

'ISI' MARKED L.T. AERIAL BUNCHED CABLE

1.0. **SCOPE:** - This specification covers the design, manufacturing, testing and other relevant requirements for supply of cross linked polyethylene insulated aluminium cables twisted over a central bare Aluminium alloy messenger wire for use on LT overhead lines.

2.0. **RATED VOLTAGE:** -The rated voltage of the cable shall be 1100 volts.

3.0. **SERVICE CONDITIONS:**

The cables to be supplied under this specification shall be suitable for satisfactory operation under following service conditions:

- (a) Maximum ambient temperature : 50 to 55 Deg. Centigrade
- (b) Maximum/minimum temperature : 45 to 04 Deg. Centigrade under shade.
- (c) Maximum relative humidity : 95% to 100% sometimes.
- (d) Average No. of thunderstorm days per annum : 40
- (e) Months of tropical monsoon condition in the year : June to October

4.0. **APPLICABLE STANDARDS:** - Unless otherwise stipulated in this specification, the following standards with latest amendments, if any, shall be applicable:

(i)	IS: 14255:1995	Aerial bunched cable for working voltage up to and including 1100 volts.
(ii)	IS: 8130:1984	Conductor for insulated electric cables and flexible cords.
(iii)	IS: 10418:1982	Drums for electric cables.
(iv)	IS: 10810:	Methods of test for cables.
(v)	IS: 7098: (Pt -I) 1985	Cross linked Polyethylene insulated PVC sheathed cables for voltages upto 1.1 KV
(vi)	IS:398(P-IV)- 1979	Aluminium alloy stranded conductors (Aluminium-magnesium- silicon type)(second revision)

5.0. **GENERAL TECHNICAL REQUIREMENTS:**

The insulated phase conductors shall be twisted around the bare messenger wire, which shall take all the mechanical stress.

6. **CONDUCTORS:**

6.1. The conductors shall be made of H2 or H4 grade aluminium and shall be round and stranded in construction and shall be insulated with cross-linked polyethylene compound suitable for 1100 V insulation.

The insulated conductor should confirm to the requirement of IS (i), (ii) and (v) in clause 4 above.

6.2. The phase conductors shall be suitably compacted. The standard size and technical characteristics of the phase conductors shall be as specified in the table given in Schedule-II enclosed.

6.3. The tensile strength of the aluminum wires used in the conductors shall be more than 90N/mm².

6.4. The phase conductors shall be provided with one, two or three ridges for the purpose of core identification.

7.0. MESSENGER WIRE:

7.1 The bare messenger wire shall be made of aluminium alloy generally confirming to IS-398 (P-IV) -1979 composed of 7 strands and shall be suitably compacted to have smooth round surface to avoid damage to the cross linked polyethylene insulation of the conductors twisted around the messenger. The size and the other technical characteristics of the messenger wire shall be as specified in the table-2 given in Schedule-II.

7.2 There shall be no joints in any wire of the messenger conductor except those made in the base rod or wires before final drawing.

8.0. INSULATION: -

Extruded cross-linked polyethylene nominal insulation shall generally confirm IS: 7098 (Pt-I)/1988 & IS: 14255/1995. The smallest of measured value of thickness of insulation shall not fall below the standard thickness value as specified in IS: 14255/1995 by more than $0.1 \text{ mm} + 0.1 \times t_i$ in mm (where t_i – nominal thickness). The XLPE insulation should have following specific requirement.

1. It should be U.V. resistant which shall be ensured by adding 2.5%, +/- 0.5% Carbon Black in XLPE in well dispersed manner.
2. Tensile strength of insulation should be Min—15 MPa
3. Ageing should be 240 hrs at 135 degrees centigrade

9.0. TESTS:

9.1. **Type Test:-** The type test reports submitted should not be older than 5 years for all offered sizes of LT XLPE Aerial Bunched Cables as per IS:14255 from any reputed Govt. test Laboratory/Independent testing lab having accreditation issued by NABL. The tenderer shall confirm that they will supply the material exactly for the design for which type test have been conducted.

- a) Test on conductor:
 - i) Tensile test (IS: 8130)
 - ii) Wrapping test (IS: 8130)
 - iii) Resistance test (IS: 8130)
- b) Test on messenger wire:
 - i) Breaking load (IS:398-part-IV)
 - ii) Elongation test (IS: 398-part-IV)
 - iii) Resistance test (IS: 398-part-IV)
- c) Physical test for XLPE insulation

- i) Tensile Strength and Elongation at break.
- ii) Ageing in air oven.
- iv) Hot set test.
- v) Shrinkage test.
- vi) Water absorption (Gravimetric).
- vii) Carbon black 1. Content & 2. Dispersion
- d) Test for thickness of insulation
- e) Insulation resistance test
- f) High voltage test

9.2. **ACCEPTANCE TEST**: All test at Sl. No. a, b, d, e, f of Clause 9.1 including Hot set test for XLPE insulation and Tensile Strength & Elongation at break test.

Besides above, physical checking of dimensions of the cable shall also be done. All the above acceptance test will be carried out by CSPDCL's representatives as per relevant ISS at the time of material inspection for the purpose of clearing the lot offered by the tenderer. Acceptance test shall be carried out in each type and size of cable, on cable drum selected at random as per sampling plan in accordance with IS: 14255.

9.3 **ROUTINE TEST**: - The following shall constitute routine test: -

- a) Conductor Resistance Test.
- b) High Voltage test

The above routine test shall be conducted by the tenderer in accordance with relevant ISS and test certificates in proof of this shall be submitted to this office along with each inspection offer. In absence of routine test certificate the inspection offer shall be considered as fake and all complication arising out of this shall be to the suppliers account.

9.4. **BENDING TEST ON THE COMPLETE CABLE**:

The test shall be performed on a sample of complete cable. The sample shall be bent around a test mandrel at room temperature for at least one complete turn. It shall then be unwound and the process shall be repeated after turning the sample around its axis 180 degree. The cycle of these operation shall then be repeated twice more. The diameter of the mandrel shall be $10(D+d)$.

Where D = actual diameter of the cable mm (i.e. the minimum circumscribing circle diameter)

d = actual diameter of the conductor mm

No cracks visible to the naked eye are allowed.

10. **PACKING AND MARKING**: -

The drum shall be marked with the following: -

- i) Manufacturer's name, brand name or trade marked
- ii) Type of the cable and voltage grade
- iii) Drum No. or Identification No.
- iv) Size of Conductor with No. of cores
- v) Size of Messenger wire
- vi) Name of purchaser i.e. CSPDCL, Order No. & Date
- vii) No. and Length of pieces of cable in each drum

- viii) Gross mass of the packing
- ix) Net mass of cables
- x) ISI mark i.e. IS:14255

The drum shall be of such construction as to assure delivery of cable in the field free from displacement and damage and should be able to withstand all stresses due to handling and the stringing operation so that cable surfaces are not dented scratched or damaged in any way during transport and erection. The cable shall be properly lagged on the drum. The cable drum should be suitable for wheel mounting.

11.0. STANDARD LENGTH:

The normal length of each cable shall be 500 meters while longer shall be acceptable up to 1000 meters, shorter length not less than 50% of the standard length shall be acceptable to the extent of 5% of the ordered quantity.

12.0 INSPECTION:

All the tests and inspection shall be made at the place of manufacturer unless otherwise specially agreed upon the manufacturer and purchaser at the time of purchase. The manufacturer shall offer all reasonable facilities to the purchaser, without charges to satisfy him that the material is being furnished in accordance with the specification.

TECHNICAL AND DIMENSIONAL DATA OF AERIAL BUNCHED CABLE

Table – 1: Dimensional data of Phase & street light conductor of 1100 volt aerial bunched cable:

SN	Nominal cross sectional area(mm²)	No. of wires	Max. DC resistance at 20°C Ohm/km	Nominal insulation Thickness (mm)
1	16	7	1.91	1.2
2	25	7	1.20	1.2
3	35	7	0.868	1.2
4	50	19	0.641	1.5
5	70	19	0.443	1.5
6	95	19	0.320	1.5
7	120	37	0.253	1.5

Table – 2: Dimensional data of Al. Alloy messenger wire:-

Cross sectional area	No. of wires	Breaking load	Max. DC resistance at 20°C
Nom. mm²	Min. nos.	Min. KN	Max Ohm/km
25	7	7.0	1.38
35	7	9.8	1.38
50	19	9.8	0.986
70	19	14.0	0.689
95	19	19.7	0.492

Note: -Tolerance of $\pm 5\%$ is allowed on conductor diameter.

Table – 3: Composition and designation of finished cables.

SN	Designation of cable in Sqmm
1.	3x120+1x16+1x95
2.	3x95+1x16+1x70
3.	3x70 + 1x16 + 1x50
4.	3 x50 +1x16 + 1x35
5.	3x35 + 1x16 + 1x25
6.	3x25 + 1x16 + 1x25
7.	3 x16 + 1x25
8.	1x25 + 1x16 + 1x25

Note: - The first part of the designation refers to the number & size of the phase conductors, the middle to the street light/neutral conductor (for all except S.No.- 5) and the last to the bare messenger wire. The sizes shown are the nominal cross sectional areas.

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