



TECHNOLOGY MANAGEMENT

SPECIFICATION

INSULATED AERIAL BUNDLED CONDUCTORS (ABC) SYSTEM

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1.0 SCOPE

This specification covers Transnet Freight Rail's requirements for the supply of medium-voltage aerial bundled conductors (ABC) system for use at operating voltages of 6.6kV and 11kV.

2.0 APPLICABLE STANDARDS

The following publications (latest edition) are referred to herein

International Electrotechnical Commission (IEC)

IEC 61089: Round wire concentric lay overhead electrical stranded conductors.

South African National Standards (SANS)

SANS 121	:	Hot dip galvanized coatings on fabricated iron and steel articles - specifications and test methods.
SANS 1411	:	Materials of insulated electric cables and flexible cords Part 1: Conductors
SANS 1411	:	Materials of insulated electric cables and flexible cords Part 4: Cross-linked Polyethylene (XLPE).
SANS 1713	:	Electric cables – Medium voltages aerial bundled conductors for voltages

3.0. APPENDICES

The following appendices form an integral part of this specification:

3.1. APPENDIX A – Schedule of requirements

Details of the cable and supports to be supplied

3.2. APPENDIX B – Technical data sheet

4.0. TENDERING PROCEDURE

- 4.1. Tenderers shall indicate clause-by-clause compliance with this specification. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance.
- 4.2. A statement of non-compliance shall be motivated by the tenderer.
- 4.3. Tenderers shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.
- 4.4. Tenderers shall submit specific technical information as required by appendix B.
- 4.5. Failure to comply with clauses 4.1, 4.2, 4.3 and 4.4 could preclude a tender from consideration.

5.0. SERVICE CONDITIONS

5.1. Atmospheric Service Condition

The cables shall be installed and continue to operate under the following conditions:

Altitude : 0 to 1800m above sea level

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

6.0. MEDIUM VOLTAGE INSULATED AERIAL BUNDLED CONDUCTOR SYSTEMS

- 6.1. The insulated aerial bundled phase conductors shall be designed, insulated, and tested in accordance with SANS 1713.
- 6.2. The cable shall be of type A for 95mm² and upwards, and type B for 35mm² up to 70mm² as described in SANS 1713.
- 6.3. The insulated aerial bundled conductors (ABC) system shall consist of three insulated phase conductors twisted around each other using a right-hand lay as in accordance with IEC 61089.
- 6.4. The phase conductors shall be separately insulated by the fin extruded cross-linked polyethylene (XLPE) semi-conductive layer to an appropriate thickness for the voltage range specified.
- 6.5. The outer layer of the XLPE shall be carbonized and treated against ultra violet radiation in accordance with SANS 1411 Part 4 and shall be resistant to abrasion when un-insulated carrier cable is supplied.
- 6.6. The phase conductors shall be laid around the carrier cable using a right-hand lay at the specified distance in accordance with SANS 1713. There shall be no overall sheath over the bundle and each insulated conductor (core) shall be able to be separated from the bundle.
- 6.7. Each conductor must be easily identified at regular intervals over the entire length as follows: Phase number, Trade name, Date of manufacture, Standard of manufacture, Size of the conductor and Voltage.
- 6.8. The carrier cable (supporting catenary) shall be circular cross section made up of galvanized or stainless steel wire strands as in accordance with SANS 121, to make up a steel carrier strong enough to support the whole system under adverse conditions prevailing in South Africa at any specified span length.
- 6.9. The carrier cable shall have the following minimum properties:

Modulus of elasticity (E)	:	160 000N/mm
Factor of linear expansion:		11 x 10 ⁻⁶ /°C
Effective Breaking Load	:	65kN
- 6.10. The bundle shall be freely supported by the carrier cable with no phase conductor under mechanical tension.

7.0. MOUNTING HARDWARE

- 7.1. Mounting and tension brackets shall be for mounting on structures or poles as specified in appendix A.
- 7.2. The suspension clamps shall be designed to allow easy clamping of the carrier (supporting conductor) after tensioning.

- 7.3. Where ABC system is used adjacent to 3kV DC electrification lines:
- 7.3.1. The carrier cable shall be block jointed at the end with a strain insulator.
 - 7.3.2. All mounting clamps used for suspending the carrier cable shall be insulated and the insulation level shall be 10.5kV r.m.s.
 - 7.4. The design of the suspension clamp assembly shall be such that it is not possible to damage the insulation on the carrier whilst clamping it securely onto the suspension bracket assembly.
 - 7.5. The strain anchor clamp assembly shall be supplied complete with a turnbuckle and pistol grip or thimble type clamp.
 - 7.6. All mounting hardware shall be galvanized in accordance with SANS 121.
- 8.0. TERMINATION AND JOINTS**
- 8.1. All terminations and joining kits supplied shall be designed specifically for the system offered.
 - 8.2. Joints and terminations shall be of the heat shrink type.
 - 8.3. Complete and detailed installation instructions shall be supplied for all jointing and terminating kits.
- 9.0. TOOLS**
- 9.1. A full set of specialized erection tools for the purpose of doing the erection shall be supplied as and when called for in appendix A.
 - 9.2. The tenderer shall indicate separately the hire cost of all tools required for the erection of the ABC system.
- 10.0. DRUMS**
- 10.1. Insulated aerial bundled conductors shall be supplied on new, non returnable wooden drums, the barrel diameter of which shall not be less than twenty times the diameter of the cable. A steel axle plate with a round hole shall be fitted to each side of the drum.
 - 10.2. Wood shall be treated against biological attack.
 - 10.3. The markings on a wooden drum shall be in accordance with SANS 1713.
- 11.0. TESTS**
- 11.1. The insulated aerial bundled conductor shall be tested in accordance with SANS 1713.
 - 11.2. Tests Certificates
 - 11.2.1 A copy of the type certificates, where called for, shall be submitted with tenders.
 - 11.2.2 Results of routine tests, where called for, shall be submitted with delivery of insulated aerial bundled conductors.
 - 11.3 Sample tests are not required

APPENDIX A

SCHEDULE OF REQUIREMENTS
(To be completed by Transnet Freight Rail)

- 1.0. Continuous length of ABC system on drums:.....
- 2.0. Nominal system voltage:.....
- 3.0. Number of cores:.....
- 4.0. Size of conductors:.....
- 5.0. Size of span length:.....
- 6.0. Mounting hardware: required for structure as per drawings.....
- 6.1. Number of suspension required:.....
- 6.2. Number and type of strain anchor clamps required:.....
- 6.3. Number of turn buckles complete with lockout required:.....
- 6.4. Number of termination kits required.....
- 5.4.1 ABC onto equipment:.....
- 5.4.2 ABC onto bare conductor distribution line:.....
- 5.4.3 ABC onto armoured cable:.....
- 6.5. Number of ABC joint kits required:.....
- 6.6. Number of joining frames required:.....
- 7.0. Type test certificates (required/Not required):.....
- 8.0. Routine test certificates (Required/Not required):.....
- 9.0. Tools suitable for the system:
- 9.0.1. Number of pulleys
 - 9.0.2. 2 x smooth jaw come-along (required /Not required):.....
 - 9.0.3. Dynamometer 0 – 2000 kg (Required/Not required):.....
 - 9.0.4. 4 x Phase separators (Required/Not required):.....
 - 9.0.5. Pulling sock (Required/Not required):.....
 - 9.0.6. 2 x winch caps (Required/Not required):.....
 - 9.0.7. Pulling Swivel (Required/Not required):.....
 - 9.0.8. Other tools recommended by tenderer:
- 9.0.9. Number of Tie Straps required:.....
- 9.1.0. Number protective sleeves required:.....

9.1.1. Number of splicing/termination kits required:.....

APPENDIX B

TECHNICAL DATA SHEET

(To be completed by tenderer)

1.0. Nominal System Voltage (U_n) (kV):.....

2.0. Number of cores, rated cross-sectional area and stranding of:

2.1. Phase conductor/s:.....

2.2. Carrier conductor:.....

3.0. Continuous current rating:.....

4.0. Fault current rating:.....

5.0. Width, thickness and No. of lays of lapping shield:.....

6.0. Earth fault rating:.....

7.0. Carrier conductor.

7.1. Modulus of elasticity:.....

7.2. Factor of linear expansion:.....

7.3. Effective breaking load:.....

8.0. Thickness of XLPE insulation:.....

9.0. Outer diameter of bundle:.....

10.0. Recommended sag and tension (kN):.....

11.0. Insulation level of suspension clamp:.....

12.0. Standard to which cable is manufactured:.....

13.0. Details of drum manufacture:.....

14.0. Length of ABC system per drum:.....

15.0. Total weight of full drum:.....

END