Annexure – 3: Technical Specification: Power and Control cables

The bidder is requested to note the following,

A. General requirements:

Type of cables:

Power cables shall be of two type's first stranded aluminum conductor, cross linked polyethylene (XLPE) insulated, extruded black FRLS PVC inner sheathed, armoured and overall FRLS extruded black PVC sheathed cables conforming to IS: 7098. Second, Multistrand Single core copper PVC insulated as per IS 694:1990

Control cables shall be 1100V grade with annealed high conductivity stranded copper conductor, PVC insulated, FRLS PVC inner sheathed, armoured and FRLS extruded black PVC outer sheathed cables conforming to relevant IS standard.

1. Conductors:

   The cable conductor shall be made from stranded aluminium for power cables and copper for control cables to form compact conductor having a resistance within the limits specified. All the cables of sizes 25mm^2 and above shall have sector shaped conductors.

2. Insulation:

   The insulation of LV type power cable shall be XLPE type 7; for control cable the insulation shall be of PVC type. It shall be designed and manufactured for the specified system voltage. The insulation shall be free from voids. The insulation shall withstand mechanical and thermal stresses under steady state and transient operating conditions. The extrusion method should give a very smooth interface between semi conducting screen and insulation. The insulation shall be high quality standards.

3. Insulation shield:

   A non magnetic semi conducting shield shall be put over the insulation to confine electrical field to the insulation. The XLPE cable insulation shield shall be strippable.
   The metallic layer of the insulation shield shall be grounded at least at one location in the cable's run. In case of single conductor cable, care should be taken with regard to ampacity when grounding at more than one point.

4. Armour:

   Hard drawn aluminium wire armouring/ galvanized steel tape/wire armouring shall be used for single core and multi core cable respectively. Cables should be unarmoured wherever indicated. The hard drawn aluminium wire for armour shall be of H4 grade, as per IS 8130 (having tensile strength above 150N/mm^2). The diameter of the aluminium wire shall be as per table for the dimensions of the galvanized steel wire armour given in the relevant standard

5. Serving / Outer sheath:

   FRLS extruded black PVC serving as per IS: 1554 otherwise shall be applied over the armouring with suitable additive to prevent attach by rodent & termites. All servings must be given anti termite treatment.

6. Packing:

   Cables shall be supplied in non returnable drums. Drum length shall be such that the cable joints should be totally avoided. The drums shall be of heavy construction.

   The ends of each cable length shall be sealed before shipment. Heat shrinkable cable caps shall be used for this purpose.

7. Spare Core:

   Multi core control cables shall have 20% spare core, minimum one spare.

8. Cable identification:

   Cable identifications shall be provided by embossing the following on the outer sheath:

   - Manufacturers name and trademark
   - Voltage Grade
   - Year of manufacture
   - Type of insulation
   - Type of outer sheath e.g. “FRLS” etc.
   - ISI marks
   - Nominal cross sectional area of the conductor & no. of cores
   - Sequential marking
   - Owners identification mark

B. Tests

<u>Type Test:</u>

All cables shall be type tested as per their respective specifications and applicable standards. The type test shall include basic tests but not limited to tests for conductor, Insulation, resistivity tests, high voltage tests, flammability tests, overall diameter test. The test certificate showing the results of these tests shall be submitted by the supplier along with the cables. The results of these test shall be in accordance with respective test standards/Indian Standards.

These test reports shall be for the tests conducted on similar type/ same batch of cables proposed to be supplied under this tender. These tests should have been conducted either an in-house laboratory or at a laboratory approved by NABL.

The Purchaser reserves the right to send the sample of each category of cables to an independent third party NABL /Government of India approved laboratory for inspection for various type tests as carried out and documented by manufacturer in their test certificates.

C. Documents to be submitted along with the bid

Datasheet and manuals to be furnished:

- Cable datasheet (technical)
- Batch wise test reports (sample test reports are required to be submitted along with bid)
- Relevant Catalogues

L.V. Power Cables 1100 V Grade

1100 V grade, power cable conforming to following requirement and in line with IS-7098, IS-1554, IS-5831, IS-8130 & IS-3975		
a.	Conductor	Stranded and compacted plain aluminium of grade H2 and class 2 / Stranded, high conductivity annealed plain copper as per Annexure, generally conforming to IS:8130
b.	Insulation	Extruded cross linked Poly ethylene (XLPE)
c.	Inner Sheath	Extruded FRLS PVC compound confirming to type ST2 of IS:5831 for multicore cable
d.	Armour	Galvanized single round / strip steel wire armour for twin and multicore cables. Nonmagnetic hard drawn aluminium single round wire conforming to H4 grade for single core cables.
e.	Overall Sheath	Extruded FRLS PVC compound confirming to type ST2 of IS:5831

Control Cables 1100 V Grade

1100 V grade, 70 ^{0}C rating, PVC Control cable conforming to following requirement and in line with IS-1554, IS-5831, IS-8130 & IS-3975		
a.	Conductor	Stranded, non compacted & circular, high conductivity annealed plain copper generally conforming to IS:8130
b.	Insulation	Extruded PVC compound conforming to type A of IS: 8130
c.	Inner Sheath	Extruded FRLS PVC compound confirming to type ST1 of IS: 5831 for multicore cables. Single core shall have no inner sheath
d.	Armour	Galvanized single round / strip steel wire armour for twin and multicore cables
e.	Overall Sheath	Extruded FRLS PVC compound confirming to type ST1 of IS:5831

D. Quantities required:

I. Material: Power Cables

S No	Specification	Color	Unit	Quantity
LOT 1				
1	Multistrand Single core copper PVC insulated PVC 1.5 sq mm as per IS 694:1990	Red	Mtrs	21,840
2		Black	Mtrs	21,840
3		Green	Mtrs	10,270
4	Multistrand Single core copper PVC insulated PVC 2.5 sq mm as per IS 694:1990	Red	Mtrs	15,750
5		Black	Mtrs	15,750
6		Green	Mtrs	270
7	Multistrand Single core copper PVC insulated PVC 4.0 sq mm as per IS 694:1990	Yellow	Mtrs	9,960
8		Blue	Mtrs	9,960
9	Multistrand Single core copper PVC insulated PVC 6.0 sq mm as per IS 694:1990	Red	Mtrs	360
10		Yellow	Mtrs	180
11		Blue	Mtrs	180
12		Black	Mtrs	360
LOT 2				
13	1100 V grade, Aluminium conductor XLPE insulated Armoured cables: 4.0 C x 120 mm² as per IS 7098		Mtrs	330
14	1100 V grade, Aluminium conductor XLPE insulated Armoured cables: 4 C x 16 mm² as per IS 7098		Mtrs	310
15	1100 V grade, Aluminium conductor XLPE insulated Armoured cables: 4.0 C x 35 mm² as per IS 7098		Mtrs	430
		Total for Power cables	**Mtrs**	**107,790**

II. Material: Control cables

S No	Specification	Color	Unit	Quantity
LOT 3				
1	Unshielded multistrand twisted pair cable (two pair), flexible copper wire conductor 0.5 sq mm confirming to relevant IS standards		Mtrs	7,600
		Total for Control cables	**Mtrs**	**7,600**

E. Standards to be followed

All the material (Power cables and Control cables) shall be designed, manufactured and tested according to the latest applicable Indian standards or IEC's as given below or any international standard acceptable to the purchaser.

S No	Standard	Description
1	IS: 7098 (Part I)	Specs for Cross linked polyethylene Insulated PVC sheathed cables for working voltage up to and including 1100V
2	IS: 694	Specification for Multistrand single core copper PVC insulated cables
3	IS: 1554 (Part I)	PVC insulated (heavy duty) electric cables for working voltage up to and including 1100V
4	IS: 5831	PVC insulation and sheath of electric cables
5	IS: 3975	Mild steel wire, strips and tapes for armouring cables
6	IS: 3961	Recommended current ratings for cables
7	IS: 8130	Conductors for insulated electric cables and flexible cords
8	IS: 2982	Copper conductor in insulated cables and cords
9	IS: 5609	Specification for low frequency wires and cables with PVC insulation and PVC sheath
10	IS: 6380	Specification for elastomeric insulation of sheath and electric cables
11	IS: 434 (I 7 II)	Specification for rubber insulation cables
12	IEC: 540	The methods for insulation and sheath of electric cables and cords (elastomeric and thermoplastic compounds)
13	IEC: 230	Impulse test on cables and their accessories
14	IEC: 60	High voltage test techniques
15	IEC: 287	Calculation of continuous current ratings of the cables
16	IEC: 288	Nominal cross sectional area and composition of conductor of insulated cables
17	IEEE	Standard for type test for class IE electric cables, filled splices and connections for nuclear power generation station
18	IEC: 332-1	Test on electric cables under fire condition

Declaration: I/ We hereby confirm that all the specification given above has been properly understood and agree to supply the material conforming to the required standard / specification.

(Signature of Bidder)

Name:

Seal/ Stamp and Date: