Contract Data:

The Employer is

Name	Transnet SOC Limited, trading as Transnet Freight Rail
Address	C/o Minnaar & Paul Kruger Streets, Nzasm Building, 2nd floor, Room 210, Pretoria, 0002
Telephone	(012) 315 2132 **Fax No**. 012 315 2138
E-mail	Nico.swart3@transnet.net
The works are	DESIGN, SUPPLY, INSTALL, TEST AND COMMISSION OF 25 KV SINGLE POLE OUTDOOR VACUUM CIRCUIT BREAKER, CONTROL PANEL WITH ASSOCIATED STEEL STRUCTURES AND FLYING BUS BARS AT BURGERREG TRACTION SUBSTATION UNDER THE CONTROL OF THE DEPOT ENGINEER, KOEDOESPOORT
The sites are	BURGERREG 25KV AC TRACTION SUBSTATION
The starting date is	To be advised……
The completion date is	To be advised……
The period for reply is	two weeks.
The defects date is	52 weeks after Completion.
The defect correction period is	within one week after defects date.
The delay damages are	R2,000.00 per day (penalties)
The assessment day is the	13th (thirteenth) of each month
The retention is	10% (ten percent) of the total value of the contract.

Does the United Kingdom Housing Grants, Construction and Regeneration Act (1996) apply? **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% (two percent) 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 R1,000,000.00 (one 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 The Contractor shall not make use of any sub-Contractor to perform the works or parts thereof without prior permission from the Employer.

1.2 The Contractor shall ensure that a safety representative is at site at all times.

1.3 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.

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

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

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

1.4.3 The explosive Act No. 26 of 1956 (as amended). The Contractor shall, when applicable, furnish the Employer / 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.

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

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

1.5 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.

1.6 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.

1.7 The Contractor shall make necessary arrangements for sanitation, water and electricity at these relevant sites during the installation of the equipments.

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

1.9 10% retention money of the total value of the contract will be retained and will be released 12 months after the completion date of the contract.

1.10 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 within 14 days after the award has been made to the successful Contractor.

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.

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 .....

(Enter the total of the prices from the Price List, incl. VAT)

State amount in words .....

.....

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 .....

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.

Pricing Data: Price list

Item	Description	Unit	Qty	Rate	Total
A	Burgerreg 25 kV Substation				
1	Dismantle and transport old equipments to Koedoespoort depot.	sum	1		
2	Design, supply and install 27.5kV, 1600A, outdoor type single phase vacuum circuit breakers with magnetic actuator.	sum	1(3)		
3	Design, supply and install steel supporting structures for vacuum circuit breakers and current transformers.	sum	1(3)		
4	Supply and cast foundations for all steelwork	ea	As required		
5	25 KV Incomer and Track Feeder Control and Protection Panel to be installed in building housing 88 kV control panel.	ea	1		
6	88kV Primary Protection Panel	ea	0 (Not required)		
7	Design, supply and install steel supporting structures for flying busbar conductors with strain insulators	sum	As required		
8	Supply current transformers on steel structures	sum	1(3)		
9	Design, supply and install outdoor type current transformers (1200/1, 15VA). (HV Side)	sum	0 (Not required)		
10	Design, supply and install 800/1 Class x (LV Side)	sum	0 (Not required)		
11	Design, supply and install outdoor type voltage transformer (26,4kV/110V) complete on steel support structure.	ea	1		
12	Supply and install clamps with flexibles from flying busbars to VT, CTs, and VCBs.	sum	1		
13	Supply and install all power / control cables, wirings and earthing of all installed equipments.	sum	1		
14	Design, supply and install 16kVA 25kV/220V Auxiliary Transformer	ea	1		
15	220V Supply distribution board	ea	1		
16	Catalogues, manuals and drawings.	sum	1		
17	Complete outdoor substation yard earthing	sum	1		
18	Standby Generator Hire (Provisional)	sum	1		

19	P's and G's (Labour, site establishment, transport, civil works, soil testing and preparations, etc).	sum	1		
20	Installation, Testing and Commissioning.	sum	1		
21	Security	sum	1		
A	**Total for Burgerreg =**		**R**		
B	**Contingency (10 % of A) =**		**R**		
C	**Gross Total (A+B) =**		**R**		
D	**VAT (14% of C)=**		**R**		
E	**Amount Due (C+D) =**		**R**		

2.0 SCOPE

2.1 This project specification covers the requirements for the design, supply, delivery, installation, testing and commissioning of Single Pole outdoor vacuum breakers with magnetic actuator 27.5kV -250kV BIL, control panel, steel structures and flying bus bars at Burgerreg 25kV Traction Substation.

2.2 This includes removal of the existing indoor switchgears, cables and associated equipments, casting of foundations, manufacture, supply and installation of support steel structures where necessary, mounting the equipment, termination and connecting of applicable cables.

2.3 Current transformers are located within existing circuit breaker housing, new current transformers shall be supplied and installed and independently mounted from the new vacuum circuit breakers.

3.0 DESCRIPTION OF WORK

3.1 Disconnect, dismantle and remove the existing damaged switchgears and old cabling.
3.2 Transport the old switchgears and associated damaged equipment to Koedoespoort Depot.
3.3 Supply, delivery, install and connect new vacuum circuit breakers and steel structures complete.
3.4 Cast concrete foundations for the support steel structures for the new vacuum circuit breakers.
3.5 Supply, and install new support galvanised steel structures for new vacuum circuit breakers.
3.6 Supply and install a new control panel (for all indications, power supply, protection and control functions) inside the substation building with cables from the circuit breakers to the control panel.
3.7 Supply, deliver, install and connect new current transformer (CTs) complete at applicable sites.
3.8 Cast concrete foundations for support structures for new current transformers at applicable sites.
3.9 Supply and install new support steel structures for new current transformers at applicable sites.
3.10 Electrically connect the new installed equipment to the existing earthing system.
3.11 Contractor shall supply and install Surge Arresters with their surge counters.
3.12 Test, commission and hand over the equipment

4.0 TRAINING

4.1 The Contractor's team Representatives could be requested to attend the Transnet Freight Rail 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 tenderer.

4.2 The Contractor shall provide vacuum circuit breaker operation and maintenance training as per specification **BBB 1267 version 10.**

5.0 CONRETE FOUNDATIONS

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

5.2 The successful tenderer shall visit site to determine foundation and steelwork requirements. The Contractor shall also carry out his own survey in regard to soil type and their load bearing capabilities.

5.3 The 28 day strength of all concrete used shall be a minimum of 35 Mpa.

5.4 The Contractor shall arrange for sampling and testing of all concrete used, and shall submit detailed record to the Technical Officer. The method of sampling used shall comply with specification S420.

5.5 Contractor shall only use ready Mix concrete and submit strength certification (Hand Mixed concrete not acceptable).

5.6 Equipment support foundation shall be finished off 200mm above the finished ground level of the yard. The design must be such as to prevent standing water on plinths.

5.7 All foundations edges shall be levelled at 45 degree angle, and surfaces must be float finished.

5.8 All support foundations shall be on the same level

6.0 STEELWORK

6.1 The design, supply and installation of the galvanised steel or the supports structures of the equipment shall be the responsibility of the Contractor.

6.2 The manufacture of any steelwork shall not take place prior to the approval of the design of the Employer's Deputy.

6.3 Transnet Freight Rail Employer's Deputy shall inspect the steelwork at the manufacturer 's works prior to dispatch.

6.4 All fasteners (nuts & bots) shall be secured using flat or bevelled washers, as necessary, as well as lock washers

6.5 All steelwork shall be galvanised in accordance with SANS 121 and, where required painted in accordance with specification CEE 045 of 2002/1

7.0 VACUUM CIRCUIT BREAKER

7.1 Contractor shall design, supply, install, test and commission outdoor vacuum breaker for railway application single pole with magnetic actuator or either of the motor wound spring mechanism type 27.5kV with basic Insulation Level of 250 KV- 1250A at the frequency of 50 Hertz and to comply with specification **BBB 1267 version 10.**

7.2 The proposed labelling scheme must be submitted to the Employer's Deputy for approval prior to the manufacture of the labels

7.3 Transnet Freight Rail requires safe working clearances whereby when in safe working position and moving to from it, no person with outstretched arms, part of his body or the

tool or equipment he is handling, comes within the safe clearances, as specified **clause 6.36.3.2.**

7.4 Contractor shall supply and install VCB control panel inside the brick substation building.

8.0 SURGE ARRESTERS

8.1 Contractors shall supply and install surge arresters with surge counters on the secondary side of the main transformer and mount on the independent steel structures.

8.2 CURRENT TRANSFORMERS

8.2.1 Current transformers shall be outdoor structure mounted type and comply with BS 3938.

8.2.2 Ratings, ratios, and class of accuracy shall be determined by the protection scheme as shown on Drawing No. CEE-TBB-109.

8.2.3 Since the accurate measurement of harmonics in the traction supply will be necessary from time to time, current transformers offered shall be suitable for this purpose.

8.3 VOLTAGE TRANSFORMERS/ AUXILIARY TRANSFORMER

8.3.1 Voltage transformers shall be single phase and have a ratio of 26,4kV/110V. They shall comply with the requirements of BS 3941 and be class E for protection with insulation withstanding 250 kV impulse voltage.

8.3.2 Voltage transformers shall be outdoor structure mounted, oil filled type.

8.3.3 The return side of the primary winding shall have a bushing insulated for 3,3kV and must not be connected to the Voltage Transformer's tank.

8.3.4 The secondary winding shall be terminated in a cable box.

8.3.5 Contractor shall supply and install 16KVA 25kV/ 220V auxiliary transformer as will be indicated and explained by Employer's Deputy in accordance to BBB 4617 Section A-A diagram and CEE-PGE-1

9.0 STRAIN INSULATORS AND FLYING BUS BARS.

9.1 Contractor shall supply and install flying bus bars with high voltage calculated insulating strain (Strain Insulators) from one structure to the other. Contractor should ensure proper tension for compatible cable sag combination.

9.2 Contractor shall supply and install new galvanised steel structures for Hand operated links H 50 as shown on the switching diagram. **(Reposition of Hand operated Link H 50)**

10.0 CABLING AND WIRING

10.1 All cables entering the control equipment building shall be block jointed (50mm of armouring to be removed). The block jointing shall be positioned above the ground before the cables enter into the control equipment building. The block joint shall be covered with heat shrink sleeve

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

10.3 Cables and earthing conductors connected to equipment installed on the steel support structures shall be supported on the steel structure vertically and horizontally by means of the cable tray. This cable tray shall be of the O-line GS50 Gridpan Wire Mesh Type or similar with the wire mesh having a diameter of 4mm and hot dip galvanised finish.

10.4 The cables shall be fixed to the cable tray using UV stabilised cable ties.

11.0 DRAWINGS, INSTRUCTION MANUALS AND SPARE PART CATALOGUES

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

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

11.3 During the duration of the contract period, the successful Contractor will be required to inform the Employer's Deputy or his Representative of any changes to these drawings and will have to resubmit the affected drawings for approval prior to it being used on this contract.

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

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

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

11.7 Transnet Freight Rail reserves the right of ownership of drawings to copy and to reproduce as will be granted as part of substations assets.

12.0 SITE TESTS

12.1 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.

12.2 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.

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

12.4 The Contractor shall submit a detailed list of on-site tests for the approval of the Employer's Deputy or his Representative.

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

12.6 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 power plants equipment will not be allowed to take place in a construction site environment.

12.7 The on-site tests shall include the following:

12.7.1 Test for the functionality of all electrical circuitry.
12.7.2 Trip tests on relays.
12.7.3 Test on equipment as per manufacturer's instructions.
12.7.4 Insulation tests.

12.8 At the completion of the on-site tests, the Employer's Deputy or Representative 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.

12.9 Upon rectification of defects, the Contractor shall arrange for the Employer's Deputy or Representative or his representative to certify satisfactory completion of on-site tests.

12.10 Acceptance by the Employer's Deputy or Representative 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.

13.0 COMMISSIONING OF EQUIPMENT

13.1 Commissioning will only take place after all defects have been rectified to the satisfaction of the Employer's Deputy or Representative.

13.2 On completion of commissioning, the Contractor will hand the equipment over to the Employer's Deputy or Representative in terms of the relevant instruction.

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

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

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

14.0 GUARANTEE AND DEFECTS

14.1 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.

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

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

14.4 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.

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

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 replacements, including the labour costs incurred in replacing defective material.

14.7 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 Representative and at the cost of the Contractor.

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

15.0 QUALITY AND INSPECTION

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

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 and ensure that all work is completed before any commissioning can take place.

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.

16.0 Specifications

16.1 South African National Standards:

16.1.1	SANS 1091	National colour standard.
16.1.2	SANS 763	Hot dip galvanised zinc coating.
16.1.3	SANS 121	Hot dip galvanised Coating for Fabricated Iron or Steel Article.
16.1.4	SANS 8528	Reciprocating internal combustion engine driven alternating current generating set.
16.1.5	SANS 10142	Wiring Code.
16.1.6	SANS 60815	Guide for selection of insulators in respect of polluted conditions
16.1.7	SANS 62271-100	High Voltage Current Circuit Breakers
16.1.8	SANS 1019	Insulation level

16.2 Transnet Freight Rail:

16.2.1	BBB 1267 version 10	Outdoor Alternating Current Circuit Breaker.
16.2.2	CEE.0111.99	Specification for 25kV AC Traction Substation
16.2.3	CEE.0023.90	Specification for installation of cables
16.2.4	BBB 2721 version 10	AC Primary Circuit Breaker Control Panel
16.2.5	CEE –TBB-109	25kV Traction Substation single line diagram and protection requirement.
16.2.6	PRE-TBK-9	Schematic diagram for SF6 Circuit Breaker Control Panel Pyramid- Pietersburg
16.2.7	CEE-TBK-0027	Control circuit diagram. No volt coil protection
16.2.8	BBC 0198 version 1	Specifications for the supply of cables.
16.2.9	CEE.0023.90	Specifications for installation of cables.
16.2.10	CEE.0045.2002/1	Painting of steel Components of Electrical Equipment.
16.2.11	CEE.0183.2002	Hot dip galvanising and painting of electrical equipment.
16.2.12	CEE.0224.2002	Drawings, catalogues, instruction manuals and spares list for electrical equipment supplied under contract

N/B!! Please note that the following diagrams will only be discussed with the Employer's Deputy during the one day session of the site meeting. Transnet Freight Rail will not offer any Contractors copies, because of owner's copying rights or to reproduce.

16.2.13 BBB 4584 Version 1. 88 KV Primary Protection AC Key Diagram
16.2.14 BBB 4594 Version 1 25kV Incomer Protection Logic Diagram
16.2.15 BBB 4595 Version 1 25kV Incomer Protection Panel AC key Diagram
16.2.16 BBB 4617 Version 1

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

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

16.4 Constraints on how the Contractor Provides the Works.
16.5 The constraints shall be as specified in the specifications of the particular equipment.

17 Requirements for the programme

17.1	Programme of work	: To be submitted by successful Contractor.
17.2	CIDB rating	: 3EP and above.
17.3	Format	: Bar chart.
17.4	Information	: How work is going to be executed and commissioned.
17.5	Submission	: Not Applicable.
17.6	Site diary	: Successful Contractor to supply in triplicates carbon copies.
17.7	Site instruction book	: Successful Contractor to supply in triplicates carbon copies.

18 Services and other things provided by the *Employer*

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

18.2 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.

19 EVALUATION TERMS AND CONDITION

19.1 Transnet Freight Rail reserves the right to award the tender to Contractor with short delivery period due to the urgency of this substation outage. Transnet Freight Rail, estimated contract delivery period of 10 working days, 7:30am to 15:30pm from the award of the tender.

19.2 Transnet Freight Rail reserves the right to disqualify any Tenderer not meeting the CIDB grading of this project.

19.3 Transnet Freight Rail reserves the right to award tender based to the following categories

Contract Data
Site Information

The works shall be performed at the Burgerreg 25KV AC TRACTION Substation
.

Part C1:
Agreement and Contract Data

Part C2:
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Scope of Work

TRANSNET freight rail

TECHNOLOGY MANAGEMENT.

SPECIFICATION.

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

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Circulation Restricted To:

Transnet Freight Rail – Chief Engineer Infrastructure
- Technology Management

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1.0 SCOPE

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

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

2.0 STANDARDS, PUBLICATIONS AND DRAWINGS

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

2.2 The following publications are referred to in this specification:

2.2.1 SOUTH AFRICAN NATIONAL STANDARDS

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

2.2.2 TRANSNET FREIGHT RAIL SPECIFICATIONS.

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

2.2.3 Occupational Health and Safety Act No 85 of 1993.

2.2.4 TRANSNET FREIGHT RAIL DRAWINGS

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

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

3.0 TENDERING PROCEDURE

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

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

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

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

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

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

4.0 APPENDICES

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

4.1 Appendix 1 -"Schedule of Requirements".

This appendix details the specific requirements for this application.

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

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

5.0 SERVICE CONDITIONS.

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

5.1 ATMOSPHERIC CONDITIONS

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

5.2 ELECTRICAL CONDITIONS

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

6.0 REQUIREMENTS FOR ALTERNATING CURRENT CIRCUIT BREAKERS.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6.34 VACUUM CIRCUIT BREAKERS.

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

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

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

6. 35 SULPHUR HEXAFLOURIDE CIRCUIT BREAKERS. (SF6)

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

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

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

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

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

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

6.36 INSULATION LEVELS, CREEPAGE DISTANCES AND CLEARANCES

6.36.1 INSULATION LEVELS

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

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

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

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

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

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

6.36.2 CREEPAGE DISTANCES

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

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

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

6.36.3 CLEARANCES

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

Highest phase to phase r.m.s voltage for equipment.	24kV	36kV	48kV	72kV	100kV	145kV	245kV
Outdoor distance	320mm	430mm	540mm	770mm	1000mm	1450mm	1850mm

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

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

6.37 SUPPORT STEELWORK.

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

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

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

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

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

8.0 TRAINING.

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

9.0 TEST CERTIFICATES.

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

10.0 GUARANTEE AND DEFECTS.

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

10.2 The guarantee period shall expire after: -

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

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

11.0 INSPECTION.

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

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

12.0 PACKAGING AND TRANSPORT.

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

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

13.0 BIBLIOGRAPHY

[1] SANS 1019: 2008. Edition 2.5

END

SCHEDULE OF REQUIREMENTS
(To be completed by client)

1.0 SYSTEM DETAIL

1.1 AC Circuit Breakers: _____ substation/location.

1.2 Pollution level: Heavy_____ Very Heavy _____

1.2 Quantity of AC Circuit Breakers. _____

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

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

1.3 Frequency: _____ Hz

1.4 Circuit breaker control DC voltage: _____ V

1.5 Circuit breakers to be used for the following:

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

DETAIL OF AC CIRCUIT BREAKERS.

2.0 Type of circuit breakers required:

Vacuum: Yes / No

Gas (SF6): Yes / No _____

2.2 Number of circuit breakers required: _____

2.3 Number of poles: _____

2.4 Rated Voltage: _____ kV

2.5 Rated short-circuit breaking current: _____kA

2.6 Rated normal current: _____ Ampere.

END

TECHNICAL DATA SHEET
(To be completed by tenderer)

DETAIL OF CIRCUIT BREAKER

1.1 Make and manufacturer _____

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

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

1.4 Number of Poles: _____

1.6 Rated short circuit breaking current _____ kA.

1.7 Rated normal current: _____ Ampere.

1.6 Breaker operating time:

1.6.1 Closing: _____ ms.

1.6.2 Opening: _____ ms.

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

1.7.1 Under full load conditions_____

1.7.2 Under fault conditions _____

1.8 First Pole to Clear Factor_____

1.9 DC control voltage: _____ V

SPOORNET

A division of Transnet limited

ENGINEERING AND TECHNOLOGY

TECHNOLOGY MANAGEMENT

SPECIFICATION

REQUIREMENTS FOR THE SUPPLY OF ELECTRIC CABLES

(Appendix to be filled in by client)

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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-XLPEdistribution cables, Part 5-Halogen free distribution cables.

3.0 APPENDIX

The following appendix forms an integral part of this specification.

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

4.0 TENDERING PROCEDURE

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

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

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

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

5.0 MEDIUM VOLTAGE CABLES

5.1 IMPREGNATED PAPER INSULATED.

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

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

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

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

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

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

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

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

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

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

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

5.2 CROSS – LINKED POLYETHYLENE INSULATED (XLPE).

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

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

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

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

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

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

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

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

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

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

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

5.1.12 The cables shall be tested in accordance with SANS 1339. Type test certificates shall be submitted with the cables offered.

5.2.12 Where specified flame-retardant and halogen free cables shall be in accordance with SANS 1339.

5.2.13 The packing, marking and sealing of cables and cable drums shall be in accordance with SANS 1339.

6.0 CABLES FOR FIXED INSTALLATIONS

6.1 Unless otherwise specified single and multi-core, wire armoured, extruded PVC insulated cables shall be used for fixed installations. The cables shall be in accordance with SANS 1507 part 1 and part 3.

6.2 The voltage range is between 300/500 V to 1900/3300 V.

6.3 Cables shall have stranded annealed copper conductors.

6.4 The cables shall be marked according to SANS 1507 part 3. Core identification shall be by means of colour code or numbering of the insulation.

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

6.6 Where XLPE or halogen free cables are specified the cables shall be in accordance with SANS 1507 parts 4 and 5.

6.7 The cables shall be tested in accordance with SANS 1507 parts 3, 4 and 5. Type test certificates shall be submitted with the cables offered.

6.8 The packing, marking and sealing of cables and cable drums shall be in accordance with SANS 1507.

7.0 QUALITY ASSURANCE

7.1 Spoornet reserves the right to carry out inspection and tests on the equipment at the works of the supplier/manufacturer.

7.2 Arrangements must be made timeously for such inspections and type/routine tests in accordance with the cable specifications are carried out before delivery of the cables to the site.

8.0 INSPECTION AND TESTING

8.1 Spoornet reserves the right to carry out inspections and any tests on cables at the factory of the supplier/ manufacture.

8.2 Arrangements must be made with The Senior Engineer, Technology Management Spoornet for inspections to be carried out before delivery of the equipment.

SCHEDULE OF REQUIREMENTS

(To be completed by the client)

1.0 MEDIUM VOLTAGE CABLES

1.1 PAPER IMPREGNATED LEAD SHEATHED (PILC)

1.1.1 Rated Voltage (V): .....

1.1.2 Number of cores: .....

1.1.3 Length of cables (m): .....

1.1.4 Size of conductors (mm^2): .....

1.2 CROSS LINKED POLYETHYLENE INSULATED (XLPE)

(XLPE is recommended for 3 kV DC Applications)

1.2.2 Rated Voltage (V): .....

1.2.3 Number of cores: .....

1.2.4 Length of cables (m): .....

1.2.5 Size of conductors (mm^2): .....

1.2.6 Flame retardant (required/not required): .....

2.1 CABLES FOR FIXED INSTALLATIONS

2.1.1 Type of cable required:

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

2.1.2 Rated Voltage (V): .....

2.1.3 Number of cores: .....

2.1.4 Length of cables (m): .....

2.1.5 Size of conductors (mm^2): .....

END

SPOORNET
(INFRASTRUCTURE)(POWER SUPPLIES)

SPECIFICATION No. CEE.0023.90

THIS ISSUE CANCELS
SPECIFICATION NO.:
CEE.0023.86

SPECIFICATION FOR THE INSTALLATION OF CABLES

This specification covers Spoornet's requirements for the installation, laying, terminating, jointing, testing and commissioning of the high and low voltage cables.

INDEX

1.0 SCOPE

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

2.0 REFERENCE LIST

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

2.1 South African Bureau of Standards

SABS 97 - Impregnated paper insulated electric cables.

SABS 0142 - Code of practice for the wiring of premises.

SABS 150 - Polyvinylchloride (PVC) insulated electric cables and flexible cords.

SABS 763 - Hot-dip (galvanised) zinc coating.

SABS 1339 - Cross-linked polyethylene insulation of electric cables.

SABS 1299 - Direct-acting indicating electrical measuring instruments and their accessories.

2.2 British Standard Institution

BS 5467 - Armoured cables with thermosetting insulation for electricity supply.

BS 6480 - Impregnated paper-insulated cables.

2.3 Machinery and Occupational Safety Act, Act No. 6, 1983

2.4 Spoornet

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.

Safety Instructions - High Voltage Electrical Equipment

3.0 APPENDICES

The following appendices form an integral part of this specification.

3.1 Appendix 1 - "Scope of Work"

3.1.1 This appendix specifies the extent of the work required and the order of priorities.

3.2 Appendix 2 - "Drawings".

3.2.1 This appendix lists Spoornets drawings applicable to the installation,

3.2.2 Cable routes indicated on these drawings shall only be a general guide to the contractor.

3.3 Appendix 3 - "Schedule of Items, Estimated Quantities, Unit Rates and Prices".

3.3.1 To ensure a uniform basis for tendering purposes, tenders shall be based on the estimated quantities given in this schedule which shall be completed in full and returned as part of the tender.

Complies/Does not comply

3.3.2 The importance of full completion of this schedule cannot be overstressed as this will constitute the tenderer's quotation.

Complies/Does not comply

3.3.3 Rates specified in this schedule will be applicable if any adjustments to requirements become necessary.

Complies/Does not comply

3.3.4 Any additional items considered to be necessary by the tenderer for the satisfactory completion of the installation and fulfilment of his guarantee shall be added by the tenderer on a similar unit price basis to this schedule and included in his total tendered price.

Complies/Does not comply

3.3.5 Actual quantities required will be based on the final survey by the successful contractor, and payment will be based on the actual measurements.

Complies/Does not comply

4.0 DRAWINGS AND INSTRUCTIONS

4.1 All drawings submitted by the tenderer shall be in accordance with Spoornets Specification No. CEE.0089

Complies/Does not comply

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

Complies/Does not comply

5.0 STANDARD OF WORK

5.1 The electrical installation shall conform to the requirements of SABS Code of Practice 0142 and shall be to the satisfaction of Spoornet.

Complies/Does not comply

5.2 Galvanising, where specified, shall be in accordance with SABS 763.

Complies/Does not comply

6.0 SAFETY INSTRUCTIONS

6.1 Work on the high voltage equipment shall be carried out in accordance with the Safety Instructions High Voltage Electrical Equipment of Spoornet.

Complies/Does not comply

6.2 All work done must comply with the requirements of the MACHINERY AND OCCUPATIONAL SAFETY ACT, Act No. 6, 1983.

Complies/Does not comply

7.0 SURVEYS

7.1 Pre-installation Route Surveys.

7.1.1 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 drawings contained in appendix 2, determine a suitable route.

Complies/Does not comply

7.1.2 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 Engineer for approval.

Complies/Does not comply

7.1.3 The Contractor shall submit in triplicate plans of the cable routes selected to the Engineer for approval. Plans may be submitted in sections as the survey progresses.

Complies/Does not comply

7.1.4 No excavation of any section of the cable route shall commence before the Contractor is in possession of the relevant approved plans and the Engineer has authorised the commencement of work on the section concerned.

Complies/Does not comply

7.2 Post Installation Surveys

7.2.1 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.

Complies/Does not comply

7.2.2 The cable route plans shall include the following information :

7.2.2.1 Overall length, type, size and voltage of each cable.

7.2.2.2 Accurate indication of the position of each cable joint by indicating two distances to each joint from permanent structures.

Complies/Does not comply

7.2.2.3 Pipes and chambers provided.

8.0 EXCAVATIONS

8.1 Excavations shall be carried out in strict compliance with the specification No. E.7 for works on, over, under or adjacent to a railway line.

Complies/Does not comply

8.2 Trenching procedure shall be programmed in advance, approved by the Engineer and shall not be departed from except with the consent of the Engineer.

Complies/Does not comply

8.3 The Contractor will be advised of any known buried services such as cables, pipes, etc. in the vicinity of the cable route.

8.3.1 When trenching the contractor shall take all necessary precautions to prevent damage to underground services.

Complies/Does not comply

8.3.2 On encountering any uncharted service, the Contractor shall promptly advise the Engineer who will give the necessary instructions. Additional excavations shall be paid for at scheduled rates.

Complies/Does not comply

8.4 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 Engineer, who shall arrange for the necessary repairs. The Contractor shall be responsible for the cost of repairs.

Complies/Does not comply

8.5 The removal of obstructions along the cable routes shall be subject to the approval of the Engineer and shall be paid for at the agreed rates.

Complies/Does not comply

8.6 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 Engineer to arrange for the necessary supervision. The cost of such supervision shall not be charged to the Contractor.

Complies/Does not comply

8.7 Excavations crossing oil pipe lines shall not commence until an authorised representative is present on site. The Engineer shall be advised 14 days in advance when such excavations will take place.

Complies/Does not comply

8.7.1 Cable crossings of oil pipe lines shall only be at right angles.

Complies/Does not comply

8.8 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.

Complies/Does not comply

8.9 Power driven mechanical excavators may be used for trenching operations. Spoornet shall not be responsible for any damage to other Services in close proximity when using mechanical excavators.

Complies/Does not comply

8.10 The Contractor shall provide shuttering in places where the danger exists of the trench collapsing, and causing damage to formations or other nearby structures.

8.10.1 Shuttering shall be paid for at scheduled rates.

Complies/Does not comply

8.11 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.

Complies/Does not comply

8.11.1 Trenches shall have no sharp objects which may cause damage to the cable during laying or backfilling.

Complies/Does not comply

8.12 The unfinished depth of trenches unless otherwise stated shall be as follows :

8.12.1 HV cables and associated pilot cables = 1 000 mm

8.12.2 LV cables and separate pilot cables = 750 mm

8.13 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.

8.13.1 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 SABS 150, SABS 97 and SABS 1339.

Complies/Does not comply

8.13.2 Trenching in railway formations shall be in accordance with Spoornet's Chief Civil Engineer's drawing FG 263.

8.14 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.

Complies/Does not comply

8.14.1 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.

Complies/Does not comply

8.15 When excavating close to railway tracks, the ballast must be covered by tarpaulins or other sheeting to prevent soiling.

Complies/Does not comply

8.16 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.

Complies/Does not comply

8.17 Spoornet 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.

Complies/Does not comply

9.0 CABLE LAYING

9.1 General

9.1.1 All possible care shall be exercised in handling cables on site.

Complies/Does not comply

9.1.2 Any drum of cable showing signs of damage shall not be used.

Complies/Does not comply

9.1.3 The outer covering of cables shall not be damaged in any way and cables shall not be bent at radii less than allowed by the manufacturer.

Complies/Does not comply

9.1.4 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 him.

Complies/Does not comply

9.1.5 Cable pulling and laying shall be done manually unless otherwise approved by the Engineer. No cable shall be subjected to a tension exceeding that stipulated by the cable manufacturer.

9.2 IN TRENCHES

9.2.1 High Voltage cables shall be spaced at a minimum of 300 mm apart (centre to centre).

9.2.2 Low Voltage cables shall be spaced at a minimum of 150 mm apart (centre to centre).

9.2.3 Pilot cables shall be laid beside the associated power cables.

9.2.4 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.

9.2.5 Pilot cables, when they are routed separately from their associated power cables, may be run next to one another.

9.2.6 Cables shall not be buried on top of each other except where cable runs cross.

9.2.7 Where the cable cannot be laid down at the specified depth, prior authority shall be obtained from the Engineer 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.

9.2.8 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.

9.2.9 Suitable rollers may be used during the laying of cables.

9.2.10 Cables shall be visually inspected for damage during and after laying. Any damage shall be reported immediately to the Engineer who will issue the necessary instructions.

Complies/Does not comply

9.3 IN SLEEVE PIPES

9.3.1 All cables crossing beneath roads and pavements shall be enclosed in asbestos cement pipes with a minimum internal diameter of 150mm. The Engineer 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.

Complies/Does not comply

9.3.2 Pipes shall maintain or exceed the specified cable spacing.

Complies/Does not comply

9.3.3 Only one High Voltage cable shall be laid per pipe.

Complies/Does not comply

9.3.4 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.

Complies/Does not comply

9.3.5 All cables crossings underneath railway tracks shall be in pipes in accordance with Chief Civil Engineer's drawing FG 263.

9.4 IN DUCTS AND BUILDINGS

9.4.1 Concrete ducts and pipes within buildings will be provided by others.

9.4.2 Before installing cables, the ducts are to be inspected to ensure that they are suitable and clean as not to damage the cables.

Complies/Does not comply

9.4.3 The cables are to be neatly positioned and cross overs are to be avoided.

Complies/Does not comply

9.4.4 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.

Complies/Does not comply

9.4.5 The Contractor shall supply all cable trays, racks, wooden cleats or other supports required to adequately support cables not laid in ducts.

Complies/Does not comply

9.4.6 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 SABS 763 when used within 50 km of the sea or inland exposed conditions.

Complies/Does not comply

9.5 UNDER BRIDGES AND IN TUNNELS

9.5.1 Where a cable route can only be against the concrete wall of a bridge or tunnel the cable shall be supported on :

9.5.1.1 suitable brackets at 750 mm intervals.

or

9.5.1.2 straining wire secured at maximum 1 200 mm intervals.

Complies/Does not comply

9.5.2 Brackets shall be of robust design and shall be galvanised and painted in accordance with specification CEE.0045

Complies/Does not comply

9.5.3 The height of the cable route on the brackets or strain wire shall be determined and agreed upon on site.

Complies/Does not comply

9.5.4 The brackets or strain wire shall be supplied and installed by the contractor.

Complies/Does not comply

9.6 CROSSING OF PIPELINES AND OTHER CABLES

9.6.1 Cables shall pass beneath pipelines with a 300 mm minimum clearance between the top of any cable and the bottom of any oil pipe.

Complies/Does not comply

9.6.1.1 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.

Complies/Does not comply

9.6.2 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 Spoornets drawing No. CEE 55/027367 shall be placed between the two cables parallel to the lower cable.

Complies/Does not comply

9.7 IN RAILWAY FORMATIONS

9.7.1 Cables to be accommodated in railway formations shall be laid in accordance with Chief Civil Engineer's drawing No. FG 263.

Complies/Does not comply

9.8 SECURED TO POLES

9.8.1 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.

Complies/Does not comply

9.8.2 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.

Complies/Does not comply

9.8.3 Straps and pipes shall be supplied and installed by the Contractor.

Complies/Does not comply

9.9 EXPOSED CONDITIONS

9.9.1 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 SABS 763.

Complies/Does not comply

9.9.2 These pipes or boxed sections shall be firmly secured to the bank or cut, at regular intervals.

Complies/Does not comply

9.9.3 All such material shall be supplied and installed by the Contractor.

Complies/Does not comply

9.9.4 Stake routes shall only be supplied when specifically called for in Appendix 1.

10.0 CABLE TERMINATIONS

10.1 General

10.1.1 All cables shall be terminated and connected to the respective equipment, whether provided by the Contractor or by others.

Complies/Does not comply

10.1.2 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.

Complies/Does not comply

10.1.3 Termination of cables on outdoor equipment shall not be done during inclement weather conditions.

Complies/Does not comply

10.1.4 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.

Complies/Does not comply

10.1.5 All materials necessary for cable termination shall be provided by the Contractor.

Complies/Does not comply

10.1.6 The contractor shall ensure that correct phase rotation is maintained throughout.

10.1.7 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.

Complies/Does not comply

10.2 HV Cables

10.2.1 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 Engineer. This bond shall be easily removable for testing purposes.

Complies/Does not comply

10.2.2 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.

Complies/Does not comply

10.3 LV Cables (and Pilot Cables)

10.3.1 All cut ends of cables are to be sealed with suitable tape, or other approved means until they are ready to be terminated.

Complies/Does not comply

10.3.2 The cables shall terminate in compression type glands, brass or bronze, suitable for PVC SWA ECC cables.

Complies/Does not comply

10.3.2.1 The glands shall be fitted with neoprene shrouds.

Complies/Does not comply

11.0 CABLE JOINTS

11.1 General

11.1.1 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.

Complies/Does not comply

11.1.2 Jointing shall not be carried out during inclement weather.

Complies/Does not comply

11.1.3 The cores of cables shall be jointed number to number or colour to colour.

Complies/Does not comply

11.1.4 The joints shall not impair the anti-electrolysis characteristics of the cables.

Complies/Does not comply

11.1.5 The conductor bridging the armouring shall be adequate to carry the prospective earth fault current.

Complies/Does not comply

11.1.6 A through joint shall only be permitted after every full drum length of cable.

Complies/Does not comply

11.1.7 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.

Complies/Does not comply

11.1.8 Spoornet reserves the right to be present during jointing operations to familiarise themselves with any special techniques.

Complies/Does not comply

11.1.9 No joint shall be situated inside a cable pipe.

Complies/Does not comply

12.0 COVERING, BACKFILLING AND REINSTATEMENT

12.1 Filling of trenches shall not commence before the Engineer or his authorised representative has inspected and approved the cables and cable joints in situ in the section of trench concerned.

Complies/Does not comply

12.2 Trenches in railway formations shall be backfilled and reinstated in accordance with Spoornet's Chief Civil Engineer's drawing No. FG 263.

Complies/Does not comply

12.3 All other trenches shall be backfilled and reinstated as follows:

12.3.1 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.

Complies/Does not comply

12.3.1.1 Only soil with a thermal resistivity of 1,5 degrees C.m/watt, or lower may be used for this purpose.

Complies/Does not comply

12.3.1.2 When necessary imported fill shall be arranged by the Contractor and paid for at scheduled rates.

Complies/Does not comply

12.3.2 HV cables shall, where likely to be mechanically damaged as decided by the engineer, be protected by concrete slabs (to Drawing No. CEE 55/027367) 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.

Complies/Does not comply

12.3.3 The minimum dry densities of backfilling after compaction shall be not less than 1 600 kg/cubic metre.

Complies/Does not comply

12.3.4 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 Engineer. 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.

Complies/Does not comply

12.3.4.1 Backfilling at pipe entries shall be such as not to stress or damage the cable during compaction from the top.

12.3.5 A continuous plastic cable warning tape, to drawing No. 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.

Complies/Does not comply

12.4 The back filled trench shall be maintained in a thoroughly safe condition by the contractor for the duration of the contract.

Complies/Does not comply

12.5 All back filling of road crossings shall be mechanically rammed.

Complies/Does not comply

12.6 Final surfacing of roads shall be restored by others unless called for under "Scope of Work", Appendix 1.

Complies/Does not comply

12.7 Concrete cable route markers shall be provided and installed by the contractor in accordance with drawing CEE-PK-14.

Complies/Does not comply

12.8 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.

Complies/Does not comply

13.0 MEASUREMENTS

13.1 All measurements for payment purposes shall be made jointly by representatives of the Contractor and Spoornet and shall be agreed upon by both parties. The Contractor shall be responsible for obtaining the Engineer's signed approval of such measurements.

Complies/Does not comply

13.2 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.

Complies/Does not comply

13.3 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".

Complies/Does not comply

13.4 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.

Complies/Does not comply

13.5 The classification of different types of ground for measurement purposes shall be as follows:

13.5.1 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.

13.5.2 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.

14.0 TESTS

14.1 The costs of all post-installation tests shall be borne by the Contractor.

Complies/Does not comply

14.2 The Contractor shall be responsible for remedial work necessary due to damages caused during tests.

Complies/Does not comply

14.3 Spoornet 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.

Complies/Does not comply

14.4 Test instruments shall be of the accuracy class 1.0 or better in accordance with SABS 1229. Calibration certificates from a recognised testing authority shall be available for inspection and shall not be older than one year.

Complies/Does not comply

14.5 Time measurements shall be carried out using an approved digital timer.

Complies/Does not comply

14.6 The final commissioning site tests will be carried out by Spoornet.

Complies/Does not comply

14.6.1 A suitably qualified staff member of the Contractor shall assist Spoornet during the tests and shall carry out any remedial work where necessary.

Complies/Does not comply

14.7 The contractor shall notify the Engineer in writing 4 weeks before the commissioning date and shall have carried out the following site tests before such date :

Complies/Does not comply

14.7.1 Prove the continuity and insulation resistance of the multicore pilot cables.

Complies/Does not comply

14.7.2 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.

Complies/Does not comply

14.7.3 The following voltage withstand tests on each completed cable run:

14.7.3.1 Paper insulated cables:

(i) rating up to 12,7/22 kV : test specified in paragraph D-3 of SABS 97.

Complies/Does not comply

(ii) rating 19/33 kV : test specified in paragraph B-3 of BS 6480, Part 1.

Complies/Does not comply

The extruded PVC impermeable serving shall withstand a test voltage of 10 kV DC between armouring and earth for 1 minute.

Complies/Does not comply

The insulation between armouring and lead sheath shall withstand a test v for 1 minute.

Complies/Does not comply

14.7.3.2 XLPE Insulated Cables:

All cables rated up to 19/33 kV shall be tested as specified in appendix E, clause 1.4, of SABS 1339, and cables rated up to 1,9/3,3 kV shall be tested as specified in appendix B, clause B.6, of BS 5467.

Complies/Does not comply

Note :

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.

Complies/Does not comply

14.7.4 PVC insulated cables shall be tested as specified in paragraph D-3 of SABS 150.

Complies/Does not comply

14.7.5 The Contractor shall submit three copies of certified test reports to the Engineer within three weeks after completion of the tests.

15.0 GUARANTEE

15.1 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.

Complies/Does not comply

15.2 The guarantee period shall commence the day the installation is formally handed over to and accepted by Spoornet.

Complies/Does not comply

15.3 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.

Complies/Does not comply

15.4 Any defects that may become apparent during the guarantee period shall be rectified to the satisfaction of, and free of cost to Spoornet.

Complies/Does not comply

15.5 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 Spoornet of such defects.

Complies/Does not comply

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

Complies/Does not comply

TENDERER'S SIGNATURE .....

DATE .....

CHIEF ENGINEER (POWER SUPPLIES)
(INFRASTRUCTURE)

SCOPE OF WORK

1.0 Site inspection required/not required.

Date : .....

Time : .....

CHIEF ENGINEER (POWER SUPPLIES)
(INFRASTRUCTURE)

REFERENCE :

DRAWINGS

DRAWING NO.	TITLE
CEE 55/027367	Concrete slab, cable protection
CEE-PK-14	Route marker, cable, electrical.
CEE-MA-307	Tape, cable warning, underground
FG 263	Accommodation of cables in Railway formations.

CHIEF ENGINEER (POWER SUPPLIES)
(INFRASTRUCTURE)

REFERENCE :

SCHEDULE OF ESTIMATED QUANTITIES AND UNIT RATES

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
1.0	Route surveys (clause 7.0)		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 (clause 8.10)		/m		
5.0	Concrete slabs supplied and installed (clause 12.3.2)		each		
6.0	Plastic cable warning tape supplied and installed (clause 12.3.5)		/m		
7.0	150 mm dia. half round concrete pipes supplied and installed (clause 9.2.7.)		/m		
8.0	150 mm dia. asbestos cement pipes supplied and installed		/m		
9.0	Cutting of checker plates (clause 9.4.4)		/m cut		
10.0	Backfilling of trenches with soil (clause 12.3)		/cubic metre		
11.0	Backfilling of trenches with 10:1 soil/cement mix (clause 12.2)		/cubic metre		

SCHEDULE OF ESTIMATED QUANTITIES AND UNIT RATES

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
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		
16.0	Installation of cables				
16.1	Installed in trenches (Clause 9.2)				
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 (clause 9.3)				
16.2.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				

SCHEDULE OF ESTIMATED QUANTITIES AND UNIT RATES

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
16.2.2	Low Voltage Cables		/m		
	..... core ..... mm sq				
	..... core ..... mm sq				
	..... core ..... mm sq				
	..... core ..... mm sq				
16.3	Installed in ducts (clause 9.4)				
16.3.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
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 (clause 9.4.5 and 9.4.6)				
17.1.1	High Voltage Cables		/m		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				

SCHEDULE OF ESTIMATED QUANTITIES AND UNIT RATES

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
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 (clause 9.8)				
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				
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				

SCHEDULE OF ESTIMATED QUANTITIES AND UNIT RATES

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
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).				
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				

SCHEDULE OF ESTIMATED QUANTITIES AND UNIT RATES

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
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				
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				

SCHEDULE OF ESTIMATED QUANTITIES AND UNIT RATES

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
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 .....

CHIEF ENGINEER (ELECTRICAL)
(INFRASTRUCTURE)

SPOORNET

A division of Transnet limited

TECHNICAL
RAILWAY ENGINEERING
SPECIFICATION

PAINTING OF STEEL COMPONENTS OF ELECTRICAL EQUIPMENT

Author:	Senior Technologist Railway Engineering	H.A.Slier	
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Authorised:	Principal Engineer Locomotive Environment	W.A.Coetzee	

Date: 27 February 2002

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

SPOORNET

A division of Transnet limited

TECHNICAL
RAILWAY ENGINEERING
SPECIFICATION

PAINTING OF STEEL COMPONENTS OF ELECTRICAL EQUIPMENT

Circulation restricted to:
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1.0 SCOPE

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

2.0 REFERENCES AND GLOSSARY

The following standards and specifications are referred to herein:

2.1 South African Bureau of Standards: -

SABS 064 : Code of Practice for the Preparation of Steel Surfaces for Coating.

SABS 1091 : National Colour Standards for Paint.

2.2 Trade names :

OptiDegreaser

OptiPrime^{Aqua}

Noxyde

2.3 Classification of level of surface degradation:

RE1 – 0.05% of surface rusted

RE2 – 0.5% of surface rusted

RE3 – 1.0% of surface rusted

RE4 – 3.0% of surface rusted

RE5 – 8.0% of surface rusted

3.0 METHOD OF TENDERING

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

4.0 SURFACE PREPARATION

4.1 NON-GALVANISED STEELWORK

4.1.1 New Steelwork

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

4.1.2 Previously Coated Steelwork

4.1.2.1 COATING START FAILING TO A LEVEL OF RE 2

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

4.1.2.2 COATING FAILURE AND RUSTING TO A LEVEL OF RE 4

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

4.1.2.3 BITUMEN COATED

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

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

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

4.2 GALVANISED STEELWORK

4.2.1 NEW AND WEATHERED GALVANISING WITH A SMOOTH GLOSSY FINISH

➢ Degrease thoroughly with OptiDegreaser ➢ Rinse down with copious quantities of potable water	➢ Apply one thin coat of OptiPrime^{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/m^2 per coat to the complete substrate using contrasting colors

4.2.2 WEATHERED GALVANISING

4.2.2.1 White rust (zinc oxide)

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

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

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

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

5. PRODUCT APPLICATION

5.1 METHOD OF APPLICATION

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

5.2DRYING TIME AND OVERCOAT PERIODS

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

5.3 CURING TIME

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

5.4 DRY FILM THICKNESS (DFT) READINGS

35 micron	➢ Severe coastal & marine environments (in the spray zone) – TWO stripe coats & overall minimum DFT of 400 micron ➢ Normal coastal environment (1 5 km from the coast line) - a single stripe coat & overall minimum DFT of 400 micron ➢ Non coastal high rainfall areas, in the immediate vaccinate of rivers, dams, lakes, etc., and in industrial areas with high levels of chemical pollution - a single stripe coat & overall minimum DFT of 400 micron ➢ Dry non aggressive environments - a single stripe coat & overall minimum DFT of 250 micron NOTE: DFT readings can only be taken after 72 hours

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

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

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

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

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

6.0 PAINT SYSTEM

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

6.1 Noxyde paint system

1st coat: OptiPrime^{Aqua}

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

2nd coat: Noxyde Topcoat

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

6.1.1 Paint application:

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

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

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

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

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

7.0 COATINGS AND WORKMANSHIP

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

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

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

TENDERER'S SIGNATURE……

DATE……

SPOORNET

A division of Transnet limited

TECHNICAL

RAILWAY ENGINEERING

SPECIFICATION CONTROL PAGE

HOT DIP GALVANISING AND PAINTING OF ELECTRIFICATION STEELWORK

Statement of authorisation:

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

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

Date: January 2002

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

SPOORNET

A division of Transnet limited

TECHNICAL

RAILWAY ENGINEERING

SPECIFICATION

HOT DIP GALVANISING AND PAINTING OF ELECTRIFICATION STEELWORK

Circulation restricted to:

Technical

INDEX

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: _____

Appendix 1

SCHEDULE OF REQUIREMENTS, QUANTITIES AND PRICES

1.0

END

FOR SPOORNET: _____

GRADE: _____