TECHNICAL SPECIFICATION FOR 11 KV 3x120 sq. mm 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 11 kv 3x120 Sq.mm. XLPE Cables for use with effectively earthed distribution system.

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 Stadard Specifications with latest amendments thereto.

Indian Standard No.	Title	Internationally
IS:7098 Part-II/1985	Specification for Cross Linked Polyethylene Insulated PVC Sheathed Cable for working Voltages from 3.3 KV Up to and including 33 KV.	IEC : 502 (1983)
IS:5831/1984	PVC insulation and sheath of electric cables.	
IS: 8130/1984	Conductors for insulated electric	IEC :502 (1983)
IS : 10418/1982	Cables and Flexible cords Specification for cable drum	IEC : 228 (1978)

Equipment 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.

3.0 PRINCIPAL PARAMETERS :

3.1 The material shall conform to the following specific parameters :

Sl. No.	Item	Specification
1.	Type of Installation	Outdoor
2.	System Voltage	11 KV (+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 Cable shall be of 11 KV grade, high conductivity, stranded compacted circular Aluminum Conductor, XLPE insulated, extruded inner PVC sheathed, galvanized steel strip armoured with overall separate extruded PVC outer sheathed, conforming to relevant standards suitable for 11 KV three phase 50 cycle per second earthed system.

4.2 MATERIALS AND CONSTRUCTION :

4.2.1 CONDUCTOR :

The conductor shall be made from stranded aluminium to form compact circular conductor having resistance within limits as specified in Table-2 of IS: 8130 /1984 and any amendment thereof.

4.2.2 CONDUCTOR SHEILD:

The conductor shall have a non – magnetic semi- conducting screen, which will ensure perfectly smooth profile and avoid stress concentration. The Conductor screen shall be extruded in the same operation, as the insulation.

4.2.3 INSULATION:

The XLPE insulation shall be suitable for specified system voltage. The manufacturing process shall ensure that insulation is free from voids. The insulation shall withstand mechanical thermal stresses under steady state and transient operating condition. The extrusion method shall give smooth interface between semi-conducting screen and insulation. The insulation of the cables shall be of high standard quality and conform to Clause-11 of IS: 7098 (Part-II)/1985 or latest amendment thereof.

4.2.4 INSULATION SHIELD:

To confine electrical field to the insulation, insulation screening consisting of two parts, namely metallic (non-magnetic) and non-metallic (semi-conducting) shall be provided over the insulation of each core. The non-metallic insulation shield shall be extruded in the same operation as the conductor shield and the insulation by the triple extrusion process. The insulation shield shall be of bonded type and strippable on adequate heating. Metallic screening of copper tape shall be provided over non-metallic shield as per provision of clause 12.4 of IS: 7098 (Part-II)/1985 and amendment thereof.

4.2.5 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 construed as a part of the inner sheath. The inner sheath shall conform to the provisions of IS: 7098 (Part-II) /1985 or latest amendment thereof.

4.2.6 ARMOUR:

Armouring shall be applied over inner sheath with galvanized steel strip complying with the requirements of IS: 3975 – 1988 and amendment thereof. The armour strips shall be applied as closely as possible. The dimensions of steel strip shall be as per table 4 of IS: 7098 (Part-II)/1985 and its latest amendment there of.

4.2.7 OUTER SHEATH:

Extruded PVC outer sheath of type **ST-2 of yellow colour** as per IS: 5831/1984 and its latest amendment shall be applied over armouring with suitable additives to prevent attach by rodents and termites and its thickness shall be in accordance with Clause –17.32 of IS:7098 (Part-III)/1985 and latest amendment thereof. Outer sheathing shall be designed to offer high degree of mechanical protection and shall also be heat, oils, chemicals, abrasion and weather resistant . Common acids, alkalies, saline solutions etc. shall not have adverse effects on the PVC sheathing material used.

4.2.8 CONSTRUCTION:

1) The cable shall have suitable PVC fillers laid up with insulation cores to provide substantially circular cross section before the inner sheath is applied. The fillers shall be suitable for the operating temperature of the cable and compatible with the insulating material.

2) 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.

3) The PVC material used in the manufacture of cable shall be of reputed make. No recycling of the PVC is permissible. The purchaser reverses 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.

4) The cable shall be suitable for laying in covered trenches and/ or buried underground to meet the out door application purposes.

5) Minimum guaranteed weight of aluminium conductor used in the cable shall be as per following-

Cable size	**Min. weight of Aluminium (kg/km)**
3x120 sq. mm	**973**

4.2.9 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 90º C. with ambient site condition specified for continuous operation at the rated current. The one second short circuit current rating shall be as per table given below at maximum temperature of 250º c.:-

Nominal Area (mm^2)	**Short circuit current Rating (KA)**
120	11.30

4.2.10 OPERATION:

Cables shall be capable of satisfactory operation, under a power supply system frequency variation of +/-5c/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 Net work service.

4.2.11 LENGTH:

The cable shall be supplied in wooden drums and the standard drum length shall be as follows :-

11 KV XLPE Cable (size 3x120 sq.mm.) : 500 Mts.

Non standard length of not less than 100 mts. shall be accepted . Total non standard length should not exceed 5% of the ordered quantity for each size of cable .

4.2.12 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.

4.2.13 EMBOSSING:

The manufacturer shall emboss (i) Property of PVVNL (ii) Name of Manufacturer (iii) Year of manufacture (iv) Specification No. (v) Voltage grade and size of cores at the interval of one meter length throughout the length of the cable. The identification embossing shall be done only on the outer sheath.

4.2.14 PACKING:

The cable shall be supplied on non-returnable wooden drums of heavy standard construction conforming to IS: 10418:1982 and latest amendment thereof and being suitable for transport by goods train or truck and for storage at site. The wood used for construction of the drums shall be properly seasoned and wood preservative shall be applied to the entire drum.

All ferrous parts shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage. Each drum shall have the following information marked on it with indelible ink along with other important information including technical data: -

(i) Specn. No. PVVNL-

(ii) Consignee & Destination Railway Station.

(iii) Trade name or trademark, if any.

(iv) Name of manufacturer.

(v) Nominal sectional area of the conductor of the cable.

(vi) Drum No.

(vii) No. of cores.

(viii) Type of cable & voltage for which it is suitable.

(ix) Gross weight of the drum(approx.)

(x) Length of cable in the drum with individual lengths if more than one.

(xi) Net weight of the cable.

(xii) ISI certification mark, if available.

A layer of waterproof paper shall be applied to the surface of the drum and over the outer cable layer. A clear space of at least 40 mm shall be left between the cable and the laggings. The packing shall be adequate to protect the cable from damage in transit and contractor shall be responsible for it and make good at his own expenses any all damages due to improper packing etc.

4.2.15 GUARANTEED TECHNICAL PARTICULARS:

The guaranteed technical particulars in the prescribed format as detailed at annexure-1 shall be furnished along with the bid without which the Bid shall be treated as non-responsive

4.2.16 TEST CERTIFICATE :

The tenderer shall furnish an authenticated copy of results of successful type test and short circuit withstand (one second) test as carried out over the cable of same design, size and type to prove that the design has successfully passed through required tests. The tests as carried out from **CPRI/ERDA/NTH**.

5.0 INSPECTION & TESTING :

5.1 If successful type test and short circuit withstand test for one second have been carried out the cable of same design, size, type and manufacturing process during last five years (counted from the date of tender opening), repetition of these tests is not required provided the manufactured materials conforms to IS: 7098 (Part-II) 1985 with latest amendment thereof in respect of type and Short Circuit withstand test.

5.2 On the other hand, if the offered design is not type tested during last five years, the sample of the cable marked out of the first lot offered for inspection shall be subjected to short circuit withstand test for one second and all type tests in accordance with IS: 7098 (Part-II) 1985 and amendments thereof, in presence of purchaser's representative at test houses/institutions mentioned

All charges/fee/transportation etc. to conduct these tests shall be borne by the contractor. Subsequently inspection, and regular supply of material shall commence only after successful type testing and short circuit withstand testing and dispatch authorization of first lot from competent authority.

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

5.4 Routine and Acceptance tests as laid down in IS: 7098 (Part-II) 1985 with latest amendment thereof shall be carried out by the inspecting officers of the PVVNL on sample selected at random as per relevant ISS.

In addition to above, length check on one drum per inspection lot shall also be carried out by the inspecting officers for which contractor shall make all necessary arrangements and provide all necessary facilities at his own cost.

6.0 VARIATION IN QUANTITY:

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

7.0 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 PVVNL Form `B'. In case if any ambiguity of technical details given elsewhere the conditions given in technical specification shall prevail.