

Technical Specification for LT XLPE Armoured Cable **Size 4x10 sq. mm. with aluminium conductor.**

1. Item:

This section provides for manufacture, testing before dispatch, supply and delivery F.O.R. destination for 4x10 sq. mm. LT XLPE Armoured Cable with aluminium conductor suitable for working voltage up to & including 1100 Volts ISI Marked & Conforming to IS 7098 (Pt-I)/1988 with latest amendments.

2. STANDARDS

The materials shall conform in all respects to the relevant Indian Standard Specifications with latest amendments thereto.

Indian Standard No.	Title	Internationally Recognized standard
IS-7098 Part-I/1988	Specification for Cross Linked Polyethylene Insulated PVC Sheathed Cables for working Voltages Up to and including 1100V	IEC 502 (1983)
IS-5831/1984	PVC insulation and sheath of electric cables	IEC 502 (1983)
IS-8130/1984	Conductors for insulated electric cables and Flexible cords	IEC 228 (1978)
IS 3975/1979	Specification for armouring	
IS-10418/1982	Specification for cable drum	

Material conforming to other internationally accepted standards, which ensure equal or higher quality than the standards mentioned above, would also be acceptable. In case the Bidders who wish to offer material conforming to the other standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. Four copies of such standards with authentic English Translations shall be furnished along with the offer. . In case of conflict the order of precedence shall be (i) IS, (ii) IEC, (iii) Other standards. In case of any difference between provisions of these standards and provisions of this specification, the provisions contained in this specification shall prevail.

3. GENERAL REQUIREMENT:

The ISI marked XLPE Insulated Armored cables shall conform to IS: 7098(Pt-I)/1988 with latest amendment and bear BIS certification mark.

The material used for construction of the cables shall be of best quality complying with the requirement of IS: 7098(Pt-I)/1988 and other relevant standards. The cables shall be suitable for outdoor/indoor installation free in air and shall be capable of withstanding the normal stresses associated with transportation, erection, reeling and unreeling operations without getting deformed.

The cable shall be suitable for use where combination of ambient temperature and temperature rise due to load results in a conductor temperature not exceeding 90 degree C under normal operation and 250 degree C under short circuit condition.

The XLPE Insulated Armored LT Cable shall be ISI marked. The tenderer (MANUFACTURER) must furnish valid ISI certificate along with offer.

4. Technical Requirements:

MAIN FEATURES:

- 4.1 The power cables shall be of LT 1.1 kV Grade, stranded compacted, high conductivity, aluminum conductor, XLPE insulated, ST-2 type extruded PVC inner sheathed and ST type extruded P.V.C. outer sheathed, conforming to relevant standards suitable for LT AC three phase, 50 c/s, effectively earthed distribution system.

4.2 **MATERIALS AND CONSTRUCTION:**

4.2.1 Conductor:

For all above items, H2 or H4 Grade Aluminium shall be used, **The conductor shall be solid circular in section**, smooth, uniform in quality, free from scale inequalities, spills, splices and any other harmful defects. The conductor shall be compressed of Aluminium wires complying with IS: 8130/1984 with amendment thereof.

The Aluminium used shall be standard make e.g. Hindalco, NALCO, BALCO.

Minimum weight of aluminum in cables shall be as per following:-

Size of Cable	Weight of Aluminum (Kg/Km)
4x10 SQ MM LT XLPE Armoured Cable	108.00

4.2.2. Insulation:

The XLPE insulation of core shall be conforming to requirement as per IS: 7098/1984 with amendment, if any. The insulation shall be so applied that it fits closely on the conductor and it shall be easily possible to remove it without any damage to the conductor. The thickness and tolerance on thickness of insulation shall be as per clause No. 9.2 of IS: 7098 (Pt- I)/1988.

4.2.3 OUTER SHEATH:

The composition of PVC compound of sheath shall be same as mentioned at Sl. 3.2 above. The compound shall be designed to have adequate mechanical strength. The colour of PVC Compound used for sheath shall be black. The sheath shall be of PVC conforming to requirement Type ST-I compound of IS: 5831/1981 by extrusion. It shall be applied over the laid up cores and it shall be possible to remove it without any damage to the insulation.

4.2.4 ARMOUR:

Galvanized steel wire armouring shall be provided. The dimensions of steel wire shall be as per IS:1554(Part-1):1988 and its latest amendment and strip shall conform to latest provisions of IS:3975-1988 and amendment thereof.

4.2.5 CONSTRUCTION:

- 1) All materials used in the manufacture of cable shall be new, unused and of finest quality. All materials shall comply with the applicable provisions of the tests of the relevant Standards.
- 2) The PVC material used in the manufacture of cable shall be of reputed make. **No recycling of the PVC is permissible.** The purchaser reserves the right to ask for documentary proof of the purchase of various materials to be used for the manufacture of cable and to check that the conductor is complying with quality control.

- 3) The cable shall be suitable for laying in covered trenches and/or buried underground to meet the out door application purposes.
- 4) Cables shall have suitable fillers laid up with the conductors to provide a substantially circular cores section before the sheath is applied. Fillers shall be suitable for the operating temperature of the insulation & compatible with the insulation material

4.2.6 CURRENT RATING:

The cables shall have current ratings and derating factors as per relevant Indian Standards. The current ratings shall be based on maximum conductor temperature of 90 deg. C with ambient site condition specified for continuous operating at the rated current. The one-second short circuit current rating shall be as per table given below at maximum temperature of 250 deg C.

4.2.7 OPERATION:

Cables shall be capable of satisfactory operation, under a power supply system frequency variation of +/- 5 c/s, voltage variation of +10% or-15%. Cable shall be suitable for laying in ducts or under ground. Cables shall have heat and moisture resistance properties; these shall be of type and design with proven record on Distribution Network service.

4.2.8 LENGTH:

The cables shall be supplied in **1000±5% meters length. Short length shall be allowed for maximum 5% of the ordered quantity** but short length cables shall not be less than **100 meters** in any case. However sub standard length up to a maximum of 5% shall be acceptable in a particular lot offered for inspection.

4.2.9 GUARANTEED TECHNICAL PARTICULARS:

The guaranteed technical particulars as detailed in the specification annexure-I shall be guaranteed and a statement of guaranteed technical particulars shall be furnished in the format along with the bid **without which the Bid shall be treated as Non -Responsive.**

Immediately after completion of the electrical tests (during routine/acceptance tests), the ends of the cable shall be enclosed by rubber/PVC caps of wall thickness not less than 2.5 mm and then sealed by non hygroscopic material (the cores being suitably insulated from the cap). The cap shall be of robust construction and tight fit, and it shall have the trademark of the manufacturer embossed thereon

5. PACKING AND MARKING:

- 5.1 The cable shall be either wound on reels or supplied in coils packed and labeled.
- 5.2 The cables which shall be securely attached to the reels or coils shall have the following information:

- (a) Property of PVVNL-MM/.....
- (b) Designation of consignee & destination railway station.
- (c) Reference of the ISS.
- (d) Name of manufacturers, Brand name or Trademark.
- (e) Cable code as per clause 13.2 of IS: 1554 (Part-1):1988.
- (f) Nominal Cross sectional area of the conductor of the cable.
- (g) Type of cable and voltage grade.
- (h) Number of cores.
- (i) Approximate Gross weight.
- (j) Year of manufacture.
- (k) Length of the cable, contained in the coil/reel.
- (l) The cable may also be marked with ISI certificate mark.

6. EMBOSSING:

On the outermost sheathing of cable, following should be embossed at the regular interval of one-metre length of cable.

- (i) PROPERTY OF PVVNL.
- (ii) NAME OF MANUFACTURER.

- (iii) VOLTAGE GRADE AND SIZE.
- (iv) YEAR OF MANUFACTURER.
- (v) SPECIFICATION NO.....
- (vi) LENGTH MARKING IN METRES.

The cables so embossed shall not be utilized or sold anywhere else by the supplier

7. **TOLERANCE OF QUANTITIES:**

The total permissible variation for the entire quantity ordered shall be subject to limit $\pm 1\%$ of ordered quantity. However, the permissible variation in case of individual consignees may be $\pm 5\%$.

8.0. **INSPECTION, TESTING AND TEST CERTIFICATES:**

- 8.1 The inspection shall be carried out by the purchaser's representative during manufacture and before dispatch. The supplier shall keep the purchaser informed in advance, about the manufacturing programme so that arrangement can be made for inspection.

The manufacturer shall grant free access to the purchaser's representative, at a reasonable time, when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser, shall not relieve the supplier of his obligation of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

- 8.2 The contractor shall furnish an authenticated electrostat copy of type test results as carried out on the same design to prove that the design has successfully passed through required tests. The type test up to a maximum of 5 years prior to date of tender opening by recognized test house of repute shall be acceptable.

However the purchaser reserves the right to get cable type tested at any stage during the currency of contract at his own expenses in any reputed test house. The transportation and arrangement of testing of sample to test laboratory shall be the responsibility of the contractor.

- 8.3 The following tests shall be carried out by the inspecting officers of the PVVNL on samples selected at random as per IS: 1554 (Part-1):1988 with latest amendments thereof, if any.

1. Tests on conductor
 - a) Tensile test (For aluminum) IS: 8130-1984
 - b) Wrapping test (For aluminum) IS: 8130-1984
 - c) Conductor resistance test IS: 8130-1984
2. Test for thickness of Insulation & Sheath IS: 5831-1970
3. Physical test for insulation & sheath IS: 5831-1970
4. Insulation resistance test IS: 8130-1984
5. High voltage test (water immersion test) IS: 694 -1977

Length/weight check shall also be carried out on minimum 5%, reels/coils subject to minimum one reel/coil by the inspecting Officers as per their decision along with above acceptance test. The contractor will make all necessary arrangements & provide all necessary facilities at his own cost for the above tests/checks.

9. **Raw material:-**

The supplier shall themselves be responsible for timely arrangement / procurement of all the raw-materials required for the manufacturing of all ordered items and shall furnish their test certificates to the purchaser if so required.

10. The cables offered by the supplier shall conform to the requirement of IS: 1554 (Part-1):1988 or latest amendment if any, and as per technical particulars enclosed herewith. No other technical particulars or Deviations from technical specification shall be accepted.

Further, these specifications are subject to the technical terms and conditions mentioned in instructions to tender general requirement of specification and form 'B'. In case of any ambiguity of technical specification/Technical particulars shall prevail.

Note:-Indian Standard (IS) guidelines issued periodically shall prevail.
