
 <b>ZESCO</b> <small>Powering the Nation &amp; the Region</small>	<b>TECHNICAL SPECIFICATION</b>	<b>Doc Number:</b> CO.14900.TCSP.000297 <b>Version: 2</b>
<b>SPMS ARTICLE CODE:</b> 081902-0001	<b>DESCRIPTION OF MATERIAL:</b> CONDUCTOR ACSR ALUMINIUM 'RABBIT' 50 MILLIMETRE SQUARED	<b>Page 1 of 7</b>

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Prepared By	Date	Reviewed By	Date	Approved By	Date
 Duncan Lungu <b>Principal Engineer - SHEQ</b>	19.05.2020	 Daniel Sichela <b>Manager – Risk Mitigation &amp; Quality</b>	19/05/2020	 Wilbroad Chanda <b>Divisional Manager – Lusaka Division</b>	21/5/2020
		 Lewis K. Bwalya <b>Chief Engineer – Electricity Services Access Project</b>	19/05/20		

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## 1.0 SCOPE


This specification covers the design, manufacture, supply, testing, performance requirements and delivery of ACSR Aluminium 'Rabbit' 50 millimetre squared Conductors.

It is not the intention to specify completely herein all the details of the design and construction of the Conductor. However, the offered conductor shall conform in all respects to 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 judgement 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
7.	Substation clearances for equipment not subject to impulse tests				
		• Phase - earth	mm	320	250
		• Phase - phase	mm	320	270
8.	Cable box clearances for fully insulated shrouded terminals	• Terminals across isolating distance	mm	380	270
		• Phase - earth	mm	100	32
		• Phase - phase	mm	125	45
		• Phase - earth over cable surface	mm	250	125

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### 3.0 ENVIRONMENTAL PARAMETERS

The conductor 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) Exposed to direct tropical sun;
- e) Frequent and severe lightning storms occurring during summer months (isokeraunic level taken to be 86 days/year); and
- f) Exposure to dust, which is prevalent for long periods in the year.

### 4.0 DETAILED REQUIREMENTS


The line conductors shall consist of aluminium conductor, steel reinforced, (hereinafter referred to as ACSR), of the cross section and having the characteristics stated in the Technical Schedules. The conductors shall comply in all aspects with the requirements of IEC 61089 or BS 215 Parts 1 & 2. The steel core wires shall be preformed so that they remain inert when the conductor is cut. The steel core shall be covered with an approved grease of applied mass per unit length.

The surface of the conductor shall be free from all imperfections visible to the unaided eye, such as nicks, indentations, etc., not consistent with good commercial practice.

The stranding of each layer of the conductor shall be as close and even as possible. The outermost layer shall be right-handed.

The aluminium shall be of the highest purity commercially obtainable and the supplier shall submit certificates of analysis giving the percentage and nature of any impurities in the metal of which wires are made. Precautions shall be taken during manufacture & storage of ACSR conductors to prevent the possibility of contamination by copper or other materials, which may adversely affect the aluminium.

The line conductors shall be supplied on drums which are constructed in accordance with relevant international standards so as to enable the conductors to be run out smoothly and in lengths as long as can be conveniently handled and erected. Drums shall be marked with type, size and length of conductor on the drum and also with an arrow to show the correct direction for rolling.

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Wooden drums battens shall be constructed from seasoned woods and be impregnated with a preservative against fungal and termite attack.

The preservative shall not react with aluminium and the barrel and sides of drums shall be covered with a waterproof paper or equivalent so as to ensure no damage to the conductors.

#### **4.1 Sample Tests**

The following sample tests shall be performed at the manufacturer's plant prior to shipment:

##### **4.1.1 Complete Conductor:**

- a) Cross-sectional area;
- b) Conductor diameter;
- c) Linear density – Mass per unit length;
- d) Surface conditions;
- e) Lay ratio and direction of lay; and
- f) Number and type of wires

##### **4.1.2 Aluminium Strand Wires:**

- a) Diameter of aluminium strand wires;
- b) Tensile strength;
- c) Resistivity at 20 deg. C; and
- d) Wrapping test.


##### **4.1.3 Galvanized Steel Wire Strands:**

- a) Diameter of steel wire strand;
- b) Tensile strength;
- c) Stress at 1% elongation;
- d) Torsion test;
- e) Wrapping test; and
- f) Mass of Zinc coating.

Samples for the above sample tests shall be taken at random from the outer end of 10% of the drums of conductor.

#### **4.2 Previous type tests**

The bidder shall provide previous type test certificates/ reports which shall include the following tests:

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- a) Joints in aluminium wires;
- b) Stress-strain curves; and
- c) Breaking strength of conductor.

#### **4.3 Joints**

There shall be no joints of any kind made in the zinc-coated steel core wire or wires during stranding.

Joints are permitted in aluminium wires unavoidably broken during stranding, provided such breaks are not associated with either inherently defective wire or with the use of short lengths of aluminium wires. Joints shall conform to the geometry of original wire, i.e. joints shall be dressed smoothly with a diameter equal to that of the parent wires and shall not be kinked.


Joints in aluminium wires shall not be closer than 15m from a joint in the same wire or in any other aluminium wire of the completed conductor. Joints shall be made by electric butt welding, electric butt cold upset welding or cold pressure welding and other approved methods. These joints shall be made in accordance with good commercial practice.

#### **4.4 Sample size**

Samples for the sample tests specified above shall be taken at random from the outer end of 10% of the drums of conductor. However, the inspection of the surface condition of the conductor shall be carried out on every drum prior to lagging.

#### **4.5 Packaging**


The conductor shall be suitably protected against damage which could occur in ordinary handling and shipping.

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## 5.0 TECHNICAL SCHEDULES (SCHEDULE A & B)

### SCHEDULE A: MINIMUM ZESCO REQUIREMENTS

S/N	Detail	Unit	Data
1	Description		50 sqmm. stranded aluminium conductor steel reinforced (ACSR)
2	Cross section area	mm <sup>2</sup>	50
3	Designation		Rabbit
4	Material of conductor		Hard-drawn Aluminium with galvanized steel core reinforcement
5	Stranding and wire diameter	No/No/mm	6/1/3.35
6	Ultimate tensile strength	kN	18.5
7	DC Resistance @ 20 °C	Ohms/km	0.5426
8	Current rating @ 30 °C	Amp	240
9	Operating ambient temperature	°C	-1 to 45
10	Maximum humidity	%	85
11	Altitude above sea level	m	1400
12	Drums		Treated wooden/ steel drums
13	Type Test certificates to be provided with bid		Required
14	Sample Test certificates to be provided on delivery		Required
15	Quality Assurance certificate to be provide with bid		Required
16	Applicable standard		IEC 61089, BS 215 Parts 1 & 2

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**SCHEDULE B: TO BE FULLY COMPLETED BY SUPPLIER**

S/N	Detail	Unit	Bidders Technical Guarantees
1	Description		
2	Cross section area	mm <sup>2</sup>	
3	Designation		
4	Material of conductor		
5	Stranding and wire diameter	No/No/mm	
6	Ultimate tensile strength	kN	
7	DC Resistance @ 20 °C	Ohms/km	
8	Current rating @ 30 °C	Amp	
9	Operating ambient temperature	°C	
10	Maximum humidity	%	
11	Altitude above sea level	m	
12	Drums		
13	Have Type Test certificates been provided with bid?	Yes/No	
14	Will Sample Test certificates be provided on delivery?	Yes/No	
15	Have Quality Assurance certificates been provided with bid	Yes/No	
16	Applicable standard		