing, signed by both Parties and added to the Agreement as an addendum hereto.

28.2 In the event the Parties cannot agree upon changes, the Parties shall in good faith seek to agree any proposed changes using the dispute resolution procedures in clause 25 *[Dispute Resolution]*.

29 GOVERNING LAW

The Agreement is exclusively governed by and construed in accordance with the laws of the Republic of South Africa and is subject to the jurisdiction of the courts of the Republic of South Africa.

29.1 **Change of Law**

In the Agreement, unless the context otherwise requires, references to a statutory provision include references to that statutory provision as from time to time amended, extended or re-enacted and any regulations made under it, provided that in the event that the amendment, extension or re-enactment of any statutory provision or introduction of any new statutory provision has a material impact on the obligations of either Party, the Parties will negotiate in good faith to agree such amendments to the Agreement as may be appropriate in the circumstances. If, within a reasonable period of time, the Service Provider and Transnet cannot reach agreement on the nature of the changes required or on modification of Fees, Deliverables, warranties, or other terms and conditions, either Party may seek to have the matter determined in accordance with clause 25 *[Dispute Resolution]* above.

30 COUNTERPARTS

The Agreement may be signed in any number of counterparts, all of which taken together shall constitute one and the same instrument. Either Party may enter into the Agreement by signing any such counterpart.

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