A SCOPE

This specification covers the design, manufacture, inspection and testing at the BIDDER's works, packing, transportation, delivery and storage to site.

The sizes & types of LV power cables are furnished below.

S.No	Description	UNIT	Qty.
Design and Supply of Multi core, 1.1 kV grade, stranded Copper conductor, XLPE insulated, extruded PVC ST-2 inner sheathed, GI steel strip armour , FRLS PVC ST-2 outer sheathed cable for effectively earthed system and as per technical specifications mentioned herewith.			
1	3C x 150 Sq.mm (Cu)	m	600
2	3.5C x 185 Sq. mm (Cu)	m	500
3	3C x 50 Sq.mm (Cu)	m	1000
4	4C x 16 Sq.mm (Cu)	m	1000
5	4 C X 6 sqmm (Cu)	m	1000

1. CODES AND STANDARDS

The design, material, construction, manufacture, inspection, testing and performance of LT power cables supplied shall comply with all currently applicable statutes, regulations and safety codes. Bidder must adhere to this Code of Conduct and cables/material shall be in full compliance with regulations and standards as listed below and furnish its certificate to the purchaser.

The cables covered by this specification, unless otherwise stated, shall be designed in accordance with the latest editions of the following standards.

IS 7098 -1988 (Part I)	Specification for XLPE insulated electrical cables
IS 8130-1984	Specification for conductors for insulated electric cables and flexible cords
IS 5831-1984	Specification for PVC insulation and sheath of electric cables
IS 3975-1988	Specification for mild steel wires, strips and tapes for armoring cables.
IS 694	PVC insulated cables for wiring (1100V).
IS 10810	Methods for test of cables

2. DESIGN AND MANUFACTURING REQUIREMENTS

2.1 General

The cables supplied under this specification shall be Cu conductor, XLPE insulated, PVC ST-2 inner sheath, FRLS PVC ST-2 outer sheathed and GI round armour armoured cables. Adequate insulation shall be provided for the cables to operate continuously at the specified voltage with a high degree of safety and reliability throughout the life of the cables. The insulating and sheathing materials shall be high quality XLPE and PVC ST-2 based compound respectively.

2.2 Construction

The armoured cables shall conform to the following construction: XLPE insulated stranded & shaped Cu conductor cable with cores suitably laid up, extruded with inner sheath of PVC, round steel armoured and overall extruded with FRLS PVC ST-2 outer sheath, black / coloured conforming to IS: 7098 (Part- I):1988, 1.1KV grade.

2.3 Conductor

Tinned, annealed, high conductivity copper conductor (complying IS 12444) in stranded form (as per class 2 IS 8130)

Joints as per section 3.4.1 of IS 8130: Joints shall be permitted in the individual wire of which the conductor is formed, but no joints shall be within 300 mm of any other joint within the same layer. The joints shall be made by resistance but welding fusion, cold pressure welding, electric welding, gas welding, brazing or silver soldering.

2.4 Insulation

The insulating material for power cables shall be cross linked polyethylene (XLPE) compound as per IS-7098 (Part-I/II)-1988. The average thickness of insulation shall not be less than the values specified in Table-3 of IS-7098 (Part-I)-1988. The cores shall be identified by the following colour schedule: 3&1/2 core: Red, yellow, blue, black, reduced neutral core being black .Insulation property shall be stable under thermal conditions arising out of continuous operation at conductor temperature 90 degree celcious raising momentarily to 250 degree celcious under short circuit.

2.5 Inner Sheath

The inner sheath material shall be extruded PVC ST-2. The sheath shall have adequate thickness, mechanical strength and elasticity as per relevant standards.

2.6 Armouring

The armouring arranged over the inner sheath shall consist of one layer of galvanised round steel. The armour being put on the cable shall conform to IS 3975-1988 for all requirements. The direction of lay of armour shall be opposite to that of the cores. Minuimum area of coverage shall be 90 % and gap between two armour strips shall not be more than the width of the strip.

2.7 Outer Sheath

Extruded outer sheath shall be provided over the armouring. The material used for sheathing shall be FRLS PVC ST-2 compound conforming to relevant Indian standards for power cable. The color of the outer sheath shall be black. The thickness of outer sheath shall be in accordance with Indian standard as applicable and mentioned elsewhere in this

document.

2.8 Fillers and laying up of cores.

Cores laid together with suitable right hand lay. No hygroscopic fillers to be used if needed.

3. INSPECTION AND TESTING.

The BIDDER shall submit their QAP documents for approval of the purchaser. The purchaser has the rights to decide whether to follow manufacturers QAP or the one furnished with this document. Out of both QAP stringent will prevail. All tests for LV power Cables, shall be carried out as per relevant Indian and International standards like IEEE, IEC, ASTM for FRLS etc, If the MANUFACTURER has already conducted the type tests, then the type test certificates shall be submitted along with his offer.

4. Guaranteed technical particulars:

In addition to the points specified above the cable offered by you, following details shall also be filled by you.

Size of cable	Continuous current rating		Maximum DC resistance at 20 degree celcious	Short circuit current KA/sec
	In ground	In Duct		

5. TECHNICAL DATA SHEET of LV Cable

(a)	Rated Voltage	1100V
(b)	Conductor	tinned, annealed, high conductivity copper conductor (class 2 as per IS 8130)
(c)	Applicable standards	IS 8130, 7098
(d)	Conductor	Stranded Cu
(e)	Shape	Cirucular / shaped/ sectored as per relevant standard
(f)	Insulation	XLPE
(g)	Inner Sheath	PVC (ST-2)
(h)	Armouring	Galvanized steel strip armour
(i)	Outer Sheath	FRLS PVC (ST-2)
(j)	System neutral earthing	Solidly earthed

(k)	Design ambient temperature	45^{O} C
(l)	Frequency	50 Hz.
(m)	Maximum conductor Temperature	90^{O}C
(n)	Maximum short-circuit Temperature	250^{O}C

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6. Tests : Tests as mentioned below to be performed.

Sl. No.	Components Characteristics Checked	Category	Method of Check	Extent Of Check	Reference Document	Acce-ptance Norm	Format of Record	Remarks
A	**ROUTINE TESTS (As per IS-WITNESS)**							
1	Conductor resistance	Major	Electrical	100%	IS 7098-2	IS	TR	
2	HV test	Major	Electrical	100%	IS 10810-45	IS	TR	
3	Partial discharge test	Major	Electrical	100%	IS 10810-46	IS	TR	
B	**ACCEPTANCE TESTS (VIEW & WITNESS)**							
1	Annealing Test (Cu.)	Major	Mechanical	Sampling	IS 10810-1	IS/PS/AD	TR	
2	Hot set test for insulation	Major	Mechanical	Sampling	IS 10810-30	IS/PS/AD	TR	
3	Conductor Resistance	Major	Electrical	Sampling	IS 10810-5	IS/PS/AD	TR	
4	H V Test	Major	Electrical	Sampling	IS 10810-45	IS/PS/AD	TR	
5	Thickness of Insulation & Sheath	Major	Measurement	Sampling	IS 10810-6	IS/PS/AD	TR	
6	Tensile & Elongation on Insulation	Major	Physical	Sampling	IS 10810-7	IS/PS/AD	TR	
7	Armouring resistance	Major	Electrical	Sampling	IS 10810-42	IS/PS/AD	TR	
8	IR at 27 & 90 degree centigrade	Major	Electrical	Sampling	IS 10810-43	IS/PS/AD	TR	
9	Oxygen Index on sheaths	Major	Physical	Sampling	IS 5831	IS/ASTM/AD	TR	
10	Temperature Index on sheaths	Major	Physical	Sampling	NES 715	IS/ASTM/AD	TR	
11	Swedish Chimney Test	Major	Physical	Sampling	SS	SS	TR	

12	HCL emission on sheaths	Major	Physical	Sampling	IEC 754-1	IS/ASTM	TR	
13	Flammability test	Major	Physical	Sampling	IEC 332-1	IS/IEC/SS	TR	
C	**TYPE TESTS (VIEW)**							
1	Annealing Test (Cu.)	Major	Mechanical	Sampling	IS 10810-1	IS/PS/AD	TR	If Type Test Certificates are not available/ not acceptable by Client
2	Conductor Resistance	Major	Electrical	Sampling	IS 10810-5	IS/PS/AD	TR	
3	IR at 27 & 90 degree Centigrade	Major	Electrical	Sampling	IS 10810-43	IS/PS/AD	TR	
4	Thickness of Insulation & Sheaths	Major	Measurement	Sampling	IS 10810-6	IS/PS/AD	TR	
5	Tensile & Elongation on Insulation	Major	Physical	Sampling	IS 10810-7	IS/PS/AD	TR	
6	Hot Set Test	Major	Physical	Sampling	IS 10810-30	IS/PS/AD	TR	
7	Armouring Resistance	Major	Electrical	Sampling	IS 10810-42	IS/PS/AD	TR	
8	Ageing on Insul.& sheaths	Major	Physical	Sampling	IS 10810-11	IS/PS/AD	TR	
9	Shrinkage test on Insulation	Major	Physical	Sampling	IS 10810-12	IS/PS/AD	TR	
10	Hot Deformation on insulation	Major	Physical	Sampling	IS 10810-15	IS/PS/AD	TR	
11	Partial discharge test	Major	Electrical	Sampling	IS 10810-46	IS	TR	
12	Bending test	Major	Mechanical	Sampling	IS 10810-50	IS	TR	
13	Dielectric power factor test	Major	Electrical	Sampling	IS 10810-48	IS	TR	
14	Heating cycle test	Major	Electrical	Sampling	IS 10810-49	IS	TR	
15	Impulse withstand test	Major	Electrical	Sampling	IS 10810-47	IS	TR	
16	High voltage test	Major	Electrical	Sampling	IS 10810-45	IS	TR	
17	FRLS properties	Major		Sampling	ASTM-D-2843-7		TR	

7. TECHNICAL DATA SHEET (To be filled by the Bidders)

SR.NO.	DESCRIPTION	UNIT	LV POWER CABLES
1	Rated Voltage	V	
2	Conductor details:	–	
	Size of phases & Nutral in sqmm		

	No & size of stands in Phase & Nutral.		
	Conductor resistance of phase & Nutral		
3	Applicable standards	–	
4	No of cores	–	
5	Shape of conductor	–	
6	Insulation: Type, colour, thickness of phases & Nutral.	–	
7	Inner Sheath: Type, colour,nominal & minimum thickness	–	
8	Armoring	–	
9	Outer Sheath	–	
10	Max OD of cable	–	
11	Design ambient temperature	^{o}C	
12	Frequency	Hz.	
13	Maximum conductor Temperature on rated current	^{o}C	
14	Maximum short-circuit temperature	^{o}C	
15	Continuous current rating of the cable	A	
	In ground at soil temperature 30^{o}C and soil thermal resistivity of 150^{o}C cm/watt and depth of burial about a metre	A	
	In air at 40^{o}C	A	
	Overload capacity and duration	A, Hr	
16	Derating Factors for:		
	Soil temperature and thermal resistivity		

	Ambient temperature		
	Single core cables laid in trefoil circuits		
17	Equivalent star impedance per km of 3 Ph, circuit at power frequency at maximum conductor temperature	Ohm	
18	Maximum electrostatic capacitance per core per km of cable	F	
19	Maximum charging current per conductor per km at nominal voltage	A	
20	Short circuit capacity for 1 Sec	KA	
21	Maximum overall dia. Of cable	mm	
22	Standard length of cable in Mtrs in each drum		
23	Max weight of drums.		
24	Max bending radious of cable		

8. QULITY ASSURANCE PLAN FOR LV POWER CABLES (To be given by the Bidders)