BSES

Technical Specification of

LT Aerial Bunched Cable

Specification no – BSES-TS-02-LTAB-R0

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ANNEXURES

1. SCOPE

This specification covers design, engineering, manufacture, assembly, stage testing, inspection & testing before supply and delivery at site at of cross linked polyethylene (XLPE) insulated cables with aluminum conductors and a messenger wire of aluminum alloy to be used for overhead LT distribution system. The size are-

i) 3CX150 (Ph) + 1CX150 (N) + 1CX125 (M) + 1CX16 (SL)
ii) 3CX95 (Ph) + 1CX95 (N) + 1CX70 (M) + 1CX16 (SL)
iii) 3CX50 (Ph) + 1CX50 (N) + 1CX35 (M) + 1CX16 (SL)

These cables are to be used for three (3) phase 4 wire systems with neutral solidly earthed rated voltage upto and including 1100V.

This specification defines the requirements (electrical, mechanical properties etc.) and tests to be performed on the LT Aerial Bunched cables.

2. REFERENCES

This specification shall be governed by following standards with all amendments unless otherwise specified in this specification.

- IS:8130 - Conductors for Insulated cables
- IS:398 (Part IV) - Messenger conductor
- IS:10810 - Methods of test for cables
- IS:14255 - Aerial Bunched cables for 1100V
- IS:10418 - Drums for Electric Cables
- IEC 60502, Part 1, 2004 - Power Cables with extruded Insulation, cables for rated voltages of 1kV and 3kV
- NFC 33-209 - Bundle Assembled Insulated Cables.
- HD 626 (CENELEC standard) – Overhead distribution cables of rated voltage Uo / U(Um): 0.6/1(1.2) KV

NOTE :

This specification has mostly considered references from Indian Standards. However, certain references have also been derived from the

above referred International standards wherever deemed suitable in meeting the onerous site requirements of Delhi Discom.

3. DEFINITIONS

3.1 A LT Aerial Bunched cable shall typically, at maximum, comprise of: Insulated phase conductors (3 numbers), Insulated neutral conductor (1 number), Insulated street lighting conductor (1 conductor) and a bare messenger wire (1 number).

Example :

i) Designation

3 x 150 (P) + 1 x 150 (N) + 1 x 125 (M) + 1 x 16 (SL)

P=Phase Conductor
N=Neutral Conductor
M= Messanger
SL=Street Light Conductor

ii) Size

3 x 150 sq. mm	= 3-phase conductors.
1 x 150 sq. mm	= 1 neutral conductor
1 x 125 sq. mm.	= 1 messenger wire
1 x 16 sq. mm.	= 1 lighting conductor

3.2 **Messenger Wire**: As defined in NFC 33-209 “Wire or cable which has principal function of supporting the cable in overhead systems and which may be separate or may be an integral part of the cable which it supports”. Messanger wire should be bare conductor.

4. SITE CONDITIONS

Sl.No.	Description	Data
1	Relative Humidity	
	a) Maximum	100%
	b) Minimum	10%
2	Average annual rainfall	750 mm
3	Average no. Of rainy days	50 per annum
4	Temperature max/min /year Average	50/0/40degree C
5	Average no. Of Thunder storm Days	40 per annum
6	Altitude (Above mean sea level)	not exceeding 300 mtrs
7	Rain months	June to October
8	Wind pressure	as per IS 975

5. SPECIFICATIONS

5.1 Conductor

The Aluminum conductor shall be of circular cross section, stranded and compacted. They shall be of H2 or H4 grade (complying with IS: 8130:1984) and per the following:

a) Upto and including 50 sq. mm. conductors = H2 grade.
b) All sizes above 50 sq. mm. conductors = H4 grade.

5.2 Messenger Wire

The messenger wire shall be stranded, circular, aluminum – magnesium – silicon alloy type. They shall have minimum 7 strands.

They shall comply with IS 398 (part 4). Specific attention is made to Tables – 1, 2 & 3 of IS 398.

5.3 Conductor Insulation

5.3.1 The cross-linked polyethylene (XLPE) insulating shall be black in colour and to be stabilized against deterioration caused by exposure to direct sunlight and ultraviolet radiation conforming to requirement specified in Table – 1 of IS : 14255 – 1995 or IEC 60502. XLPE insulation shall be pressure extruded

5.3.2 The nominal value of the carbon black content of the sheath (insulation) shall be 2.5 with a tolerance of ± 0.5% (Table 20 of IEC : 60502-1, 2004)

5.3.3 The XLPE material shall be preferably of BOREALIS, DOW or any other make subject to the prior written approval of the buyer.

5.3.4 The average thickness of insulation shall comply to Table – 4 of IS : 14255 – 1995. For nominal area of conductors above 95 sq. mm., the average thickness of insulation shall not be less than the nominal value mentioned hereunder :

Nominal Area of Conductor (sq. mm.)	Nominal Thickness (mm.)
150	1.8

5.3.5 All other requirements related to insulation shall comply to clause 7 of IS : 14255 – 1995.

5.4 Core Identification

The core identification shall be as per clause no. 8.1 of IS : 14255 – 1995. Ridges shall be provided over phase core and neutral core also.

5.5 Laying of Cores

The assembly (laying up) of cores shall be as per clause 9 of IS : 14255 – 1995.

5.6. Embossing on cores.

All the cable shall have the following embossing on insulated neutral conductor for identification in interval not more than 2 mtrs. Font size of letters to be min. 5 mm.

i. Name or trade mark of manufacturer
ii. Voltage grade
iii. Type of cable, i.e LT ABC
iv. Size of phase conductor, i.e. 150 sqmm.
v. Size of messenger conductor, i.e 125 sqmm
vi. Year and month of manufacturing.
vii. Type of insulation, i.e XLPE
viii. Name of purchaser
ix. P.O. Number

6. TESTS

6.1	Routine test	a. Conductor resistance test.
		b. Messenger resistance test.
		c. High voltage test in water (Duration of immersion > 10 minutes)
6.2	Acceptance test	Sampling to be done as per IS: 14255:1995, Annexure-A.
		a. Tensile test for phase and street light conductor
		b. Wrapping test for phase and street light conductor
		c. Conductor resistance test.
		d. Direction and ratio of lay in the outer layer of conductor
		e. Breaking load test for messenger conductor and street light conductor.
		f. Messenger resistance test.
		g. Elongation test for messenger conductor
		h. Direction and ratio of lay for messenger conductor.
		i. Thickness of insulation.
		j. Tensile strength and elongation at break of insulation
		k. Hot set test for insulation.

		l. Carbon black content
		m. Insulation resistance test at room temperature and 90 deg.C .
		n. High voltage test of core in water (Duration of immersion > 1 hour.)
		o. Lay length of complete cable
		p. Chemical composition test for aluminum conductor.
		q. Dimensional test as per parameters specified in the technical particulars.
		q. Bend test for complete cable
6.3	Type Test	Type test to be carried out on one randomly selected sample from CPRI / ERDA. **Test report Validity shall be 10 Years**
		a. All the type test as per IS: 14255:1995
		b. UV radiation test as per ASTM standard. (sample shall meet min. 80% retention after exposure of 21 day as per ASTM standard)

Note: UV radiation test is applicable in case bidder has not conducted the same test against BSES supply.

7. IDENTIFICATION, PACKING AND MARKING

7.1 The AB Cable shall be wound on non-returnable wooden drums conforming to IS: 10418 with latest amendments thereof. The drums should have supporting plate with bush at central hole. The end of the cable shall be sealed by means of non-hygroscopic sealing material. The marking of drum shall be in line with IS: 14255:1995.

7.2 The drums 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 surface is not dented, scratched or damaged in any way during transportation and erection. The cable shall be properly lagged on the drums.

7.3 Details of drums length tolerance and short length shall be as follows.

- Tolerance in drum length shall be ± 5%
- Total Order quantity tolerance shall be ± 2%
- Non standard length shall not be less than 250mtrs in one continuous length.
- One drums non standard length to be acceptable.

ANNEXURE – 1 / DATA SHEET FOR LT AB CABLE

Sl. No.	Technical Parameter	Unit	BSES Specification	Vendor Data
1	YEARS OF MANUFACTURING SIMILAR CABLE	Nos.	3 or more years of supply of similar sizes and design / higher sizes of cables. (Furnish client list)	
2	TYPE TEST CERTIFICATES		Furnish for all type tests as mentioned in IS 14255 - 1995. The tests should have been performed NOT earlier than 5 years. Type test certificate shall be from CPRI/REDA/KEMA shall be submitted.	
	GUARANTEED PERIOD.(DATE OF SUPPLY / DATE OF COMMISSIONING WHICH EVER IS EARLIER.		66 / 60 MONTHS	
3	APPLICABLE STANDARDS		IS 14255:1995, IS 398 (part 4): 1979, IS 8130: 1984, IS 10810:1990, IS 10418:1982, IEC-60502, NFC-33-209 HD 626 (Cenelec standard.)	
4	VOLTAGE GRADE		1.1KV Grade	
5	NO. OF CORES/TYPE			
	i) PHASE CONDUCTOR		3 (Al)	
	ii) NEUTRAL CONDUCTOR		1 (Al)	
	iii) MESSENGER		1 (Al Alloy)	
	iv) STREET LIGHTING CONDUCTOR		1 (Al)	

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Sl. No.	Technical Parameter	Unit	BSES Specification			Vendor Data		
6	**CROSS-SECTIONAL AREA : sq. mm.**		**150 mm^2**	**95 mm^2**	**50 mm^2**	**150 mm^2**	**95 mm^2**	**50 mm^2**
	i) PHASE CONDUCTOR	(nom.)	150	95	50			
	ii) NEUTRAL CONDUCTOR	(nom.)	150	95	50			
	iii) MESSENGER	(nom.)	125	70	35			
	iv) STREET LIGHTING CONDUCTOR	(nom.)	16	16	16			
7	**TYPE OF CONDUCTOR MATERIAL**							
	i) PHASE CONDUCTOR		As per clause 5.1 of specification					
	ii) NEUTRAL CONDUCTOR		As per clause 5.1 of specification					
	iii) MESSENGER		Al Alloy conductor as per IS 398 (part 4) & IS 14255 : 1995					
	iv) STREET LIGHTING CONDUCTOR		E.C grade AL H2 /H4 as per IS 8130 : 1984					
8	**NUMBER OF STRANDS IN**							
	i) PHASE CONDUCTOR		Circular Stranded Compacted Per Table 2 of IS 8130					
	ii) NEUTRAL CONDUCTOR		Circular Stranded Compacted Per Table 2 of IS 8130					
	iii) MESSENGER		Circular Stranded Per Table 2 of IS 8130					
	iv) STREET LIGHTING CONDUCTOR		Circular Stranded Compacted Per Table 2 of IS 8130					
9	**MINIMUM / NOMINAL DIAMETER OF STRANDS**							
	i) Phase Conductor		As per manufacturer standard					
	ii) Neutral conductor		As per manufacturer standard					
	iii) Street light conductor		As per manufacturer standard					
	v) MESSENGER		As per IS: 398, Part-4					

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Sl. No.	Technical Parameter	Unit	BSES Specification			Vendor Data		
10	**LINEAR RESISTANCE OF CONDUCTOR AT 20^{0}C (max) (with the combination of phase conductor and others per sl. No. 6 above)**					**150 mm^2**	**95 mm^2**	**50 mm^2**
	i) PHASE CONDUCTOR	ohm / km	As per Table 2 of IS 8130**- 1984**					
	ii) NEUTRAL CONDUCTOR	ohm / km	As per Table 2 of IS 8130**- 1984**					
	iii) MESSENGER	ohm / km	As per Table 2 of IS 398 (Part-4)**- 1994**					
	iv) STREET LIGHTING CONDUCTOR	ohm / km	As per Table 2 of IS 8130**- 1984**					
11	**CONTINUOUS CURRENT CARRYING CAPACITY IN AIR(at 40^{0}C ambient) (with the combination of phase conductor and others per sl. No. 6 above)**					**150 mm^2**	**95 mm^2**	**50 mm^2**
		Amps						
12	**CONTINUOUS CURRENT CARRYING CAPACITY IN AIR(at 50^{0}C ambient) (with the combination of phase conductor and others per sl. No. 6 above)**					**150 mm^2**	**95 mm^2**	**50 mm^2**
		Amps						
13	**SHORT CIRCUIT CURRENT RATING FOR 1 Sec. (with the combination of phase conductor and others per sl. No. 6 above)**					**150 mm^2**	**95 mm^2**	**50 mm^2**
		KA						
14	**BREAKING STRENGTH (min.)**		**125 mm^2 Messenger**	**70 mm^2 Messenger**	**35 mm^2 Messenger**	**125 mm^2 Messenger**	**70 mm^2 Messenger**	**35 mm^2 Messenger**
	i) MESSENGER	kN	36.64	19.7	10.11			
	ii) STREET LIGHTING CONDUCTOR : 16 sq. mm	kN	1.9					

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Sl. No.	Technical Parameter	Unit	BSES Specification	Vendor Data		
15	**DIAMETER OF BARE (mm)**			**150 mm^2**	**95 mm^2**	**50 mm^2**
	i) PHASE CONDUCTOR	(min.)				
		(max.)				
	ii) NEUTRAL CONDUCTOR	(min.)				
		(max.)				
	iii) MESSENGER	(nom.)				
	iv) STREET LIGHTING CONDUCTOR	(nom.)				
16	**Lay ratio and direction of lay of conductor**			**150 mm^2**	**95 mm^2**	**50 mm^2**
	i) Phase conductor					
	ii) Neutral conductor					
	iii) Messenger conductor					
	iv) Street light conductor					
17	Type of insulation		**XLPE**			
	i) Make of insulation					
	ii) Grade of insulation					
18	**COLOUR OF INSULATION**		Black			
19	**CARBON BLACK CONTENT (%)**		2.5% (MAX.)			
20	**EXTRUSION PROCESS**		PRESSURE EXTRUDER			
21	**ISULATED CABLE OUSIDE DIAMETER (mm)**			**150 mm^2**	**95 mm^2**	**50 mm^2**
	i) PHASE CONDUCTOR	(min.)				
		(max.)				
	ii) NEUTRAL CONDUCTOR	(min.)				
		(max.)				
	iii) STREET LIGHTING CONDUCTOR	(nom.)				

ANNEXURE – 1 / DATA SHEET FOR LT AB CABLE

Sl. No.	Technical Parameter	Unit	BSES Specification			Vendor Data		
22	**CORE IDENTIFICATION**							
	i) PHASE CONDUCTOR		Ridges per clause 8.1 of IS : 14255-1995					
	ii) NEUTRAL CONDUCTOR		Ridges per clause 8.1 of IS : 14255-1995					
	iii) STREET LIGHTING CONDUCTOR		None					
23	**ASSEMBLY LAY LENGTH**					**150 mm^2**	**95 mm^2**	**50 mm^2**
		mm						
24	**ASSEMBLY LAY DIRECTION**		Right Hand					
25	**CABLE IDENTIFICATION ON NEUTRAL CORE**		As per specification clause no. 5.6					
	Font size of letters	mm						
26	**WEIGHT OF THE CABLE (with the combination of phase conductor and others per sl. No. 6 above)**					**150 mm^2**	**95 mm^2**	**50 mm^2**
		Kg/km						
27	**STANDARD LENGTH PER DRUM (with the combination of phase conductor and others per sl. No. 6 above)**		**150 mm^2**	**95 mm^2**	**50 mm^2**	**150 mm^2**	**95 mm^2**	**50 mm^2**
		Mtr.	**300**	**400**	**500**			

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Sl. No.	Technical Parameter	Unit	BSES Specification	Vendor Data		
28	TYPE / SIZE OF THE DRUM (with the combination of phase conductor and others per sl. No. 6 above) (Include dimensions details)		Wooden Drum	150 mm^2	95 mm^2	50 mm^2
	(Flange x Barrel x Traverse)					
29	GROSS WEIGHT OF THE DRUM (with the combination of phase conductor and others per sl. No. 6 above)			150 mm^2	95 mm^2	50 mm^2
		kg				
30	MARKING ON THE DRUM		AS PER clause 13 of IS : 14255-1995			
31	BENDING RADIUS OF COMPLETE CABLE (with the combination of phase conductor and others per sl. No. 6 above)			150 mm^2	95 mm^2	50 mm^2
		mm.				
32	Weight of bare core			150 mm^2	95 mm^2	50 mm^2
	i) Phase or neutral conductor	Kg/km				
	ii) Messenger conductor	Kg/km				
	iii) Street light conductor	Kg/km				
33	Weight of insulated core			150 mm^2	95 mm^2	50 mm^2
	i) Phase or neutral core	Kg/km				
	ii) Street light core	Kg/km				

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Sl. No.	Technical Parameter	Unit	BSES Specification	Vendor Data		
34	**CHEMICAL COMPOSITION**					
	i) ALUMINIUM CONDUCTOR		AS PER IS 5484:1997			
	ii) ALUMINIUM ALLOY CONDUCTOR		AS PER IS 9997:1991			

Bidder / Vender Signature and seal ----------

a. Name of bidder	
b. Address of bidder	
c. Name of contact persons	
d. Telephone number and email id of contact persons.	

Note: Bidder shall furnish the GTP format with all details against each clause. Bidder shall not change the format of GTP or clause description. Bidder to submit duly filled GTP in hard copy with company seal.

ANNEXURE 2: DOCUMENT SUBMITTAL REQUIREMENT

Document/Drawing submission shall be as per the matrix given below:

a. All documents/drawings shall be provided in soft copy only via mail or in returnable Pen drives
b. Language of the documents shall be English only.
c. Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure
d. No submission is acceptable without check list compliance.
e. Deficient/ improper or incomplete document/ drawing submission shall be liable for rejection.
f. Order of documents shall be strictly as per the check list.
g. Any document not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope

S No.	Detail of Document	Bid	Approval	Pre Dispatch
1	Guaranteed Technical Particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Detailed cross sectional drawing of cable	Required	Required	
4	Dimensional drawing of cable drum	Required	Required	
5	Type test reports of offered type and rating of cable	Required	Required	
6	BIS certificate	Required		
7	Complete cable catalogue	Required		
8	Make of Raw Materials	Required	Required	
9	Cable de-rating factors	Required	Required	
10	Inspection test reports and Routine Test Certificates carried out in manufacturer's works			Required
11	Test certificates of all raw materials			Required
12	Calibration test reports of instruments			Required