



उत्तर दक्षिण हरियाणा बिजली वितरण निगम  
UTTAR DAKSHIN HARYANA BIJLI VITRAN NIGAM



Specification No. CSC-XIII/R-IV/DH/UH/P&D/2020-2021

**TECHNICAL SPECIFICATION FOR**  
**For**  
**FOUR CORE & TWO CORE PVC INSULATED**  
**&**  
**PVC SHEATHED LT ARMoured CABLES**

Issue of Month: - May,2020

Common Specification Committee  
DHBVN & UHBVN



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**Technical Specification for Two Core and Four Core PVC Insulated & PVC Insulated & PVC Sheathed LT Armoured Cables.**

**1. SCOPE:**

- 1.1 This section provides for manufacture, testing before dispatch, supply and delivery F.O.R. destination of 2 Core & 4 Core PVC insulated and PVC sheathed armoured circular cables with Aluminium conductor suitable for working voltage up to & including 1100 Volts ISI marked & conforming to IS 1554 (Pt-I)1988 with latest amendments.

**2. STANDARDS:**

2.1	IS: 1554 (Pt-I)/1988	PVC Insulated (heavy duty) electric cable for working voltages up to and including cables.
2.2	IS: 8130/1984	Conductors for insulated cables
2.3	IS: 5931/1984	PVC insulation and sheath of electric cables
2.4	IS: 10810/1984	Method of test for cables
2.5	IS: 3975/1979	Galvanized steel wire/strips
2.6	IS: 10418/1982	Drums for electric cables

**3. CLIMATIC CONDITION**

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 (°C)	60
III.	Maximum ambient air temperature (°C)	-5
IV.	Maximum average daily ambient temperature (°C)	40
V.	Maximum yearly weighed average ambient temperature (°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 use in moderately hot and humid tropical climate, conducive to rust and fungus growth.



**4. GENERAL REQUIREMENT:**

- 4.1 The ISI marked PVC insulated Armoured cables shall conform to IS: 1554 (Pt-I)/1988 with latest amendment and bear BIS certification mark. The material used for construction of the cables shall be of best qualities complying with the requirement of IS: 1154(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.
- 4.2 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 70°C under normal operation and 160°C under short circuit condition.
- 4.3 The PVC insulated Armored LT Cable shall be ISI marked. The tenderer (MANUFACTURER) must furnish valid ISI certificate along with offer.

**5. MATERIAL:**

**5.1 CONDUCTOR:**

The conductor shall be composed of Aluminium wire complying with IS: 8130/1984 with latest amendments.

**5.2 INSULATION:**

Insulation shall be Type- A PVC composed of Aluminium wire complying with IS: 8130/1984 with latest amendments.

**5.3 FILLERS:**

- 5.3.1 The filler shall be of vulcanized rubber, un-vulcanized rubber or Thermoplastic material and shall be provided to fill the gaps between cores.
- 5.3.2 The filler material shall be so chosen so as to be compatible with temperature of the cable and shall have no deleterious effect on other components of the cable. These shall not be harder than PVC used for insulation and outer sheath respectively.

**5.4 ARMOURING:**

Armouring shall be of galvanized round steel wires / galvanized steel strips as per IS 1554 (Part-1):1988. The galvanized steel wires/strips shall comply with the requirements of IS: 3975-1979.



**5.5 OUTER SHEATH:**

The outer sheath shall consist of type ST-1 PVC Compound conforming to the requirements of IS: 5831/1984.

**6. CONSTRUCTION:**

**6.1 CONDUCTOR:**

The construction of the conductor shall be stranded for cable size above 10 mm<sup>2</sup> whereas it is solid for 6 mm<sup>2</sup> & 10 mm<sup>2</sup> as per Clause No. 8.1 of IS:1554(Pt-I)1988 & relevant clause of IS: 8130/1984.

**6.2 INSULATION:**

The conductor shall be provided with Type-'A' PVC compound insulation applied by extrusion. The insulation shall be so applied that it fits closely on the conductor and it shall be possible to remove it without damage to the conductor. The thickness and tolerance on thickness of insulation shall be as per clause No. 9.2 of IS: 1554(Part-I)/1988.

**6.3 CORE IDENTIFICATION:**

The core shall be identified by different colouring of PVC insulation as per clause No. 10.1 of IS: 1554 (Part-I)/1988.

**6.4 LAYING UP OF CORES:**

The core shall be laid up together with the suitable right hand lay. The interstices shall be filled with non-hygroscopic material.

**6.5 INNER SHEATH (COMMON COVERING):**

6.5.1 The laid up cores shall be provided with an inner sheath applied by extrusion. It shall be ensured that it is as circular as possible. The thickness of inner sheath shall be as given in Table-4 of IS: 1554(Part-I)/1988.

6.5.2 The inner sheath shall be so applied that it fits closely on the laid up cores and it shall be possible to remove it without damage to the insulation.

**6.6 ARMORING:**

**6.6.1 APPLICATION**

Armouring shall be applied over the inner sheath. The armour wires/formed wire shall be applied as closely as possible with a coverage of not less than 90 percent. The coverage of armour shall be done as per Appendix C of IS: 1554 (Part-I):1988.



The direction of lay of armour shall be left hand. A binder tape may be provided on the armour.

#### 6.6.2 TYPE OF ARMOUR:

Where the calculated diameter below armouring does not exceed 13mm, the armour shall consist of galvanized round steel wires. Where the calculated diameter below armouring is greater than 13 mm, the armour shall consist of either galvanized round steel wires or galvanized steel strips.

The dimensions of galvanized steel wires and strips shall be as specified in Table 5 of IS: 1554(Part-I)/1988.

#### 6.6.3 JOINTS:

The joints in the armour wire/strips shall be made by brazing or welding and the surface irregularities shall be removed. A joint in any wire/strips shall be at least 300 mm from the nearest joint in any other armour / wire in the completed cable.

#### 6.7 OUTER SHEATH:

6.7.1 The outer sheath consists of type ST-PVC compound & shall be applied by extrusion over the armouring.

6.7.2 The colour of the outer sheath shall be black.

6.7.3 The minimum thickness of PVC outer sheath shall not fall below the thickness specified in Table-7 of IS: 1554(Part-I)/1988.

7. The following minimum weight of Aluminium conductor shall be guaranteed by the manufacturer.

Nominal cross sectional area (mm <sup>2</sup> )	Minimum mass of Aluminium per km per phase of conductor	
	Solid (kg)	Stranded (kg)
10	27	--
16	42.2	43.9
25	66.2	69.5
35	91.8	96.4
50	124	131
70	180	189
95	249	262
120	315	331
185	485	509
300	800	839
630	--	1746



**8. TESTS AND TEST CERTIFICATES:**

8.1 The cable should meet the requirement of all tests including optional tests as specified at clause No. 15.4 of IS: 7098 (Pt-I)/1988.

**8.1.1. The following shall constitute routine tests:**

8.1.1.1 Conductor resistance test.

8.1.1.2 High Voltage test.

**8.1.2 The following shall constitute Acceptance tests:**

8.1.2.1 Tensile test (for Aluminium).

8.1.2.2 Wrapping test (for Aluminium).

8.1.2.3 Conductor resistance test.

8.1.2.4 Test for thickness of Insulation & Sheath.

8.1.2.5 Tensile strength & elongation at break of Insulation & sheath.

8.1.2.6 Insulation resistance test.

8.1.2.7 High Voltage test at room temperature

8.1.2.8 Cold Bend Test.

8.1.2.9 Cold Impact Test

8.1.2.10 Armour resistance Test.

**8.1.3 The following shall constitute type tests:**

8.1.3.1 Tests of Conductor

8.1.3.2 Tensile test (for Aluminium)

8.1.3.3 Wrapping test (for Aluminium)

8.1.3.4 Conductor resistance test.

8.1.3.5 Test for Armouring Wires/Strips

8.1.3.6 Test for thickness of insulation and sheath

**8.1.4 Physical test for insulation:**

8.1.4.1 Tensile strength and elongation at

8.1.4.2 Ageing in air oven.

8.1.4.3 Hot Deformation Test.



- 8.1.4.4 Shrinkage Test.
- 8.1.4.5 Loss of Mass in Air oven.
- 8.1.4.6 Heat Shock Test.
- 8.1.4.7 Thermal Stability Test.

**8.1.5 Physical test for Outer Sheath:**

- 8.1.5.1 Tensile strength and elongation at break.
- 8.1.5.2 Ageing in air oven.
- 8.1.5.3 Loss of mass in air oven.
- 8.1.5.4 Shrinkage Test.
- 8.1.5.5 Hot Deformation Test.
- 8.1.5.6 Heat shock Test.
- 8.1.5.7 Thermal Stability.

**8.1.6 Insulation resistance test.**

**8.1.7 High Voltage test at room temperature.**

**8.1.8 High voltage test at room temperature.**

**8.1.9 Flammability test.**

8.2 The tenderer must also clearly indicate various testing facilities available at their works for testing the material as per relevant standards. In case of otherwise, particulars of the place where such testing is proposed to be conducted during the course of inspection, shall be indicated with the offer.

**9. Inspection:**

- 9.1 The inspection may be carried out by the purchaser at any stage of manufacture. The successful tenderer shall grant free access to the purchaser's representatives at a reasonable time when the work is in progress. Inspection and acceptance of any equipment / material under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment / material is found to be defective.
- 9.2 The supplier shall keep the purchaser informed in advance about the manufacturing program so that arrangement can be made for inspection.





9.3 The acceptance tests as per IS: 1554(Part-I)/1988 shall also be conducted by the manufacturer before dispatch in the presence of Nigam's Representative / Inspecting Officer as per relevant clause of NIT along with verification of lengths & weight and checking the manufacturing defects, if any of samples coils. The mass of Aluminum, XLPE, PVC & Filler in sample coils shall also be verified by the inspecting officer(s). Cold bend/cold impact test (IS: 5831/1984) shall constitute the optional tests and shall be conducted on each offered lot of the cables of each size as per Clause No. 15.4 of IS: 1554(Part-I)/1988.

9.4 At least 5% of total numbers of drums subject to minimum of 2 in each lot put up for inspection shall be selected at random to ascertain the length/workmanship of cable by the following method:

At the work of the manufacture, the cable shall be transferred from one drum to another for checking any manufacturing defects in the cable drum selected for conducting acceptance tests, at the same time measuring its length with the help of the graduated pulley & cyclometer. The difference in the average length thus obtained from the declared length by the supplier in the packing list shall be applied to all the drums if the cable is found short during checking the sample lot (s).

**9.5 Test Charges:**

All test charges incurred towards test checking of the material received in our stores shall be borne by the Nigam.

**10. Identification:**

10.1 The Manufacture shall be identified through-out the length of cables as per clause No. 17.1 of IS: 1554(Part-I)/1988.

10.2 In order to distinguish these electric cables from telephone cables, the word ELECTRIC shall be indicated, pointed or embossed throughout the length of the cable on outer sheath.

10.3 The cable code shall be provided as per Clause No. 17.3 of IS: 1554 (Part-I)/1988.

10.4 The cable shall also be required to be embossed with the word name of manufacture or trade name, cable code, voltage grade, DHBVN, size of cable, year of manufacture and ISI certification mark at every meter length for which no extra charges shall be paid.



**11. Packing and Marking:**

11.1 The cables shall be wound on non-returnable wooden drums conforming to IS: 10418/1982 of suitable size and packed. The ends of the cable shall be sealed by means of non-hygroscopic sealing material. Only one cable length shall be supplied on a drum.

11.2 The cable shall carry the following information stenciled or painted on the drum:

11.2.1 Manufacturer's name, Brand name or trade mark.

11.2.2 Type of cable and voltage grade.

11.2.3 Number of cores.

11.2.4 Nominal Cross-sectional area of the Conductor.

11.2.5 Cable code.

11.2.6 Length of cable on the drum.

11.2.7 Approximate gross weight.

11.2.8 Year of manufacture.

11.2.9 BIS Certification marks.

11.2.10 Name of the consignee and full destination.

11.2.11 Tender number/Purchase order No.

11.2.12 The word SUITABLE FOR OUTDOOR USE & LOW TEMPERATURE CONDITIONS.

**12. Standard Length:**

12.1 The cables shall be supplied in the standard length of 500 Meters for size 4C x 95 mm<sup>2</sup>, 4C x 50 mm<sup>2</sup>, 4C x 25 mm<sup>2</sup>, 4C x 16 mm<sup>2</sup> and 1000 meters for size 4C x 10 mm<sup>2</sup>, 2C x 15 mm<sup>2</sup>, 2C x 10 mm<sup>2</sup>, 2C x 6 mm<sup>2</sup>.

12.2 A tolerance (+/-) 5% shall be allowed in standard length.

12.3 Only one cable length shall be acceptable by non-standard length measuring not less than 50% of standard length to complete the ordered quantity in each size.

**13. Quantity:**

The quantities as mentioned in the Schedule of requirement are tentative & these may increase/decrease as per the requirement of the Nigam.



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**14. Quantity Tolerance:**

The quantity tolerance of (+/-) 2% shall be allowed in each size for completion of supply.

**15. Guaranteed Technical Particulars:**

The tenderer shall furnish guaranteed technical particulars in the relevant schedule.

**16. Constructional Drawings: -**

The tenderer is required to furnish the detailed construction drawing of the cable clearly showing shape of core, type and size of fillers I interstices along with centre filler etc. In absence of this the tender is likely to be ignored.

  
Superintending Engineer/P&D  
Cum-Member Secretary CSC  
DHBVN & UHBVN



**Guaranteed Technical and Other Particulars for the Supply of LT PVC Armoured Cables**

Sr. No.	Particulars	PVC Armored cables in Sq. mm.		
		Size-1	Size-2	Size-3... so on
1.	Manufacturer's name and works address.			
2.	Standard specification to which the material shall			
3.	Voltage Grade			
4.	No of Cores.			
5.	Conductor Details			
	Normal Cross section area of :			
A	1 Phase Conductor (Sq. mm)			
	2 Neutral Conductor (Sq. mm)			
	No. and size of strands (in mm)of :			
B	1 Phase Conductor (Sq. mm)			
	2 Neutral Conductor (Sq. mm)			
C	SHAPE OF CONDUCTOR			
D	Whether compacted or non-compacted			
	Resistance			
E	1 Phase Conductor (Sq. mm)			
	2 Neutral Conductor (Sq. mm)			
6.	INSULATION			
1.	Type			
2.	Colour			
3.	Thickness			
A	Phase Conductor (Sq. mm)			
	1 Nominal (mm)			
	2 Minimum (mm)			
B	Neutral Conductor (Sq. mm)			
	1 Nominal (mm)			
	2 Minimum (mm)			
7.	Type of inner sheathing and colour			
8.	Whether Binder Tape Provided			
9.	Armoring			
A	Type			
B	Dimension (mm)			
10.	Outer Sheath			
A	Material			
B	Thickness			
	1 Nominal (mm)			
	2 Minimum (mm)			
C	Standard to which it Confirm			
11.	A Type and size of filler used			
	B Min. WT. of filler in KG./KM.			
12.	Max. overall diameter of the cable in MM.			
13.	Nature of packing			
14.	Drum			
A	Tare Weight of Drum			
B	Whether Drum is wheel mounted.			



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C	Standard specification to which drum shall conform.
D	Drum details & dimensions
E	Whether 2-Full Ply Flange Construction or 2-Full
1	Drum Size
A	Flange Diameter (d1) (mm)
B	Barrel Diameter (d2) (mm)
C	Centre Hole Diameter (d3) (mm)
D	Overall with (L-1) (mm)
E	Travers (L2) (mm)
F	Thickness of Flange.
G	Barrel End supporting disc or core
1	Diameter (mm)
2	Thickness (mm)
H	Stretchers (Core carrier Planks)
1	Number (Min.)
2	Thickness x width (mm)
I	Barrel Battens Thickness (core filler)
J	Barrel Middle Supports (Middle core discs)
K	Thickness of External Lagging (mm)
2	Details of Metal Components:
A	Clamping Studs with Hexagonal Nuts
1	Numbers
2	Diameter (mm)
B	Square of Round Washers
1	Numbers
2	Diameter (mm)
C	M.S. Bushes
1	Numbers
2	Thickness of Sleeve (mm)
3	Dimension of Sleeve (mm)
4	Number of Bolts
5	Diameters of Bolts
D	M.S. / C.I. Centre Plate
1	Numbers
2	Diameter of Bolts (mm)
3	Centre Plate Bolts (mm)
A	Numbers
B	Diameter of Bolts (mm)
E	Centre Hole Diameter (mm)
F	Minimum weight in Kg./Km.
1	Aluminium
2	XLPE
3	PVC
G	Standard Length of Cable in meter & its
H	Whether material bears BIS Certification



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I	BIS License no. & validity		
J	Embossing		
K	Any other particulars		