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1. SCOPE:

This specification covers the technical requirements of design, manufacture, test at manufacturer's works, packing & forwarding, supply and unloading at store/site and performance of LT ABC cable for trouble free and efficient operation. The specific requirements are covered in the enclosed technical data sheet.

The sizes specified in the specifications are tabulated below:

Sl. No.	Phase Conductor	Messenger	Street light
1	4C X 150	1C X 150 (Bare)	1C X 16
2	4C X 120	1C X 120 (Bare)	1C X 16
3	4C X 95	1C X 95 (Bare)	1C X 16
4	4C X 70	1C X 70 (Bare)	1C X 16
5	4C X 50	1C X 50 (Bare)	1C X 16
6	4C X 35	1C X 35 (Bare)	1C X 16
7	3C X 50	1C X 35 (Insulated)	-
8	3C X 35	1C X 25 (Insulated)	-
9	2C X35	1C X25 (Bare)	-
10	2C X25	1C X25 (Bare)	-
11	1C X 35	1C X 25 (Insulated/bare)	-

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IS-398 (Part IV)	Aluminum conductor for overhead transmission purposes- Part IV Aluminum alloy stranded conductor
IS-5216	Guide for safety procedures and practices in electric works
IS-7098 (part-I)	Specification for Cross-linked polyethylene insulated PVC sheathed cables- Part I for working voltage up to and including 1100 volts.
IS-8130	Specification for Conductor for insulated electric cables & flexible cords.
IS-10418	Specification for drums for electric cables
BS-5468	Cross-linked polyethylene insulation of electric cables
IEC-540	Test methods for insulations and sheaths of electric cables and cords
IEC-60228/3	Conductor for insulated cables
IEC-60502-1	Power cables with extruded insulation and their accessories for rated voltages from 1kV (Um=1.2kV), up-to 30kV(Um=36kV)-Part 1:Cables for rated voltages of 1 kV /Um=1,2kV) and 3kV/Um=3.6kV)
ASTMG- 53/DIN 56687	UV testing of XLPE insulation
SANS 1713	South African Standard for Aerial Bunched conductor
IS14255	Aerial Bunched conductors for working voltages up to and including 1100 volts

3. CLIMATIC CONDITIONS:

SL.NO.	CONDITIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.


Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces as mentioned above.

4. GENERAL TECHNICAL REQUIREMENTS:

Table 1:

SL NO	DESCRIPTION	UNITS	Requirement	
1	Type of Cable		LT ABC cable with cross linked polyethylene insulated Phase, neutral and street lighting core twisted around the bare messenger wire.	
2	Size of Aerial Bunched cable		4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	
3	Rated Voltage	kV	1.1	
4	System Voltage	kV	0.415 - 0.433	
5	Nominal Area of Phase Conductor	mm ²	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	150
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	120
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	95
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	70

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			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	50
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	35
6	Nominal Area of Messenger	mm ²	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	150
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	120
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	95
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	70
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	50
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	35
			7	Phase & Neutral Core
8	Messenger Wire		Stranded compacted circular aluminum alloy conductor	
9	Maximum conductor temperature during continuous operation	Deg C	90	
10	Maximum conductor temperature during short circuit	Deg C	250	
11	Phase Core RYBN insulated			
a)	Conductor			
(i)	Material		EC Grade Aluminum of H4 Grade to IS: 8130:1984	
(ii)	No. of Cores & Nominal Size	mm ²	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	4CX150
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	4CX120
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	4CX95
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	4CX70
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	4CX50
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	4CX35
(iii)	Minimum number of strand wires As per IS 8130, Table no 2		4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	15
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	15
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	15
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	12
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	6
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	6
(iv)	Diameter	Shall be suitably selected to meet conductor DC resistance as per IS 8130		
(v)	Max. DC Resistance of phase conductor at 20 deg.C	Ω/km	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	0.206
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	0.253
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	0.320
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	0.443
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	0.641
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	0.868
(vi)	Shape of Conductor		Stranded Compacted Circular	
(vii)	Short Circuit current rating of conductor for 1 sec	kA	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	14.1
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	11.28
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	8.93
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	6.58
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	4.7
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	3.29
(viii)	Continuous current rating in air at 40 Deg. C		4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	280
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	230
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	230
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	200

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			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	149
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	125
(ix)	Diameter of conductor core		To be provided by bidder in the GTP with the Technical bid	
(x)	Weight of conductor core		To be provided by bidder in the GTP with the Technical bid	
b)	Insulation			
i)	Material		XLPE Insulation as per IS 14255:1995 (Black colored)	
ii)	Nominal Thickness	mm	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	1.7
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	1.6
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	1.5
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	1.5
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	1.5
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	1.2
iii)	Tolerance in Insulation Thickness	mm	XLPE Insulation as per IS 14255	
iv)	Diameter of insulation/core		To be provided by bidder in the GTP with the Technical bid	
v)	Weight of one core		To be provided by bidder in the GTP with the Technical bid	
12	Street light core			
a)	Conductor			
i)	Material		EC grade aluminum of H4 grade to IS: 8130:1984	
ii)	Nominal size	mm ²	16	
iii)	Nominal no. of wire As per IS 8130, Table no 2		6 (As per IS 8130, Table no 2)	
iv)	Max DC resistance at 20 deg. C	Ohm/k m	1.91(As per IS 8130:1984)	
v)	Shape of conductor		Stranded compacted circular	
b)	Insulation			
i)	Material		As per IS: 14255:1995	
ii)	Nominal thickness	mm	1.2	
iii)	Tolerance in Insulation Thickness		XLPE Insulation as per IS 14255:1995 (Black colored)	
iv)	Diameter of conductor		To be provided by bidder in the GTP with the Technical bid	
v)	Weight of conductor		To be provided by bidder in the GTP with the Technical bid	
vi)	Weight of insulation		To be provided by bidder in the GTP with the Technical bid	
13	Bare Messenger Wire			
a)	Messenger wire			
i)	Material		Aluminum Alloy Wire	
ii)	Nominal size	mm ²	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	150
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	120
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	95
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	70
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	50
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	35
iii)	No and Nominal Dia (As per IS 14255 clause no 6.2 & IS 398 part 4, table no 2)	No./mm	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	19/3.17
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	19/2.84
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	7/4.16
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	7/3.57
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	7/3.02
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	7/2.54

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iv)	Calculated Maximum resistance at 20 deg C (As per IS 14255 table no 3 & IS 398 part 4, table no 2)	ohm/km	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	0.229
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	0.287
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	0.357
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	0.492
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	0.689
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	0.986
v)	Shape of conductor		Stranded circular-compacted	
vi)	Short circuit rating for 1 sec	KA	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	14.1
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	11.28
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	8.93
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	6.58
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	4.7
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	3.29
vii)	Material of insulation		NA	
viii)	Thickness of insulation	mm	NA	
ix)	Min Breaking load of messenger wire (As per IS 14255 table no 3 & IS 398 part 4, table no 2)	KN	4CX150mm ² (P)+1CX150mm ² (M)+1CX16 mm ² (S)	43.5
			4CX120mm ² (P)+1CX120mm ² (M)+1CX16 mm ² (S)	33.6
			4CX95mm ² (P)+1CX95mm ² (M)+1CX16 mm ² (S)	27.8
			4CX70mm ² (P)+1CX70mm ² (M)+1CX16 mm ² (S)	19.7
			4CX50mm ² (P)+1CX50mm ² (M)+1CX16mm ² (S)	14
			4CX35mm ² (P)+ 1CX35mm ² (M)+1CX16mm ² (S)	9.8
xi)	Diameter of messenger wire		To be provided by bidder in the GTP with the Technical bid	
xii)	Weight of messenger wire		To be provided by bidder in the GTP with the Technical bid	
14	Over all weight of AB Cable		To be provided by bidder in the GTP with the Technical bid	
15	Core Identification		Core Identification: RIDGES required for phase identification – A) Ridges shall be provided on two locations on the Outer sheath at 180 degree apart. 1 ridge for R phase, 2 ridges for Y phase, 3 ridges for B phase and there shall be no ridge for neutral core. B) There shall be clearly visible phase embossing with R/ Y/ B letters on respective core at every One Meter and the letter “N” on neutral core shall be embossed at every meter.	
16	Formation of cable		Four (RYBN) insulated phase and street light core shall be twisted around the bare Earth cum messenger wire to form the circular assembly.	
17	Standard Drum Length	Mtr	500	
18	Tolerance in Drum length	%	+/-5%	
19	Reference Standard		IS 14255	
20	Embossing on XPLE cable		Embossing on phase insulation of the cable: 1. Manufacturer name 2. 1100V 3. Size of cable 4. ISI Mark 5. Month & year of manufacturing(MM/YY) 6. “TPCODL/ TPNODL/ TPWODL/ TPSODL/ TPDDL/ TPADL/ TPC” 7. PO number 8. XLPE 90	
21	Sequential meter marking shall be available on Neutral core.			

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Table 2:


SL NO	DESCRIPTION	UNITS	Requirement	
1	Type of Cable		1CX35mm ² (P)+1CX25mm ² (M)	LT ABC cable with XLPE insulated Phase core twisted around the insulated/ bare neutral cum messenger wire.
			3CX50mm ² (P)+1C×35mm ² (M)	LT ABC cable with XLPE insulated Phase core twisted around the insulated neutral cum messenger wire.
			3CX35mm ² (P)+1CX25mm ² (M)	
			2CX35mm ² (P)+1CX25mm ² (M)	LT ABC cable with XLPE insulated Phase and neutral core twisted around the bare messenger wire.
			2CX25mm ² (P)+1CX25mm ² (M)	
2	Size of Aerial Bunched cable		1CX35mm ² (P)+1CX25mm ² (M)	
			3CX50mm ² (P)+1C×35mm ² (M)	
			3CX35mm ² (P)+1CX25mm ² (M)	
			2CX35mm ² (P)+1CX25mm ² (M)	
			2CX25mm ² (P)+1CX25mm ² (M)	
3	Rated Voltage	kV	1.1	
4	System Voltage	kV	1CX35mm ² (P)+1CX25mm ² (M)	240
			3CX50mm ² (P)+1C×35mm ² (M)	0.415 - 0.433
			3CX35mm ² (P)+1CX25mm ² (M)	
			2CX35mm ² (P)+1CX25mm ² (M)	
			2CX25mm ² (P)+1CX25mm ² (M)	240
5	Nominal Area of Phase Conductor	mm ²	1CX35mm ² (P)+1CX25mm ² (M)	35
			3CX50mm ² (P)+1C×35mm ² (M)	50
			3CX35mm ² (P)+1CX25mm ² (M)	35
			2CX35mm ² (P)+1CX25mm ² (M)	35
			2CX25mm ² (P)+1CX25mm ² (M)	25
6	Nominal Area of Messenger	mm ²	1CX35mm ² (P)+1CX25mm ² (M)	25
			3CX50mm ² (P)+1C×35mm ² (M)	35
			3CX35mm ² (P)+1CX25mm ² (M)	25
			2CX35mm ² (P)+1CX25mm ² (M)	25
			2CX25mm ² (P)+1CX25mm ² (M)	25
7	Phase Core		Stranded compacted circular aluminum conductor, Extruded XLPE insulated.	
8	Neutral core		1CX35mm ² (P)+1CX25mm ² (M)	Same as insulated messenger (Stranded compacted circular aluminum alloy conductor, Extruded XLPE insulated.)
			3CX50mm ² (P)+1C×35mm ² (M)	
			3CX35mm ² (P)+1CX25mm ² (M)	
			2CX35mm ² (P)+1CX25mm ² (M)	Same as insulated phase (Stranded compacted circular aluminum conductor, Extruded XLPE insulated)
			2CX25mm ² (P)+1CX25mm ² (M)	

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9	Messenger Wire		1CX35mm ² (P)+1CX25mm ² (M	Stranded compacted circular aluminum alloy conductor, Extruded XLPE insulated/ bare.
			3CX50mm ² (P)+1C×35mm ² (M)	Stranded compacted circular aluminum alloy conductor, Extruded XLPE insulated.
			3CX35mm ² (P)+1CX25mm ² (M)	
			2CX35mm ² (P)+1CX25mm ² (M)	Stranded compacted circular aluminum alloy conductor, bare.
			2CX25mm ² (P)+1CX25mm ² (M)	
10	Maximum conductor temperature during continuous operation	Deg C	90	
11	Maximum conductor temperature during short circuit	Deg C	250	
12	Phase Core RYBN insulated			
a)	Conductor			
(i)	Material		EC Grade Aluminum of H4 Grade to IS: 8130:1984	
(ii)	No. of Cores & Nominal Size	mm ²	1CX35mm ² (P)+1CX25mm ² (M)	1CX35
			3CX50mm ² (P)+1C×35mm ² (M)	3CX50
			3CX35mm ² (P)+1CX25mm ² (M)	3Cx35
			2CX35mm ² (P)+1CX25mm ² (M)	2Cx35
			2CX25mm ² (P)+1CX25mm ² (M)	2Cx25
(iii)	Minimum number of strand wires As per IS 8130, Table no 2		1CX35mm ² (P)+1CX25mm ² (M)	6
			3CX50mm ² (P)+1C×35mm ² (M)	6
			3CX35mm ² (P)+1CX25mm ² (M)	6
			2CX35mm ² (P)+1CX25mm ² (M)	6
			2CX25mm ² (P)+1CX25mm ² (M)	6
(iv)	Diameter		Shall be suitably selected to meet conductor DC resistance as per IS 8130	
(v)	Max. DC Resistance of phase conductor at 20 deg.C	Ω/km	1CX35mm ² (P)+1CX25mm ² (M)	0.868
			3CX50mm ² (P)+1C×35mm ² (M)	0.641
			3CX35mm ² (P)+1CX25mm ² (M)	0.868
			2CX35mm ² (P)+1CX25mm ² (M)	0.868
			2CX25mm ² (P)+1CX25mm ² (M)	1.2
(vi)	Shape of Conductor		Stranded Compacted Circular	
(vii)	Short Circuit current rating of conductor for 1 sec	kA	1CX35mm ² (P)+1CX25mm ² (M)	3.29
			3CX50mm ² (P)+1C×35mm ² (M)	4.7
			3CX35mm ² (P)+1CX25mm ² (M)	3.29
			2CX35mm ² (P)+1CX25mm ² (M)	3.29
			2CX25mm ² (P)+1CX25mm ² (M)	2.36
(viii)	Continuous current rating in air at 40 Deg. C	A	1CX35mm ² (P)+1CX25mm ² (M)	125
			3CX50mm ² (P)+1C×35mm ² (M)	149
			3CX35mm ² (P)+1CX25mm ² (M)	125
			2CX35mm ² (P)+1CX25mm ² (M)	125
			2CX25mm ² (P)+1CX25mm ² (M)	117
(ix)	Diameter of conductor core		To be provided by bidder in the GTP with the Technical bid	

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(x)	Weight of conductor core		To be provided by bidder in the GTP with the Technical bid	
b)	Insulation			
i)	Material		XLPE Insulation as per IS 14255:1995 (Black color)	
ii)	Nominal Thickness	mm	1CX35mm ² (P)+1CX25mm ² (M)	1.2
			3CX50mm ² (P)+1C×35mm ² (M)	1.5
			3CX35mm ² (P)+1CX25mm ² (M)	1.2
			2CX35mm ² (P)+1CX25mm ² (M)	1.2
			2CX25mm ² (P)+1CX25mm ² (M)	1.2
iii)	Tolerance in Insulation Thickness	mm	XLPE Insulation as per IS 14255	
iv)	Diameter of insulation/core		To be provided by bidder in the GTP with the Technical bid	
v)	Weight of one core		To be provided by bidder in the GTP with the Technical bid	
12	Street light core			
a)	Conductor		NA	
i)	Material			
ii)	Nominal size	mm ²		
iii)	Nominal no. of wire			
iv)	Max DC resistance at 20 deg. C	Ω/km		
v)	Shape of conductor			
b)	Insulation			
i)	Material			
ii)	Nominal thickness	Mm		
iii)	Tolerance in Insulation Thickness			
13	Insulated Neutral Cum Messenger Wire / Bare Messenger			
a)	Conductor			
i)	Material		Aluminum Alloy Wire	
ii)	Nominal size	mm ²	1CX35mm ² (P)+1CX25mm ² (M)	25
			3CX50mm ² (P)+1C×35mm ² (M)	35
			3CX35mm ² (P)+1CX25mm ² (M)	25
			2CX35mm ² (P)+1CX25mm ² (M)	25
			2CX25mm ² (P)+1CX25mm ² (M)	25
iii)	No and Nominal Dia of each strand	No./mm	1CX35mm ² (P)+1CX25mm ² (M)	7/2.14
			3CX50mm ² (P)+1C×35mm ² (M)	7/2.54
			3CX35mm ² (P)+1CX25mm ² (M)	7/2.14
			2CX35mm ² (P)+1CX25mm ² (M)	7/2.14
			2CX35mm ² (P)+1CX25mm ² (M)	7/2.14
iv)	Calculated Maximum resistance at 20 deg C	Ω/km	1CX35mm ² (P)+1CX25mm ² (M)	1.38
			3CX50mm ² (P)+1C×35mm ² (M)	0.986
			3CX35mm ² (P)+1CX25mm ² (M)	1.38
			2CX35mm ² (P)+1CX25mm ² (M)	1.38
			2CX25mm ² (P)+1CX25mm ² (M)	1.38
v)	Shape of conductor		Stranded circular-compacted	
			1CX35mm ² (P)+1CX25mm ² (M)	2.35
			3CX50mm ² (P)+1C×35mm ² (M)	3.29
			3CX35mm ² (P)+1CX25mm ² (M)	2.35

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vi)	Short circuit rating for 1 sec	kA	2CX35mm ² (P)+1CX25mm ² (M)	2.35
			2CX25mm ² (P)+1CX25mm ² (M)	2.35
b)	Insulation			
vii)	Material of insulation		1CX35mm ² (P)+1CX25mm ² (M)	XLPE Insulation as per IS 14255 (Black color) / bare As per DISCOM requirement
			3CX50mm ² (P)+1C×35mm ² (M)	XLPE Insulation as per IS 14255 (Black color)
			3CX35mm ² (P)+1CX25mm ² (M)	
			2CX35mm ² (P)+1CX25mm ² (M)	NA
			2CX25mm ² (P)+1CX25mm ² (M)	NA
viii)	Thickness of insulation	mm	1CX35mm ² (P)+1CX25mm ² (M)	1.2 (For insulated messenger) & NA (For bare messenger)
			3CX50mm ² (P)+1C×35mm ² (M)	1.2
			3CX35mm ² (P)+1CX25mm ² (M)	1.2
			2CX35mm ² (P)+1CX25mm ² (M)	NA
			2CX25mm ² (P)+1CX25mm ² (M)	NA
ix)	Min Breaking load of messenger wire	KN	1CX35mm ² (P)+1CX25mm ² (M)	7
			3CX50mm ² (P)+1C×35mm ² (M)	9.8
			3CX35mm ² (P)+1CX25mm ² (M)	7
			2CX35mm ² (P)+1CX25mm ² (M)	7
			2CX35mm ² (P)+1CX25mm ² (M)	7
x)	Diameter of messenger wire		To be provided by bidder in the GTP with the Technical bid	
xi)	Weight of messenger wire		To be provided by bidder in the GTP with the Technical bid	
14	Over all weight of AB Cable		To be provided by bidder in the GTP with the Technical bid	
15	Core Identification		1CX35mm ² (P)+1CX25mm ² (M)	Core Identification: A) Ridges shall be provided on two locations on the Outer sheath at 180 degree apart. 1 ridge for R phase, and there shall be no ridge for neutral core. B) There shall be clearly visible phase embossing with R letter on respective core at every One Meter and the letter “N” on neutral core shall be embossed at every meter. Note – No N printing required for bare messenger/Neutral.
			3CX50mm ² (P)+1C×35mm ² (M)	Core Identification: A) Ridges shall be provided on two locations on the Outer sheath at 180 degree apart. 1 ridge for R phase, 2 ridge for Y phase & 3 ridge for B phase

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			3CX35mm ² (P)+1CX25mm ² (M)	and there shall be no ridge for neutral core. B) There shall be clearly visible phase embossing with R/Y/B letter on respective core at every One Meter and the letter “N” on neutral core shall be embossed at every meter.
			2CX35mm ² (P)+1CX25mm ² (M)	Core Identification: A) Ridges shall be provided on two locations on the Outer sheath at 180 degree apart. 1 ridge for R phase, and there shall be no ridge for neutral core. B) There shall be clearly visible phase embossing with R letter on respective core at every One Meter and the letter “N” on neutral core shall be embossed at every meter.
			2CX25mm ² (P)+1CX25mm ² (M)	
16	Formation of cable		1CX35mm ² (P)+1CX25mm ² (M)	1 phase core XLPE insulated shall be twisted around the insulated/bare earth cum messenger wire, with R-H direction of lay.
			3CX50mm ² (P)+1C×35mm ² (M)	3 phase cores XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay
			3CX35mm ² (P)+1CX25mm ² (M)	
			2CX35mm ² (P)+1CX25mm ² (M)	2 cores (PN) XLPE insulated shall be twisted around the bare messenger wire, with R-H direction of lay
			2CX25mm ² (P)+1CX25mm ² (M)	
17	Standard Drum Length	Mtr	1CX35mm ² (P)+1CX25mm ² (M)	1000
			3CX50mm ² (P)+1C×35mm ² (M)	500
			3CX35mm ² (P)+1CX25mm ² (M)	500
			2CX35mm ² (P)+1CX25mm ² (M)	1000
			2CX25mm ² (P)+1CX25mm ² (M)	1000
18	Tolerance in Drum length	%	+/-5%	
19	Reference Standard		IS 14255	
20	Embossing on XPLE cable		Embossing on phase insulation of the cable: 1. Manufacturer name 2. 1100V 3. Size of cable	

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			4. ISI Mark 5. Month & year of manufacturing(MM/YY) 6. “TPCODL/ TPNODL/ TPWODL/ TPSODL/ TPDDL/ TPADL/ TPC” 7. PO number 8. XLPE 90
21	Sequential meter marking shall be available on Neutral core.		

5. GENERAL CONSTRUCTION: CONDUCTORS:

All conductors shall be Class 2, Stranded, compacted circular, High electrical conductivity, Aluminum, Grade H4 as per IS 8130:1984.

Before stranding, the conductor shall be circular in cross section, uniform in quality, solid, smooth and free from scale, sharp edges and other defects.

Conductor shall conform to the standards for permissible number of joints in any one of the single wires forming every complete length of conductor, for location of joints in same layer of conductors and for method of making such joints. No joint shall be made in any conductor after it is stranded.

All conductors shall be of high electrical conductivity Aluminum as specified, conforming to requirement of relevant standards.

Note – Raw material supplier shall be from Nalco/ Balco/ Vedanta/ Hindalco.

INSULATION:

The insulating material shall be Cross Linked Polyethylene (XLPE) applied by extrusion as per latest IS 14255 and its latest amendments.

The insulation shall be both heat and moisture resistant and shall be suitable for continuous operation at conductor temperature of 90 Degree Centigrade, rising momentarily to 250 Degree Centigrade under short circuit conditions.

It shall be free from any foreign material or porosity visible to unaided eye. The insulation shall be so applied that it fits closely to the conductor and it shall be possible to remove insulation without damaging the conductor. The XLPE insulation shall be ultraviolet protected for operation in direct sunlight.

It shall be free from any foreign material or porosity visible to unaided eye. The insulation shall be so applied that it fits closely to the conductor and it shall be possible to remove insulation without damaging the conductor. Average thickness of the insulation shall not be less than nominal value specified in latest IS 14255 with latest amendments. The tolerance on the thickness shall be as specified in latest IS 14255. The insulating material shall have excellent electrical properties with regard to resistivity, dielectric constant and loss factor and shall have high tensile strength and resistance to abrasion. This shall not deteriorate at elevated temperatures or when immersed in water. The insulation shall be preferably fire resistant and resistant to chemicals like acids, alkalis, oils and ozone.

Note – Raw material supplier shall be Dow/ Borealis/ Hanwa/ K Kalpana or D Dev/ KLJ only.

MESSENGER WIRE:

The insulated messenger wire shall be made of aluminum alloy, generally conforming to latest IS 14255. The conductor shall be of heated aluminum-magnesium-silicon alloy wires containing approximate 0.5% magnesium and approximately 0.5% silicon conforming to IS 398(Part 4). Insulation shall be as per IS 14255.

Note – Aluminium alloy raw material shall be procured only from Nalco/ Balco/ Vedanta/ Hindalco. The material shall be supplied exclusively in the form of aluminium alloy rods. Third-party alloying or re-processing of aluminium is strictly unacceptable.

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CORE IDENTIFICATION:

Ridges required for phase identification in 4CX150+1CX150+1CX16 / 4CX95+1CX95+1CX16 / 4CX70+1CX70+1CX16 / 4CX50+1CX50+1CX1 / 4CX35+1CX35+1CX16 LT AB cable:

- A) Ridges shall be provided on two locations on the Outer sheath at 180 degree apart. 1 ridge for R phase, 2 ridges for Y phase, 3 ridges for B phase and there shall be no ridge for neutral core.
 B) There shall be clearly visible phase embossing with R/ Y/ B letters on respective core at every One Meter. And the letter “N” on neutral core shall be embossed at every meter.

Ridges required for phase identification in 2Cx25+1x25 / 1CX35+1CX25 LT AB cable:

- A) Ridges shall be provided on two locations on the Outer sheath at 180 degree apart. 1 ridge for R phase, and there shall be no ridge for neutral core.
 B) There shall be clearly visible phase embossing with R letter on respective core at every One Meter. And the letter “N” on neutral core shall be embossed at every meter.

Ridges required for phase identification in 3Cx35+1x25 / 2CX35+1CX25 LT AB cable:

- A) Ridges shall be provided on two locations on the Outer sheath at 180 degree apart. 1 ridge for R phase, 2 ridges for Y phase, 3 ridges for B phase and there shall be no ridge for neutral core, and there shall be no ridge for neutral core.
 B) There shall be clearly visible phase embossing with R/Y/B letter on respective core at every One Meter. And the letter “N” on neutral core shall be embossed at every meter.

LAYING OF CORES:

Cores shall be laid up with a right-hand lay, and shall have a lay length not exceeding $28(d_1+d_2)$, where;

- d_1 is the core diameter, including sheath, in mm.
- d_2 is the diameter of the messenger, including the outer protective covering where applicable, in mm.


Note – For Delhi application lay ratio of the 4Cx150sqmm + 1x150sqmm + 1Cx16sqmm LT AB cable shall be 40 to 45 times the core diameter.

STRANDING:

The wire used in the construction of a stranded conductor shall, before and after stranding, satisfy all the relevant requirements of IS 398(Part-IV): 1994. The lay ratio of the different layers shall be within the limits given in IS 398(Part-IV): 1994. The successive layers shall have opposite directions of lay, the outermost layer being right- handed. The wires in each layer shall be evenly and closely stranded. The lay ratio of any layer shall not be greater than the lay ratio of layer immediately beneath it.

CABLE DRUM:

Cables shall be furnished in the specified reels or coil lengths of 500 meters/ 1000 meters as per clause 4 of this specification. Drums shall be of non-returnable MS/Steel drums as per IS/ Steel Drum of recycled steel/ wooden drums as per IS 10418:1982 (as per tender requirement) and the drums should be free from defects such as through cracks, knots, warps and split. The ends of the cables shall be suitably sealed by means of non-hygroscopic sealing. The tolerance on the Drum length shall be +/- 5% / as per PO terms.

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6. MARKING:

The cable shall carry the following information either stenciled on the drum or contained in a label attached to it:

- Reference to the Standards.
- Manufacturer's name.
- Type of cable.
- Voltage grade.
- Number of cores.
- Nominal cross-section area of the conductor.
- Length of the cable on the drum.
- Length of the cable perm.
- Marking of PO
- Direction of rotation of the drum.
- Gross mass.
- Country of manufacture.
- Year of manufacture.
- ISI Certification mark.

Note – Sequential meter marking shall be available on Neutral core.

7. TESTS:

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All Routine/ acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted on the LT ABC cables in additions to others specified in the IS/ IEC/ SANS Standards.

ACCEPTANCE TESTS:

- Tensile test (for phase/street light conductor)
- Wrapping Test (for phase/street light conductor)
- Breaking load test for messenger conductor
- Elongation test for messenger conductor
- Conductor Resistance test for messenger and phase conductor.
- Test for thickness of insulation
- Hot set test for XLPE insulation
- Tensile strength and elongation test at break for test of insulation
- High voltage test.
- Insulation resistance (volume resistivity test).
- UV test for XLPE insulation (black carbon content and dispersion test).
- Carbon black dispersion test. (The carbon black Dispersion Test shall be witnessed by Tata power representative at the time of inspection, separate type test report shall be submitted. Carbon black Content and Dispersion test shall be conducted as acceptance test on every lot at the time of material inspection)

ROUTINE TESTS:

- Conductor resistance test
- High voltage test

TYPE TESTS:

- Tests on phase/street light Conductor
 - Tensile test
 - Wrapping test
 - Resistance test
- Tests on messenger Conductor
 - Breaking load test
 - Elongation test.
 - Resistance test.
- Physical Test for XLPE Insulation:
 - Tensile strength and elongation at break
 - Ageing in air oven
 - Hot test
 - Shrinkage test
 - Water absorption (gravimetric)
 - Carbon black Content & Dispersion.
 - Insulation resistance (Volume resistivity) test.
 - Test for thickness insulation.
- High voltage test.
- **OPTIONAL TESTS**
 - Bending Test

TYPE TESTS REQUIREMENT:

Sl. No.	Cable Size	Remarks
1	4C X 150 + 1C X 150 + 1C X 16	A. Type test done on 1.1kV, 4CX150+1CX150+1CX16 LT AB Cable as per this Technical Specification will be also valid for 1.1kV, 4CX150+1CX150+1CX16; 1.1kV, 4CX120+1CX120+1CX16; 1.1kV, 4CX95+1CX95+1CX16; 1.1kV, 4CX70+1CX70+1CX16 & 1.1kV, 4CX50+1CX50+1CX16 & 1.1kV, 4CX35+1CX35+1CX16 LT AB Cable.
2	4C X 120 + 1C X 120 + 1C X 16	
3	4C X 95 + 1C X 95 + 1C X 16	
4	4C X 70 + 1C X 70 + 1C X 16	
5	4C X 50 + 1C X 50 + 1C X 16	
6	4C X 35 + 1C X 35 + 1C X 16	B. If Bidder has submitted the cable sizes mentioned other than above sizes, type test reports will be considered for that cable size & below sizes.

7	3C X 50 + 1C X 35 (Insulated)	A. Type test done on 1.1kV, 3CX50+3CX35 LT AB Cable as per this Technical Specification will be also valid for 1.1kV, 3CX50+3CX35; 1.1kV, 2CX35+1CX25; 1.1kV, 2CX25+1CX25 & 1.1kV, 1CX35+1CX25 LT AB Cable. B. If Bidder has submitted the cable sizes mentioned other than above sizes, type test reports will be considered for that cable size & below sizes.
8	3C X 35 + 1C X 25 (Insulated)	
9	2C X35 + 1C X25 (Bare)	
10	2C X25 + 1C X25 (Bare)	
11	1C X 35 + 1C X 25 (Insulated/bare)	

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the cable for the tests as mentioned as above as per the corresponding standards. All the tests shall be conducted at CPRI/ ERDA/ CIPET as per relevant IS. Type tests should have been conducted in certified Test laboratories during the period not exceeding from the date of 5 years from the date of opening of bid/ as per latest CEA Guidelines from the date of opening the bid. In the event of any discrepancy in the test reports, i.e., any test report not acceptable, or any/ all type tests (including additional same shall be carried out without any cost implication to TPCODL/ TPNODL/ TPSODL/ TPWODL/TPDDL/TPADL/TPC.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/ TPNODL/ TPSODL/ TPWODL/TPDDL/TPADL/TPC. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacturing to TPCODL/ TPNODL/ TPSODL/ TPWODL/TPDDL/TPADL/TPC representatives at all times when the work is in progress. Inspection by the TPCODL/ TPNODL/ TPSODL/ TPWODL/TPDDL/TPADL/TPC or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/ TPNODL/ TPSODL/ TPWODL/TPDDL/TPADL/TPC.

Following documents shall be sent along with material.


- Test reports
- MDCC issued by TPCODL/ TPNODL/ TPSODL/ TPWODL/TPDDL/TPADL/TPC
- TPCODL/ TPNODL/ TPSODL/ TPWODL/TPDDL/TPADL/TPC Invoice in duplicate
- Packing list
- Drawings & catalogue
- Guarantee / Warrantee card
- Delivery Challan
- Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/ TPNODL/ TPSODL/ TPWODL/TPDDL/TPADL/TPC, store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department and contracts department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/

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manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the company up to a period of 30 months from the date of commissioning or 36 months from the date of last supplies made under the contract, whichever is earlier, (the time scale of 30/36 months could be enhanced subject to mutual agreements). Bidder shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

The bidder shall further be for "free replacement" for another period of three years from the end of the guarantee period for any latent defects if noticed and reported by the purchaser.

12. PACKING AND TRANSPORT:

The cable shall be wound on non-returnable MS/Steel drums as per IS/ Steel Drum of recycled steel/ wooden drums as per IS 10418:1982 (as per tender requirement). The ends of the cable shall be sealed by means of non-hygroscopic sealing material. Bidder shall ensure that all the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit.

Note: Single use plastic shall not be used for packing.

13. TENDER SAMPLE:

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL/ TPNODL/ TPSODL/ TPWODL/TPDDL/TPADL/TPC).

14. QUALITY CONTROL:

The bidder shall submit Quality Assurance Plan (QAP) indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International/Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS

The bidder shall provide a list of complete set of accessories and tools required for erection and maintenance of LT ABC along with the installation procedure.

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be prepared based on TPCODL/ TPNODL/ TPSODL/ TPWODL/TPDDL/TPADL/TPC Specifications and statutory requirements with complete BOM and shall be submitted with bid.

- Completely filled in Schedule “A” Guaranteed Technical Particulars.
- Work Experience details
- Type test certificates.
- General descriptions of the equipment and all components including brochure.

After the award of the contract, four (4) copies of the drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (compact Disk CD) of all the drawing, GTP, test certificates shall be submitted after the final approval of the same to the purchaser.

Following Drawings / Documents shall be submitted after the award of the contract.

SL. No.	Description	For Approval	For Review information	Final Submission
1	Technical Particulars	✓		✓
2	Manual / Catalogues / drawings for all components		✓	
3	Technical details and test certificates of XLPE compound		✓	✓
4	Cross sectional area of the cable		✓	✓
5	Installation instructions		✓	✓
6	Instructions for use		✓	✓
7	Transport/ shipping dimension drawing		✓	✓
8	QA & QC Plan	✓	✓	✓
9	Routine, Acceptance and type test certificates	✓	✓	✓
10	Fault level calculation for armor and manual	✓	✓	✓


All the documents and drawings shall be in English language only.

Instruction Manuals: Bidder shall furnish two (2) soft copies (CD) and four (4) hard copies of nicely bound manual (in

English Language) covering erection and maintenance instructions and all relevant information pertaining to the main equipment as well as auxiliary devices.

19. SCHEDULE- “A” GUARANTEED TECHNICAL PARTICULARS: (To be furnished by bidder)

All clauses and points in the specification to be complied as per Clause Number 4.0(GENERAL TECHNICAL PARAMETERS) & Clause Number 5.0 (GENERAL CONSTRUCTION)

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20. SCHEDULE “B” DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation