



## CORPORATE PURCHASING SPECIFICATION

AA 285 02

Rev. No. 02

PREFACE SHEET

### CREPE PAPER COVERED FLEXIBLE COPPER CABLE

FOR INTERNAL USE ONLY  
REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS

#### Comparable Standards:

1. INDIAN : IS: 8572-1993

#### Suggested/Probable suppliers and grades:

1. M/S Asian Cables corporation Ltd., Thane
2. M/S Indian Cable Co. Ltd., Jamshedpur
3. Refer plant vendors list.

#### User Plant References:

1. BHOPAL : PS 35103  
BP 28595 (NI)
2. JHANSI : - DO-

#### Revisions :

Ref. Lr: BHEL/JS/604 dt: 25.03.05 from Jhansi

#### APPROVED :

INTERPLANT MATERIAL  
RATIONALISATION COMMITTEE -MRC (E)

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December, 1986

**CREPE PAPER COVERED FLEXIBLE COPPER CABLE****1.0 GENERAL:**

This specification covers the quality requirements of flexible copper cable covered with Crepe Kraft paper and suitable for use in insulating oil to IS:335 and having temperature index of at least 105.

**2.0 APPLICATION:**

Used for making leads, windings and terminals in power and instrument transformers.

**3.0 COMPLIANCE WITH NATIONAL STANDARDS:**

There is no Indian standard covering this type of cable. However, assistance has been taken from IS:8572-1993 with certain alternative /additional requirements .

**4.0 DIMENSIONS:**

The dimensions of the cable shall be as stated in BHEL order and will generally be chosen from Annexure-I, but other sizes may also be ordered. Increased in diameter due to covering ( twice the radial insulation thickness) shall also be stated in BHEL order.

**5.0 TEST METHOD:**

Unless otherwise specified the tests shall be conducted in accordance with relevant methods of IS: 10452, part 1.

**6.0 SAMPLE FOR TEST:****6.1 Paper:**

The supplier should send the test certificates of papers for all tests as per specification AA 21117 for BHEL approval. The test report should be sent for each lot of paper and of different thicknesses received from the paper mill which are to be used in the manufacture of BHEL paper covered conductors.

In the absence of proper test certificates, 20 sheets of size 300 X 300 mm of paper from each lot and different thicknesses shall be supplied for BHEL testing and inspection.

**6.2 Finished Cable:**

5 meters long sample of finished cable shall be supplied for testing and inspection purposes.

**Revisions :**

Ref. Lr: BHEL/JS/604 dt:25.03.05 from Jhansi

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## 7.0 CONDUCTOR ( AA 12004):

### 7.1 Conductor Material:

The conductor shall be manufactured from plain (untinned) annealed high conductivity copper wire conforming to class 5 of IS : 8130. It shall be clean, reasonably uniform in size and shape, smooth and free from harmful defects. Its surface shall be free from sharp edges.

### 7.2 Wire diameter:

The wires of which a conductor is made shall have same nominal diameter before bunching as given in Annexure I.

The tolerance on diameter of wire shall be  $+0.01$  mm  
– 0.00

### 7.2 Conductor Resistance Test:

DC resistance of the conductor shall not be more than that specified for single core plain wires, in table No. 3 of IS : 8130.

### 7.4 Joints in Conductor:

Not more than two joints shall be allowed in any one of the single wire forming every complete length of the conductor and no two joints shall be within 300 mm of any other joint in the same layer. No joint shall be made in the conductor after it has been stranded. The joints shall be made by resistance but welding or silver soldering.

## 8.0 CREPE PAPER:

Crepe paper conforming to AA 21111, Type-B shall be used for covering the conductor. The basic parameters of this crepe paper are as below:

Nom. thickness of base paper	:	$75 \pm 7.5$ micron
Nom. thickness of crepe paper	:	$250 \pm 50$ micron
Elongation at break	:	51 to 69%
Degree of creping	:	Fine
Hill counts per 10 mm	:	16

## 9.0 APPLICATION OF PAPER:

### 9.1 General:

To prevent the inclusion of copper dust or other extraneous matter under the paper covering, the conductor shall be fully cleaned by felt pads or other suitable means immediately before entering the paper covering machine. Each layer of crepe paper shall be continuous, firmly applied and substantially free from creases. No bonding or adhesive material shall be used except to anchor the ends of crepe paper. Any such bonding or adhesive material shall have no deleterious effect on transformer oil, crepe paper or the electric strength of the covering.



**9.2 Width of Paper:**

The width of the crepe paper used shall not exceed three times the diameter of the conductor. However the width should not be less than 10 mm.

**9.3 Arrangement of layer:**

All the layers shall be applied in the same direction, all except the outermost layer shall be butt wound, and the outermost layer shall be overlap wound by not less than 25% of the paper width with a minimum of 3 mm. Within each group of papers the position of the butt joints of any layer relative to the layer below shall be progressively displaced by approximately 30 percent of the paper width with a minimum of 3 mm.

**9.4 Number of layers of crepe paper covering:**

Tension on the crepe paper shall be so adjusted that all the layers are stretched uniformly and six layers of paper per mm of radial covering are applied.

**10.0 INCREASE IN DIAMETER DUE TO COVERING:**

The increase in diameter due to the covering shall be calculated from the bare cable diameter and the overall diameter of the covered cable measured by means of a suitable ratchet micrometer with a measuring pressure of 300 to 450 Kpa having accuracy better than 2 micron. The spindle and anvil of the micrometer shall have a diameter of 5 to 8 mm. The measurement shall include at least one overlap. The increase in diameter so derived shall not exceed that specified nor shall it be less than that specified by more than 5 percent i.e. tolerance is

+ 0  
- 5 %

**11.0 TEST CERTIFICATES:**

Unless otherwise specified, three copies of test certificates shall be supplied alongwith each consignment .

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

The test certificate shall bear the following information:

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Bare cable size (Nominal area, No. of wires, Diameter of wire & Conductor diameter)

Overall cable size

Increase in diameter due to covering

Test results obtained for tests on bare and covered cable as per clauses 4.0, 7.0, 9.0 and 10.0

**12.0 PACKING & MARKING :**

The crepe paper covered flexible copper cable shall be tightly and evenly wound without twist on drum in such a direction that, when unrolled, the exposed edge of the overlap of the outer layer of paper is towards the drum. Drums used for packing shall be from seasoned wood.

It is referred that each drum shall be contain one continuous length free from joints, but where necessary, a drum could contain two lengths, provided that the shorter length is not less than 20 percent of the total length of cable required.

The paper covered cable shall be protected by a layer of oiled canvas or similar water proof material under the final wrapping, and the cable end shall be inside this covering so that no part of it is exposed.

Each drum shall be labeled clearly stating the following information. The label shall preferably be cemented into a recess in the side of the flange of the drum.

AA 285 02: Crepe paper covered flexible copper cable

BHEL Order No.

Manufacturer's Name and Grade

Bare cable size (Nominal area, No. of wires, Diameter of wire & Conductor diameter)

Overall cable size

Increase in diameter due to covering

Length of cable ( where two lengths are supplied, the length of each shall be stated.)

Net weight

Gross weight

**13.0 REFERRED STANDARDS (Latest Publications Including Amendments):**

1) IS:335

2) IS:8130

3) IS: 8572

4) IS: 10452, Part 1

5) AA 12004

6) AA 21111

7) AA 21117

**ANNEXURE – I****STANDARD SIZES OF CREPE PAPER COVERED FLEXIBLE COPPER CABLE**

<b>NOM. CROSS SECTIONAL AREA</b>	<b>No. OF BUNDLES</b>	<b>No. OF WIRES</b>	<b>BARE DIAMETER OF EACH WIRE, mm</b>	<b>BARE DIAMETER OF CABLE , mm</b>
2.5	--	50	0.25	2.3
6	--	84	0.30	3.6
25	--	196	0.40	7.5
35	--	276	0.50	9.0
70	--	360	0.50	12.5
95	--	475	0.50	15.0
120	19 X 32	608	0.50	16.5
150	27 X 28	756	0.50	18.5
185	37 X 25	925	0.50	20.5
240	37 X 33	1221	0.50	23.5
300	61 X 25	1525	0.50	26.0
400	61 X 33	2013	0.50	30.0
500	61 X 29	1769	0.60	33.6