

JOHANNESBURG WATER (SOC) Ltd.
BULK WASTEWATER
PARTICULAR SPECIFICATION
E05 : ELECTRICAL LOW VOLTAGE POWER
AND CONTROL CABLES



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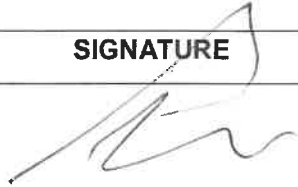
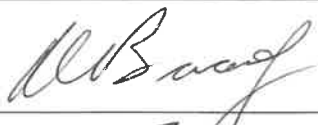

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DOCUMENT APPROVAL

ACTION	FUNCTION	NAME	DATE	SIGNATURE
Prepared	Senior Electrical Engineer	B Pieterse	August 2019	
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Approved	Regional Maintenance Manager	T Thabeng	August 2019	

RECORD OF REVISIONS

Date	Revision	Author	Comments
5	2019-08-20	B Pieterse	Review of Electrical Standards, plus New Design Guidance
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PARTICULAR SPECIFICATION: VOLUME E05: ELECTRICAL LOW VOLTAGE POWER AND CONTROL CABLES

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E05.1 SCOPE

This specification covers the requirements with regards to the manufacture, supply, delivery, installation, testing and commissioning of power and control cables rated up to 600/1000V. The term cable shall indicate electrical conductors or carriers manufactured for supplying power for the control and supervision of multipurpose loads.

E05.1.1 Statutory Documents and Standards

Cables shall be strictly manufactured in accordance with the requirements of the latest editions of the following standards:

- | | | |
|----------------------|---|--|
| (a) SANS 1507 | : | Electrical cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) |
| (b) SANS 1411 | : | Materials of insulated electric cables and flexible cords |
| (c) SANS 1339 | : | Electric cables - Cross-linked polyethylene (XLPE) insulated cables for rated voltages 3,8/6,6 kV to 19/33 kV |
| (d) SANS 1520 | : | Flexible electrical cables for use in mines |
| (e) SANS 10198 | : | The selection, handling and installation of electric power cables of rating not exceeding 33 kV |
| (f) SANS 10142-1 | : | The Wiring of Premises Part 1 – Low Voltage Installations |
| (g) IEC 60245 | : | Rubber insulated cables |
| (h) IEC 60287 | : | Electric cables - Calculation of the current rating |
| (i) IEC 60811 | : | Electric and optical fibre cables - Test methods for non-metallic materials |
| (j) DIN VDE 0250-816 | : | Cables – Wires and flexible cords for power installation – Heat-resistant silicone rubber insulated flexible cable |

The Occupational Health and Safety Act (Act No. 85 of 1993)

E05.1.2 Definitions and Terminology

In general, the following definitions and terminology shall apply:

Armouring	A layer or layers of galvanized steel wires applied to the cable to provide mechanical protection or earth continuity, or both.
Bedding	A layer of extruded compound applied to the cable beneath the armouring.
Cable	A length of core or more cores assembled, that may or may not be provided with an overall mechanical covering.
Core	A single insulated conductor without protective covering.
Direction of lay	The lateral direction of inclination to the axis (either left or right) of the receding helix formed by wire or core in a cable or flexible cord.
PVC	Polyvinyl chloride
Sheath	A solid extruded protective covering applied as the exterior of a cable or a flexible cord.

E05.1.3 Particular Specifications to read in Conjunction with this Specification

This specification shall be read in conjunction with the following specifications:-
E06: ELECTRICAL MEDIUM AND LOW VOLTAGE CABLE INSTALLATION

E05.2 GENERAL SCOPE

E05.2.1 Design and Supply

(a) Conductor sizes

The minimum conductor size for control cables shall be 2.5mm².

The minimum conductor size for power cables on plant equipment (excluding small power and lighting) shall be 16mm².

(b) Conductor material

In the case of plants with a high risk of cable theft, cables with aluminium conductors must be used where the nominal core diameter exceeding 25mm². This must be agreed upon in writing by the Engineer.

E05.3 CONSTRUCTION

The cable shall be constructed as follows:

E05.3.1 Conductor Material

The copper conductors shall be of plain annealed or hard draw wire in accordance with the requirements of the latest edition of SANS 1411.

The aluminium conductors shall be of plain hard drawn aluminium wire in accordance with the requirements of the latest edition of SANS 1411.

E05.3.2 Insulation

The insulation material shall comprise of PVC in accordance with the requirements of the latest edition of SANS 1411.

E05.3.3 Core Colour Identification

The cable cores colour shall be in accordance with the requirements of the latest edition of SANS 1507-3.

E05.3.4 Bedding

The bedding shall consist of a continuous PVC extruded sheath.

E05.3.5 Armour

The armouring shall consist of one layer of round galvanised steel wire in accordance with the requirements of the latest edition of SANS 1411.

E05.3.6 Sheath

The outer sheathing shall be an impermeable, halogen free, reduced smoke emission, flame retardant PVC in accordance with the latest edition of SANS 1411.

E05.4 CABLE MARKINGS

The cables shall be legibly marked in accordance with the requirements of the latest edition of SANS 1507, and shall include the following:

- (a) Conductor size in square millimetres
- (b) Number of cores
- (c) Conductor material (copper)
- (d) The specification number (SANS 1507) to which the cable has been manufactured.
- (e) The year of manufacture.
- (f) Nominal voltage.

E05.5 STORAGE

Cables shall be packed on reeled drums. The moisture content of wooden cable drums shall not exceed 20%.

Each end of the cable shall before being secured to the reeled drum, be sealed by an acceptable

method approved by the Engineer. The outer end shall be secured to the reel drum and the inner end shall be protected in a manner against mechanical damage.

The cable reeled drums shall be capable of taking a round spindle and be lagged with strong, closely fitted battens, at the inner and outer circumference to prevent damage to the cables. The spindle bearing plates shall be steel. The dimensions of the drum shall not exceed 1 100 mm width, 2 000 mm diameter and the spindle bearing plate shall not be less than 9 mm thick. Each drum shall be clearly marked on both sides in accordance with the latest edition of SANS 1507.

The ends of the PVC sheathed cable shall be sealed to avoid penetration of moisture. Each cable drum shall be numbered.

E05.6 CABLE SIZING AND DE-RATING

The cables shall be sized and de-rated in accordance with the requirements of the latest edition of SANS 10142-1.

E05.7 TESTING OF CABLES

E05.7.1 Testing and Commissioning

The contractor shall supply factory test certificates for each drum of cable supplied under the Contract.

After the installation is complete, the contractor and the Engineer shall inspect the installation. The Engineer must be notified in advance of the inspection dates. The contractor will keep a snag list, reflecting all items not acceptable to the Engineer. The contractor will correct the snag items as required to the Engineers approval, updating the snag list as the items are completed and signed off by the Engineer.

On completion of his work, the Contractor will issue an Electrical Certificate of Compliance (CoC). All tests deemed necessary to issue the CoC should be included. The Contractor shall make all arrangements, pay all fees and provide all equipment for these tests. The Contractor shall notify the Engineer timeously so that he may witness the tests.

Each installed cable shall be tested in accordance with:

- (a) The Occupational Health and Safety Act (OHSA) 1994;
- (b) SANS 1507 (Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V));

SANS 1507	Duration (min)	Commissioning test voltage between conductors (V)			Commissioning test voltage between conductors / earth (V)		
Test Wave		300/ 500	600/ 1000	1900/ 3300	300/ 500	600/ 1000	1900/ 3300
		AC (rms)	15	1000	2000	6000	1000
DC	15	1500	3000	9000	1500	3000	5000

This test will be conducted to the Engineers judgement. The constructor must obtain written approval from the Engineer before conducting any tests.

- (a) The requirements of the Local and Supply Authorities.

E05.8 QUALITY ASSURANCE

All the cables supplied under the Scope of Works of this project shall be designed and manufactured under a quality control system, typically to ISO 9000 series. The contractor must supply current compliance certificates on the manufacturers ISO classification.

E05.9 MEASUREMENT AND PAYMENT

Measurement and payment will distinguish between supply/delivery and installation/commissioning of the cabling lengths required.

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<u>Item</u>	<u>Unit</u>
Supply and delivery of low-voltage cable	metre

The unit of measurement shall be the length of low-voltage cable supplied. It is the responsibility of the Contractor to verify the lengths of cables required on site. The Contractor shall only supply the required length of cables required. The final quantity of installed cable lengths shall determine the final quantity to be paid of the supplied cable lengths.

The tendered rate shall include for the design, manufacture, supply and delivery of the specified cable to the site.

Separate items shall be scheduled under this payment item for each size and type of cable.