

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

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

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

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

“PREVIEW COPY ONLY”

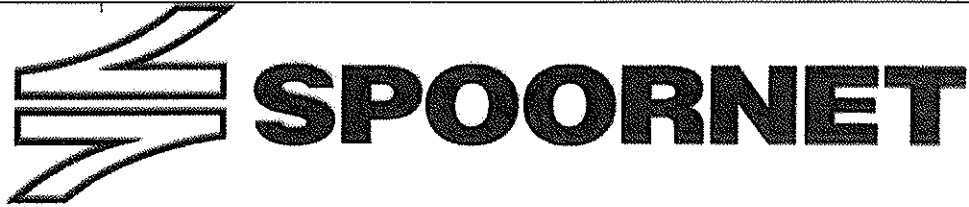
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT RATE	TOTAL
19.0	Cable joints complete (Supply material, terminate and connect up)				
19.1	PVC to PVC		each		
	240 mm sq				
	185 mm sq				
	120 mm sq				
	95 mm sq				
	16 mm sq				
	Other sizes				
19.2	XLPE to XLPE		each		
	240 mm sq				
	185 mm sq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

TENDERER'S SIGNATURE.....

DATE.....

17.0 APPENDIX 3

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



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)

Authors: Engineering Technician (level 1) B.L. Ngobeni
Section: Technology Management

A handwritten signature in black ink, appearing to read 'B.L. Ngobeni', positioned above a horizontal dotted line.

Approved: Engineering Technician (level 3) D.O. Schulz
Section: Technology Management

A handwritten signature in black ink, appearing to read 'D.O. Schulz', positioned above a horizontal dotted line.

Authorised: Senior Engineer L.O. Borchard
Section: Technology Management

A handwritten signature in black ink, appearing to read 'L.O. Borchard', positioned above a horizontal dotted line.

Date: 5 September 2005

Circulation restricted to:

- Engineering & Technology: Infrastructure Maintenance
- Engineering & Technology: Infrastructure Engineering
- Engineering & Technology: Technology Management

© This document as a whole is protected by copyright. The information herein is the sole property of Transnet Ltd. It may not be used, disclosed or reproduced in part or in whole in any manner whatsoever, except with the written permission of and in a manner permitted by the proprietors.

INDEX

SECTION	DESCRIPTION	PAGE NO
1.0	SCOPE.....	3
2.0	STANDARDS.....	3
3.0	APPENDIX.....	3
4.0	TENDERING PROCEDURE.....	3
5.0	MEDIUM VOLTAGE CABLES.....	3
6.0	CABLES FOR FIXED INSTALLATIONS.....	4
7.0	QUALITY ASSURANCE.....	5
8.0	INSPECTION AND TESTING.....	5
9.0	APPENDIX 1.....	6

“PREVIEW COPY ONLY”

1.0 SCOPE

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

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

2.0 STANDARDS

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

2.1 SOUTH AFRICAN NATIONAL STANDARDS

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

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

SANS 1507: Electric cables with extruded solid dielectric insulation for fixed installations 300/500 V to 1900/3300 V,

- Part 1-General,
- Part 3-PVC Distribution cables,
- Part 4-XLPE distribution cables,
- Part 5-Halogen free distribution cables.

3.0 APPENDIX

The following appendix forms an integral part of this specification.

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

4.0 TENDERING PROCEDURE

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

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

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

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

5.0 MEDIUM VOLTAGE CABLES**5.1 IMPREGNATED PAPER INSULATED.**

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

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

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

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

- 5.1.5 The armouring shall be galvanised steel wire with outer extruded PVC over sheath over the armouring.
- 5.1.6 The cable shall be so manufactured that it is fully protected against the effect of electrolysis.
- 5.1.7 Single core cables used for 3 kV DC application shall withstand a test voltage of 10,5 kV for one minute.
- 5.1.8 Cables shall be suitable for laying directly in soil and concrete trenches.
- 5.1.9 The cables shall withstand exposure to water, corrosive conditions as well as high ultra violet conditions caused by direct sunlight.
- 5.1.10 The cables shall be tested in accordance with SANS 97. Type test certificates shall be submitted with the cables offered.
- 5.1.11 The packing, marking and sealing of cables and cable drums shall be in accordance with SANS 97.

5.2 CROSS – LINKED POLYETHYLENE INSULATED (XLPE).

- 5.2.1 XLPE cables used for reticulation systems, 3kV DC traction feeders and traction power supplies and other applications shall be in accordance with SANS 1339.
- 5.2.2 The voltage range for the cables shall be between 3,8kV and 33kV.
- 5.2.3 Cables shall be single or three core with stranded copper conductors.
- 5.2.4 The cables shall be type A (armoured) for single and three core cables.
- 5.2.5 Single core type A cable shall be copper tape screened, aluminium wire armoured and provided with a PVC outer sheath.
- 5.2.6 Single core cables shall be rated for 3,8/6,6kV.
- 5.2.7 Single core cables used for 3 kV DC application shall withstand a test voltage of 10,5 kV for one minute.
- 5.2.8 Three core type A cable shall be copper tape screened, galvanised steel wire armoured and provided with a PVC outer sheath.
- 5.2.9 The manufacture of the single and three core cables shall be such that the cables are fully protected against the effect electrolysis.
- 5.2.10 The cables shall be suitable for laying directly in soil and concrete trenches.
- 5.2.11 The cables shall withstand exposure to water, corrosive conditions as well as high ultra violet conditions caused by direct sunlight.
- 5.1.12 The cables shall be tested in accordance with SANS 1339. Type test certificates shall be submitted with the cables offered.
- 5.2.12 Where specified flame-retardant and halogen free cables shall be in accordance with SANS 1339.
- 5.2.13 The packing, marking and sealing of cables and cable drums shall be in accordance with SANS 1339.

6.0 CABLES FOR FIXED INSTALLATIONS

- 6.1 Unless otherwise specified single and multi-core, wire armoured, extruded PVC insulated cables shall be used for fixed installations. The cables shall be in accordance with SANS 1507 part 1 and part 3.
- 6.2 The voltage range is between 300/500 V to 1900/3300 V.
- 6.3 Cables shall have stranded annealed copper conductors.

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

7.0 QUALITY ASSURANCE

- 7.1 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.

“PREVIEW COPY ONLY”

SCHEDULE OF REQUIREMENTS

(To be completed by the client)

1.0 MEDIUM VOLTAGE CABLES

1.1 PAPER IMPREGNATED LEAD SHEATHED (PILC)

1.1.1 Rated Voltage (V):

1.1.2 Number of cores:

1.1.3 Length of cables (m):

1.1.4 Size of conductors (mm²):

1.2 CROSS LINKED POLYETHYLENE INSULATED (XLPE)

(XLPE is recommended for 3 kV DC Applications)

1.2.2 Rated Voltage (V):

1.2.3 Number of cores:

1.2.4 Length of cables (m):

1.2.5 Size of conductors (mm²):

1.2.6 Flame retardant (required/not required):

2.1 CABLES FOR FIXED INSTALLATIONS

2.1.1 Type of cable required:

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

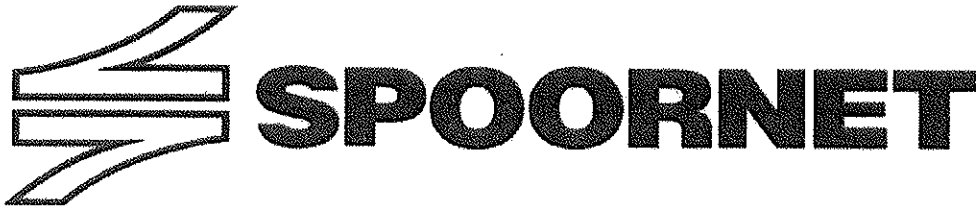
2.1.2 Rated Voltage (V):

2.1.3 Number of cores:

2.1.4 Length of cables (m):

2.1.5 Size of conductors (mm²):

END



A division of Transnet limited

**TECHNICAL
RAILWAY ENGINEERING**

SPECIFICATION CONTROL PAGE

**3kV DC UNDER VOLTAGE RELAY MANUFACTURING
SPECIFICATION.**

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 Spoornets requirements. The specification has been compiled in a manner which shall favour / encourage local manufacture of material / equipment to a maximum degree.

Author: Grade: Chief Engineering Technician. D.O. Schulz

Section: Traction Power Supply Technology

Handwritten signature of D.O. Schulz over a dotted line.

Approved: Grade: Chief Engineering Technician. J. Rothman.

Section: Traction Power Supply Technology

Handwritten signature of J. Rothman over a dotted line.

Authorised: Grade: Senior Engineer. L.O. Borchard.

Section: Traction Power Supply Technology

Handwritten signature of L.O. Borchard over a dotted line.

Date: 18TH Nov 2002

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

6.1 ENVIRONMENTAL

- 6.1.1 Altitude : 0-1800m above sea level.
- 6.1.2 Ambient temperature range : Minus 5°C to plus 50°C.
- 6.1.3 Relative humidity : 10% to 90%.
- 6.1.4 Lighting conditions : 12.0 flashes/km²/annum

6.2 ELECTRICAL SERVICE CONDITIONS

- 6.2.1 Nominal 3-kV DC busbar voltage : 3150 volts DC
- 6.2.2 Variable 3 kV DC busbar voltage : 2100V DC – 4000V DC

6.3 MECHANICAL SERVICE CONDITIONS

- 6.3.1 Vibration : Vibration can be expected as the Substations are next to the railway lines.

7.0 GENERAL REQUIREMENTS

- 7.1 Equipment supplied shall be in terms of this specification. Deviations from this specification will not be allowed without written consent of Spoornet's Traction Power Supply Technology staff.
- 7.2 Spoornet reserves the right to subject equipment offered to test or inspection to check compliance with clauses of this specification.
- 7.3 The onus to prove compliance with the manufacturing specification shall rest with the successful tenderer once the manufacturing contract has been awarded.
- 7.4 The successful tenderer will be responsible for all costs caused by modifying or replacing equipment accepted by Spoornet on the grounds of his statement of compliance and found by Spoornet not to comply.

8.0 TECHNICAL AND MANUFACTURING REQUIREMENTS

8.1 DESCRIPTION OF THE UNDERVOLTAGE RELAY

- 8.1.1 The main components of the 3kV DC undervoltage relay are as follows:

- 3kV Voltage divider.
- Optic fibre transmitter.
- Optic fibre receiver.
- Control circuit.

8.2 3kV VOLTAGE DIVIDER

- 8.2.1 The voltage divider shall consist of 9x22 kΩ, 50 watt and 3x8,2 kΩ, 50 watt aluminium housed resistors in series as shown in circuit diagram BBB 2932.
- 8.2.2 A 3 ampere 3.3 kV, minimum 5kA rated fuse shall be provided and connected on the 3 kV positive input side in series with the resistors as shown in circuit diagram BBB 2932.
- 8.2.3 The resistors shall be arranged on a celleron plate, which shall be fitted with stand off insulators for mounting on the wall in the busbar chamber. These insulators must provide a minimum allowable clearance of 100mm for 3kV potential.

1.0 SCOPE

This specification provides Spoornet's requirements for the manufacturing of the 3 kV DC Under Voltage Relay utilising optic fibre.

2.0 BACKGROUND

The 3kV DC under voltage relays are installed at Spoornet's 3kV DC traction substations and tie-stations. The purpose of the relay is to clear faults which occur whilst the feeding network is crippled. The relay is set to operate at the highest voltage (i.e. smallest volt drop) that can occur under crippling conditions with a fault in the section.

The under voltage relay trips the 3kV DC track breakers when the 3kV DC busbar voltage drops below the set value

This optic fibre relay is an alternative to the existing switching under voltage relay and other models of relays fitted in the 3 kV DC traction substations throughout Spoornet.

Spare parts for the switching under voltage relays and other models are difficult to obtain and are costly. The optic fire under voltage relay is constructed from components, which can be locally sourced.

3.0 STANDARDS AND PUBLICATIONS

Unless otherwise specified all materials and equipment shall comply with the current edition of the relevant SABS or Spoornet publication where applicable.

3.1 SOUTH AFRICAN BUREAU OF STANDARDS

- SABS 1091 : National Colour Standards for Paint
- SABS 1274 : Coatings applied by Powder Coating Process

3.2 SPOORNET DRAWINGS

- CEE- TBD-7 : Earthing arrangement for 3 kV DC traction substation.

4.0 APPENDICES

The following appendixes from an integral part of this specification,
 Appendix 1: Circuit and manufacturing drawings

5.0 TENDERING PROCEDURE

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

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

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

6.0 SERVICE CONDITIONS

The equipment shall be designed and rated for operation under the following service conditions.

- 8.2.4 If encapsulated voltage dividers are offered the successful tenderer shall supply Spornet Electrical samples for inspection and acceptance.
- 8.2.5 The encapsulated voltage divider shall consist of the same amount of resistors and the ohmic values as the above divider.
- 8.2.6 Carbon resistors are not acceptable, as they are extremely temperature sensitive. Only high quality resistors such as metal oxide or vitreous enamel resistors may be used for the encapsulated voltage divider.
- 8.2.7 Suitable studs minimum 6mm shall be provided for the positive connection from the potential divider to the undervoltage relay and 10mm stud for the negative return circuit.

8.3 OPTIC FIBRE TRANSMITTER

- 8.3.1 The circuitry components for the optic fibre transmitter shall be in accordance with circuit diagram, drawing No BBB 2930 and printed circuit board layout, drawing No BBB 2935. These shall be housed in a high impact plastic /fibre box which is mounted on the 3kV voltage divider board.
- 8.3.2 The reference voltage of 0 to 400 volts is obtained from the voltage divider and is the operating voltage for the fibre optic transmitter unit.
- 8.3.3 The required reference voltages are obtained and generated from an integrated circuit, IC1 and a 24V Zener diode.
- 8.3.1 Voltage comparison is carried out by IC2 (LM 741). Pick up and drop out voltages are adjusted with potentiometers P2 and P3, which are multi turn top adjustable potentiometers.
- 8.3.2 The transmitter is mounted on a high quality fibreglass printed circuit and is populated by resistors (tolerance 2%) and capacitors.
- 8.3.3 The circuitry is protected by Metal Oxide Varistors (MOV'S).
- 8.3.4 The output of the optic fibre transmitter is connected to the optic fibre receiver.

8.4 OPTIC FIBER RECEIVER

- 8.4.1 The optic fibre receiver and control circuits shall be mounted in a metal enclosure with a hinged door to enable ease of maintenance.
- 8.4.2 The optic fibre printed board shall be manufacture according to circuit diagram BBB2929 and circuit board layout BBB2934.
- 8.4.3 The optic fibre isolation level for the transmitter and receiver shall not be less than 7 kV.
- 8.4.4 The operating voltage for the receiver is a 110 V DC voltage obtained from a voltage divider R1 and R2. Activating the optic fibre receiver results in the energising of a relay by means of a transistor on the fibre optic receiver printed circuit board.

8.5 CONTROL CIRCUIT

- 8.5.1 The control circuitry shall be mounted in same metal enclosure as the optic fibre receiver and shall consist of the components shown in drawing BBB2931.
- 8.5.2 The front door of the metal enclosure shall be fitted with a lamp which indicates that a trip has occurred as well as electrically actuates the trip counter which counts the number of trips.

- 8.5.3 The operating voltage for the control circuit is 110 V DC.
- 8.5.4 The input control signals as well as the output control signals shall be routed to a clearly marked terminal strip.
- 8.5.5 The internal wiring of the control circuit shall be wired with 1.0 mm² stranded copper wire.
- 8.5.6 The 110 V DC shall be protected by a 180 V MOV and a 4 ampere fuse.
- 8.5.7 If the line voltage is above the pick up voltage the optic fibre transmitter activates and the optic fibre receiver enables the switching transistor to energise relay 1 (R1) this retains the circuit breaker holding coil when timed contacts open.
- 8.5.8 If the line voltage drops below the drop out voltage the fibre optic transmission stops and relay 1 is de-energised.

The metal enclosure shall be power coated in accordance with SABS 1274 and the colour of the enclosure shall be light orange to SABS 1091 colour No. B26.

- 8.5.9 Provision shall be made for cable entry at the bottom of the metal enclosure.
- 8.5.10 A suitable earthing terminal for a 95mm² earth conductor shall be provided on the metal enclosure.

8.6 MODIFICATIONS AND IMPROVEMENTS

- 8.6.1 If the successful tenderer wishes to submit recommendations for modifications or improvements he shall first contact members of Spoornet Engineering staff who will approve or reject them.
- 8.6.2 No additions, alterations or modifications shall be acceptable unless Spoornet Traction Power Supply Technology staff is in agreement.

8.7 TEST METHOD

For testing of the operation of the undervoltage relay a variable 0 to 400V DC supply is required.

Inject 140V DC on the input side of the Optic Fibre transmitter and set the Trimpot P1 until a output voltage of 10V (reference voltage) is obtained at pin N06 on the output side of the reference IC1. Connect a temporary Optic Fibre cable between Optic Fibre transmitter and the receiver.

Supply the under voltage relay with 110VDC at terminals 1 (positive) and 2 (negative) and inject 250V to the transmitter. Adjust the Trimpot P2 until the undervoltage relay picks up. Reduce the voltage to the transmitter to 240V, and adjust the Trimpot P2 until the relay drops out.

To set the pick up time, connected a positive 110V DC supply to terminal 7 of the fleeting timer relay and adjust until the require time setting is obtained.

END

APPENDIX 1

CIRCUIT AND MANUFACTURING DRAWINGS

DRAWING No	TITLE
BBB2929	Optic Fibre Receiver Circuit Diagram.
BBB2930	Optic Fibre Transmitter Circuit Diagram.
BBB2931	3kV Undervoltage Relay Circuit Diagram.
BBB2932	Voltage Divider Circuit Diagram.
BBB2934	Optic Fibre Receiver PC Board and component Layout.
BBB2935	Optic Fibre Transmitter PC Board and component Layout.
BBB2942	General arrangement of High Tension Divider Board.

END

“PREVIEW COPY ONLY”



TRANSNET
freight rail

TECHNOLOGY MANAGEMENT.
SPECIFICATION.

REQUIREMENTS FOR BATTERY CHARGERS FOR 3kV DC TRACTION SUBSTATIONS.

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

[Handwritten signature]
.....

[Handwritten signature]
.....

[Handwritten signature]
.....

Date: 21st September 2009

Circulation Restricted To:
Transnet Freight Rail – Chief Engineer Infrastructure
- Technology Management

“PREVIEW COPY ONLY”

© This document as a whole is protected by copyright. The information herein is the sole property of Transnet Ltd. It may not be used, disclosed or reproduced in part or in whole in any manner whatsoever, except with the written permission of and in a manner permitted by the proprietors.

INDEX

SECTION	DESCRIPTION	PAGE NO
1.0	SCOPE	3
2.0	GENERAL	3
3.0	STANDARDS	3
4.0	DEFINITIONS	3
5.0	TENDERING PROCEDURE	3
6.0	SERVICE CONDITIONS	4
7.0	ELECTRICAL REQUIREMENTS	4
8.0	CONSTRUCTURAL REQUIREMENTS	7
9.0	INSPECTION AND TESTING	8
10.0	DRAWINGS, INSTRUCTION MANUALS AND SPARES LISTS	8
11.0	SPECIAL TOOLS AND/OR SERVICING AIDS	8
12.0	TRAINING	8
13.0	GUARANTEE AND DEFECTS	8
14.0	APPENDIX 1: QUALITY OF SUPPLY CHARACTERISTICS OF 230 VOLT SUPPLY	10
15.0	APPENDIX 2: TECHNICAL DATA SHEET	12

“PREVIEW COPY ONLY”