C1.1 Form of Offer & Acceptance

Offer

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

Supply and Delivery of 3 kV DC High Speed Circuit Breakers for Traction Substations at Heidelberg ,Standerton and New Castle.

The tenderer, identified in the Offer signature block, has examined the documents listed in the Tender Data and addenda thereto as listed in the Returnable Schedules, and by submitting this Offer has accepted the Conditions of Tender.

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

	The offered total of the Prices exclusive of VAT is	R
	Value Added Tax @ 14% is	R
	The offered total of the amount due inclusive of VAT is[1]	R
	(in words)	

This Offer may be accepted by the *Purchaser* by signing the Acceptance part of this Form of Offer and Acceptance and returning one copy of this document including the Schedule of Deviations (if any) to the tenderer before the end of the period of validity stated in the Tender Data, or other period as agreed, whereupon the tenderer becomes the party named as the *Supplier* in the *conditions of contract* identified in the Contract Data.

Signature(s) _____ _____

Name(s) _____ _____

Capacity _____ _____

For the tenderer: _____

Name & signature of witness _____ Date _____

[1] This total is required by the *Purchaser* for budgeting purposes only. Actual amounts due will be assessed in terms of the *conditions of contract*.

Acceptance

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

The terms of the contract, are contained in:

Part C1	Agreements and Contract Data, (which includes this Form of Offer and Acceptance)
Part C2	Pricing Data
Part C3	Scope of Work: Goods Information including Supply Requirements

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

Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Returnable Schedules as well as any changes to the terms of the Offer agreed by the tenderer and the *Purchaser* during this process of offer and acceptance, are contained in the Schedule of Deviations attached to and forming part of this Form of Offer and Acceptance. No amendments to or deviations from said documents are valid unless contained in this Schedule.

The tenderer shall within two weeks of receiving a completed copy of this agreement, including the Schedule of Deviations (if any), contact the *Purchaser's Supply Manager* (whose details are given in the Contract Data) to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the *conditions of contract* identified in the Contract Data at, or just after, the date this agreement comes into effect. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the date when the tenderer receives one fully completed original copy of this document, including the Schedule of Deviations (if any).

Unless the tenderer (now *Supplier*) within five working days of the date of such receipt notifies the *Purchaser* in writing of any reason why he cannot accept the contents of this agreement, this agreement shall constitute a binding contract between the Parties.

Signature(s) _____ _____

Name(s) _____ _____

Capacity _____ _____

for the Purchaser Transnet SOC Ltd
Transnet Freight Rail (RME)
Corner of Jetpark and North Reef Road
Elandsfontein

Name & signature of witness _____ Date _____

Note: If a tenderer wishes to submit alternative tenders, use another copy of this Form of Offer and Acceptance.

TRANSNET SOC LTD
CONTRACT NUMBER: **EFT-2444086-003/2012-E**
DESCRIPTION OF THE WORKS: THE SUPPLY AND DELIVERY OF 3 KV DC HIGH SPEED CIRCUIT BREAKERS FOR TRACTION SUBSTATIONS AT HEIDELBERG, STANDERTON AND NEW CASTLE

Schedule of Deviations to be completed by the *Purchaser* prior to contract award

Note:

1. This part of the Offer & Acceptance would not be required if the contract has been developed by negotiation between the Parties and is not the result of a process of competitive tendering.
2. The extent of deviations from the tender documents issued by the Purchaser prior to the tender closing date is limited to those permitted in terms of the Conditions of Tender.
3. A tenderer's covering letter must not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid be the subject of agreement reached during the process of Offer and Acceptance, the outcome of such agreement shall be recorded here and the final draft of the contract documents shall be revised to incorporate the effect of it.

No.	Subject	Details
1		
2		
3		
4		
5		

By the duly authorised representatives signing this Schedule of Deviations below, the *Purchaser* and the tenderer agree to and accept this Schedule of Deviations as the only deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Tender Schedules, as well as any confirmation, clarification or changes to the terms of the Offer agreed by the tenderer and the *Purchaser* during this process of Offer and Acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the tenderer of a completed signed copy of this Form shall have any meaning or effect in the contract between the parties arising from this Agreement.

	For the tenderer:	**For the Purchaser**
Signature		
Name		
Capacity		
		Transnet SOC Ltd Transnet Freight Rail Corner of Jetpark and North Reef Road Elandsfontein
On behalf of		
Name & signature of witness		
Date		

C1.2 SC3 Contract Data

Part one - Data provided by the *Purchaser*

Clause	Statement	Data
1	**General**	
	The *conditions of contract* are the core clauses and the clauses for Options	**X7: Delay damages**
	of the NEC3 Supply Contract (December 2009)[1]	
10.1	The *Purchaser* is (name):	**Transnet SOC Ltd (Reg no. 1990/000900/30)**
	Address	**Carlton Centre, 150 Commissioner Street, Johannesburg, 2001**
	Tel No.	**011 308-3001**
	Fax No.	**011 308-2638**
	Having elected its Contractual Address for the purposes of this contract as:	**Transnet Freight Rail Corner of Jet Park and North Reef Road Elandsfontein**
	Tel No.	**011 878 7111**
	Fax No.	**011 878 7055**
10.1	The *Supply Manager* is (name):	**Mr. Sandile Magenuka**
	Address	**Corner of Jet Park and North Reef Road Elandsfontein**
	Tel	**011 878 7214**
	e-mail	**sandile.magenuka@transnet.net**
11.2(13)	The *goods* are	**Supply and Delivery of 3 kV DC High Speed Circuit Breaketrs for Traction Substations at Heidelberg, Standerton and New Castle.**
12.2	The *law of the contract* is the law of	**the Republic of South Africa**

[1] Available from Engineering Contract Strategies Tel 011 803 3008 Fax 011 803 3009, www.ecs.co.za.

13.1	The *language of this contract* is	**English**
13.3	The *period for reply* is	**1 day**
2	**The *Supplier's* main responsibilities**	**Data required by this section of the core clauses is provided by the *Supplier* in Part 2 and terms in italics used in this section are identified elsewhere in this Contract Data.**
3	**Time**	
30.1	The *starting date* is:	**28 September 2012**
	The *completion date* is:	**01 March 2013**
30.1	The *delivery date* of the *goods* is:	**As per Purchase Order**
4	**Testing and defects**	
42	The *defects date* is	**12 months after Installation.**
43.2	The *defect correction period* is	**4 weeks**
5	**Payment**	
50.1	The *assessment interval* is monthly	**On the 10th of each successive month.**
51.1	The *currency of this contract* is the	**South African Rand**
51.2	The period within which payments are made is	**Payment will be effected on or before the last day of the month following the month during which a valid Tax invoice and statement were received.**
51.4	The *interest rate* is	**0% per annum above the prime rate of the Standard Bank of South Africa.**
6	**Compensation events**	**No additional data is required for this section of the *conditions of contract.***
7	**Title**	**No additional data is required for this section of the *conditions of contract.***
8	**Risks, liabilities, indemnities and insurance**	
80.1	These are additional *Purchaser's* risks	**1. Nil**
84.1	The *Supplier* provides these additional insurances	
	1. Insurance against	**Motor Vehicle Liability Insurance comprising (as a minimum) "Balance of Third Party" Risks including Passenger and Unauthorised Passenger Liability indemnity with a minimum indemnity limit of R10,000,000.00**
84.2	The minimum amount of cover for loss of or damage to any plant and materials provided by the *Purchaser* is:	**Nil**

84.2	The minimum limit of indemnity for insurance in respect of loss of or damage to property (except the *goods*, plant and materials and equipment) and liability for bodily injury to or death of a person (not an employee of the *Supplier*) caused by activity in connection with this contract for any one event is:	**whatever the *Supplier* deems necessary.**
84.2	The minimum limit of indemnity for insurance in respect of death of or bodily injury to employees of the *Supplier* arising out of and in the course of their employment in connection with this contract for any one event is:	**As prescribed by the Compensation for Occupational Injuries and Diseases Act No. 130 of 1993 as amended.**
88.1	The *Supplier's* liability to the *Purchaser* for indirect or consequential loss, including loss of profit, revenue and goodwill is limited to	**R0.0 (zero Rand)**
9	**Termination and dispute resolution**	
94.2(3)	The *Adjudicator nominating body* is:	**the Chairman of The Association of Arbitrators (Southern Africa)**
94.4(2)	The *tribunal* is:	**Arbitration**
94.4(5)	The *arbitration procedure* is	**the latest edition of Rules for the Conduct of Arbitrations published by The Association of Arbitrators (Southern Africa).**
94.4(5)	The place where arbitration is to be held is	**Johannesburg**
	The person or organisation who will choose an arbitrator - if the Parties cannot agree a choice or - if the arbitration procedure does not state who selects an arbitrator, is	**the Chairman for the time being or his nominee of the Association of Arbitrators (Southern Africa).**
10	**Data for Option clauses**	
X7	**Delay damages**	
X7.1	Delay damages for Delivery are	**R4000.00 per day**

C1.2 Contract Data

Part two - Data provided by the *Supplier*

Notes to a tendering supplier:

1. Please read both the NEC3 Supply Contract (December 2009) and the relevant parts of its Guidance Notes (SC3-GN)[1] in order to understand the implications of this Data which the tenderer is required to complete.
2. The number of the clause which requires the data is shown in the left hand column for each statement however other clauses may also use the same data
3. Where a form field like this [ ] appears, data is required to be inserted relevant to the option selected. Click on the form field ***once*** and type in the data. Otherwise complete by hand and in ink.

Completion of the data in full, according to Options chosen, is essential to create a complete contract.

Clause	Statement	Data
10.1	The *Supplier* is (Name): Address Tel No. Fax No.	
11.2(8)	The Goods Information for the *Supplier's* design is in:	**C3.1**
11.2(11)	The tendered total of the Prices is	**R** **(in words)**
11.2(12)	The *price schedule* is in:	**C2.2**
11.2(14)	The following matters will be included in the Risk Register	**N/A**
30.1	The *delivery date* of the *goods* is:	**As per Purchase order**

[1] Available from Engineering Contract Strategies Tel 011 803 3008 Fax 011 803 3009 www.co.za

PART C2: PRICING DATA

NEC3 Supply Contract

Document reference	Title	No of pages
C2.2	The *price schedule*	2

C2.2 the *price schedule*

The quantity stated in the price schedule is an estimate only of Transnet's projected consumption and is based on the previous year's usages. Transnet gives no assurance of the quantities to be purchased over the contract period.

Tenderers are to ensure that prices quoted per item are inclusive of Transport to the Delivery points as per Pricing Schedule.

Transnet Material No.	Description	Delivery Point	Estimated Quantity.	Unit	Price per item (Excl. VAT)
TBA	3 KV DC HIGH SPEED CIRCUIT BREAKER (SEE ATTACHED SPECIFICATIONS – ANNEXURE A)	Heidelberg	32	EACH	R
TBA	3 KV DC HIGH SPEED CIRCUIT BREAKER (SEE ATTACHED SPECIFICATIONS – ANNEXURE A)	Standerton	46	EACH	R
TBA	3 KV DC HIGH SPEED CIRCUIT BREAKER (SEE ATTACHED SPECIFICATIONS – ANNEXURE A)	New Castle	22	EACH	R

The total of the Prices by quantity | R

PART 3: GOODS INFORMATION

Document reference	Title	No of pages
	This cover page	1
C3.1	*Purchaser*'s Goods Information	2
	Total number of pages	3

C3.1: *PURCHASER'S* GOODS INFORMATION

Contents

Contents

1 Overview of the *goods*

Supply and Delivery of 3 kV Rectifiers for Traction Substations at Heidelberg, Standerton and New Castle on an as and when required basis as per Purchase Order received.

2 Specifications of the *goods*

a) Specifications of goods to be as per Specifications of Transnet SOC Ltd for 3Kv Rectifiers for Traction Substations.
(see attached Annexure A)

b) Returnable Schedule 2.2-29 Life Cycle Costs

TRANSNET
freight rail
A division of Transnet limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

3 KILOVOLT DC HIGH SPEED CIRCUIT BREAKERS FOR TRACTION SUBSTATIONS

Author:	Electrical Engineer Technology Management	Shonell Harripershad	
Approved:	Senior Engineer Technology Management	Ludwig Borchard	
Authorised:	Principal Engineer Technology Management	Willie Coetzee	
Date:			27 August 2010

Circulation restricted to: Transnet Freight Rail

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INDEX

1.0 SCOPE

This specification covers Transnet Freight Rail's requirements for the supply of 3kV DC, 2000A (nominal) high speed circuit breakers for use on a DC electrified railway system.

2.0 REFERENCES

2.1 The following standard specifications (latest edition) are referred to in this document:

2.1.1 INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC 60947-2	:	Switchgear and Controlgear

2.1.2 TRANSNET FREIGHT RAIL

CEE 0224	:	Drawings, Catalogues, Instruction manuals and spares lists for electrical equipment supplied under contract.
CEE 0227	:	The design and manufacture of a modular 3kV DC, 2000A circuit breaker cell and truck for use on a 3kV DC traction system
BBB 0041	:	Preparation of drawings for Transnet Freight Rail Infrastructure.

2.2 A list of Transnet Freight Rail's drawings applicable to this specification is reflected in Appendix 1.

3.0 DEFINITIONS

All technical terms used in this specification shall have the definitions as per IEC 60947-2 section 2.

4.0 METHOD OF TENDERING

4.1 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. This document can be used by tenderers to elaborate on their response to a clause.

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

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

4.4 The Schedule of Requirements, Quantities and Prices, Appendix 1 to this specification shall be fully completed by Tenderers.

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

5.0 APPENDICES

The following appendices form an integral part of this specification:-

5.1 Appendix 1: List of drawings.

5.2 Appendix 2: Schedule of Specific Requirements.

5.3 Appendix 3: Technical Data Sheet (specific technical information to be furnished with tenders).

5.3.1 Equipment offered in this appendix shall be supplied in terms of this specification and no changes or substitutes will be allowed without the written consent of Transnet Freight Rail.

5.3.2 Acceptance by Transnet Freight Rail's Technology Management staff of the equipment offered in this appendix, in no way relieves the tenderer of his obligation to fulfil his statement of compliance with this specification.

5.3.3 Transnet Freight Rail reserves the right to subject the material offered to tests and inspection to check compliance with the relevant clauses of this specification and/or the quality/performance claimed by the tenderer, prior to adjudication or at any stage during manufacture.

6.0 SERVICE CONDITIONS.

The circuit breakers shall be designed and rated for operation under the following service conditions:

6.1 Atmospheric service conditions.

Altitude:	O to 1 800 m above sea level
Ambient temperature:	-5°C to +50°C.
Relative humidity:	10% to 90%
Lightning conditions:	12 Ground flashes per square kilometre per annum.
Pollution:	Industrial and heavily salt laden coastal pollution.

6.2 Mechanical service conditions.

The substations in which the breakers are to be installed are situated next to the railway lines and the breakers will therefore be subjected to vibration.

6.3 Electrical service conditions.

6.3.1 The circuit breakers are required for the switching and protection of overhead track circuits, the rail being the negative return.

6.3.2 The system voltage is nominally 3.15kV DC, but varies during normal operation between 2,4kV and 3,9kV.

6.3.3 For the purpose of surge and lightning protection to the substation equipment, a 4 micro Farad capacitor is connected between the positive cable termination and negative rail. A Zinc Oxide surge arrester, having a residual voltage of 13kV, is also connected between the positive cable termination and earth mat.

6.3.4 The breakers are fed from sub- or tie-station busbars and calibrated to protect sections of overhead equipment to which they are connected. Sub- and tie-stations are unattended but remote controlled.

6.3.5 Circuit conditions under which track breakers operate vary over a wide range. The following information is considered typical.

6.3.5.1 Sub-station spacing: On open lines it varies from 10 to 25 km, whilst in heavily loaded, multi track areas it varies from 3 to 10 km.

6.3.5.2 Sub-station capacity: The installed capacities vary from 3MW to 12MW, with individual rectifier capacities varying from 3MW to 6MW.

6.3.6 The substation has the following overload ratings:

200 percent for 30 minutes

Short circuit proof for 200 milliseconds.

6.3.7 Typical fault conditions.

	Fault near sub	Fault remote from sub.
Prospective current	50kA	10kA
Time constant	10ms	45ms

6.3.8 All substations on a section normally work in parallel.

6.3.9 The breakers will be fitted with single shot 20 second interval auto reclosing relays. The breakers will be remote controlled, permitting reclosures to be attempted from remote at approximately 2 minute intervals.

7.0 LIFE CYCLE COST

7.1 The cost of the high speed circuit breaker is not the only deciding factor when purchasing high speed circuit breakers. Life cycle cost will be taken into account when evaluating the offers made.

7.2 The life cycle cost will be based on maintenance history in Transnet Freight Rail. The following information shall be submitted by the tenderer.

7.2.1 A separate quotation for the recommended spares Transnet Freight Rail should acquire for normal maintenance purposes to cover expected requirements for a five year operating period, per 20 breakers purchased, indicating the price per item.

7.2.2 A separate quotation for any special tools required, for the maintenance of breakers.

7.2.3 A separate quotation for any other items required, to adapt the breakers to fit into Transnet Freight Rail's system.

7.2.4 A prescribed average maintenance requirement in man-hours per year per high speed circuit breaker, over a 25 year period.

7.3 The recommended quantity of spares and prescribed man-hours per year shall be based on 30 overload and fault trips per month per breaker. It is estimated that an average of 10 percent of all trips are due to faults.

8.0 DRAWINGS, INSTRUCTIONS AND CATALOGUES

8.1 Tenderers shall include in their tenders for the supply of operating and maintenance instruction manuals and drawings to enable the erection, maintenance, repair and adjustment of the breakers to be carried out.

8.1.1 All catalogues, instruction manuals and spares lists shall comply with the requirements of Transnet Freight Rail's specification CEE.0224 (Latest edition).

8.1.2 The preparation of the drawings shall be in accordance with Transnet Freight Rail's specification BBB 0041.

8.1 One copy of the instruction manual must be supplied for every 4 breakers supplied, plus a further 10 copies.

8.2 Tenderers shall also include in their tenders for the supply of spare parts catalogues. These catalogues must contain detailed illustrations and descriptions, and suitably indexed pages reflecting:

8.2.1.1 Illustration item numbers, complete description of items including coil winding data and material, manufacturer's item numbers and Transnet Freight Rail stores item number (left blank).

8.2.2 One copy of the catalogue must be supplied for every 10 breakers supplied, plus a further 10 copies.

8.3 Proof copies of the drawings, instruction manuals and spare parts catalogues shall be submitted by the successful tenderer for approval as soon as possible after the business has been placed to enable the final copies to be supplied at the commencement of delivery of the breakers.

8.4 The successful tenderer shall supply Transnet Freight Rail with one complete set of detailed manufacturing drawings and specifications of all consumable items, i.e. of all coils, main and arcing contacts, arc chutes and components, etc.

9.0 TECHNICAL REQUIREMENTS

9.1 GENERAL

9.1.1 The breakers shall have a minimum continuous rating of 2 000A and shall be suitable for operation under the service conditions described in clause 6.

9.1.2 The breakers shall be capable of clearing a prospective short circuit current of 50kA with a time constant of 10ms, 4 times in succession with time intervals of 20s, 60s and 120s between applications. It shall then still be capable of normal service without attention.

9.1.3 Consideration will only be given to those types of breakers which have been proved to operate satisfactorily on a 3kV DC traction system, under conditions comparable with those encountered on Transnet Freight Rail. Tenderers shall furnish full details (Appendix 3) in regard to experience, viz. approximate number of breakers of tendered design manufactured to date, dates of supply and where installed.

9.1.4 The breakers shall be mounted horizontally on the standard rackout type truck provided by Transnet Freight Rail to drawings referred to in Appendix 1 of this specification or in a modular circuit breaker cell as per specification CEE 0227.

9.1.5 The overall dimensions of a breaker, complete with arc chute, when mounted on this truck shall be such as to afford clear passage of the truck into the standard breaker cell, leading dimensions of which are indicated on the drawings.

9.1.6 The breakers shall operate satisfactorily in buildings where the roof details are as follows:

9.1.6.1 Concrete roof: minimum height 2,6m.

9.1.6.2 Roof consisting of steel members supporting asbestos or metal sheeting: minimum height 3,25m.

9.1.7 All parts shall be interchangeable between breakers.

9.1.8 The breaker and arc chute shall be designed to require the minimum maintenance. The minimum maintenance interval shall be 250 trips at a trip setting of 4 000A at 3,2kV. Of these trips 10 percent may be fault trips.

9.2 INSULATION

9.2.1 The minimum clearance distance in air that shall apply from the 3kV DC circuit to the auxiliary circuits and to the steel base shall be 100mm. Alternatively, double insulation or barriers shall be provided.

9.2.2 The insulation between the 3kV DC circuit and (a) the auxiliary circuits and (b) the steel base shall be capable of withstanding a test voltage of 10,5kV(rms) 50Hz for one minute.

9.2.3 All low voltage auxiliary equipment shall be capable of withstanding a test voltage of 2kV(rms) 50Hz for one minute.

9.2.4 The circuit breaker shall be able to withstand the following 50Hz test voltages for 60 seconds between the open main contacts:

9.2.4.1 With the arc chute removed: 10,5kV(rms).

9.2.4.2 With the arc chute in its working position: 5,4kV(rms).

9.2.5 Full particulars of the insulation, including the class, shall be supplied.

9.3 CIRCUIT BREAKER

9.3.1 The circuit breaker shall be of the trip free type.

9.3.2 The method of closing, latching and the trip free feature shall be described in detail, with the use of drawings and sketches.

9.3.3 In the event of circuit breakers being offered that use mechanical latching (to be delatched), the tenderer shall ensure that the circuit breakers will not malfunction to open due to the mechanical latching mechanism not operating correctly. Such mechanisms shall be suitably protected from dust or fragments from the arc chutes or contacts which can affect their satisfactory operation.

9.3.4 Main contacts, which are not self-cleaning, shall be of material which will not oxidise when the breakers are open or closed for lengthy periods.

9.3.5 Main contacts (or arcing contacts, if fitted) shall be tipped with material with a high resistance to arc erosion, welding and sticking.

9.3.6 Arcing contacts (if fitted) and main contacts shall be accessible for inspection and maintenance and shall be designed to facilitate any necessary adjustments and renewal.

9.3.7 The temperature rise limit of main contacts (if made of copper) shall not exceed 45 degrees Celsius while passing the continuous rated current.

9.3.8 It shall **not** be possible to close the breaker manually.

9.3.9 The breakers shall be designed to prevent dust or fragments from the arc chutes or contacts from affecting their satisfactory operation.

9.3.10 All adjustments shall be such that they can be easily effected. The need for special tools should be avoided.

9.3.11 Tenderers shall furnish full details of all adjustments which can be made, particularly of the main contact alignment and pressure, and where applicable of pole face and toggle mechanism.

9.4 CALIBRATION

9.4.1 The breakers may be either uni- or bi-directional tripping. Tenderers shall state what type is offered; giving details of the calibration ranges for both the forward and reverse current tripping.

9.4.2 A scale plate, indicating the maximum and minimum trip settings and at least five intermediate graduations shall be provided on each breaker at the calibration adjustment position.

9.4.3 The calibration range for the forward direction shall be from 2 000A to 5 000A.

9.4.4 The calibration range for the reverse direction (if reverse tripping is possible) shall be at least the same as that of the forward direction.

9.4.5 Tenderers shall indicate clearly the means whereby the above calibration ranges are provided.

9.4.6 The stability at any particular setting shall be such that the current required to trip the breaker shall not vary by more than 2 percent below or above the set calibrated value when calibration is checked under similar conditions.

9.4.7 The breaker design shall incorporate features to ensure that the breakers can be closed satisfactorily on to a steady (residual) load of not less than 60 percent of any particular calibration setting.

9.5 ARC CHUTES

9.5.1 Arc chutes manufactured from asbestos cement shall not be accepted. Arc chutes made of low maintenance materials are preferred. Tenderers shall specify what materials are used.

9.5.2 Transnet Freight Rail would prefer an offer of an arc chute incorporating a removable metal splitter plate design.

9.5.3 Materials used in arc chutes must be of a type that is easily cleaned.

9.5.4 The arc chutes shall be constructed as to render the contacts easily accessible by removal of separate parts of the arc chutes as a unit.

9.5.5 Tenderers shall submit full details of the principles of operation of the arc chute, as well as sketches and drawings of the various components and assemblies. Details of the maintenance and repairs that can/should be done, and at what intervals, shall also be furnished.

9.6 AUXILIARY CONTACTS

9.6.1 Auxiliary contacts for operating in conjunction with the indication and control circuits shall be located well clear of the arc chutes and main contacts.

9.6.2 The auxiliary contacts shall be of robust construction and tipped with silver or other suitable material.

9.6.3 At least six auxiliary contacts which close ('a' contacts) and six auxiliary contacts which open ('b' contacts) when the breaker closes shall be provided and mounted on each breaker.

9.6.4 A robust, dust tight, non-metallic non-flammable cover for the auxiliary contacts shall be provided on each breaker to prevent ionised air from the 3kV DC circuit or dust causing flashovers or tracking. Hard plastic covers are not acceptable.

9.7 CONTROL CIRCUITRY

9.7.1 Drawings CEE-TBP-35, 39. 40, 41, 42 and 44 reflect the control schematic diagram of circuit breakers in use at present.

9.7.2 The closing and control circuits are supplied from a 110V DC battery under constant trickle charge. The equipment shall be capable of satisfactory continuous operation at any voltage between the limits of 90V and 140V.

9.7.3 In order to ensure constant calibration, the holding coil is normally supplied from a separate constant 110V DC source.

9.7.4 The circuit breakers shall be suitable for operation from the above stated supplies.

9.7.5 The remote control equipment, control relays, indication lights, control switches and reclosing relays shown on drawings CEE-TBP-35 and 39 will be provided by Transnet Freight Rail.

9.7.6 All other items of equipment required to enable the breakers to operate correctly, without any alterations to the standard wiring circuitry provided by Transnet Freight Rail, shall be included in the tenderer offers.

9.7.7 The design of the breakers and control circuitry shall be such that the breakers shall "fail to safety", particularly on loss of the low voltage control supplies.

9.8 TESTS AND OSCILLOGRAMS

9.8.1 Short circuit tests shall be carried out on breakers connected to a 3kV DC system with similar fault currents to that which is specified in clause 6.3.7 and oscillograms thereof shall be submitted with the tenderers offers. For the purpose of the test the breakers shall be calibrated at 4 500A.

9.8.2 The following shall be clearly indicated on the oscillogram traces:

9.8.2.1 Commencement of short circuit.

9.8.2.2 Opening time, i.e. time from the application of the short circuit to initial opening of the arc breaking contacts.

9.8.2.3 Arcing time.

9.8.2.4 Arc voltage (Transient recovery voltage).

9.8.2.5 Rate of rise of current.

9.8.2.6 Prospective peak current.

10.0 TESTS BY TRANSNET FREIGHT RAIL AND TYPE TEST CERTIFICATES

10.1 Transnet Freight Rail reserves the right to test a circuit breaker, selected at random, for compliance with any or all of the following clauses.

10.1.1 Fault clearing test, clause 9.1.2.

10.1.2 A maintenance interval test (an in service test), clause 9.1.8.

10.1.3 Insulation tests, clause 9.2.2 to 9.2.5.

10.1.4 Temperature rise of the main contacts, clause 9.3.7.

10.1.5 Stability of calibration, clause 9.4.6.

10.1.6 Closing on to a steady (residual) load, clause 9.4.7.

10.1.7 Breaker "fail to safety" feature, clause 9.7.7.

10.2 The tenderer shall provide type test certificates to confirm that the breakers comply to the requirements as specified in clauses 10.1.1 to 10.1.7.

11.0 PACKING

11.1 Each circuit breaker shall be completely assembled and operationally checked before packing and dispatch.

11.2 The circuit breakers and arc chutes shall be packed separately.

11.3 The breakers shall be bolted down to substantial battens firmly secured to the packing cases to prevent movement of the breakers in the cases during transit. The packing cases shall be of substantial construction to prevent damage to the breaker by rough handling. The bases of the cases shall be suitable for handling with a fork lift truck.

11.4 The interiors of the cases shall be lined with waterproof paper or other suitable material.

12. INSPECTION

12.1 An Inspection Certificate will be issued by Technology Management – Electrical Technology to certify that material / equipment conforms to Transnet Freight Rail's requirement.

END

SCHEDULE OF DRAWINGS

LIST OF DRAWINGS

DRAWINGS ISSUED WITH THIS SPECIFICATION

DRAWING NUMBER	DESCRIPTION
CEE-TBP-35	Wiring diagram: H.S.C.B, Electronic Control Relay
CEE-TBP-39	Circuit diagram; H.S.C.B, Electronic Control Relay
CEE-TBP-40	Truck circuit diagram
CEE-TBP-41	Truck wiring diagram
CEE-TBP-42	Connection diagram for HSCB
CEE-TBP-44	Connection diagram for Ansaldo IR6003 HSCB
CEE-TCQ-63	Assembly of lightweight concrete cell with H.S.C.B. truck in position.
CEE-TCQ-69 Sh 1	Truck frame assembly H.S.C.B.

Appendix 2

SCHEDULE OF REQUIREMENTS

Supply of the 110V closing contactor 154X as depicted on drawing CEE-TBP-35 if required.

TECHNICAL DATA SHEET

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

1. Make of breaker: _____

2. Experience with tendered design of breaker: (Clause 9.1.3)

NUMBER SUPPLIED	WHERE INSTALLED	DATE SUPPLIED

3. Continuous current rating of breaker : _____

4 Rated voltage of breaker : _____

5 Mechanically latched Yes/No. _____

6 Magnetically latched Yes/No. _____

7 Main contact material _____

8 Arcing contacts fitted Yes/No. _____

9 Contact material of main contact (or arcing contact, if fitted)

_____

REQUIREMENTS FOR THE SUPPLY OF 3kV DC RECTIFIERS, POSITIVE ISOLATORS AND MODULAR TRACK BREAKERS

CONTENTS

REQUIREMENTS FOR THE SUPPLY OF 3kV DC RECTIFIERS, POSITIVE ISOLATORS AND MODULAR TRACK BREAKERS

1.0 3KV DC RECTIFIERS

1.1 7 off new 3kV DC rectifier units shall be supplied and allocated for installation as follows:

No.	Allocated Substation	Rectifier
1	Spruytsrus	1 x 6 MW
2	Sprucewell	1 x 6 MW
3	Cedarmont	1 x 6 MW
4	Elmtree	1 x 6 MW
5	Perdekop	1 x 6 MW
6	Sandspruit	1 x 6 MW
7	Landsend	1 x 6 MW

1.2 The rectifiers shall be supplied complete with diode monitoring system and fan control and fully comply with Transnet Freight Rail's specification BBB0496.

1.3 The rectifiers shall be rated **6 MW** full load continuously and as per section 5.8 (Ratings) of specification BBB0496.

1.4 In addition to section 4.3.1 (Input Voltage) of specification BBB0496 the rectifiers shall provide for full wave 12 pulse rectification from the 6 phase output of 6MVA traction transformers (new) with the following configuration:

Winding	Power MVA	Voltage(kV)	Group	Tap Changer
High Voltage	6	88 ± 2 x 2.5%	Y	Off load
Low Voltage	2 x 3.0	1,220/1,220	d/y	-
Tertiary	0,1	2,360	yn	-
Vector group		Yd11Yy0Yyn0		

1.5 In addition to section 8.3 (Snubber Circuitry) of specification BBB0496 the Snubber circuits shall be properly sealed.

1.6 All components, especially diodes shall be easy accessible for maintenance and replacement purposes.

1.7 Only rectifiers approved by Transnet Freight Rail's Technology Management department will be accepted.

2.0 3KV DC POSITIVE ISOLATORS WITH EARTHING SWITCHES

2.1 12 off new 3kV DC positive isolators with earthing switches shall be supplied and allocated for installation as follows:

No.	Allocated Substation	Quantity
1	Spruytsrus	1
2	Sprucewell	1
3	Teakworth	1
4	Cedarmont	1
5	Elmtree	1
6	Firham	1
7	Platrand	1
8	Perdekop	1
9	Sandspruit	1
10	Landsend	1
11	Majuba	1
12	Glen Harte	1

2.2 The positive isolators with earthing switches shall fully comply with Transnet Freight Rail's specification BBB4724.

2.3 The positive isolator switch shall be rated at a minimum 3000A continuous as per 6.3 of specification BBB4724.

2.4 The earthing switch shall be rated at a minimum 1500A as per 6.10 of specification BBB4724.

2.5 The LV compartment shall include a under voltage relay, ammeter and voltmeter as per 6.21 of specification BBB4724.

2.6 The HV compartment shall include a potential divider for the under voltage relay and fuses for metering as per 6.28 of specification BBB4724.

2.7 The under voltage relays supplied shall fully comply with specification BBB3005 and be installed with the potential divider as per 28.0 of specification BB5452.

2.8 Only positive isolators approved by Transnet Freight Rail's Technology Management department will be accepted.

3.0 3KV DC HIGH SPEED CIRCUIT BREAKERS

3.1 100 off new 3kV DC high speed circuit breakers (HSCBs) shall be supplied and installed in the modular cell and track breakers as per 4.1.

3.2 The HSCBs shall fully comply with Transnet Freight Rail's specification CEE-0099. 2010.

3.3 The HSCBs shall be rated for service conditions for 3kV DC traction substations with a 6 MW rectifier capacity.

3.4 Only HSCBs approved by Transnet Freight Rail's Technology Management department will be accepted.

3.5 Should Secheron breakers be offered they shall be fitted with dirt cover plates as per drawing BBC5872 version 1.

4.0 MODULAR 3KV DC TRACK BREAKER CELLS AND TRUCKS

4.1 100 off modular type, steel 3kV DC track breaker cells and trucks shall be supplied in banks of connected cells for installation at the allocated substations as follows:

Bank	Allocated Substation	Number of modular track breaker cells and trucks in bank
1	Rooikop	4
2	Heidelberg	4
3	Spruytsrus	4
4	Balfour North	4
5	Sprucewell	5
6	Greylingstad	4
7	Teakworth	4
8	Cedarmont	4
9	Elmtree	4
10	Firham	5
11	Kromdraai	4
12	Platrand	4
13	Rusthof	4
14	Perdekop	4
15	Beechwick	4
16	Sandspruit	4
17	Vooruitsig	6
18	Landsend	4
19	Majuba	4
20	Glenharte	4
21	Rietspruit	5
22	Clontarf	4
23	Wykom	5
24	Newcastle	5
	Total	**100**

4.2 The modular track breaker cells and trucks shall fully comply with Transnet Freight Rail's specification CEE-0227.95.

4.3 The modular track breaker cells and trucks shall be complete units and include the installation of the HSCB's supplied under 3.0.

4.4 Each modular track breaker cell and truck shall be installed with DC Feeder Protection Relays as per 5.0.

4.5 All required connecting busbars and earthing between the cells shall be provided for each bank of connected cells.

4.6 An earthing switch to earth the positive busbar shall be fitted to one end of each bank of connected cells. The earthing contacts shall be visible when applying the earth.

4.7 This earthing switch shall be robust and lockable in both positions (earthed and not earthed) and provision made to electrically interlock it with the HSCB and PCB to prevent accidental earthing of the live busbar. The electrical interlock shall cause the substation to trip and lock out.

4.8 The door of the earthing switch shall be provided with mechanically interlocking forming part of the isolating procedure of the substation.

4.9 The cell's shutter gear shall be robust and mechanically locked to prevent it from opening while the truck is withdrawn from the cell.

4.10 Only modular track breaker cells and trucks approved by Transnet Freight Rail's Technology Management department will be accepted.

5.0 DC FEEDER PROTECTION RELAYS

5.1 On all HSCBs the automatic re-closing feature shall be replaced with DC Feeder Protection Relays.

5.2 The relay is required to operate in conjunction with the 3 kV DC HSCB.

5.3 The main functions of the relay is to be used as:

5.3.1 Protection of the overhead track equipment.

- Automatic line test function to determine if any fault is on the system and to prevent auto reclosing.
- Over current protection (I^2t and di/dt discrimination).
- Under voltage protection.
- Frame fault protection.
- Thermal protection of the Overhead Track.

5.3.2 Control of the breaker.

- Auto re- closure in the event of no fault on the system.
- Auxiliary contacts.
- Serial Communication port (RSR232/RSR485).

5.3.3 As a measurement/condition monitoring device on each track circuit.

- Measure Current (DC)
- Measure Voltage (DC)
- Measure Energy kWh (Export and Import)
- Counting all Energy operations (Condition Monitoring).

5.4 The relay must operate from a 110 Volt DC supply.

5.5 If resistors, potential dividers and current transducers are used the clearance and insulation levels for 3 kV DC must be adhered to. It should also be noted due to spacing the size (physical) of the resistor used for testing the line shall be limited to Length 600 mm x Width 400mm x Height 500 mm.

5.6 The existing Transnet Freight Rail metering shunt may be used.

5.7 Only DC Feeder Protection Relays approved by Transnet Freight Rail's Technology Management department will be accepted.

END