	CORPORATE PURCHASING SPECIFICATION	**AA 120 07**
		Rev. No. 03
		PREFACE SHEET

COPPER STRIP – ANNEALED (CLOSE TOLERANCES)

FOR INTERNAL USE ONLY
REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS

Comparable Standards:

1. INDIAN : IS : 1897 – 1983, Gr.O – Annealed.

Suggested/Probable Suppliers and Grades:

Refer plant vendors list.

User Plant References:

1. HEEP, HARDWAR : 0502 002 (Strips)
   0502 008
2. BHOPAL : PS 12009
   PS 12054 (Strips)
   PS 12070 to PS 12073
   (Partially i.e. for application in electrical windings)
3. HYDERABAD : TADS - A

Revisions : **Cl: 20.10.9 of MOM of MRC-NFCW+HE**			**APPROVED :** **INTERPLANT MATERIAL RATIONALISATION COMMITTEE-MRC (NFCW+HE)**		
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COPPER STRIP – ANNEALED (CLOSE TOLERANCES)

1.0 GENERAL:

This specification governs the quality requirements of bright annealed bare Copper strip of thickness over 0.15 mm and upto 10 mm and widths upto 160 mm with radiused edges and close tolerances.

2.0 APPLICATION: Used for general electrical purposes such as bus bars, connectors etc.

3.0 CONDITION FO DELIVERY:

Bright and Annealed.
The material shall be supplied in annealed condition, with close tolerances in coils or straight lengths as specified in BHEL order.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall in general comply with the requirements of the following national standard and also meet the requirements of this specification.

IS: 1897 – 1983 : Copper strips for Electrical Purposes.
Gr: 'O 'Annealed

5.0 DIMENSIONS AND TOLERANCES:

5.1 Sizes: Copper Strips shall be supplied to the dimensions specified in BHEL order:

5.2 Tolerances:

Tolerances on width, thickness, and length shall be as follows:

5.2.1 Width / Thickness:

Tolerance on thickness, width and length shall be as follows,

Width/Thickness, mm		Tolerance, ± mm
Over	Upto & including	
-	3.0	0.03
3.0	6.3	0.05
6.3	12.0	0.07
12.0	25.0	0.10
25.0	50.0	0.12
50.0	100.0	0.25
100.0	160.0	0.50

5.2.2 Length:

Tolerance on fixed length, shall be as per the table given below:

Length, meter		Tolerance, ± mm
Over	up to & including	
-	0.2	1.0
0.2	1	2.0
1	2	3.0
2	4	6.0
4	6	10.0

5.3 Radius on Edges:

The strip shall be supplied with edge radiused as per IS:1897, reproduced below, reproduced below.

Thickness, mm		Nominal radius	Tolerance on radius, mm
Over	upto & incld.	on edges, mm	
--	1.0	Semi circular	± 0.06
1.0	1.6	0.60	± 0.15 – 0.10
1.6	2.25	0.80	± 0.15
2,25	3.55	1.0	± 0.20
3.55	10.00	1.25	± 0.25

5.4 Straightness:

The edges of strips supplied in straight lengths shall not vary from a straight line by more than 20 mm in any 1000 mm length.

6.0 MANUFACTURE:

The strip shall be manufactured form copper of ETP grade conform to IS:191.

The conductor shall be manufactured from ETP grade copper conforming to BHEL specification: AA 12024: Electrolytic Tough Pitch Copper Wire/Bars/Ingots/Continuously cast wire rods.

NOTE: It is preferable to manufacture conductor from continuously cast copper rods provided all other parameters and conditions remain same.

7.0 FREEDOM FROM DEFECTS:

The strips shall be clean, bright, smooth and free from harmful defects.

8.0 CHEMICAL COMPOSITION:

The analysis of copper when analyzed in accordance with IS:440 or any other conventional/ instrumental methods shall be as follows:

Element	Percent, min.	Percent, max.
Copper and Silver	99.90	--
Bismuth*	--	0.001
Lead*	--	0.005
Total of all impurities excluding silver and oxygen excl. silver and oxygen	--	0.030

* These elements need not be determined when the material supplied conforms with mechanical and electrical properties specified in this specification. However, the supplier shall ensure that the composition of the material lies within the limits specified above.

9.0 TEST SAMPLES:

One sampling per size per melt per consignment of 3 tonnes or part thereof shall be taken for chemical, mechanical and electrical tests.

The sample shall be cut off cold and shall receive no further treatment before being tested.

10.0 MECHANICAL PROPERTIES:

10.1 Tensile strength (For sizes over 0.50 mm and upto & including 10mm thick):

The test samples, when tested in accordance with IS:1608 shall show the following properties:
IS:1608 , shall show the following properties:

Tensile Strength : 205 N/mm^2 , minimum.
Elongation on $4\sqrt{A}$ or 50 mm gauge length: 35% Min
NOTE: Material upto and including 0.5mm shall be tested only for hardness.

10.2 Hardness (Vickers):

When tested in accordance with IS:1501, the strips shall have a Vickers hardness not exceeding 60 HV, min.

10.3 Bend Test:

The strip shall not be subjected to transverse bend test. where this is not possible, it shall be subjected to a longitudinal bend test. The strip when tested in accordance with IS: 1897 shall withstand a close bend test, through an angle of 1800, without showing any sign of cracks or failures upon the convex surface of the bend.

10.4 Edgewise Bending:

The material shall withstand without showing any sign of cracks or failure, when bent on edge through an angle of 180 over a former of radius equal to half the width of the strip.

11.0 ELECTRICAL RESISTIVITY (AS RECEIVED):

When measured in accordance with IS: 3635, the electrical resistivity at 20^0 shall not be greater than 0.01737 ohm-mm^2/metre, which is equivalent to an electrical conductivity of 99.25%, minimum of IACS standard.(Refer Appendix B of IS: 613 for temperature correction factor).
Alternatively, the method of measurement employing eddy current probes as per ASTM E 1004 is also acceptable.

12.0 INSPECTION AT SUPPLIER'S WORKS:

Whenever specified, tests and inspection are to be conducted in the presence of BHEL'S representative.
The supplier shall offer BHEL'S representative all reasonable facilities, without charge to satisfy the latter that the material is being furnished in accordance with this specification. The supplier shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilities are not available at his carrying out the prescribed tests elsewhere. The supplier shall notify BHEL in advance about the readiness of the material for inspection and testing.
BHEL reserves the right to test the material at BHEL'S works and the final acceptance of the material shall be based on these test results.

13.0 TEST CERTIFICATES:

Unless otherwise specified, three copies of test certificates shall be supplied along with 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:

AA 120 07, Rev 03: Copper strip – Annealed, Close Tolerances
BHEL Order No,
Manufacturer's/Supplier's Name :
Lot/Identification/Batch/Melt No.
Sizes and Quantity Supplied

Results of dimensional inspection, chemical analysis, mechanical and electrical tests as per this specification.

14.0 PACKING AND MARKING:

The material shall be supplied in coils or drums or in straight length as ordered. The minimum eye of coil or barrel diameter of drums shall be 250 mm.

The material not supplied in drums shall be hessian wrapped and tied with string and not with wire and shall be suitably protected to with wire and shall be suitably protected to avoid damage in transit. Each coil or drum or bundle shall be legibly marked or labeled with the following information.

Each coil or drum or bundle shall be legibly marked or labeled with the following information:

AA 12007 : Copper strip – Annealed, (Close Tolerances)
BHEL Order No.
Manufacturer's/Supplier's Name :
Lot/Identification/Batch/Melt No.
Sizes and Quantity Supplied

15.0 REFERRED STADARDS (Latest Publications Including Amendments):

1. IS:191	2. IS:440	3. IS:613	4. IS: 1501
5. IS:1897	6. IS:1608	7. IS:3635	8.ASTM E 1004
9. AA 12024			