

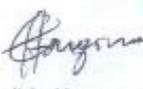
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1.0 SCOPE

The specification covers the design, manufacture, testing, supply and delivery in proper packed condition of 70 mmsq, 600/1000V, four core, Copper Conductor, Polyvinyl (PVC) insulated, armoured, screened cables. These cables shall be suitable for the 3 phase AC-50 Hz system and shall primarily be designed for effectively earthed neutral system.

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The cables shall conform in all respects to the highest standards of engineering, design, workmanship of this specification and the latest revisions of relevant standards at the time of offer and ZESCO shall have the power to reject any work or material, which in ZESCO’s judgment is not in full compliance therewith.

2.0 SYSTEM PARAMETERS

Unless otherwise specified in the Schedule of Requirements, the ZESCO distribution system parameters shall be taken to be as follows:

Item	Description	Unit	Nominal Voltage Level		
			33kV	11kV	0.4kV
1.	Nominal system voltage phase to phase	kV	33	11	0.4
2.	Highest system voltage phase - phase	kV	36	12	0.44
3.	System Frequency	Hz	50 ± 2.5%	50 ± 2.5%	50 ± 2.5%
4.	Method of System Earthing		Resist.	Resist. or Solid	Solid
5.	Impulse withstand voltage (1.2/50 μsec wave)	kV peak	170	95	-
6.	Power frequency withstand voltage 1 minute	kV peak	70	28	3

3.0 ENVIRONMENTAL PARAMETERS

The cables shall be capable of operating under the following environmental conditions:

- a) At an altitude of 1,400m above sea level;
- b) Ambient air temperature not exceeding a maximum of +45°C or below -1°C with a daily maximum average of 35°C;
- c) Relative humidity of 85%;
- d) Exposure to direct tropical sun; and
- e) Frequent and severe lightning storms occurring during summer months (isokeraunic level taken to be 86 days/year).

4.0 DETAILED REQUIREMENTS

4.1 General

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All cables, accessories and materials shall be in accordance with the latest editions (including all amendments) of SANS 1507 and National Standards as specified in Schedule A of this specification.

All cables shall be suitable for operation: -

- a) On an effectively earthed system with earth faults cleared within 30 seconds;
- b) Under the loads specified and such sudden variations of load and voltage as may be met with under working conditions on the system; and
- c) In the climatic conditions prevailing on site.

4.2 Conductors

All conductors shall be stranded annealed copper as specified in the Technical Schedules. The conductor shall be clean, uniform in size, shape and quality, smooth and free from scale, spills, splits, sharp edges and other harmful defects.

The conductors shall comply with the requirements of SANS 1411-1.

Where joints are permitted in individual wires, formed into a conductor they shall be made in the manner prescribed in the appropriate standard and the frequency shall conform to the limiting dimensions stated therein. No joints shall be made in the conductor after it has been formed.

4.3 Insulation

The insulation shall be of extruded polyvinyl chloride (PVC).

4.4 Identification of Cores

The cores of the four core cables shall be identified by color as red, yellow, blue for phases and black for the neutral.

4.5 Cable Marking

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The external surface of the cable shall be legibly embossed with the following information on two lines running parallel to the length of the cable, approximately equally spaced around the circumference of the cable.

- **Zesco Ltd, Electric Cable 600/1000V Manufacturer's Name Description of Cable.**
- For example, for a 4-core, 70 mmsq, PVC insulated cable, the legend would read as follows:
 - **Zesco Ltd, Electric Cable 600/1000V
Manufacturer's Name 4x70mmsq
PVC/AWA/PVC**

NOTE: The bedding material is not included in the PVC/AWA/PVC naming convention.

In addition, the cable shall be sequentially marked, by indelible printing, indenting or other suitable means, at 1 m intervals, to indicate the approximate length of cable remaining on the drum. The numbers shall start with **001**, 1 m from the inner end of the cable and continue every metre to the outer end. The start and finish lengths of sequential markings (if not 0 to 500m) shall be indicated on the cable drum.

4.6 Cable Drum Marking

The drum shall be marked in legible and indelible letters on both sides of the drum giving the following information:

- Manufacturer's name and/or trademark
- Cable voltage, conductor material and cable Size
- Type of cable
- Length and weight of cable on drum
- Gross weight
- Dimensions of drum
- ZESCO stock code **081301-0014** in bold numerals
- Direction of rolling
- **NOT TO BE LAID FLAT** instruction
- Indication by 'T' that wood is treated

4.7 Protective Coverings

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600/1000V grade cables shall have an extruded black PVC oversheath.

4.8 Laying-up and Fillers

The cores of the multicore cables shall be laid-up together with suitable fillers, wormed circular and binding tapes applied overall.

The direction of lay of the cores shall be right-hand for the multicore power cables. The term "right-hand" has the same meaning as for screw threads.

4.9 Armour

The type of armour shall be round aluminium wire armour as specified in SANS 1507.

4.10 Current Carrying Capacity & Design Parameters

The maximum continuous current carrying capacity and maximum permissible continuous conductor temperature and the factors for determining such rating and temperature shall be based on IEC 60287 and subsequent amendments and all conditions prevailing on site.

4.11 Routine and sample tests

The routine and sample tests required shall be as indicated in Table 8 of SANS 1507-3.

4.12 Previous type tests results

The previous type test reports/certificates to be submitted with the bids shall be as provided in Table 8 of SANS 1507-1-3 or other equivalent standards, taking note of the following: -

When type tests have been successfully performed on a type of cable covered by SANS 1507-1-3 standard with a specific conductor cross-sectional area and rated voltage, type approval shall be accepted as valid for cables of the same type with other conductor cross-sectional areas and/or rated voltages, provided the following three conditions are all satisfied: -

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- a) The same insulation materials and manufacturing process are used;
- b) The conductor cross-sectional area is not larger than that of the tested cable, with the exception that all cross-sectional areas up to and including 185 mm² are approved when the cross-sectional area of the previously tested cable is in the range of 70 mmsq to 185 mmsq inclusive;
- c) The rated voltage of the cable being procured is not higher than the rated voltage of the tested cable, but tested to the same reference standard (SANS 1507-3 or equivalent).

Approval shall be independent of the conductor material.

5.0 TECHNICAL SCHEDULES (SCHEDULE A & B)

SCHEDULE A: MINIMUM ZESCO REQUIREMENTS

S/N	Detail	Unit	Data
1.	Description		70 mmsq 4 core PVC/AWA/PVC 600/1000V cable
2.	Maximum sustained conductor temperature	°C	70
3.	Minimum current rating (direct burial/in air)	A	232/246
4.	Ground Temperature	°C	25
5.	Ground Thermal Resistivity	K.m/W	1.2
6.	Depth of laying	m	0.5
7.	Method of Installation		Both in air and direct burial under ground
8.	Possible Exposure to Sunlight	Yes/No	Yes
9.	Material of Conductor		Stranded Annealed Copper
10.	Insulating material		PVC
11.	Number of Cores		4
12.	Core identification (Phases and Neutral)		Red, Yellow, Blue and Black
13.	Nominal System Voltage (U ₀ /U)	V	600/1000
14.	Maximum Permissible Operating Voltage	V	1100
15.	Conductor size	mm ²	70
16.	Single layer Aluminium armour		Required
17.	Armour diameter		As Per SANS 1507
18.	Type of outer sheath		Ultra violet stabilize PVC
19.	Cable length per Drum	m	500
20.	Type of drum		Treated wooden or steel
21.	Bedding material		PVC
22.	Materials used are not hygroscopic		Required
23.	Complete manufacturers' cable technical data sheets/brochure to be submitted with the bid		Required
24.	Cable Marking (as per clause 4.5 above)		Required
25.	Cable Drum Markings (as per clause 4.6 above)		Required
	Environmental parameters		
26.	Ambient temperature	°C	-1 to 45
27.	Altitude	m	1400
28.	Relative humidity	%	85
	Drawings/test certificates		
29.	Previous Type Tests Certificates/results to be submitted with the bid		Required
30.	Routine Test Results/Certificate to be provided on delivery		Required
31.	Quality assurance certification to be provided with bid		Required
32.	Applicable Standard(s)		SANS 1507



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SCHEDULE B: TO BE FULLY COMPLETED BY SUPPLIER

S/N	Detail	Unit	Bidders technical guarantees
1.	Description		
2.	Maximum sustained conductor temperature	°C	
3.	Minimum current rating (direct burial/in air)	A	
4.	Ground Temperature	°C	
5.	Ground Thermal Resistivity	K.m/W	
6.	Depth of laying	m	
7.	Method of Installation		
8.	Possible Exposure to Sunlight		
9.	Material of Conductor		
10.	Insulating material		
11.	Number of Cores		
12.	Core identification (Phases and Neutral)		
13.	Nominal System Voltage (U ₀ /U)	V	
14.	Maximum Permissible Operating Voltage	V	
15.	Conductor size	mm ²	
16.	Does the cable have a single layer Aluminium armour?		
17.	Armour diameter		
18.	Type of outer sheath		
19.	Cable length per Drum	m	
20.	Type of drum		
21.	Bedding material		
22.	Are materials used are not hygroscopic?	Yes/No	
23.	Have complete manufacturers' cable technical data sheets/brochure been submitted with the bid?	Yes/No	
24.	Will Cable Markings be provided as per clause 4.5 above?	Yes/No	
25.	Will Cable Drum Markings be provided as per clause 4.6 above?	Yes/No	
	Environmental parameters		
26.	Ambient temperature	°C	
27.	Altitude	m	
28.	Relative humidity	%	
	Drawings/Test certificates		
29.	Have previous Type Tests Certificates/results been submitted with the bid?	Yes/No	
30.	Will routine Test Results/Certificate be provided on delivery?	Yes/No	
31.	Have quality assurance certifications been provided with bid?	Yes/No	
32.	Applicable Standard(s)		