

.Specification NO.	D-30
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**Technical Specification of
LV Aerial Bundled Conductor
(LV Twisted Cables)**

REVISION	Feb. 2018
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L.T TWISTED INSULATED CABLE

1. SCOP OF THE TENDER

This specification covers the technical requirements for the manufacture, supply, testing, packing, and delivery of High Density Polyethylene insulated (HDPE) Aluminium Cables twisted over a central bare Aluminium alloy messenger wire for use on Low Voltage (LV) overhead lines for the sizes:

- 3×70+50+16 mm²
- 3×95+70+16 mm²
- 3×120+70+16 mm²

2. GENERAL REQUIRMENT

The materials shall be of first class quality and designed for continues satisfactory operation as continuity of supply is of prime importance and to operate satisfactorily under variation of load voltage and short circuit or other conditions which may occur on the system provided that these variations are within the assigned rating of the apparatus. The materials used shall be suitable for the following climatic & soil conditions:

2.1 Ambient temperature:

Highest maximum (in the shade)	+55 °C for about 6 hours a day
Lowest minimum	10 °C
Maximum yearly average	+30 °C
Maximum daily average	+40 °C

2.2 Sun shine temperature:

Black objects under direct sunshine attain a temperature of 80 °C

2.3 Air humidity:

Maximum	92% at 40 °C
Minimum	12%
Yearly average	44%

2.4 Altitudes:

From sea level up to (1000m)

3. TECHNICAL REQUIREMENT

System Data:

Nominal system voltage	230/400V ± 10%
Highest system Voltage	600/1000 (1200) V
The rated voltage of the cables	0.6/1kV
System	3-phase, 4 wire with neutral solidly grounded
Frequency	50 HZ

4. STANDARDS

The cable shall be manufactured in accordance with the latest issue of the IEC standards.

IEC 60228	Conductors of insulated cables
IEC 60502-1	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) - Part 1: Cables for rated voltages of 1 kV (Um = 1,2 kV) and 3 kV (Um = 3,6 kV)
IEC 60540	Test methods for insulations and sheaths of electric cables and cores (Elastomeric and Thermoplastic Compounds)
IEC 60538	Electric cables, wires and cords: Methods of test for polyethylene insulation and sheath

Any other applicable standard not mentioned above.

5. DEVIATIONS:

The tenderer shall particularly mention in his tender all deviations of his offer from the specifications described in these tender documents.

6. CONSTRUCTIONAL REQUIREMENTS

The over-head cables for the L.V distribution consist of bundle assembled single core cable twisted together with a neutral messenger of insulated stranded aluminium alloy conductor. The bundle comprises three cores with neutral plus one for public lighting conductors. The conductors are round, stranded aluminium. The properties of the wire before stranding shall be:

6.1 Conductor

6.1.1 Compact stranded aluminium for phases

6.1.2 Stranded aluminium alloy for messenger

6.1.3 Soled aluminium for street lighting

6.1.4 The resistance of each conductor at 20 °C shall not exceed the appropriate maximum value given in IEC 60228

6.2 Insulation:

The insulation shall be extruded black, weather - resistant, high density polyethylene (HDPE). The (HDPE) compound shall be treated with anti-UV chemicals to prevent ultra violet radiation (UV) attack by sunlight. The thickness for main conductors and messenger Conductor shall be 1.6mm for the size (95 & 120) mm², 1.4mm for the size (50 & 70) mm², and 1.2 mm² for Street Lighting conductors.

6.3 Phase identification:

6.3.1 Durable and clearly visible longitudinal ridges shall be providing on each insulated conductor for identification phases.

- **Phase conductors (2, 3, 4)**
- **Neutral conductors (Messenger) (1)**
- **Street lighting No marking**

6.4 Messenger (Neutral Conductor)

6.4.1. The messenger shall be an All Aluminium Alloy conductor composed according to IEC 60228, drawn from rod, which is manufactured in a continuous casting and rolling procedure.

6.4.2. No joints are allowed in the messenger except those made on the base rod or wire before final drawing. The messenger shall be round, stranded and compacted to have smooth round surface. The messenger takes all the mechanical stress and also serves as neutral conductor.

7. Electrical Characteristics and Test

7.1 Nominal voltage of ABC cables is 0.6/1 kV.

- **Dielectric strength: Cores shall be designed to withstand without breakdown the application of 10 kV voltage during 1 minute.**
- **Impulse withstand: Cores shall be designed to withstand without breakdown a standard impulse voltage sequence 1.2/50 μ s of positive and negative polarity with a peak value equal to 20 kV.**
- **Routine test: 4 kV/15 minutes**

7.2 Cable structure conductors

The conductor cross sectional area shall be circular. The strands of phase and neutral conductors shall consist of hard drawn aluminum alloy according to IEC 60 889. The aluminum strands used for the construction of phase and neutral conductors for bundles shall have, before stranding, an ultimate tensile stress at least equal to 120 MPa.

8. PACKING

8.1 The cable shall be wound on non-returnable wooden drums. The drums shall be covered with heavy wood lagging after winding the cable. The ends of the cable shall be sealed by means of non-hygroscopic sealing materials. Two name plates shall be fixed on each cable drum; the name plates shall contain the following information.

- a. Manufacturer's Name or Trade Mark.**
- b. Type of cable and voltage grade.**
- c. Drum number or identification number.**
- d. Number of cores and size of cable.**
- e. Number and length of pieces of cable in each drum.**
- f. Gross and Net mass of the cable.**
- g. Direction of rotation of drum. (By means of an arrow).**

- h. MoE Monogram.**
- i. purchase order number.**
- j. packing list.**

8.2 The drums shall be of such construction as to assure delivery of conductor in the field free from displacement and damage, and shall be able to withstand all stresses due to handling and the stringing operation so that cable surface is not dented, scratched or damaged in any way during transport and erection. The cable shall be properly lagged on the drums.

8.3 The cable drum should be suitable for wheel mounting.

8.4 Each drum shall be 1000m \pm 5%.

Note: The total length of the cable on drums should not exceed the total required amount stated in the contract. Otherwise, any extra amount should be free of charge.

9. MARKING

All the cables shall have the markings embossed on the insulated phase conductors for identification at regular intervals of not more than one meter.

- a. Voltage designation (600/1000) V**
- b. HDPE**
- c. Numbering total length of the cable**
- d. MoE Monogram**

10. DOCUMENTATION

The bidder shall submit its tender complete with technical documents required by Appendix for tender evaluation. The technical documents to be submitted (all in English Language) for tender evaluation shall include the following:

- a) Fully filled clause by clause description of the item on offer as per Appendix and signed by the manufacturer.**
- b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data.**

ANNEX

SCHEDULE OF TECHNICAL INFORMATIONS to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, copies of complete type test reports and accreditation certificate to ISO (or the third party testing laboratory).

Sr. no.	Description	Unit	Bidder Data
1	Manufacturer's Name and address		
2	Country of manufacture		
3	Bidders Name and address		
4	Applicable standards		
5	Insulation material of phase conductors		
6	Insulation thickness of phase conductors	mm	
7	Design details and drawings		Provide drawing
8	Applicable standards	Phase conductors	
		Insulation material	
		Messenger	
9	Number of strands	Phase conductors	
		Messenger	
10	Nominal diameter of strand	Phase conductors	mm
		Messenger	mm
11	Max diameter of bare conductor	Phase conductors	mm
		Messenger	mm
12	Nominal cross-section area of bare conductor	Phase conductors	mm ²
		Messenger	mm ²
13	DC resistance at 20 °C max	Phase conductors	
		Messenger	
14	Tensile strength of (min)/breaking load	Phase conductors	kN
		Messenger	kN
15	Diameter of insulated conductor	mm	
16	Total weight	kg/km	
17	Standard drum length offered and tolerance	Meter	
18	Gross weight of the cable drum	kg	
19	Short circuit current for 1 Sec. Max.	KA	
20	Sizes of conductors	mm ²	
21	Insulation material is black and weather resistant		

22	Tensile strength of wires before stranding		N/mm²	
23	UV stability test on insulation material			
24	Tensile strength of insulation		N/mm²	
25	Elongation (%) at break			
26	Phase identification			
27	Tensile strength at 20 °C		N/mm²	
28	Breaking load			
29	Manufacturer's Warranty			