

**TECHNICAL SPECIFICATION FOR SINGLE CORE LT UN-ARMoured XLPE CABLE****1.0. SCOPE:**

This specification covers design, engineering, manufacture, stage testing, inspection and testing before supply and delivery at site and testing and commissioning of following sizes of Single Core XLPE Cables for use with effectively earthed distribution system.

- |                   |                    |                    |
|-------------------|--------------------|--------------------|
| (1) 1 x 70 Sq. mm | (2) 1 x 120 Sq. mm | (3) 1 x 150 Sq. mm |
| (4) 1x240 Sq. mm  | (5) 1x400 Sq. mm   | (6) 1 x 630 Sq. mm |
| (7) 1x1000 Sq. mm |                    |                    |

- 1.1.** It is not the intent to specify completely herein all the details of the design and construction of material. However the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such, components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

**2.0. STANDARDS:**

- 2.1.** 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-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.

Moderately hot and humid tropical climate, conducive to rust and fungus growth.

**3.0. PRINCIPAL PARAMETERS** : The material shall conform to the following specific parameters:

Sl. No.	Item	Specification
1.	<b><u>Type of Installation</u></b>	Outdoor
2.	System Voltage	LT 433 V (+10% -15%)
3.	System Frequency	50 Hz +/- 5%
4.	No. of Phases	Three
5.	System of earthing	Solidly grounded

**4.0 TECHNICAL REQUIREMENTS:**

**4.1 MAIN FEATURES:**

The power cables shall be of LT 1.1 kV Grade, stranded compacted, high Conductivity, aluminum conductor, XLPE insulated, extruded PVC inner sheathed, 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:**

The cable conductor shall be made from stranded aluminum to form compacted conductor having resistance within the limits specified in IS-8130/1984. **Minimum guaranteed weight of Aluminium used in the cable shall be as given below :**

Sl. No.	Cable Size	Minimum guaranteed weight of Alu. Kg/ km
1.	1×70 mm <sup>2</sup>	189.00 Kg/KM.
2.	1×120 mm <sup>2</sup>	325.00 Kg/KM.
3.	1×150 mm <sup>2</sup>	405.45 kg/ km
4.	1×240 mm <sup>2</sup>	649.00 Kg/KM
5.	1×400 mm <sup>2</sup>	1081.00 Kg/KM.
6.	1×630 mm <sup>2</sup>	1700.00 Kg/KM.
7.	1×1000 mm <sup>2</sup>	2700.00 Kg/KM.

**4.2.2 INSULATION:**

The XLPE insulation shall be suitable for the specified system voltage. The manufacturing process shall ensure that the insulation is free from voids. The insulation shall withstand mechanical and thermal stresses under steady state as well as transient operating conditions. The extrusion method shall give smooth surface of insulation. The insulation shall be so applied that it fits closely on the conductor and it shall be easily possible to remove it without damaging the conductor.

**4.2.3 INNER SHEATH: -**

An extruded PVC inner sheath shall be provided over laid up cores. The sheath shall be suitable to withstand the site conditions and the desired temperature. It shall be of thickness as per the relevant standards, consistent quality and free from all defects. The binding tape used

over the laid up cores shall not be constructed as a part of the inner sheath.

**4.2.4. OUTER SHEATH:**

Extruded PVC outer sheath of Green colour shall be applied with suitable additives to prevent attack by rodents and termites. Outer sheathing shall be designed to offer high degree of mechanical protection and shall also be heat, oil, chemical, abrasion and weather resistant. Common acids, alkalies, saline solutions etc., shall not have adverse effects on the PVC sheathing material used.

**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 outdoor application purposes.

**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.

Sl. No.	Nominal Area (mm <sup>2</sup> )	Short Circuit Current Rating (KA)
1.	1×70 mm <sup>2</sup>	6.6
2.	1×120 mm <sup>2</sup>	11.28
3.	1×150 mm <sup>2</sup>	14.10
4.	1×240 mm <sup>2</sup>	22.56

5.	1×400 mm <sup>2</sup>	37.60
6.	1×630 mm <sup>2</sup>	59.22
7.	1×1000 mm <sup>2</sup>	94.00

#### 4.2.7 **OPERATION:**

Cables shall be capable of satisfactory operation, under a power supply system frequency variation of  $\pm 5$  C/S, voltage variation of +10% to -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 cable shall be supplied in wooden drums and the standard drum length shall be as follows-

(1) 1 x 50 sq. mm-	500 meters +/- 5%
(2) 1 x 70 sq. mm-	500 meters +/- 5%
(3) 1 x 150 sq. mm-	500 meters +/- 5%
(4) 1 x 240 sq. mm-	500 meters +/- 5%
(5) 1 x 400 sq. mm-	500 meters +/- 5%
(6) 1 x 630 sq. mm-	500 meters +/- 5%
(7) ) 1 x 1000 sq. mm-	500 meters +/- 5%

#### 4.2.9 **IDENTIFICATION:**

For identification of individual cores, coloured strips of red, yellow and blue colours respectively shall be used on the cores to identify phase conductors as per relevant ISS.

#### 4.2.10 **EMBOSSING :**

The cable shall be embossed throughout the length with the name of the manufacturer or trade mark and the letters "Property of P.V.V.N.L.", voltage grade with cable size and the year of manufacture. The embossing shall be done only on the outer sheath, the distance between any two consecutive embossing shall not be more than 1 Meter. The cable shall be embossed for the verification of its length at intervals of 1 Meter say 1,2,3 up to full length.

#### 4.2.11 **GUARANTEED TECHNICAL PARTICULARS:**

The guaranteed technical particulars of the material shall be as per Annexure enclosed herewith. In case of any inconsistency with GTP, the parameters given in Technical Specification shall prevail.

#### 5.0. **TESTS:**

##### 5.1 **Type Test :**

The material offered shall be fully type tested at independent test laboratories by the Bidder as per the relevant standards but test reports shall not be more than five years old from the date of opening of bid. The bidder shall furnish following type test reports

along with the bid. The bids received without these type test reports shall be treated as non responsive.

1. Tests on conductors.
2. Test for thickness of insulation and sheath.
3. Physical tests for insulation.
4. Physical tests for outer sheath.
5. Insulation resistance test.
6. High voltage test.

**5.2. Acceptance and Routine test:** All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the supplier in presence of purchaser's representative.

## **6.0 INSPECTION**

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.

All Acceptance tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the Bidder and purchaser at the time of purchase.

The purchaser reserves the right to insist for witnessing the acceptance/ routine testing of the bought out items. The supplier shall give 15 days (for local supply)/ 30 days (incase of foreign supply) advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests. Material shall be dispatched only after getting the dispatch authorization from Inspectors representing purchaser, after successful testing.

## **7 VARIATION IN QUANTITY**

The supplied quantity can vary within plus/minus two percent of the ordered quantity.

The cables offered by the tenderers shall conform to the requirement of IS: 7098 (Part-Ii)/1985 with latest amendment thereof and as per technical particulars enclosed herewith. No other technical particulars or deviation from Technical particulars and technical specifications shall be accepted. Any deviation may result in the cancellation of order.

Further, these specifications are subject to the instructions to Tenderers, General Technical specifications, Terms and conditions mentioned in General requirement of specifications, and PuVVNL Form 'B'. In case if any ambiguity of technical details given elsewhere the conditions given in technical specification shall prevail.

**Note -**

- (i) In case of any contradiction in technical specification as mentioned above the relevant IS, shall be prevail.
- (ii) In case of any contradiction in terms & conditions mentioned at more than any place, the terms & conditions to the best advantage of PVVNL will prevail.

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