SPCIFICATION FOR L.T.AERIAL BUNCHED CABLES

1. SCOPE :

This specification covers the requirement of cross linked polyethylene insulated aluminium cables twisted over a central bare aluminium alloy messenger wire for use on L.T. overhead lines in electrification system.

RATED VOLTAGE :
The rated voltage of the cables shall be 1100 Volts.

2. **SERVICE CONDITIONS:**

Equipment to be supplied against the specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

2.1	Maximum ambient temperature (Degree C)	50
2.2	Maximum temperature in shade (Degree C)….	45
2.3	Minimum temperature of Air in Shade (Degree C)..	3.5
2.4	Relative Humidity (Percent)	10 to 100
2.5	Maximum annual rain fall (mm)	1450
2.6	Maximum wind pressure (Kg/sq.mm.)	150
2.7	Maximum altitude above mean sea level (Metres)	1000
2.8	Isoceraunic level (day per year)	50
2.9	Siesmic level (Horizontal Acceleration)	0.3 g
2.10	Ground Temp.	30 Degree C
2.11	Moderately hot and humid tropical climate Conducive to rust and fungus growth	

3. **STANDARDS:**

APPLICABLE STANDARDS :
Unless otherwise specified elsewhere in this specification the rating as well as performance and testing of the L.T.A.B. cables shall conform to the IS: 14255/1995 or the latest revision available at the time of placement of order and bearing ISI mark. In addition the following Standards (or the latest version thereof) shall be applicable :

i) IS 8130 - 1984 cross linked polyethylene insulated aluminium cables.
ii) IS 398 (Part - IV) - 1994 Aluminium alloy conductors.

4. GENERAL TECHNICAL REQUIREMENTS :-

The insulated phase conductors (with additional street lighting conductor, if provided) shall be twisted around the bare aluminium alloy messenger wire, which shall take all the mechanical stress. The messenger wire can also serve as the earth cum neutral wire.

5. PHASE/NEUTRAL CONDUCTORS :

The conductors shall be made of aluminium & shall be stranded in construction and shall be insulated with black weather resistant cross linked polyethylene suitable for 1100 Volts insulation. The insulated conductors shall generally conform to the standards (i) and (ii) quoted in clause 3 above.

The conductors shall be suitably compacted. The outer diameter shall be within the limit as specified in 5.3 below :

5.1 The conductors shall be provided with one, two and three ridges for quick identification.

5.2 The tensile strength of the aluminium wires used in the conductors shall not be less than 90 N/ sq.mm.

5.3 The standard size and technical characteristics of conductors shall be as shown in the following table :

Nominal Sectional Area (sq.mm)	Diameter of compacted conductor (mm)	Max.DC resistance at 20 Deg. (0hm/km)	Insulation thickness (mm)	Approx. mass (kg/km)	Minimum No. of Strands
(1)	(2)	(3)	(4)	(5)	(6)
16	4.4	1.91	1.0	42	6
35	6.8	0.868	1.0	95	6
50	7.9	0.641	1.2	127	6
70	9.6	0.443	1.4	184	12
95	11.3	0.320	1.4	254	15
120	12.7	0.253	1.6	320	15
150	14.2	0.196	2.1	382	17

NOTE :-

(A) The resistance values given in col.3 are the max. Permissible.

(B) Tolerance of + 5 % is allowable on diameters shown in Col. 2.

6. **MESSENGER WIRE** :

The bare messenger wire shall be made of aluminium alloy generally conforming to IS - 398 (part - IV) - 1994 or the latest version thereof composed of 7 strands and shall be suitably compacted to have smooth round surface to avoid damage to the insulation of the phase conductors twisted around the messenger.

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

6.2 The sizes and other technical characteristics of the messenger wire shall be as given in the following table :

Nominal Sectional Area (sq.mm.)	Diameter of compacted conductor (mm)	Approx Mass (kg/km)	Max.DC resistance at 20 Deg. (0hm/km)	Minimum Tensile Strength. (KN)
(1)	(2)	(3)	(4)	(5)
25	5.8	65	1.380	7.4
35	6.8	95	0.968	10.3
50	8.1	130	0.690	14.7
70	9.6	185	0.493	20.6
95	11.2	210	0.398	26.3
120	13.7	287	0.312	33.2

Note :-

While the limiting values in Col. 4 & 5 are to be guaranteed a tolerance of + 5 % will be

permissible on values in Col. 2.

7.0 **CROSS LINKED POLYETHYLENE INSULATION :**

The polyethylene insulation shall generally conform to IS: 14255 / 1995 or the latest version thereof. The following properties shall be guaranteed by the supplier

Melt flow index	0.5 or less
Yield Stress	Not less than 8 N/sq.mm
Percentage elongation	Not less than 350
Carbon black content	Between 2 and 3
Vicat Softening Point	Not less than 85 Deg. C
Insulation resistivity:	
at 27 Deg.C	1x10 (15) ohm cm (Min)
at 70 Deg. C	1x10 (13) ohm cm (Min)

8.0 COMPOSITION AND DESIGNATION OF FINISHED CABLES:

The composition and designation of finished cables are given in the flowing tables:

Sr.No	Designation	Complete Bunched Cables	
		Overall dia approx	Total mass approx
		(mm)	(kg/km.)
1.	3x50+16+35	32	640
2.	3x70+16+50	34	890
3.	3x95+16+70	39	1180
4.	3x120+16+95	42	1430
5.	3x150+16+120	49	1905

Note : -

The first part of the designation refers to the number and size of the phase conductor, the middle to the street lighting conductor (where provided) and the last to the bare messenger wire. The sizes shown are the nominal sectional areas.

9.0 TESTS FOR PHASE CONDUCTORS:

9.1 TYPE TESTS:

All the type tests are detailed below in accordance with relevant IS , amended upto date , shall be performed on cable samples drawn by the purchaser.

Type tests are required to be carried out from the first lot of supply on a sample of any one size of cable ordered. In case facilities of any of the type test is not available at the works of the supplier, then such type tests shall be carried out by the supplier at an independent recognized laboratory at the cost of supplier. Sample for the type test will be drawn by the purchaser's representative and the type tests will be witnessed by him.

Supplier, however, can claim exemption from carrying out type tests as above, provided such type tests were already conducted for the UPPCL in the past within five years and the test certificates thereof submitted to authorities may grant waival from carrying type tests, if the type test certificates are acceptable . In case of other Government recognized laboratories / Test House valid approved Government certificate shall be enclosed along with test certificate.

TYPE TESTS :

a)	Conductor Resistance Test	(IS : 8130)
b)	Test for thickness of insulation	(IS : 14255)
c)	Physical tests for polyethylene insulation	(IS : 14255)
d)	Test for bleeding and blooming of pigment	(IS : 14255)
e)	Insulation Resistance Test	(IS : 14255)

f) High voltage test including water immersion test (IS : 14255)

9.2 **ACCEPTANCE TESTS :**

All tests as per 9.1 except (c) and (d)
In addition, check of diameter values as per clause 5.5.

10.0 TESTS FOR MESSENGER :

10.1 TYPE TESTS :

a) Breaking load test (to be made on the finished conductors) (IS:398-PART-IV)
b) Elongation test (IS:398-PART-IV)
c) Resistance test (IS:398-PART-IV)

10.2 ACCEPTANCE TESTS:

All tests indicated in clause 10.1 above.
In addition, check of diameter values as per clause 6.3

11.0 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 it's axis 180 Deg. The cycle of these operations shall then be repeated twice more. The diameter of the mandrel shall be

$$10 (D + d)$$

Where D = actual diameter of the cable (i.e. the minimum circumscribing circle diameter) , in mm
d = actual diameter of the conductor, in mm No cracks visible to the naked eye are allowed.

12. PACKING AND MARKING

12.1 The cables shall be wound non-returnable wooden drums conforming to IS : 1778 / 1961 or the latest version thereof (specification for Reels & Drums for bare wire). The drum shall be marked with the following.

a. Manufacturer's name.
b. Trade mark, if any.
c. Drum number or identification number.
d. Size of conductors.
e. Size of messenger
f. Voltage grade.
g. Number and lengths of pieces of cable in each drum
h. Gross mass of the packing.
i. Net mass of cable,
j. ISI mark.

12.2 The drums shall be of such construction as to ensure delivery of conductor 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 surface is not dented, scratched or damaged in any way during transport and erection. The cable shall be properly lagged on the drum.

12.3 The cable drum should be suitable for wheel mounting.

12.4 The mass of finished cable in a drum (without mass of drum) of various designations shall not exceed by more than 10 % of the actual values.

12.5 The normal length of each cable shall be 500 meters with plus / minus 5 % tolerance. While longer lengths shall be acceptable, shorter lengths not less than 100 meters shall be acceptable to the extent of 5 % of the ordered quantity.

13.0 INSPECTION:

All tests and inspection shall be made at the place of manufacture unless otherwise especially agreed upon by the manufacture and purchaser at the time of purchase. The manufacturer shall afford the inspector representing the purchaser all reasonable facilities without charge, to satisfy him that the material is being furnished in accordance with this specification.

14.0 QUALITY ASSURANCE PLAN :

A detailed list of bought out items which got into the manufacture of cables should be furnished indicating name of the firms from whom these items are procured. The bidder shall also give the details of quality assurance plan followed by him in respect of the raw materials, in process, final inspection, packing and marking. Company may at it's option order the verification of these plans at manufacturer's works as a pre qualification for technically accepting the bid. During verification if it is found that firm is not meeting with quality assurance plan submitted by the firm, the offer shall be liable for rejection

15 SCHEDULES:

15.1 The tenderer shall fill in the following schedules which are part and parcel of the tender specification and offer.

Schedule A' - Tenderer's Experience

15.2 The tenderer shall submit the list of orders for similar type of equipments, executed or under execution during the last three years, with full details in the schedule of Tenderer's experience (Schedule X) to enable the purchaser to evaluate the tender.

SCHEDULE A TENDERER'S EXPERIENCE

Tenderer shall furnish here a list of similar orders executed/under execution by him to whom a reference may be made by Purchaser in case he considers such a reference necessary.

Sr No	Name of the client & description order	Value of order	Period of supply and commissioning	Name & address whom reference may be made
1	2	3	4	5

Name of the firm

Name & signature of tenderer

Designation

Date ----------
SEAL & SIGNATURE OF THE TENDERER