
Part C1: Agreement and Contract Data

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Contract Data

The Employer is

Name Transnet Limited, Trading as Transnet Freight Rail
Address C/o Paul Kruger & Minnaar streets, Nzasm Building, Pretoria
Telephone (012) 315 2137/2 Fax No. (012) 315 2138
E-mail Nico.swart3@transnet.net

The works is: The replacement of 88kV disconnects with steel structures at various substations under the control of the Depot Engineer, Koedoespoort

The site is Van der Merwe, Bon Accord and Rant substations
The starting date is to be advised.....
The completion date is to be advised.....
The reply period is two weeks
The defects date is fifty two weeks after completion
The defect correction period is within 1 (one) week after defects date
The delay damages are R2,000.00 per day
The assessment day is the 13th (thirteen) of each month
The retention is 10 %(ten)

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

The Adjudicator is

Name: To be advised if disputes arise.....

Address:.....

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

E-mail:.....

Contract Data

The interest rate on late payment is 2% per complete week of delay.

The Contractor is not liable to the Employer for loss of or damage to the Employer's property in excess of R2m (two million) for any one event.

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

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

> R25,000.00 (Limited to R10, 000, 000.00. for any one event)

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

Not applicable

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

The tribunal is: **Arbitration**

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

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

As mentioned in paragraph 1.0 (Contractual obligations)

1.0 CONTRACTUAL OBLIGATIONS

- 1.1 This project specification covers Transnet freight rail's requirements for the replacement of 88kV disconnects with steel structures at Van der Merwe, Bon Accord and Rant 3kV DC traction substations under the control of the Depot Engineer, Koedoespoort.
- 1.2 The Contractor shall not make use of any sub-Contractor to perform the works or parts thereof without prior permission from the Employer.
- 1.3 The Contractor shall ensure that a safety representative is at site at all times. All safety measures prescribed by Transnet Freight Rail – Electrical Safety Instructions and the "Occupational Health and Safety Act 1993 (Act 85 of 1993)" associated with working on a project of this nature shall be adhered to.
- 1.4 The Contractor shall comply with all applicable legislation and Transnet safety requirements adopted from time to time and instructed by the Employer / Employer's Deputy. Such compliance shall be entirely at his own cost, and shall be deemed to have been allowed for in the rates and prices in the contract.

- 1.5 The Contractor shall, in particular, comply with the following Acts and Transnet Specifications:-
- 1.5.1 The Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993. The Contractor shall produce proof of his registration and good standing with the Compensation Commissioner in terms of the Act.
- 1.5.2 The Occupational Health and Safety Act (Act 85 of 1993).
- 1.5.3 The explosive Act No. 26 of 1956 (as amended). The Contractor shall, when applicable, furnish the Employer / Employer's Deputy with copies of the permits authorising him or his employees, to establish an explosives magazine on or near the site and to undertake blasting operations in compliance with the Act.
- 1.5.4 The Contractor shall comply with the current Transnet Specification E.4E, Safety Arrangements and Procedural Compliance with the Occupational Health and Safety Act, Act 85 of 1993 and Regulations and shall before commencement with the execution of the contract, which shall include site establishment and delivery of plant, equipment or materials, submit to the Employer / Employer's Deputy.
- 1.5.5 The Contractor shall comply with the current Specification for Works On, Over, Under or Adjacent to Railway Lines and near High Voltage Equipment – BDD 8210, if applicable, and shall take particular care of the safety of his employees on or in close proximity to a railway line during track occupations as well as under normal operational conditions.
- 1.6 The Contractor's Health and Safety Programme shall be subject to agreement by the Employer / Employer's Deputy, who may, in consultation with the Contractor, order supplementary and/or additional safety arrangements and/or different safe working methods to ensure full compliance by the Contractor with his obligations as an employer in terms of the Act.
- 1.7 In addition to compliance with clause 1.4 hereof, the Contractor shall report all incidents in writing to the Employer / Employer's Deputy. Any incident resulting in the death of or injury to any person on the works shall be reported within 24 hours of its occurrence and any other incident shall be reported within 48 hours of its occurrence.
- 1.8 The Contractor shall make necessary arrangements for sanitation, water and electricity at these relevant sites during the installation of the equipments.
- 1.9 A penalty charge of **R2,000** per day will be levied for late completion of the project.
- 1.10 10% retention money will be retained and will be released 12 months after the completion date of the contract.
- 1.11 The Contractor shall supply a **site diary** (with triplicate pages). This book shall be used to record any unusual events during the period of the work. Any delays to the work shall also be recorded such as delays caused by poor weather conditions, delays caused by permits being cancelled etc. The appointed Employer or Employer's Deputy must countersign such delays. Other delays such as non-availability of equipment from 3rd party suppliers must be communicated to the Employer or Employer's Deputy in writing.
- 1.12 The Contractor shall supply a **site instruction book** (with triplicate pages). This book shall be used to record any instructions to the Contractor regarding problems encountered on site – for example the quality of work or the placement of equipment. This book shall be filled in by the Employer or Employer's Deputy and must be countersigned by the Contractor.
- 1.13 Both books mentioned in 1.10 and 1.11 shall be the property of Transnet Freight Rail and shall be handed over to the Employer or Employer's Deputy on the day of energising or handing over.

- 1.14 All processes or the manufacture and assembly of the product components must be subjected to a quality assurance system.
- 1.15 The Contractor will assume full responsibility for assuring that the products purchased meet the requirements of Transnet Freight Rail for function, performance, and reliability, including purchased products from 3rd party suppliers/Manufacturers.
- 1.16 The Contractor shall prove to Transnet Freight Rail that his equipment or those supplied from 3rd party suppliers/manufacturers confirms to Transnet freight rail specifications.
- 1.17 The Contractor will remain liable for contractual delivery dates irrespective of deficiencies discovered during workshop inspections.
- 1.18 ISO.9000 to 9004 inclusive (SABS 0157 parts 1 to 4) must be regarded as a guideline, where applicable.
- 1.19 The successful Contractor shall provide a Gantt or a similar chart showing when the works will be done and energised. A final chart should be submitted to the Employer's deputy or Supervisor within 14 days after the award has been made to the successful Contractor.
- 1.20 The onus is on the manufacturer to prove the effectiveness of their system to Transnet Freight Rail during the production of the prototype.

2.0 INSTALLATION

- 2.1 The Contractor shall be responsible for the transport to site, off-loading, handling, storage and security of all material required for the construction/execution of the works.
- 2.2 The Contractor shall be responsible for all necessary (as decided by the Transnet Freight Rail Employer's deputy or Technical Officer) connections between the equipment supplied and other components in the substation including connections to the earth-mat.

3.0 INTERCONNECTION OF EQUIPMENT

- 3.1 All fasteners on steelwork, components and electrical connections (nuts and bolts) shall be secured using flat as well as lock washers.
- 3.2 All HT electrical equipment interconnections shall be done using conductors similar to that being used in the existing substation yard.
- 3.3 Conductors between separately mounted outdoor equipment shall incorporate a degree of flexibility to avoid any over-stressing of these connections due to the foundation movement or conductor expansion/contraction and to facilitate alignment of equipment.
- 3.4 High conductive silicon grease shall be liberally applied to all the connections.
- 3.5 All dissimilar metal connections (Cu to Al) shall be made using bi-metallic clamps that are specifically designed and manufactured to make that particular connection (ad hoc fabricated clamps are not acceptable).

4.0 DRAWINGS, INSTRUCTION MANUALS AND SPARE PART CATALOGUES

- 4.1 All as built drawings shall be supplied in electronic format (Microstation/Acad).
- 4.2 The successful Contractor will be required to submit all drawings (paper prints), within four weeks of award of tender, to the Employer's deputy or Technical Officer for approval. No

construction or manufacturing activity will be allowed prior to the associated drawings having been approved.

- 4.3 During the duration of the contract period, the successful Contractor will be required to inform the Employer's deputy or Technical Officer of any changes to these drawings and will have to resubmit the affected drawings for approval prior to it being used on this contract.
- 4.4 All drawings, catalogues, instruction book and spares lists shall be in accordance with Transnet Freight Rail's specification CEE.0224.2002.
- 4.5 All final as built drawings shall be provided to Transnet Freight Rail within four weeks after commissioning.

5.0 **SITE TESTS**

- 5.1 The equipment shall be inspected/tested and approved by Transnet Freight Rail Quality Assurance at the Contractor's workshop prior to it being taken to site. Only once the approval has been granted can the equipment be taken to site for installation.
- 5.2 The Contractor shall be responsible for carrying out of on-site tests and commissioning of all equipment supplied and installed in terms of this specification and the contractual agreement.
- 5.3 Functional on-site tests shall be conducted on all items of equipment and circuitry to prove the proper functioning and installation thereof.
- 5.4 The Contractor shall submit a detailed list of on-site tests for the approval of the Employer's deputy or Technical Officer.
- 5.5 The Contractor shall arrange for the Technical Officer or his representative to be present to witness the on-site tests.
- 5.6 The on-site tests and subsequent commissioning will not commence until ALL CONSTRUCTION work has been completed. Construction staff, material and equipment shall be removed from site prior to the commencement of testing. Testing and commissioning of the substation equipment will not be allowed to take place in a construction site environment.
- 5.7 The on-site tests shall include the following:
 - 6.7.1 Test for the functionality of all electrical circuitry.
 - 6.7.2 Trip tests on relays.
 - 6.7.3 Test on equipment as per manufacturer's instructions.
 - 6.7.4 Insulation tests.
- 5.8 At the completion of the on-site tests, the Employer's deputy or Technical Officer or his representative shall either sign the tests sheets (supplied by the Contractor) as having witnessed the satisfactory completion thereof, or hand to the Contractor a list of defects requiring rectification.
- 5.9 Upon rectification of defects, the Contractor shall arrange for the Employer's deputy or Technical Officer or his representative to certify satisfactory completion of on-site tests.
- 5.10 Acceptance by the Employer's deputy or Technical Officer of satisfactory completion of on-site tests in no way relieves the Contractor of his obligation to rectify defects which may have been overlooked or become evident at a later stage.

6.0 COMMISSIONING OF EQUIPMENT

- 6.1 Commissioning will only take place after all defects have been rectified to the satisfaction of the Employer's deputy or Technical Officer.
- 6.2 Commissioning will include energising of equipment from the primary isolator to the track feeder circuits. The Contractor must prove the satisfactory operation of all equipment under live conditions.
- 6.3 On completion of commissioning, the Contractor will hand the equipment over to the Employer's deputy or Technical Officer in terms of the relevant instruction.
- 6.4 The commissioning of protection equipment by Transnet Freight Rail will in no way absolve the Contractor from any of his responsibilities during the guarantee period. It is the Contractor's responsibility to satisfy himself or herself that the commissioning of the protection equipment has been carried out in a satisfactory manner, and in no way compromises the proper operation of the equipment supplied in terms of the contract.
- 6.5 The Contractor shall be present during the testing and setting of the protection to rectify any faults found.

7.0 GUARANTEE AND DEFECTS

- 7.1 The Contractor shall guarantee the satisfactory operation of the complete electrical installation supplied and erected by him and accept liability for maker's defects that may appear in design, materials and workmanship.
- 7.2 The Contractor shall be issued with a completion certificate with the list of all defects to be repaired within 14 working days after commissioning.
- 7.3 The guarantee period for these substations shall expire after:
A period of 12 months commencing on the date of completion of the contract / sub-order or the date the substation is handed over to Transnet Freight Rail whichever is the earliest.
- 7.4 Any defects that may become apparent during the guarantee period shall be rectified to the satisfaction of Transnet Freight Rail, and to the account of the Contractor.
- 7.5 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.
- 7.6 Should the Contractor fail to comply with the requirements stipulated above, Transnet Freight Rail shall be entitled to undertake the necessary repair work or effect replacement of defective apparatus or materials, and the Contractor shall reimburse Transnet Freight Rail the total cost of such repair or replacements, including the labour costs incurred in replacing defective material.
- 7.7 Any specific type of fault occurring three times within the guarantee period and which cannot be proven to be due to other faulty equipment not forming part of this contract e.g., faulty locomotive or overhead track equipment, etc., shall automatically be deemed an inherent defect. Such inherent defect shall be fully rectified to the satisfaction of the Employer's deputy or Technical Officer and at the cost of the Contractor.

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.

Contract Data

The Contractor's Offer

The Contractor is:

Name

Address

.....

Telephone **Fax No.**

E-mail

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

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

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

The offered total of the Prices is (VAT @14% inclusive) **(In words)**

.....

.....

Amount in figures: R.....(VAT @14% inclusive)

Signed on behalf of the Contractor

Name

Position

Signature..... **Date**

The Employer's Acceptance

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

Signed on behalf of the Employer

Name

Position

Signature..... **Date**

Part C2: Pricing Data

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Part C2.1: Pricing Data

Price Instructions

2.0 PRICING INSTRUCTIONS

1. The agreement is based on the NEC Engineering and Construction Short Contract 3. The contract specific variables are as stated in the contract data. Only the headings and clause numbers for which allowance must be made in the Price list are recited.
2. Preliminary and General Requirements are based on part 1 of SANS 1921, 'Construction and Management Requirements for Works Contracts'. The additions, deletions and alterations to SANS 1921 as well as the contract specific variables are as stated in the contract data. Only the headings and clause numbers for which allowance must be made in the Price list are recited.
3. It will be assumed that prices included in the Price list are based on Acts, Ordinances, Regulations, By-laws, International Standards and National Standards that were published 28 days before the closing date for tenders.
4. Reference to any particular trademark, name, patent, design, type, specific origin or producer is purely to establish a standard for requirements. Products or articles of an equivalent standard may be substituted.
5. The Price list is not intended for the ordering of materials. Any ordering of materials, based only on the Price list, is at the Contractor's risk.
6. The amount of the Preliminaries to be included in each monthly payment certificate shall be assessed as an amount prorated to the value of the work duly executed in the same ratio as the preliminaries bears to the total of prices excluding any contingency sum, the amount of the Preliminaries and any amount in respect of contract price adjustment provided for in the contract.
7. The amount or items of the Preliminaries shall be adjusted to take account of the theoretical financial effect which changes in time or value (or both) have on this section. Such adjustments shall be based on adjustments in the following categories as recorded in the Price list:
 - a) An amount which is not to be varied, namely Fixed (F).
 - b) An amount which is to be varied in proportion to the contract value, namely Value Related (V).
 - c) An amount which is to be varied in proportion to the contract period as compared to the initial construction period, excluding revisions to the construction period for which no adjustment the Contractor is entitled to in terms of the contract, namely Time Related (T).
8. The following abbreviations are used in the Price list:

Hr	=	Hour
Ea	=	Each
Quant	=	Quantity
9. The prices and rates in these Price list are fully inclusive prices for the work described under the items. Such prices and rates cover all costs and expenses that may be required in and for the execution of the work described in accordance with the provisions of the scope of work and shall cover liabilities and obligations set forth or implied in the Contract data, as well as profit.

- 10 Where the scope of work requires detailed drawings and designs or other information to be provided, all costs associated therewith are deemed to have been provided for and included in the unit rates and sum amount tendered for such items.
- 11 Where no quantity has been provided against an item in the Price list, the Contractor shall use their discretion and provide the quantity.
- 12 The quantities set out in these Price list are approximate and do not necessarily represent the actual amount of work to be done. The quantities of work accepted and certified for payment will be used for determining payments due and not the quantities given in these Price list.
- 13 The short descriptions of the items of payment given in these Price list are only for purposes of identifying the items. More details regarding the extent of the work entailed under each item appear in the Scope of Work.
- 14 Contractor shall ensure that provision (financial as well as time) for excavations in a range of soil types is made for in their tenders.
- 15 For each item in the Price list, including Preliminaries, the Contractor shall provide in the appropriate column the portion of the tendered sum (inclusive of labour and material) which has been sourced locally (Republic of South Africa).
- 16 The Contractor shall also arrange forward cover within two weeks after contract award on all imported items.
- 17 The Contractor shall provide information related to imported content, i.e. equipment to be imported, value and applicable exchange rates. This information shall be provided as an Annexure to the Price list.
- 18 The total in the Price list shall be exclusive of VAT.
- 19 Transnet Freight Rail payment terms: 30 days from month end statement.

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Contract Data Price List

Item	Description	Unit	Quantity	Rate	Price
A	VAN DER MERWE 3KV DC TRACTION SUBSTATION				
	AC Disconnects	Unit	Quantity	Rate	Price
1	Dismantle, remove and transport old equipment from site to Koedoespoort Depot.	sum	1		
2	Supply 88kV ac disconnects combined with Earthing Switches.	ea	3		
3	Supply flying busbars c/w clamps from AC disconnects to PCB to current transformers to main transformer (Where required).	sum	1		
4	Re-wire the electrical interlock between the AC disconnect and the PCB.	sum	1		
5	Supply steel structures for ac disconnects including channels to support the steel structures.	ea	3		
6	Generator/Standby plant Hire/Oil Tank.	sum	1		
7	Installation, Testing and Commissioning.	sum	1		
8	P's and G's (Labour, site establishment, transport, civil works, preparations, etc)	sum	1		
9	Security	sum	1		
A	Sub-Total for Van Der Merwe			R	
B	Contingency (10 % of A)(If applicable)			R	
C	SUB TOTAL (A+B) =			R	
D	VAT (14% of C) =			R	
E	Gross Total (Sum of C and D)			R	

Contract Data Price List

Item	Description	Unit	Quantity	Rate	Price
B	BON ACCORD 3kV AC TRACTION SUBSTATION.				
	AC Disconnects	Unit	Quantity	Rate	Price
1	Dismantle, remove and transport old equipment from site to Koedoespoort Depot.	sum	1		
2	Supply 88kV ac disconnects combined with Earthing Switches.	ea	3		
3	Supply flying busbars c/w clamps from AC disconnects to PCB to current transformers to main transformer (Where required).	sum	1		
4	Re-wire the electrical interlock between the AC disconnect and the PCB.	sum	1		
5	Supply steel structures for ac disconnects including channels to support the steel structures.	ea	3		
6	Generator/Standby plant Hire/Oil Tank	sum	1		
7	Installation, Testing and Commissioning.	sum	1		
8	P's and G's (Labour, site establishment, transport, civil works, preparations, etc).	sum	1		
9	Security.	sum	1		
A	Sub-Total for Bon Accord			R	
B	Contingency (10 % of A)(If applicable)			R	
C	SUB TOTAL (A+B) =			R	
D	VAT (14% of C) =			R	
E	Gross Total (Sum of C and D)			R	

Contract Data Price List

Item	Description	Unit	Quantity	Rate	Price
C	RANT 3KV DC TRACTION SUBSTATION.				
	AC Disconnects	Unit	Quantity	Rate	Price
1	Dismantle, remove and transport old equipment from site to Koedoespoort Depot.	sum	1		
2	Supply 88kV ac disconnects combined with Earthing Switches.	ea	3		
3	Supply flying busbars c/w clamps from AC disconnects to PCB to current transformers to main transformer. (where required)	sum	1		
4	Re-wire the electrical interlock between the AC disconnect and the PCB.	sum	1		
5	Supply steel structures for ac disconnects including channels to support the steel structures.	ea	3		
6	Generator/Standby plant Hire/Oil Tank	sum	1		
7	Installation, Testing and Commissioning.	sum	1		
8	P's and G's (Labour, site establishment, transport, civil works, preparations, etc).	sum	1		
9	Security	sum	1		
A	Sub-Total for Rant			R	
B	Contingency (10 % of A)(If applicable)			R	
C	SUB TOTAL (A+B) =			R	
D	VAT (14% of C) =			R	
E	Gross Total (Sum of C and D)			R	

Part C3: Scope of Work

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Contract Data

Works Information

8.0 Description of work

- 8.1 Where applicable in the attached schedule of quantities and prices, the Contractor shall perform the following:
- 8.1.1 Disconnect, dismantle and remove the existing poles with AC disconnects.
 - 8.1.2 The Contractor shall transport the old AC disconnects to Koedoespoort depot.
 - 8.1.3 The Contractor shall supply, deliver, install and connect the new high voltage double pole 88kV outdoor, high voltage, alternating current disconnects combined with earthing switches and support steel structures as per bill of quantities.
 - 8.1.4 The Contractor shall electrically connect the newly installed equipment to the existing earthing system.
 - 8.1.5 The Contractor shall test, commission and hand over the equipment
 - 8.1.6 The Contractor shall design, supply and install steel structures for the support of equipment. The manufacture of any steelwork shall not take place prior to the approval of the design drawings. Transnet freight rail shall inspect the steelwork at the manufacturer's works prior to dispatch.
 - 8.1.7 All fasteners (nuts & bolts) shall be secured using flat or bevelled washers, as necessary, as well as lock washers.
 - 8.1.8 On backfilling of the soil after trenching has been done the Contractor shall compact the soil to the same pressure as the surrounding soil before it is covered with stone.
 - 8.1.9 The Contractor's team could be requested to attend the Transnet freight rail's electrical safety training course and be authorised to supervise the Contractor's staff whilst working in the substations on this contract. Transnet freight rail will organise the course and further details will be communicated to the successful Contractor.
 - 8.1.10 The Contractor shall provide training for the operation and maintenance of disconnects to Transnet freight rail maintenance staff and as per specification BBB1267 clause 8.0.
 - 8.1.11 The Contractor shall provide his own water for concrete mixing and other needs and shall also supply his own electrical power whilst working in the substation outdoor yard, since availability of power from Eskom or auxiliary supplies cannot be guaranteed.
 - 8.1.12 All steelwork shall be galvanised in accordance with SANS 121, CEE 0183 issue 2002 and, and where required painted in accordance with specification CEE 045 of 2002/1.

- 8.1.13 Supply and install new aluminium flying busbars complete with clamps from AC disconnects to the next electrical equipment and to the transformer bushings. Contractor to use existing busbars from the Eskom supply to the AC disconnects. The busbars shall be of the same conductor size.
- 8.1.14 The Contractor shall fill each flying busbar clamp on connection with anticorrosive grease type SANCHEM - NO- OX – ID “A “. Each clamp shall be torqued on flying busbar connection in accordance with manufacturers specification.
- 8.1.15 The support steelwork for the AC disconnect shall be re-connected to the existing substation AC earth system.
- 8.1.16 On completion of the installation, it will be required from the Contractor to submit as built drawings and schematic diagrams of all newly installed equipment as well as showing interface to the existing equipment.
- 8.1.17 The earthing shall be by means of copper clad steel rod. The Contractor shall paint earth straps to all structures green.
- 8.1.18 The Contractor shall repair any damage resulting from negligence of his or her staff to the substation equipment.

9.0 INSPECTION

- 9.1 Transnet freight rail reserves the right to be present during repair work and testing and must be timeously advised of the dates of commencement of the repair work and of testing.
- 9.2 Arrangements must be made timeously via the “Employer’s deputy” for Transnet freight rail staff from the Principal Engineer and his Technical Support, in Johannesburg or his designated personnel to perform witness and authorise the tests for each disconnects.

10.0 GUARANTEE

- 10.1 The Contractor shall guarantee the repaired AC disconnects against faulty workmanship for a period of twelve months from the date disconnects starts to function.

11.0 SAFE WORKING ON TRANSNET FREIGHT RAIL SUBSTATION SITES.

- 11.1 The Contractor or his sub Contractor shall be required to work on site in accordance with Transnet freight rail’s safety specification E4E of April 1997 and the Occupational Health and Safety Act 85 of 1993.
- 11.2 The Contractor shall be required to work under direct supervision of Transnet freight rail’s depot personnel on site and shall work only in the area which shall be demarcated by suitable barriers.

12.0 INSURANCE.

12.1 Transnet freight rail will provide insurance cover for the transportation of transformers and the work at the substation.

13.0 CONCRETE FOUNDATIONS

13.1 The Contractor shall be responsible for the design and casting of foundations for all the equipment to be installed.

13.2 The foundation and steel structural designs shall be certified by a professional Engineer or Technologist registered with the Engineering council of S.A. (ECSA). These designs shall be submitted before this civil work is commenced.

13.3 The successful tenderer shall visit all sites of determine foundation and steelwork requirements.

13.4 The Contractor shall also carry out his own survey in regard to soil types and their load carrying capabilities.

13.5 **CONTRACTORS MUST ENSURE THAT PROVISION (FINANCIAL AS WELL AS TIME) FOR EXCAVATIONS IN A RANGE OF SOIL TYPES IS MADE FOR IN THEIR TENDER.**

13.6 The 28-day strength of all concrete used shall be a minimum of 20Mba.

13.7 If ready mix concrete is used, the Contractor shall submit certificates confirming the strength of the concrete to the Supervisor.

13.8 Hand mixed concrete is not acceptable.

13.9 The addition of water to a concrete mix reduces the strength of that concrete significantly and on no account shall water be added to a mix after test cubes have been taken.

13.10 Equipment support foundations shall be finished off, 200mm above the compacted ground level of the yard. The design must be such as to prevent water standing.

13.11 All foundations shall be bevelled at 45° and the surfaces float finished.

13.12 All support foundations shall be at the same level.

14.0 STEELWORK

14.1 The design, supply and installation of all steel structures for the support of equipment as well as the alterations to existing steelwork shall be the responsibility of the Contractor.

14.2 The manufacture of any steelwork shall not take place prior to the approval of the design drawings by the Supervisor.

14.3 Transnet Freight Rail shall inspect the steelwork (stainless or galvanized for corrosion) at the manufacturers works prior to dispatch.

- 14.4 All fasteners (nuts & bolts) shall be secured using flat and spring washers where necessary.
- 14.5 All steelwork shall be galvanized in accordance with SANS 121 and, where required painted in accordance with specification CEE 045 of 2002/1.

15.0 QUALITY AND INSPECTION

- 15.1 Transnet Freight Rail shall inspect the support steel structure on the premises of the manufacturer.
- 15.2 The Contractor shall notify Transnet Freight Rail 14 days in advance of such an inspection date.
- 15.3 The Contractor shall apply 14 days in advance for the date of energizing.
- 15.4 The Contractor shall be responsible to issue a compliance certificate in terms of SANS 0142 for each site before energizing of the equipment shall take place.

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Contract Data

Works Information

16.0 DRAWINGS

- 16.1 CEE-TBD-0008 Earthing arrangement for 3 kV DC Traction substation.

17.0 SPECIFICATIONS

17.1 South African National Standards:

- 17.1.1 SANS 1091 National colour standard.
- 17.1.2 SANS 763 Hot dip galvanised zinc coating.
- 17.2 SANS 121 Hot Dip Galvanised Coating for Fabricated Iron or Steel Article.
- 17.2.1 SANS 10142-1 Wiring Code.
- 17.2.2 SANS 1064.2005 Code of Practice for the preparation of steel surfaces for coating.

18.0 Transnet Freight Rail:

- 18.1.1 CEE TBK 0027 Control circuit diagrams – NO volt operation.
- 18.1.2 S.420 (1999) Specification for concrete work.
- 18.1.3 BBC 0198 version 1 Specifications for the supply of cables.
- 18.1.4 CEE.0023.90 Specifications for installation of cables.

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

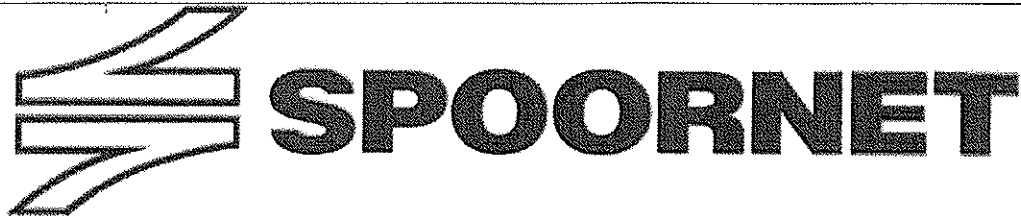
- 18.2 Occupational Health and Safety Act No. 85 of 1993 (Available at depot for referral)
- 18.3 Constraints on how the Contractor Provides the Works
- 18.3.1 The constraints shall be as specified in the specifications of the particular equipment.
- 18.4 Requirements for the programme
- 18.4.1 Programme of work :To be submitted by successful Contractor
- 18.4.2 Format :Gantt chart
- 18.4.3 Information :How work is going to be executed and commissioned

- 18.4.4 Submission :3 weeks after the award of contract
- 18.4.5 Site diary :Successful Contractor to supply in triplicate carbon copies
- 18.4.6 Site instruction book :Successful Contractor to supply in triplicate carbon copies

Services and other things provided by the *Employer*

- 18.4.7 Transnet Freight Rail shall inspect the support steel structure on the premises of the manufacturer.
- 18.4.8 Transnet Freight Rail shall inspect all equipment before dispatching the equipment to site.
- 18.4.9 Transnet Freight Rail shall have an electrician available for isolation and the erection of barriers to live electrical equipment and issuing of work permits.
- 18.4.10 Upon successful completion of the works to the satisfaction of Transnet Freight Rail, Transnet Freight Rail shall perform necessary protection tests and commission the equipment.
- 18.4.11 The Contractor shall make necessary arrangements for sanitation, water and electricity at these relevant sites during the installation of the equipments.
- 18.4.12 Transnet Freight Rail will arrange for the reconnecting of telecontrol equipment in the substation and no final energising shall take place without this.

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**ENGINEERING AND TECHNOLOGY
TECHNOLOGY MANAGEMENT**

SPECIFICATION

**REQUIREMENTS FOR THE SUPPLY OF ELECTRIC
CABLES**

(Appendix to be filled in by client)

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Date: 5 September 2005

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1.0 SCOPE

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

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

2.0 STANDARDS

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

2.1 SOUTH AFRICAN NATIONAL STANDARDS

- SANS 97 : Electric cables - Impregnated paper insulated metal-sheathed cables for rated voltages 3,3/3,3 kV to 19/33 kV (excluding pressure assisted cables).
- SANS 1339 : Electric cables – Cross-linked polyethylene (XLPE) insulated cables for rated voltages 3,8/6,6 kV to 19/33 kV.
- SANS 1507 : Electric cables with extruded solid dielectric insulation for fixed installations 300/500 V to 1900/3300 V,
Part 1-General,
Part 3-PVC Distribution cables,
Part 4-XLPE distribution cables,
Part 5-Halogen free distribution cables.

3.0 APPENDIX

The following appendix forms an integral part of this specification.

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

4.0 TENDERING PROCEDURE

- 4.1 Tenderers shall indicate clause-by-clause compliance with the specification. They shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance.
- 4.2 The tenderers shall motivate a statement of non-compliance.
- 4.3 The tenderer shall submit technical specifications of the cables offered.
- 4.4 Failure to comply with clauses 4.1, 4.2 and 4.3 could preclude a tender from consideration.

5.0 MEDIUM VOLTAGE CABLES

5.1 IMPREGNATED PAPER INSULATED.

- 5.1.1 Paper impregnated lead sheathed (PILC) cables used for reticulation systems and traction power supplies and other applications shall be in accordance with SANS 97.
- 5.1.2 The voltage range for the cables shall be between 3,3kV and 33kV.
- 5.1.3 The cables shall be three core with stranded copper conductors.
- 5.1.4 The cables shall be paper insulated, screened type, lead sheathed provided with an extruded PVC bedding.

- 5.1.5 The armouring shall be galvanised steel wire with outer extruded PVC over sheath over the armouring.
- 5.1.6 The cable shall be so manufactured that it is fully protected against the effect of electrolysis.
- 5.1.7 Single core cables used for 3 kV DC application shall withstand a test voltage of 10,5 kV for one minute.
- 5.1.8 Cables shall be suitable for laying directly in soil and concrete trenches.
- 5.1.9 The cables shall withstand exposure to water, corrosive conditions as well as high ultra violet conditions caused by direct sunlight.
- 5.1.10 The cables shall be tested in accordance with SANS 97. Type test certificates shall be submitted with the cables offered.
- 5.1.11 The packing, marking and sealing of cables and cable drums shall be in accordance with SANS 97.
- 5.2 CROSS – LINKED POLYETHYLENE INSULATED (XLPE).**
- 5.2.1 XLPE cables used for reticulation systems, 3kV DC traction feeders and traction power supplies and other applications shall be in accordance with SANS 1339.
- 5.2.2 The voltage range for the cables shall be between 3,8kV and 33kV.
- 5.2.3 Cables shall be single or three core with stranded copper conductors.
- 5.2.4 The cables shall be type A (armoured) for single and three core cables.
- 5.2.5 Single core type A cable shall be copper tape screened, aluminium wire armoured and provided with a PVC outer sheath.
- 5.2.6 Single core cables shall be rated for 3,8/6,6kV.
- 5.2.7 Single core cables used for 3 kV DC application shall withstand a test voltage of 10,5 kV for one minute.
- 5.2.8 Three core type A cable shall be copper tape screened, galvanised steel wire armoured and provided with a PVC outer sheath.
- 5.2.9 The manufacture of the single and three core cables shall be such that the cables are fully protected against the effect electrolysis.
- 5.2.10 The cables shall be suitable for laying directly in soil and concrete trenches.
- 5.2.11 The cables shall withstand exposure to water, corrosive conditions as well as high ultra violet conditions caused by direct sunlight.
- 5.1.12 The cables shall be tested in accordance with SANS 1339. Type test certificates shall be submitted with the cables offered.
- 5.2.12 Where specified flame-retardant and halogen free cables shall be in accordance with SANS 1339.
- 5.2.13 The packing, marking and sealing of cables and cable drums shall be in accordance with SANS 1339.
- 6.0 CABLES FOR FIXED INSTALLATIONS**
- 6.1 Unless otherwise specified single and multi-core, wire armoured, extruded PVC insulated cables shall be used for fixed installations. The cables shall be in accordance with SANS 1507 part 1 and part 3.
- 6.2 The voltage range is between 300/500 V to 1900/3300 V.
- 6.3 Cables shall have stranded annealed copper conductors.

- 6.4 The cables shall be marked according to SANS 1507 part 3. Core identification shall be by means of colour code or numbering of the insulation.
- 6.5 The cable shall be so manufactured that it is fully protected against the effect of electrolysis.
- 6.6 Where XLPE or halogen free cables are specified the cables shall be in accordance with SANS 1507 parts 4 and 5.
- 6.7 The cables shall be tested in accordance with SANS 1507 parts 3, 4 and 5. Type test certificates shall be submitted with the cables offered.
- 6.8 The packing, marking and sealing of cables and cable drums shall be in accordance with SANS 1507.

7.0 QUALITY ASSURANCE

- 7.1 Spornet reserves the right to carry out inspection and tests on the equipment at the works of the supplier/manufacturer.
- 7.2 Arrangements must be made timeously for such inspections and type/routine tests in accordance with the cable specifications are carried out before delivery of the cables to the site.

8.0 INSPECTION AND TESTING

- 8.1 Spornet reserves the right to carry out inspections and any tests on cables at the factory of the supplier/ manufacture.
- 8.2 Arrangements must be made with The Senior Engineer, Technology Management Spornet for inspections to be carried out before delivery of the equipment.

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SCHEDULE OF REQUIREMENTS

(To be completed by the client)

1.0 MEDIUM VOLTAGE CABLES

1.1 PAPER IMPREGNATED LEAD SHEATHED (PILC)

1.1.1 Rated Voltage (V):

1.1.2 Number of cores:

1.1.3 Length of cables (m):

1.1.4 Size of conductors (mm²):

1.2 CROSS LINKED POLYETHYLENE INSULATED (XLPE)

(XLPE is recommended for 3 kV DC Applications)

1.2.2 Rated Voltage (V):

1.2.3 Number of cores:

1.2.4 Length of cables (m):

1.2.5 Size of conductors (mm²):

1.2.6 Flame retardant (required/not required):

2.1 CABLES FOR FIXED INSTALLATIONS

2.1.1 Type of cable required:

- PVC Distribution cables: (Yes/ No):
- XLPE Distribution cables: (Yes/No):

2.1.2 Rated Voltage (V):

2.1.3 Number of cores:

2.1.4 Length of cables (m):

2.1.5 Size of conductors (mm²):

END



TRANSNET
freight rail

A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

INSTALLATION OF LOW AND MEDIUM VOLTAGE CABLES

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Transnet and Relevant Third Parties

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1.0 SCOPE

- 1.1 This specification covers Transnet Freight Rail's requirements for the installation, laying, terminating, jointing, testing and commissioning of low and high voltage cables.

2.0 APPENDICES

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

- 2.1 Appendix 1 - "Scope of Work" - to be completed by Transnet Freight Rail (Client).
 2.2 Appendix 2 - "Schedule of Requirements" – (to be completed by Tenderer).
 2.3 Appendix 3 – "Normative SANS references"

3.0 STANDARDS, PUBLICATIONS AND DRAWINGS

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

3.1 British Standards

BS 5467: Electric cables – thermosetting insulated, armoured cables for voltages of 600/1000V and 1900/3300V.

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

3.2 South African National Standards

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

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

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

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

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

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

3.3 Transnet Freight Rail Instructions

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

CEE.0012 - Method of Tendering

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

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

Electrical Safety Instructions 2012 - High Voltage Electrical Equipment

3.4 Transnet Freight Rail Drawings

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

CEE-PK-14 - Electrical cable route marker.

CEE-MA-307 – Route marker electrical cables.

FG 263 - Accommodation of cables in Railway formations

3.5 Statutory Requirements

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

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

4.0 TENDERING METHODS

- 4.1 Tenderer shall indicate clause by clause compliance with the specification. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance. This document can be used by tenderer to elaborate on their response to a clause.
- 4.2 A statement of non-compliance shall be motivated by the tenderer.
- 4.3 Tenderer shall complete Appendix 2 – “Schedule of requirements”.
- 4.4 Tenderer shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.
- 4.5 Failure to comply with clauses 4.1, 4.2, 4.3 and 4.4 could preclude a tender from consideration.

5.0 SERVICE CONDITIONS

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

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

6.0 GENERAL REQUIREMENTS

- 6.1 The tenderer shall submit all drawings in accordance with Transnet Freight Rails Specification CEE.0089
- 6.2 Where joints and terminations are to be done by others, the contractor shall submit detailed instructions regarding the procedure recommended by the cable manufacturer.
- 6.3 The electrical installation shall conform to the requirements of SANS 10142 part 1 and 2 and shall be to the satisfaction of Transnet Freight Rail.
- 6.4 Galvanising where specified shall be in accordance with SANS 32 and SANS 121.
- 6.5 Work on the high voltage equipment shall be carried out in accordance with the Transnet Freight Rail's Safety Instructions 2012 - High Voltage Electrical Equipment.
- 6.6 All work done must comply with the requirements of Occupational Health and Safety Act and Regulations, Act 85, 1993

SURVEYS

- 6.7 The Contractor shall within 30 days after being awarded the contract carry out a pre-installation route survey which shall include digging test holes and guided by the Transnet Freight Rail's drawings to determine a suitable route.
- 6.8 The contractor shall determine where cables are liable to be subjected to chemical, electrolytic, mechanical or other damage and shall submit his recommendation to the Depot Maintenance Manager (Electrical) for approval.
- 6.9 The Contractor shall submit in triplicate plans of the cable routes selected to the Depot Maintenance Manager (Electrical) for approval. Plans may be submitted in sections as the survey progresses.

- 6.10 No excavation of any section of the cable route shall commence before the Contractor is in possession of the relevant approved plans and the Depot Maintenance Manager (Electrical) has authorised the commencement of work on the section concerned.
- 6.11 After completion of all cable laying and jointing and before commissioning of any cable the Contractor shall carry out a final "as laid" survey of the cable routes and submit plans on transparencies suitable for reproduction.
- 6.12 The cable route plans shall include the following information:
- 6.12.1 Overall length, type, size and voltage of each cable.
- 6.12.2 Accurate indication of the position of each cable joint by indicating two distances to each joint from permanent structures.
- 6.12.3 Pipes and chambers provided.
- 7.0 EXCAVATIONS**
- 7.1 Excavations shall be carried out in strict compliance with the specification BBD 8210 for general work and works on, over, under or adjacent to a railway lines and near high voltage equipment.
- 7.2 Trenching procedure shall be programmed in advance, approved by the Depot Maintenance Manager (Electrical) and shall not be departed from except with the consent of the Depot Maintenance Manager (Electrical).
- 7.3 The Contractor will be advised of any known buried services such as cables, pipes, etc. in the vicinity of the cable route.
- 7.3.1 When trenching the contractor shall take all necessary precautions to prevent damage to underground services.
- 7.3.2 On encountering any uncharted service, the Contractor shall promptly advise the Depot Maintenance Manager (Electrical) who will give the necessary instructions. Additional excavations shall be paid for at scheduled rates.
- 7.4 Should any underground service, water mains, road pavement, drainage system, building or any other structure be damaged by the Contractor's staff, it shall be reported immediately to the Depot Maintenance Manager (Electrical), who shall arrange for the necessary repairs. The Contractor shall be responsible for the cost of repairs.
- 7.5 The removal of obstructions along the cable routes shall be subject to the approval of the Depot Maintenance Manager (Electrical) and shall be paid for at the agreed rates.
- 7.6 The Contractor shall not trench beneath any railway line without departmental supervision. Should the contractor wish to carry out such work, a minimum of 14 working days notice is required by the Depot Maintenance Manager (Electrical) to arrange for the necessary supervision. The cost of such supervision shall not be charged to the Contractor.
- 7.7 Excavations crossing oil pipe lines shall not commence until an authorised representative is present on site. The Depot Maintenance Manager (Electrical) shall be advised 14 days in advance when such excavations will take place.
- 7.7.1 Cable crossings of oil pipe lines shall only be at right angles.
- 7.8 Trenches across roads, access ways or foot-paths shall not be left open. If trenching, cable laying and backfilling cannot be done during the same shift, the portion of trench across the full width of the road, etc., must be temporarily backfilled and consolidated sufficiently to carry the traffic concerned without subsidence. Alternatively, adequately strong cover plates shall be laid across the trench.
- 7.9 Power driven mechanical excavators may be used for trenching operations. Transnet Freight Rail shall not be responsible for any damage to other Services in close proximity when using mechanical excavators.
- 7.10 The Contractor shall provide shuttering in places where the danger exists of the trench collapsing, and causing damage to formations or other nearby structures.
- 7.10.1 Shuttering shall be paid for at scheduled rates.

- 7.11 Trenches shall be as straight as possible and the bottom of each cable trench shall be firm and of smooth contour without sharp dips or rises which may cause tensile forces in the cable during backfilling.
- 7.11.1 Trenches shall have no sharp objects which may cause damage to the cable during laying or backfilling.
- 7.12 The unfinished depth of trenches unless otherwise stated shall be as follows:
- 7.12.1 HV cables and associated pilot cables = 1 000 mm.
- 7.12.2 LV cables and separate pilot cables = 750 mm.
- 7.13 The width of the trench unless otherwise stated shall be 500 mm for one or two HV cables and associated pilot cables, and shall increase by 300 mm for each additional HV cable and its associated pilot cable.
- 7.13.1 The width of the trench at any bend or places where cable slack is required, shall be such that the bending radius of the cables shall not be less than that specified for the particular cable as per specifications SANS 97 and SANS 1339.
- 7.13.2 Trenching in railway formations shall be in accordance with Transnet Freight Rail's drawing FG 263.
- 7.14 The material excavated from each trench shall be placed in such a manner as to prevent nuisance or damage to adjacent ditches, railway lines, drains, gateways and other properties and shall not interfere with traffic.
- 7.14.1 Where, owing to certain considerations, this is not possible the excavated materials shall be removed from site and be returned for refilling the trench on completion of laying.
- 7.15 When excavating close to railway tracks, the ballast must be covered by tarpaulins or other sheeting to prevent soiling.
- 7.16 Removal of accumulated water or other liquid from trenches shall be done by the Contractor at his expense. The Contractor shall provide all pumps and appliances required to carry out this operation. Water or any other liquid removed shall be disposed of without creating any nuisance or hazard.
- 7.17 Transnet Freight Rail reserves the right to alter any cable route or portion thereof prior to cable laying. Payment in respect of any additional work involved shall be at scheduled rates.

8.0 CABLE LAYING

8.1 GENERAL

- 8.1.1 All possible care shall be exercised in handling cables on site.
- 8.1.2 Any drum of cable showing signs of damage shall not be used.
- 8.1.3 The outer covering (insulation) of cables shall not be damaged in any way and cables shall not be bent at radii less than allowed by the manufacturer.
- 8.1.4 When cable is supplied by the contractor, the drums thereof remain the property of the Contractor and shall be removed from the site and disposed of by the contractor.
- 8.1.5 Cable pulling and laying shall be done manually unless otherwise approved by the Depot Maintenance Manager (Electrical). No cable shall be subjected to a tension exceeding that stipulated by the cable manufacturer.

8.2 IN TRENCHES

- 8.2.1 High Voltage cables shall be spaced at a minimum of 300 mm apart (centre to centre).
- 8.2.2 Low Voltage cables shall be spaced at a minimum of 150 mm apart (centre to centre).
- 8.2.3 Pilot cables shall be laid beside the associated power cables.
- 8.2.4 High Voltage and Low Voltage cables (and pilot cables not associated with High Voltage cable) shall be spaced at a minimum of 300 mm apart.

- 8.2.5 Pilot cables, when they are routed separately from their associated power cables, may be run next to one another.
- 8.2.6 Single core low voltage cables to be clamped in trefoil formation.
- 8.2.7 Where the cable cannot be laid down at the specified depth, prior authority shall be obtained from the Depot Maintenance Manager (Electrical) by the Contractor to protect the cable by means of 150 mm diameter half round concrete pipes with 50 mm concrete slab coverings or other approved methods.
- 8.2.8 Where cables have to be drawn around corners well lubricated skid plates shall be used. The skid plates shall be securely fixed and constantly examined during cable laying operations.
- 8.2.9 Suitable rollers may be used during the laying of cables.
- 8.2.10 Cables shall be visually inspected for damage during and after laying. Any damage shall be reported immediately to the Depot Maintenance Manager (Electrical) who will issue the necessary instructions.
- 8.3 IN SLEEVE PIPES
- 8.3.1 All cables crossing beneath roads and pavements shall be enclosed in cement or PVC pipes with a minimum internal diameter of 150mm. The Depot Maintenance Manager (Electrical) shall be advised timeously of the locations and quantity of pipes to be laid and chambers to be provided by others. Separate lengths of pipe shall be properly jointed.
- 8.3.2 Pipes shall maintain or exceed the specified cable spacing.
- 8.3.3 Only one High Voltage cable shall be laid per pipe.
- 8.3.4 Pipes shall extend at least 1 m on either side of the road or pavement formations and shall maintain the specified cable depth. All pipes shall be graded for water drainage: the required grade is 1:400.
- 8.3.5 All cables crossings underneath railway tracks shall be in pipes in accordance with Transnet Freight Rail's drawing FG 263.
- 8.4 IN DUCTS AND BUILDINGS
- 8.4.1 Concrete ducts and pipes within buildings will be provided by others.
- 8.4.2 Before installing cables, the ducts are to be inspected to ensure that they are suitable and clean as not to damage the cables.
- 8.4.3 The cables are to be neatly positioned and cross overs are to be avoided.
- 8.4.4 Steel checker plates over ducts will be supplied by others. The tenderer will however be required to cut all the slots for emerging cables. These slots are to be neatly cut and smoothed to avoid damage to the cable.
- 8.4.5 The Contractor shall supply all cable trays, racks, wooden cleats or other supports required to adequately support cables not laid in ducts.
- 8.4.6 Cable trays or racks shall be of reinforced glass fibre or steel suitably treated to prevent corrosion, Steel trays, racks and other supports shall be galvanised in accordance with SANS 32 and SANS 121 when used within 50 km of the sea or inland exposed conditions.
- 8.4.7 Where cable enters buildings sufficient measures shall be installed to ensure no moisture/water is digressing into the ducts. A sealing system based rubber modules from multi removable layers may be used.
- 8.5 UNDER BRIDGES AND IN TUNNELS
- 8.5.1 Where a cable route can only be against the concrete wall of a bridge or tunnel the cable shall be supported on:
- 8.5.1.1 Suitable brackets at 750 mm intervals or.

- 8.5.1.2 Straining wire secured at maximum 1 200 mm intervals.
- 8.5.2 Brackets shall be of robust design and shall be galvanised and painted in accordance with Transnet Freight Rail's specification CEE.0045.
- 8.5.3 The height of the cable route on the brackets or strain wire shall be determined and agreed upon on site.
- 8.5.4 The brackets or strain wire shall be supplied and installed by the contractor.
- 8.6 CROSSING OF PIPELINES AND OTHER CABLES
- 8.6.1 Cables shall pass beneath pipelines with a 300 mm minimum clearance between the top of any cable and the bottom of any oil pipe.
- 8.6.1.1 The level of any cable at an oil pipeline crossing shall be maintained for not less than 3 m on either side of the centre line of the pipeline or on either side of the centre line of the outermost pipelines where there is more than one pipeline on the same route.
- 8.6.2 Where cables cross communication or signal cables, at least 300 mm of fill shall be provided between the two cables. In addition a concrete slab in accordance with Transnet Freight Rail's drawing CEE PA-0105 shall be placed between the two cables parallel to the lower cable.
- 8.7 IN RAILWAY FORMATIONS
- 8.7.1 Cables to be accommodated in railway formations shall be laid in accordance with Transnet Freight Rail's drawing FG 263.
- 8.8 SECURED TO POLES
- 8.8.1 Cables to be terminated at disconnectors (isolators) mounted on wood, concrete or steel poles, shall be clamped onto such structures by means of stainless steel straps applied at such a tension that the cable or cable sheath is not damaged. Straps shall be located at intervals of not more than 1,2 m.
- 8.8.2 Cables shall be protected by a pipe or boxed section of galvanised steel or other approved material for a distance of 250 mm below and 600 mm above ground level, strapped or screwed to the pole at a minimum of two points and connected to the earth connection, if of steel construction.
- 8.8.3 Straps and pipes shall be supplied and installed by the Contractor.
- 8.9 EXPOSED CONDITIONS
- 8.9.1 Whenever cables enter buildings or tunnels, or where excavations are not permitted down banks or cuts, the exposed portion shall be suitably protected by means of concrete slabs, or suitable steel pipes or boxed sections which shall be galvanised in accordance with SANS 32 and SANS 121.
- 8.9.2 These pipes or boxed sections shall be firmly secured to the bank or cut, at regular intervals.
- 8.9.3 All such material shall be supplied and installed by the Contractor.
- 8.9.4 Stake routes shall only be supplied when specifically called for in Appendix 1.
- 9.0 CABLE TERMINATIONS**
- 9.1 GENERAL
- 9.1.1 All cables shall be terminated and connected to the respective equipment, whether provided by the Contractor or by others.
- 9.1.2 Jumpers between cable end boxes and disconnectors shall either be short enough to be rigidly self supporting, or shall be supported on suitably placed pin insulators.
- 9.1.3 Termination of cables on outdoor equipment shall not be done during inclement weather conditions.

- 9.1.4 Both ends of each cable shall be identified by means of embossed stainless steel strips clamped around the cables. The characters shall have a minimum height of 6 mm.
- 9.1.5 All materials necessary for cable termination shall be provided by the Contractor.
- 9.1.6 The contractor shall ensure that correct phase rotation is maintained throughout.
- 9.1.7 Glands of cables terminating on equipment provided with frame leakage protection shall be insulated from the frame by high grade non-deteriorating, non-hygroscopic insulation, at least 2 mm thick, capable of withstanding a test voltage of 4 kV DC for one minute.
- 9.2 HV Cables
- 9.2.1 The cable armouring shall be bonded with an approved copper bond to the cable end box at one end of the cable only as directed by the Depot Maintenance Manager (Electrical). This bond shall be easily removable for testing purposes.
- 9.2.2 Where for any reason a cable cannot be terminated, sufficient length of cable shall be left to reach the cable end box position. The cable shall be coiled and buried or otherwise protected. The cable end of paper insulated cables shall be capped immediately with a plumbed lead seal. Other cables shall be sealed with suitable tape.
- 9.3 LV Cables (and Pilot Cables)
- 9.3.1 All cut ends of cables are to be sealed with suitable tape, or other approved means until they are ready to be terminated.
- 9.3.2 The cables shall terminate in compression type glands, brass or bronze, suitable for PVC SWA ECC cables.
- 9.3.2.1 The glands shall be fitted with neoprene shrouds or corrosion guard to prevent the ingress of moisture and dust at the point of cable entry.
- 10.0 CABLE JOINTS**
- 10.1 General
- 10.1.1 Jointing shall be carried out strictly in accordance with the manufacturer's jointing instructions and by artisans thoroughly experienced and competent in jointing the classes of cables used. They shall be adequately supervised to ensure the highest quality of workmanship.
- 10.1.2 Jointing shall not be carried out during inclement weather.
- 10.1.3 The cores of cables shall be jointed number to number or colour to colour.
- 10.1.4 The joints shall not impair the anti-electrolysis characteristics of the cables.
- 10.1.5 The conductor bridging the armouring shall be adequate to carry the prospective earth fault current.
- 10.1.6 A through joint shall only be permitted after every full drum length of cable.
- 10.1.7 Each cable joint shall be identified by a non-corrodible label fixed securely to the top of the joint. Each label shall have stamped on it, in characters having a minimum height of 10 mm, the identification of equipment at each end of the cable concerned.
- 10.1.8 Transnet Freight Rail reserves the right to be present during jointing operations to familiarise themselves with any special techniques.
- 10.1.9 No joint shall be situated inside a cable pipe.
- 11.0 COVERING, BACKFILLING AND REINSTATEMENT**
- 11.1 Filling of trenches shall not commence before the Depot Maintenance Manager (Electrical) or his authorised representative has inspected and approved the cables and cable joints in situ in the section of trench concerned.

- 11.2 Trenches in railway formations shall be backfilled and reinstated in accordance with Transnet Freight Rail's drawing FG 263.
- 11.3 All other trenches shall be backfilled and reinstated as follows:
- 11.3.1 Two 75 mm thick layers of soil sifted through a 6 mm mesh shall be laid directly under and over the cables respectively and consolidated by hand ramming only.
- 11.3.1.1 Only soil with a thermal resistivity of 1,5 degrees C.m/watt, or lower may be used for this purpose.
- 11.3.1.2 When necessary imported fill shall be arranged by the Contractor and paid for at scheduled rates.
- 11.3.1.3 The backfill material shall be free from rubble/stones or foreign material.
- 11.3.2 HV cables shall, where likely to be mechanically damaged as decided by the Depot Maintenance Manager (Electrical), be protected by concrete slabs (to Drawing CEE PA-0105) to be supplied and laid by the Contractor on top of the sifted soil. These slabs shall be laid close-butted, convex end to concave end, directly above each HV cable throughout the underground portion except where otherwise protected as by pipes, etc. Only unbroken cable protection slabs may be used, and only slabs actually laid will be paid for.
- 11.3.3 Reinforced resin protection trench covers might also be used instead of concrete slabs. These covers shall be made of material which is flame retardant, non toxic and corrosion resistant.
- 11.3.4 The minimum dry densities of backfilling after compaction shall be not less than 1600 kg/cubic metre.
- 11.3.5 All excavations made (whether for the purpose of cable laying, joint bays or trial holes) shall be back-filled in 150 mm layers, the earth in each layer being well rammed and consolidated and sufficient allowance being made for settlement. The back-filling shall be completed to the satisfaction of the Depot Maintenance Manager (Electrical). If necessary, water shall be used to obtain the specified compacted density. Any cable damaged during backfilling shall be replaced by the Contractor at his own expense.
- 11.3.5.1 Backfilling at pipe entries shall be such as not to stress or damage the cable during compaction from the top.
- 11.3.6 A continuous plastic cable warning tape, to drawing CEE-MA-307 shall be laid directly above each HV cable, 150 mm below the normal surface level and run for the full length of the cable before completing the back-filling.
- 11.4 The back filled trench shall be maintained in a thoroughly safe condition by the contractor for the duration of the contract.
- 11.5 All back filling of road crossings shall be mechanically rammed.
- 11.6 Final surfacing of roads shall be restored by others unless called for under "Scope of Work", Appendix 1.
- 11.7 Concrete cable route markers shall be provided and installed by the contractor in accordance with drawing CEE-PK-14.
- 11.8 Pipes shall be filled with a sand/water mixture to also have a thermal resistivity of 1,5 degrees C.m/watt or lower when dry. The sand used in the mixture shall be chemically tested not to be harmful to the cable outer sheath.

12.0 MEASUREMENTS

- 12.1 All measurements for payment purposes shall be made jointly by representatives of the Contractor and Transnet Freight Rail and shall be agreed upon by both parties. The Contractor shall be responsible for obtaining the Depot Maintenance Manager (Electrical)'s signed approval of such measurements.

- 12.2 Measurements of cable length shall be made from centre to centre of cable joints and to the cable ends and will exclude any wastage due to jointing and terminating.
- 12.3 When cable is drawn through pipes, only the portion remaining in the pipe will be paid for at the rates quoted for "as installed in pipes".
- 12.4 Determination of trench volume for measurement purposes shall be based on measured length and specified width and depth. No allowance shall be made where trenches have to be widened at the bottom to accommodate cables, cable joints and protection slabs.
- 12.5 The classification of different types of ground for measurement purposes shall be as follows:
- 12.5.1 Soft rock will be taken as broken or friable rock which can be removed by pick or mechanical excavator or paving breaker. This includes hard clay.
- 12.5.2 Hard rock will be taken as rock which cannot be removed by a mechanical excavator and requires drilling and blasting or splitting. This includes reinforced or plain concrete.

13.0 TESTS

- 13.1 The costs of all post-installation tests shall be borne by the Contractor.
- 13.2 The Contractor shall be responsible for remedial work necessary due to damages caused during tests.
- 13.3 Transnet Freight Rail reserves the right to carry out any further tests deemed necessary, using either the Contractor's instruments and equipment or its own, or both. The costs of such tests will not be charged to the Contractor.
- 13.4 Test instruments shall be of the accuracy class. Calibration certificates from a recognised testing authority shall be available for inspection and shall not be older than one year.
- 13.5 Time measurements shall be carried out using an approved digital timer.
- 13.6 The final commissioning site tests will be carried out by Transnet Freight Rail.
- 13.6.1 A suitably qualified staff member of the Contractor shall assist Transnet Freight Rail during the tests and shall carry out any remedial work where necessary.
- 13.7 The contractor shall notify the Depot Maintenance Manager (Electrical) in writing 4 weeks before the commissioning date and shall have carried out the following site tests before such date:
- 13.7.1 Prove the continuity and insulation resistance of the multicore pilot cables.
- 13.7.2 Verify that the insulation level between frame and earth of switchboards fitted with frame leakage protection is not reduced by the installation of the cables.
- 13.7.3 The following voltages withstand tests on each completed cable run:
- 13.7.3.1 Paper insulated cables:
- (i) Rating up to 12,7/22 kV shall be tested in accordance to SANS 97.
- (ii) Rating 19/33 kV shall be tested in accordance to BS 6480.
- The extruded PVC impermeable serving shall withstand a test voltage of 10 kV DC between armouring and earth for 1 minute.
- The insulation between armouring and lead sheath shall withstand a test voltage of 4 kV DC for 1 minute.

13.7.3.2 XLPE Insulated Cables:

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

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

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

14.0 GUARANTEE

- 14.1 All work undertaken by the Contractor shall be subject to a guarantee for a period of one year against faulty and/or inferior workmanship and material.
- 14.2 The guarantee period shall commence the day the installation is formally handed over to and accepted by Transnet Freight Rail.
- 14.3 The Contractor shall undertake to repair all faults or defects due to bad workmanship and/or faulty materials, and to replace all defective equipment or materials during the guarantee period.
- 14.4 Any defects that may become apparent during the guarantee period shall be rectified to the satisfaction of, and free of cost to Transnet Freight Rail.
- 14.5 The Contractor shall undertake work on the rectification of any defects that may arise during the guarantee period within 7 days of his being notified by Transnet Freight Rail of such defects.
- 14.6 Should the Contractor fail to comply with the requirements stipulated above, Transnet Freight Rail shall be entitled to undertake the necessary repair work or effect replacement of defective apparatus or materials, and the Contractor shall reimburse Transnet Freight Rail the total cost of such repair or replacement, including the labour costs incurred in replacing defective material.

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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		

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
16.0	Installation of cables				
16.1	Installed in trenches				
16.1.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
16.1.2	Low Voltage Cables		/m		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core		mm sq		
16.2	Installed in sleeve pipes				
16.2.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
16.2.2	Low Voltage Cables		/m		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
16.3	Installed in ducts				
16.3.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
16.3.2	Low Voltage Cables		/m		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
	..... Core.....		mm sq		
17.0	Installation of cables (Special conditions)				
17.1	Cable supports				
17.1.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
17.1.2	Low Voltage Cables		/m		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
17.2	Securing cables to poles				
17.2.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
17.2.2	Low Voltage Cables		/m		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
17.3	Securing cables to concrete/tunnel walls				
17.3.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
17.3.2	Low Voltage Cables		/m		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
17.4	Installation of cables in track formations				
17.4.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
17.4.2	Low Voltage Cables		/m		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
18.0	Cable terminations complete (Supply material, terminate and connect up).				

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
18.1	XLPE cable				
18.1.1	High Voltage terminations		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
18.1.2	Low Voltage terminations		each		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
18.2	PILC SWA cable				
18.2.1	High Voltage terminations		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
18.2.2	Low Voltage terminations		each		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		
	..... core.....		mm sq		

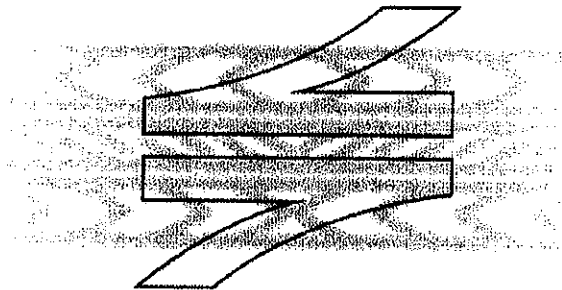
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
19.0	Cable joints complete (Supply material, terminate and connect up)				
19.1	PVC to PVC		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
19.2	XLPE to XLPE		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
19.3	PILC to PILC		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
19.4	XLPE to PILC		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				

TENDERER'S SIGNATURE.....

DATE.....

17.0 APPENDIX 3

- SANS 1411 – 1: Materials of insulated electric cables and flexible cords Part 1: Conductors.
- SANS 1411 – 2: Materials of insulated electric cables and flexible cords Part 2: Polyvinyl chloride (PVC).
- SANS 1411 – 3: Materials of insulated electric cables and flexible cords Part 3: Elastomers.
- SANS 1411 – 4: Materials of insulated electric cables and flexible cords Part 4: Cross-linked polyethylene (XLPE).
- SANS 1411 – 5: Materials of insulated electric cables and flexible cords Part 5: Halogen-free, flame-retardant materials.
- SANS 1411 – 6: Materials of insulated electric cables and flexible cords Part 6: Armour.
- SANS 1411 – 7: Materials of insulated electric cables and flexible cords Part 7: Polyethylene (PE).
- SANS 1507 – 1: Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 1: General.
- SANS 1507 – 2: Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 2: Wiring cables.
- SANS 1507 – 3: Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 3: PVC Distribution cables
- SANS 1507 – 4: Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 4: XLPE Distribution cables
- SANS 1507 – 5: Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 5: Halogen-free distribution cables.
- SANS 10198 – 1: The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 1: Definitions and statutory requirements.
- SANS 10198 – 2: The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 2: Selection of cable type and methods of installation.
- SANS 10198 – 3: The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 3: Earthing systems - General provisions.
- SANS 10198 – 4: The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 4: Current ratings.
- SANS 10198 – 5: The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 5: Determination of thermal and electrical resistivity of soil.
- SANS 10198 – 6: The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 6: Transportation and storage.
- SANS 10198 – 7: The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 7: Safety precautions.



SPOORNET

A division of Transnet limited

**TECHNICAL
RAILWAY ENGINEERING
SPECIFICATION**

**PAINTING OF STEEL COMPONENTS OF
ELECTRICAL EQUIPMENT**

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

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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)
<ul style="list-style-type: none"> ➤ Sandblast to a standard of Sa2 to remove mill scale and/or flash rust ➤ Remove dust with <u>clean</u> compressed air (Check air for oil contamination) 	<ul style="list-style-type: none"> ➤ 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/m²

4.1.2 Previously Coated Steelwork

4.1.2.1 COATING START FAILING TO A LEVEL OF RE 2

<ul style="list-style-type: none"> ➤ 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 	<ul style="list-style-type: none"> ➤ 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

<ul style="list-style-type: none"> ➤ 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. 	<ul style="list-style-type: none"> ➤ 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/m² to the entire substrate using a contrasting color.
---	---

4.1.2.3 BITUMEN COATED

<ul style="list-style-type: none"> ➤ 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. 	<ul style="list-style-type: none"> ➤ 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/m² per coat to the complete substrate using contrasting colors
---	---

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

<ul style="list-style-type: none"> ➤ 1.Degrease thoroughly with OptiDegreaser ➤ 2.Hydro Blast complete substrate using a spinner tip and minimum 250 bar at the nozzle ➤ 3.Shotblast/sandblast complete substrate giving particular attention to bolts nuts rivets and crevices. Sa2 ➤ 4.Dedust 	<ul style="list-style-type: none"> ➤ 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/m²
---	--

4.2 GALVANISED STEELWORK

4.2.1 NEW AND WEATHERED GALVANISING WITH A SMOOTH GLOSSY FINISH

<ul style="list-style-type: none"> ➤ Degrease thoroughly with OptiDegreaser ➤ Rinse down with copious quantities of potable water 	<ul style="list-style-type: none"> ➤ Apply one thin coat of OptiPrime^{AQUA} (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/m² per coat to the complete substrate using contrasting colors
---	---

4.2.2 WEATHERED GALVANISING

4.2.2.1 White rust (zinc oxide)

<ul style="list-style-type: none"> ➤ Degrease thoroughly using OptiDegreaser - ensure that all traces of "white rust" are removed ➤ Rinse down with copious quantities of potable water 	<ul style="list-style-type: none"> ➤ 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/m² 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)

<ul style="list-style-type: none"> ➤ 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 	<ul style="list-style-type: none"> ➤ 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/m² 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 ^{Aqua}	Noxyde
Temperature-Min 5 °C Relative humidity-Max 80% R.H. ➤ Apply by brush, lacquer roller or airless spray using a 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"

5.2 DRYING TIME AND OVERCOAT PERIODS

<ul style="list-style-type: none"> ➤ 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 	<ul style="list-style-type: none"> ➤ 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
--	---

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	<ul style="list-style-type: none"> > 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 vicinities 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 <p>NOTE: DFT readings can only be taken after 72 hours</p>
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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 1/2 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/m².

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/m² in low to mild corrosive areas, and 500g/m² 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

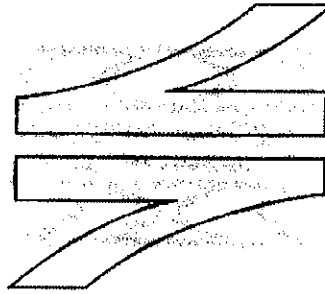
7.1 All specified coatings shall be applied according to the relevant specification and the manufacturer's instructions shall be followed.

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.....

DATE.....



SPOORNET

A division of Transnet limited

**TECHNICAL
RAILWAY ENGINEERING
SPECIFICATION**

**HOT DIP GALVANISING AND PAINTING OF
ELECTRIFICATION STEELWORK**

Circulation restricted to:

Technical

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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.

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.

END

TENDERER'S SIGNATURE: _____

DATE: _____

FOR SPOORNET: _____

GRADE: _____

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Appendix 1

SCHEDULE OF REQUIREMENTS, QUANTITIES AND PRICES

1.0

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END

FOR SPOORNET:

GRADE:
