

	CORPORATE PURCHASING SPECIFICATION	AA 285 44 REV. No. 02 PAGE 1 OF 5
<u>PVC INSULATED SINGLE CORE FLEXIBLE COPPER CABLES</u> <u>(GRADE 1100 VOLTS)</u>		
1. <u>GENERAL:</u> This specification governs the quality requirements of Polyvinylchloride (PVC) Insulated Single Core (Unsheathed) Flexible Tinned/ Untinned Copper Cable for operation upto a voltage of 1100 volts and temperature of 70°C.		
2. <u>APPLICATION:</u> Switchgear and Controlgear wiring for industrial and power station application.		
3. <u>COMPLIANCE WITH NATIONAL STANDARDS:</u> The material shall comply, in general, with the requirements of the following National Standard and also meet the requirements of this specification. IS:694-1990 : PVC Insulated Cables For Working Voltages : Upto And Including 1100 Volt. B.S.6231-1990 : PVC Insulated Cables For Switchgear And : Controlgear Wiring.		
4. <u>SIZES:</u> As stated on order. The sizes shall preferably be selected from Annexure - I.		
5. <u>CONDUCTOR CORE:</u> The conductor core shall consist of Tinned/Untinned annealed high conductivity copper wire with electrical and mechanical properties in accordance with IS:8130. The conductor shall be tinned or untinned as specified on order. The details of the conductor shall be as per the Annexure - I. The resistance of the conductor at 20°C shall not exceed the appropriate maximum value given in the annexure - I.		
6. <u>INSULATION:</u> 6.1 <u>Type:</u> The insulation shall be provided with polyvinylchloride compound conforming to the requirements of type-A compound of IS:5831. The radial thickness of insulation shall be not less than the nominal values (t_1) specified in Annexure-I.		
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The smallest of the measured values of thickness of insulation shall not fall below the nominal value (t_1) by more than $0.1 \text{ mm} + 0.1t_1$

Insulation shall be applied by extrusion method in such a way that it fits closely on the conductors and shall be possible to remove it easily without damage to the conductors.

6.2 Colour Of Insulation:

The colour of PVC insulation shall be as specified in the order

7. OVERALL DIAMETER AND TOLERANCE:

The mean overall diameter shall not exceed the upper limit specified in Annexure-I.

8. TEST SAMPLES:

One coil/reel shall be submitted for testing and approval.

9. PROPERTIES:

Unless otherwise specified, when tested in accordance with the relevant clauses of IS:10810 the test sample shall show the following properties:

9.1 Electrical:

Unless otherwise specified, tests shall be made with alternating voltages of approximately Sine-wave form having a frequency in the range of 50 Hz to 60 Hz and the r.m.s. values given.

9.1.1 Spark Test (Clause 16.4, IS:694):

The cable shall withstand the test voltage specified without failure of the insulation.

The test shall be carried out during the manufacture of the cables.

9.1.2 Voltage Test:

Test is carried out on a sample of suitable length after the cable has been immersed in water for not less than 1 hour. Apply the voltage between the conductors and the water, which shall be earthed. Make the test at room temperature with an alternating voltage of 3000 V. Increase the voltage gradually and maintain it at full value for 5 minutes. The insulation shall not breakdown.

10. TYPE TESTS:

10.1 Insulation Resistance (IS: 5831):

Insulation resistance test shall be carried out at 500 volt. D.C. The value of volume resistivity when calculated from the measured insulation resistance value shall not be less than $1.0 \times 10^{13} \text{ Ohm-cm}$ at 27°C and $1.0 \times 10^{10} \text{ Ohm-cm}$ at 70°C

**10.2 Flame Retardance:**

The period of burning after removal of flame shall not exceed 60 seconds and unaffected portion from the lower edge of the top clamp shall be atleast 50 mm.

10.3 Water Immersion Test - AC Test:

A sample of approximately 3 metre length from the finished cable shall be immersed at $60^{\circ}\pm 3^{\circ}\text{C}$ in such a way that the ends protrude atleast 200 mm above the water level. After 24 hours, a voltage of 3 kV (rms) shall be applied between conductors and water. This voltage shall be raised to 6 kV (rms) within 10 seconds and held constant at this value for 5 minutes. If the sample fails in this test one more sample shall be subjected to this test.

10.4 Physical Tests On Insulation:**10.4.1 Tensile Strength:**

As received : 12.5N/mm², Min
After ageing at $80^{\circ}\pm 2^{\circ}\text{C}$ for 168 hours : 12.5N/mm², Min
Variation : $\pm 20\%$, Max

10.4.2 Elongation:

As received : 150%, minimum
After ageing at $80^{\circ}\pm 2^{\circ}\text{C}$ for 168 hours : 150%, minimum
Variation : $\pm 20\%$, Max

10.4.3 Heat Ageing Shock Test At $150^{\circ}\pm 2^{\circ}\text{C}$ For One Hour:

No signs of cracks or scales.

10.4.4 Shrinkage Test At $150^{\circ}\pm 2^{\circ}\text{C}$ For 15 Minutes:

4%, maximum.

10.4.5 Cold Bend Test (For Diameter Less Than 12.5 mm):

No signs of cracks or scales, when tested at -10°C

11. TEST CERTIFICATES:

Unless otherwise stated, three copies of test certificates shall be supplied along with each consignment giving the following information.

In addition, the supplier shall ensure to enclose one copy of test certificate along with their despatch documents to facilitate quick clearance of the material.



AA 28544 : PVC Insulated Single Core Flexible
(Rev.No.02) : Copper Cables (Grade 1100 Volts)
BHEL order no.
Manufacturer's/supplier's name.
Trade mark, if any.
Batch/lot no.
Size and length of the cable Supplied.
Test results of clause 6, 9 and 10.

12. PACKING AND MARKING:

The cables shall be either wound on reels, drums or supplied in packed coils. Each reel shall be covered in thick polythene sheet and further packed in carton to avoid damage during transit. Each drum or reel should be marked with the following information:

AA 28544 : PVC Insulated Single Core Flexible
: Copper Cables (Grade 1100 Volts)
BHEL order no.
Manufacturer's/supplier's name.
Batch/lot no.
Trade mark, if any.
Sizes, length and quantity Supplied.
Date of manufacture.

13. REJECTION AND REPLACEMENT:

If the material does not comply with the requirements of this specification during receipt inspection at BHEL or if any defect is found during further processing of the material, BHEL reserves the right to reject the whole consignment notwithstanding any previous certification of satisfactory testing and/or inspection. The supplier shall undertake to replace the rejected material at his own cost and the rejected material shall be taken back by the supplier after fulfilling all the commercial terms and conditions.

14. REFERRED STANDARDS:

The following is the list of the latest standards, as published by the respective issuing bodies, referred to in this specification.

1.IS:5831. 2.IS:10810 3.IS:8130

ANNEXURE - I

Sl No	Nominal : Cross : Sectional : Area, mm ²	Max dia. : of wire in : conductor : mm	Max.dia : of con- : ductor : mm	Radial : insulation : thickness : mm	Mean : overall dia. : upper limit : mm	Max. conductor Resistance : at 20oC Ohm/km	Untinned wire : Tinned wire
1.	0.50	0.21	0.93	0.6	3.0	39.0	40.1
2.	0.75	0.21	1.14	0.6	3.2	26.0	26.7
3.	1.00	0.21	1.32	0.7	3.2	19.5	20.0
4.	1.50	0.26	1.60	0.7	3.4	13.3	13.7
5.	2.50	0.26	2.00	0.8	4.2	7.98	8.21
6.	4.00	0.31	2.60	0.8	4.8	4.95	5.09
7.	6.00	0.31	3.60	0.8	5.6	3.30	3.39
8.	10.00	0.41	4.60	1.0	7.0	1.91	1.95
9.	16.00	0.41	5.70	1.0	8.2	1.21	1.24
10.	25.00	0.41	7.10	1.2	10.0	0.780	0.795
11.	35.00	0.41	8.50	1.2	11.5	0.554	0.565
12.	50.00	0.41	10.30	1.4	14.5	0.386	0.393
13.	70.00	0.51	12.40	1.4	17.0	0.272	0.277
14.	95.00	0.51	14.50	1.6	19.0	0.206	0.210
15.	120.00	0.51	16.00	1.6	21.0	0.161	0.164
16.	150.00	0.51	18.00	1.8	23.5	0.129	0.132