Specification No. CSC- 49 /DH/UH/P&D/2010-2011

TECHNICAL SPECIFICATION

OF

33 kV, 3 x 300mm²

XLPE ARMOURED Cable

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(CSC approved Dt. 23.4.10) ***UHBVN & DHBVN***

TECHNICAL SPECIFICATION OF 33 kV 3x300mm² XLPE ARMOURED Cable

1. **SCOPE**

This specification covers design, manufacture, inspection, testing and supply of 33kV, 3X300 sq. mm. XLPE armoured cable to destination Station anywhere in the jurisdiction of UHBVN/DHBVN for use with effectively earthed distribution system.

2. **STANDARDS**

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

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

Equipment conforming to other internationally accepted standards, which ensure equal or higher quality than the standards mentioned above, would also be acceptable. In case bidder wishes to offer material conforming to 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 PARAMTERS**:

3.1 The material shall conform to the following specific parameters.

S.I. No.	Item	Specification
1.	Type of Installation	Outdoor
2	System Voltage	33 kV (+10% - 15%)
3	System Frequency	50 Hz. ± 5%
4	No. of Phases	Three
5	System of earthing	Solidly grounded

4. **TECHNICAL REQUIREMENT**

The cable shall be 33 kV Grade, high conductivity stranded compacted circular aluminium conductor, 3 core, XLPE insulated, inner PVC sheathed, galvanized steel strip armoured with overall separate extruded PVC outer sheath, conforming generally to IS: 7098 (Part-II) - 1985 and amendment thereof suitable for 33 kV 3 phase 50 Hz earthed system.

4.1 Two distinct sheaths i.e. inner and outer shall be provided. Outer sheathing shall be designed to afford high degree of mechanical protection and shall also be heat, oil, chemicals and weather resistant, common acids, alkalies and saline solution shall not have adverse effect on the material used for PVC outer sheathing.

4.2 The cable should be suitable for lying in covered trenches and/or buried direct underground.

5. **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.

6. **CONDUCTOR SHIELD**

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

7. **INSULATION**

The XLPE insulation shall be suitable for specified 33 kV system voltage. The manufacturing process shall ensure that insulation shall be free from voids. The insulation shall withstand mechanical and thermal stresses under steady state and transient operating conditions. The extrusion method shall give very 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.

8. **INSULATON 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. The non-metallic semi-conducting shield shall be put over the insulation of each core. The insulation shield shall be extruded in the same operation as the conductor shield and the insulation by triple extrusion process. The insulation shield shall be bonded and Strippable, on adequate heat treatment. Metallic shield shall be provided over non-metallic portion as per provision of clause 12.4 of IS: 7098 (Part-II)/1985 and amendment thereof.

9. **INNER SHEATH**

The sheath shall be suitable to withstand the operating conditions and the desired temperature rating of the cable. It shall be of adequate thickness, consistent quality and free from all defects.

10 **ARMOUR**

Galvanized steel strip armouring shall be provided. The dimensions of steel strip shall be as per table 4 of IS: 7098 (Part-II)/1985 and its latest amendment and strip shall conform to latest provisions of IS: 3975 - 1988 and amendment thereof.

11. **OUTER SHEATH**

Extruded PVC outer sheath of type ST-2 as per IS: 5831/1984 and its latest amendment shall be applied over armouring with suitable additives to prevent attack by rodent and termite and its thickness shall be in accordance with Clause -17.32 of IS:7098 (Part-III)/1985 and latest amendment thereof.

12. **CONSTRUCTION**

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

12.2 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 specification, IS, Indian Electricity Rules, Indian Elect. Act and any other applicable statutory provisions, rules and regulations.

12.3 The PVC material used in the manufacture of cable shall be of reputed make. No recycling of the PVC is permitted. 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 manufacturer is complying with quality control.

13. **WORKMANSHIP AND QUALTIY ASSURANCE**

The workmanship shall be neat, clean and of highest grade/quality

14. **CURRENT RATING**

14.1 The cable will have current rating and de-rating factors as per relevant Indian Standards.

14.2 The one -second short circuit current rating shall be 28.20 kA.

14.3 The current rating shall be based on maximum conductor temperature of 90^{o}C with ambient site condition specified in General Requirement of Specification for continuous operation at the rated current.

15. **OPERATION**

15.1 Cable shall be suitable for laying in ducts and direct in ground.

15.2 Cables shall have heat and moisture resistant properties. These shall be of type and design, with proven record of distribution network service.

16. **LENGTHS**

The cables shall be supplied in standard drum lengths i.e. 250 m. Non-standard length of not less than 100 m is acceptable. Total of Non-standard lengths should not exceed 5% of the ordered quantity.

17. **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. CSC- /DH/UH/P&D/2010-2011
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) 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.

18.0 **IDENTIFICATION MARKING**

For the identification of individual cores, coloured strips of red, yellow and blue colours shall be used to identify phase conductors.

The manufacturer shall emboss following at the interval of two m length throughout the length of the cable:-

(i) Property of UHBVN / DHBVN.

(ii) Name of Manufacturer

(iii) Year of manufacture

(iv) Specification No.

(v) Voltage grade and size of cores.

The cable shall also be embossed (clearly visible) for the verification of its length at intervals of 1 m say 1,2,3 up to full length on outer sheath

19.0 **TEST CERTIFICATE**

The tenderer shall furnish an authenticated copy of results of successful type tests. The tests as carried out at any NABL accredited lab and / or in any of the following institutions / test houses shall be acceptable.

(a) National Physical Laboratory, Delhi.

(b) Indian Institute of Science, Bangalore.

(c) Central Power Research Institute, Bangalore / Bhopal.

(d) ERDA, Badodra.

(e) National Test House, Alipur, Calcutta,

(f) Indian Institute of Technology.

(g) Shri Ram Test House, New Delhi.

(h) Indian Fuel Research Institute, Dhanbad.

20. **INSPECTION & TESTING**

20.1 However, the purchaser reserves the right to get the cable type tested at any stage during, pendency of contract at its own expenses in any reputed test house mentioned in Clause-19. The transportation and arrangement of testing of sample to test laboratory shall be the responsibility of the contractor.

20.2 Routine and Acceptance tests as laid down in IS: 7098 (Part-II) 1985 with latest amendment thereof shall be carried out by the representative/ inspecting officers of the UHBVN / DHBVN 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 officer(s) for which contractor shall make all necessary arrangements and provide all necessary facilities at its own cost.

20.3 **Fake Inspection calls**

In case the supplier makes a fake inspection call i.e., the material is not found ready by the Inspecting Officer deputed by the Nigam for inspection, the supplier shall be liable to pay actual expenditure incurred

by the Nigam subject to a minimum of Rs. 20, 000/- for each such fake call.

21.0 **VARIATION IN QUANTITY & QUALITY**

The supplied quantity can vary within plus/minus five 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 UHBVN / DHBVN 'Annexure-D'. In case if any ambiguity of technical details given elsewhere the conditions given in technical specification shall prevail

22. **CLIMATIC CONDITIONS:**

The equipment/material to be supplied against this specification shall be suitable for satisfactory operation under the following climatic Conditions

i)	**Location**	**At various locations in the state of Haryana**
ii)	Maximum ambient temperature (^{o}C)	60
iii)	Minimum ambient air temperature (^{o}C)	-5
iv)	Maximum average daily ambient temperature (^{o}C)	40
v)	Maximum yearly weighed average ambient temperature (^{o}C)	32
vi)	Maximum altitude above mean sea level (m)	1000
vii)	Minimum Relative Humidity (%)	26
viii)	Maximum Relative Humidity (%)	95
ix)	Average no of Rainy days/ year	120
x)	Average annual rainfall	900 mm
xi)	Maximum wind pressure	195 kg/m sq.

The equipment shall be for safe operation in moderately hot and humid tropical climate, conducive to rust and fungus growth.

23. **GUARANTEE / WARRANTEE**

The supplier shall be responsible to replace, free of cost, with no transportation or insurance cost to the Purchaser, up to destination, the whole or any part of the material which in normal and proper use proves defective in quality or workmanship, subject to condition that the defect is noticed within 36 months from the date of receipt of material in stores or 30 months from the date of commissioning whichever period may expire earlier. The consignee or any

other officer of Nigam actually using the material will give prompt notice of each such defect to the supplier. The replacement shall be effected by the supplier within a reasonable time, but not in any case exceeding 45 days. The supplier shall, also arrange to remove the defect within a reasonable period, but not exceeding 45 days from the date of issue of notice in respect thereof; failing which, the purchaser reserves the right to dispose of defective material in any manner considered fit by him (Purchaser), at the sole risk and cost of the supplier. Any sale proceeds of the defective material after meeting the expenses incurred on its custody, disposal handling etc., shall however be credited to the supplier's account and set off against any outstanding dues of the purchaser against the supplier. The warranty for 30/36 months shall be one time.

24. **CHALLENGE CLAUSE**

The material offered / received after the inspection by the authorized inspecting Officer may again be subjected to the test for losses or any other parameters from any testing house / in house technique of the Nigam having requisite capabilities and facilities**.** The results if found deviating / unacceptable or in non-compliance with approved GTP's, the lot shall be rejected and bidder shall arrange to supply the within thirty (30) days of such detection at his cost including to & fro transportation. In addition to this a penalty @ 10% of cost of the rejected lost of material shall be imposed

General Manager/P&D
cum-Member Secretary CSC
UHBVN Panchkula.

GUARANTEED TECHNICAL PARTICULARS TO BE FILLED BY THE BIDDER			
Sl. No.	**Particulars**	**Unit**	**Quoted Value**
1	Manufacturer's name and address		
2	Location of Factory		
3	Standard to which cable conforms		
4	Conductor Details a) Material compositions class as per IS:8130 b) Shape of stranded conductor c) Number of strands in each core (Min) d) Diameter of each strand e) Nominal cross section area of each core f) Guaranteed weight of aluminum per Core per Km (min)	 No. mm. sq.mm kg/km	
5.	Conductor Screen a) Material b) Thickness (min)	 mm	
6.	Insulation a) Material with ref. of ISS b) Thickness of insulation (mm) (min)	 mm	
7.	Insulation Screen a) Material 1) Semi Conducting Part 2) Metallic Part b) Thickness for 1) Semi conducting part (min) 2) Metallic part (min)	 mm mm	
8.	INNER SHEATH a) Material b) Thickness (min)	 mm	
9.	Filler material		
10.	ARMOURING a) Material b) Dimension of Flat armouring strip	 mm x mm	
11	OUTER SHEATH a) Material b) Thickness of sheath (min)	 mm	
12.	Weight of Finished cable (approx)	kg/km	
13	Standard delivery length per drum	m	
14	Tolerance in standard drum length of the cable	%	
15	Gross weight of drum including cable (approx)	kg	
16	Recommended depth of laying	mm	
17	Short circuit withstand current for 1 sec.	kA	
18	Voltage drop per thousand m length at rated current a) When laid directly in ground b) When laid directly in covered trench c) When laid directly in air	 volt/km volt/km volt/km	
19	Impulse voltage withstand	kV	
20	Derating factors under various conditions of installation a) D.C resistance per core at 20°C (Max.) b) AC impedance per core at 20°C (Max.) c) AC Reactance per core at 20°C (Max.) d) Capacitance per core e) Insulation resistance at 27°C (Min) f) Volume resistivity of insulation at 27°C (Min)	 ohm/km ohm/km micro F/km M-ohm/km ohm/km	
21	Maximum partial discharge magnitude at 1.5 Uo	pC	

22	Maximum cable charging current at normal operating voltage	amp/km	
23	Recommended minimum bending radius	mm	
24	Name of manufacturers of bought out raw material a) Aluminium b) PVC compound c) XLPE compound d) Galvanized steel strip for armouring e) Any other		
25.	A) Whether same cable has been type tested? If yes, when and where it was tested B) It is expected that you will enclose an authenticated electrostate copy of type test of same design, size and type of cable. i) Please inform whether or not you have enclosed the same. ii) If yes, how main sheets does it contain.	Yes/No Yes/No Nos.	
26	Whether wood preservative shall be applied to whole drum?	Yes/ No	
27	If yes, Details in brief Whether all ferrous parts shall be treated with rust preventive finish or coating? If yes, details in brief.	Yes/ No	
28	Whether water proof paper layer shall be applied to the surface of drum and over the outer cable layer?	Yes / No	
29	Reference of license in use of ISI and other certification marks, if any		

Dated For M/s

Place Signature

(By its constituted attorney)

Note:

The tenderes should clearly note that above guaranteed technical particulars are to be given only in the proforma given above and not in random form. Technical particulars given in any other form shall not be considered. Any extra information can be given separately in the form of Annexure to above technical particulars