

TECHNICAL SPECIFICATION

FOR11/22/

33KV

H.T.XLPE POWER CABLE

TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLE

I N D E X

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**TECHNICAL SPECIFICATION FOR 11/22/33 kV
NOMINAL VOLTAGE HT XLPE POWER CABLES**

1. SCOPE:

The specification covers design, manufacture, shop testing, packing and delivery of 11,22 & 33 kV , multi core , cross linked polyethylene insulated power cables by road/rail to the designated Store Centers in the State of Maharashtra. These cables shall be suitable for the 3 phase AC-50 Hz system with the nominal voltage of 11/22/33 kV which may reach maximum of 12/24/36 kV respectively. These cables shall primarily be designed for effectively earthed neutral system.

2. SERVICE CONDITIONS:

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

2.1	Maximum ambient temperature (deg C)	50
2.2	Maximum temperature in shade (deg C)	45
2.3	Minimum temperature in air (deg C) in shade	3.5
2.4	Relative Humidity (%)	10 to 100
2.5	Maximum annual Rainfall (mm)	1450
2.6	Maximum Wind Pressure (kg/mm ²)	150
2.7	Maximum altitude above mean sea level (Meters)	1000
2.8	Isoceraunic level (days/year)	50
2.9	Seismic level (Horizontal acceleration)	0.3 g.
2.10	Moderately hot and humid tropical climate, conducive to rust and fungus growth.	

3. STANDARDS:

- 3.1 Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the HT XLPE power cables shall conform to the latest revisions available at the time of placement of order of all the relevant standards as listed in, but not limited to Annexure-I.

4. GENERAL TECHNICAL REQUIREMENTS:

- 4.1 6.35/11 kV , 12.7/22 kV , 19/33 kV earthed, multi core power cables shall normally be with stranded compacted H2/H4 grade aluminium conductor as per IS: 8130 - 1984, provided with conductor screening (of extruded semi-conducting cross link material) and shall be insulated with XLPE of natural colour. Identification of cores shall be by colour, as per provision of clause 13.1 of IS: 7098 (Part 2) - 1985. The insulation (XLPE) screening shall be provided consisting of extruded semi-conducting cross link material in combination with a metallic layer of copper tapes. Three such screened cores shall be laid up together with fillers and/or binder tapes where necessary and provided with extruded inner sheathing of heat resistant PVC conforming to type ST-2 of IS: 5831 - 1984.

Maximum continuous operating temperature shall be 90 deg C under normal operation and 250 deg C under short circuit condition

Armouring shall be provided consisting of single galvanized round steel wires (In case of Single core cable armouring shall be of Non-magnetic material) conforming to IS: 3975 - 1988 (amended upto date) and over the armouring a tough outer sheath of PVC compound shall be extruded. The PVC compound for the outer sheath shall conform to type ST-2 of IS: 5831 - 1984 (amended upto date). The colour of the outer sheath shall be black. The cable shall be manufactured strictly conforming to IS:7098 (Part 2) - 1985 amended upto date and shall bear ISI mark.

4.2 SEQUENTIAL MARKING OF LENGTH ON CABLE

Non erasable Sequential Marking of length shall be provided by embossing on outer sheath of the cable for each meter length.

The quality of insulation should be good and insulation should not be deteriorated when exposed to the climatic conditions.

4.2.1 DISCHARGE FREE CONSTRUCTION:

Inner conductor shielding, XLPE insulation and outer core shielding shall be extruded in one operation by special process (viz. Triple Extrusion Process) to ensure that the insulation is free from contamination and voids and perfect bonding of inner and outer shielding with insulation is achieved. The bidders are requested to elaborate the manufacturing technique adopted by their manufacturers to achieve this motive.

The Company will order the verification of triple extrusion process at manufacturer's works as a pre-qualification if it is technically accepting the bid . During verification if it is found that the firm is not manufacturing the cable with triple extrusion process the offer shall be rejected.

4.3 CONTINUOUS A.C. CURRENT CAPACITY:

Continuous a.c. current capacity shall be as per Table given below.

Conductor sizes in sq.mm.	Continuous a.c. current capacity in Amps.at maximum conductor temp. of 90 deg .c.		
	When laid direct in the ground 30 deg.C		When laid in air 40 deg.C.
	11 kV	22/33 kV	11/22/33 Kv
70 sq.mm	160	155	165
95 sq mm	190	175	200
120 sq mm	215	195	230
150 sq mm	240	225	265
185 sq mm	270	255	310
240 sq mm	315	290	345
300 sq mm	355	325	396
400 sq mm	405	385	460
500 sq mm	450	450	590

4.4 SHORT CIRCUIT CURRENT

Short circuit current of 11,22 & 33 kV XLPE cable shall be as per Table given below.

Duration of Short Circuit in sec	Area of Al. Conductor	Short circuit current in kA
t	A	$I=0.094 \times A/\text{sq.rt}(t)$
1	70 sq.mm	6.58
1	95 sq.mm	8.93
1	120 sq.mm	11.28
1	150 sq.mm	14.10
1	185 sq.mm.	17.39
1	240 sq.mm.	22.56
1	300 sq.mm.	28.20
1	400 sq.mm.	37.60
1	500 sq.mm	47.00
1	630 sq.mm	59.20

5. TESTS AND TESTING FACILITIES :

5.1 TYPE TESTS:

All the type tests in accordance with IS: 7098 (Part 2) - 1985, amended upto date, shall be performed on cable samples drawn by 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 for each voltage grade. In case facilities of any of the type tests are not available at the works of the supplier , then such type test shall be carried out by the supplier at the independent laboratory at the cost of supplier. Sample for the type test will be drawn by the purchaser's representative and the type test will be witnessed by him.

5.2 ROUTINE TESTS:

All the Routine tests as per IS:7098 (Part 2) - 1985 amended upto date shall be carried out on each and every delivery length of cable. The result should be given in test report. Partial discharge test must be carried out in a fully screened test cell. It is, therefore, absolutely essential that the manufacturer should have the appropriate type of facility to conduct this test which is routine test.

The details of facility available in the manufacturer's works in this connection should be given in the bid.

5.3 ACCEPTANCE TESTS:

All Acceptance tests as per IS:7098 (Part 2) - 1985 as modified upto date including the optional test as per clause no 18.4 and Flammability Test shall be carried out on sample taken from the delivery lot.

5.4 SHORT CIRCUIT TEST:

The contractor shall also undertake to arrange for the short circuit test as a type test on any one size of each voltage grade i.e on one size of 11 kV, one size of 22 kV and one size of 33 kV earthed grade shielded XLPE cables ordered at a recognized testing center such as Central Power Research Institute at Bangalore/ Bhopal at the cost of supplier. If facilities for carrying out short circuit tests are available at the works of the supplier, and provided the certification procedure is approved by the Purchaser, testing at the

supplier's works will be acceptable. Short Circuit test shall be witnessed by the purchaser's representative.

5.4.1 The short circuit test shall be preceded and followed by the following tests so as to ensure that the characteristics of the cable remain within the permissible limits even after it is subjected to the required short circuit rating.

- a) Partial Discharge Test.
- b) Conductor Resistance Test.
- c) High Voltage Test.

5.4.2 The manufactured cable will be acceptable only after such a sample test is successfully carried out at CPRI or at suppliers works and approved by the Purchaser.

5.5 TESTING FACILITIES

The supplier / tenderer shall clearly state as to what testing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out type, routine and acceptance tests mentioned in specified IS. The facilities shall be provided by the bidder to purchaser's representative for witnessing the tests in the manufacturer's works. If any test cannot be carried out at manufacturer's works reason should be clearly stated in the tender.

6 PACKING AND MARKING :

6.1 IDENTIFICATION MARKS ON CABLE:

The following particulars shall be properly legible embossed on the cable sheath at the intervals of not exceeding one meter throughout the length of the cable. The cables with poor and illegible embossing shall be liable for rejection.

- a) Manufactures name and/or Trade name.
- b) Voltage grade.
- c) Year of manufacture.
- d) Successive Length.
- e) Size of cable
- f) ISI mark

6.2 The cable shall be supplied in continuous standard length of 250 running meters with plus minus 5% tolerance wound on non returnable wooden drum of good quality and non-standard lengths not less than 100 meters upto 5% of the ordered quantity shall be accepted. Alternately cable can be supplied wound on non-returnable steel drum without

any extra cost to the purchaser. Packing and marking shall be as per clause No. 21 of IS:7098 (Part 2) - 1985 amended up to date.

6.3 Supplier should provide statistical data regarding cables of all sizes viz.-

- 1) Weight of one meter of finished product of cable of various sizes and ratings.
- 2) Weight of one meter of bare conductor used for cables of various sizes and ratings.

7 QUALITY ASSURANCE PLAN:

A detailed list of bought out items which got into the manufacture of cables should be furnished indicating the name of the firms from whom these items are procured.. The bidder shall enclose the quality assurance plan invariably along with offer followed by him in respect of the bought out items, items manufactured by him & raw materials in process as well as final inspection, packing & marking. The Company may at its 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 the firm is not meeting with the quality assurance plan submitted by the firm, the offer shall be liable for rejection.

8 SCHEDULES:

8.1 The tenderer shall fill in the following schedule which form part of the offer.

Schedule `C' - Tenderer's Experience.

8.2 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 `C') to enable the purchaser to evaluate the tender.

SCHEDULE - C

SCHEDULE OF 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 client and description	Value of order	Period of supply and commissioning	Name and address to whom reference may be made
1	2	3	4	5

NAME OF FIRM

NAME & SIGNATURE OF TENDERER

DESIGNATION

DATE

ANNEXURE-I

LIST OF STANDARDS (All amended uptodate)

SR.N O.	STANDARD NO.	TITLE
1.	IS: 8130 ó 1984	Conductors for insulated electric cables and flexible cords.
2.	IS :7098 (Part 2) ó 1985	XLPE PVC sheathed cable for working voltages from 3.3 kVupto and including 33 kV.
3.	IS: 5831 ó 1984	PVC insulation and sheath of electric cables.
4.	IS: 3975 ó 1988	Mild steel wires , Formed wires and Tapes for armouring of cables.
5.	IS :10462 (Part I) ó1983	Fictitious calculation method for determination of dimensions of protective coverings of cables.