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A. AERIAL BUNCHED CABLES FOR 11kV LINES

SCOPE : This specification covers requirements of XLPE insulated, 11kV Aerial Bunched Cables for overhead lines.

1.0 Qualifying Requirement of AB Cable Manufacturer/Supplier

The manufacturer should have manufactured, successfully type tested and supplied at least one hundred (100) kms of 11k V or above voltage grade XLPE armoured and/or AB cable in the last five (5) years as on the date of bid opening.

2. COMPOSITION OF THE CABLE

The composite cable shall compose three single-core cables twisted around a bare aluminium alloy messenger wire, which will carry the weight of the cable.

3. RATED VOLTAGE

The rated voltage of the cables shall be 6.35 kV/11kV and the maximum operating voltage shall be 12 kV

4. APPLICABLE STANDARDS

Unless otherwise stipulated in this specification, the following standards shall be applicable:

- i) IS:7098 (part-II) – 1985 – Cross linked Polyethylene Insulated PVC Sheathed Cables
- ii) IS:8130-1984-Conductors for Insulated Cables
- iii) IS:398 (Part-IV) – 1979 – Aluminium Alloy Conductors

5. DETAILS OF SINGLE CORE CABLE

5.1 The cable conductors shall be of round, stranded and compacted aluminium of nominal cross sectional area 35 mm² and 70 mm². Corresponding nominal conductor diameter and number of wires in the conductor shall be as given in clause 5.7.

5.2 Conductor Screen

The conductors screen shall be of extruded semi-conducting cross linked polyethylene compound of thickness not less than 0.5 mm.

5.3 Insulation

The Insulation screen shall be as per IS:7098 (Part II).

5.4 Insulation screen

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The Insulation screen shall comprise extruded semi-conducting compound and/or semi-conducting tape. Thickness of the screen shall be not less than 0.6 mm.

5.5 Metallic Screen

The metallic screen shall consist of aluminium tape/sheath of thickness not less than 0.2 mm.

5.6 Outer Sheath

The outer sheath shall be black polyethylene. The nominal thickness of sheath shall be 1.8mm and it shall conform to the technical requirements of ST-3 of EIC-502

5.7 Dimensional and Electrical Data

The Dimensional and Electrical Data for single –core cable is given below:

S.No.	Description	Nominal area of conductors	
		35 mm ²	70mm ²
I.	Nominal conductor diameter(mm)/No. of wires in conductor	6.8/6	10/12
II.	Approx over dia of cable (mm)	22	25
III.	Max D.C. resistance at 200c Ohm/Km	0868	.443
IV.	Max SC current for 1 Sec. KA	3.4	6.7
V.	Max continuous load (amps)	106	156

Note: Due to limitation of short circuit current rating, it is recommended that 70mm² cable is used the base line for the first 4-5kms from the 33/11kV substation and thereafter the lower size of cable i.e. 35mm² can be used depending upon the line loading .Normally the current loading of 70mm² cable should not exceed 145amps and that of 35mm² cable as 95 amps .For a maximum ambient temperature of 50⁰C.

6. MESSENGER (NEUTRAL CONDUCTOR)

- 6.1 The bare messenger wire shall be of 70 mm² (nominal area) aluminium alloy, generally conforming to IS:398 (Part IV) – 1979, comprising of seven (7) strands and shall be suitably compacted to have smooth round surface to avoid damage to the outer insulating sheath of single-core phase cables twisted around the messenger.
- 6.2 There shall be no joints in any wire of the stranded messenger conductor except those made in the base rod or wire before finally drawing.
- 6.3 The technical characteristics of messenger wire shall be as follows:

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i.	Nominal sectional area(mm ²)	70
ii.	Nos. of wire	7
iii.	Nominal dia of wires /compacted conductor (approx.)mm	3.5/10
iv.	Approx. Mass kg/Km	184
v.	D.C resistance at 20°C Ohm/Km	0.493
vi.	Breaking load(KN)	20
vii.	Modulus of elasticity (approx) KN/mm ²	59
viii.	Coefficient of linear expansion	23X10 ⁻⁶ °C

Note: the value of item v above is to be guaranteed. A tolerance of (-) 5% is permissible on the value in item vi above.

7. DESIGNATION AND PARAMETER OF FINISHED CABLES

The designation and parameter of finished cables are given in the following table:

S.No.	Designation	Complete bunched cables	
		Overall dia approx mm	Total mass(Approx.)Kg/Km
I.	3 x 35+70	53	1450
II.	3 x 70+70	59	1900

Note: the first part of the designation refers to the number and size of phase conductor and the second to the size of messenger wire. The sizes shown represent the nominal cross sectional area in mm.

8. TESTS

8.1 The following tests shall be carried out on the single-core cables as per IS-7098 (Part-II).

8.1.1 Type Tests

- a) Tests on conductor:
 - i) Tensile test
 - ii) Wrapping test
 - iii) Resistance test
- b) Tests for thickness of insulation and sheath
- c) Physical tests for insulation:
 - i) Tensile strength and elongation at break
 - ii) Agency in air oven
 - iii) Hot test
 - iv) Shrinkage test
 - v) Water absorption

- d) Tests for outer sheath:
 - i) Tensile strength and elongation at break
 - ii) Ageing in air oven
 - iii) Shrinkage test
 - iv) Hot deformation
 - v) Bleeding and blooming test.
- e) Partial discharge test
- f) Bending test
- g) Dielectric Power factor test:
 - i) As a function of voltage
 - ii) As a function of temperature
- h) Insulation resistance test
- g) Heating cycle test
- k) High voltage test
- l) Flammability test

8.1.2 Acceptance Test

- a) Tensile Test
- b) Wrapping Test
- c) Conductor resistance test
- d) Test for thickness of insulation and sheath
- e) Hot set test for insulation
- f) Tensile strength and elongation at break test for insulation and sheath
- g) Partial discharge test
- h) High voltage test
- i) Insulation resistance (volume resistivity) test

8.1.3 Routine Tests

- a) Conductor resistance test
- b) Partial Discharge Test
- c) High voltage test

8.2 The following tests shall be carried out on the bare messenger wire in accordance with IS:398 (Part-IV).

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Type Tests/Acceptance Test

- a) Breaking Load Test (on finished wire)
- b) Elongation Test
- c) Resistance Test

9. **PACKING AND MARKING**

9.1 **Packing**

Cables shall be supplied in returnable wooden drums conforming to IS: 10418. The standard length of the bunched cable in each drum shall be 500 meters (+/-) 5%. Other lengths may be acceptable subject to the approval of employer/purchaser.

9.2 **Marking**

The Cable drum shall carry the information as per the requirements of IS: 7098 (Part-II). However, exact details of marking/embossing, color of outer sheath etc. Will be as per the detailed purchase order.

- 9.3 Suitable identification marks shall be given on the outer sheath to clearly distinguish three phases of the bunched cable.