



CORPORATE PURCHASING SPECIFICATION

AA 120 08

Rev. No. 05

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COPPER RODS - ANNEALED

1.0 GENERAL:

This specification governs the quality requirements of round and rectangular Copper Rods, over 6 mm and upto and including 125 mm, size, in the annealed condition.

2.0 APPLICATION:

Used for general electrical purposes such as end rings of squirrel cage motors etc.
Refer AA 12022 for rectangular copper rods with edgewise bending.

3.0 CONDITION FO DELIVERY:

The rods shall be supplied in annealed condition in straight lengths. Rectangular bars shall be supplied with corners radiused to Cl.5.3.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

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

IS: 613 - 2000 : Copper Rods and Bars for Electrical Purposes.

Condition: Annealed:

5.0 DIMENSIONS AND TOLERANCES:

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

5.2 **Tolerances:**

5.2.1 **Tolerances on diameter/across flats shall as follows:**

Diameter, Width across flats or thickness		Tolerance (±)		
Over	Upto & incld.	Round (dia)	Square & Hex. Rod (Width across flat)	Rectangular bar (Width or thickness)
6	10	0.05	--	--
10	12	0.05	0.08	0.07
12	25	0.08	0.10	0.10
25	50	0.12	0.16	0.14
50	80	0.18	0.25	--
80	100	as agreed between BHEL and supplier...		
100	160	as agreed between BHEL and supplier.....		

Revisions : Clause: 19.10.10 of MOM of
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5.2.2 Tolerance on length shall be as follows:

<u>Length, mm</u>		Tolerance, $\pm$ mm
Over	Upto and Incl.	
-	150	1.2
150	1200	1.5
1200	2400	2.5
2400	--	5.0

5.2.3 Straightness:

The edges of rods shall not vary from a straight line by more than 3 mm in any 1000 mm length.

5.3 Radius on Edges - Rectangular:

<u>Thickness, mm</u>		Edge radius, mm	Tolerance, $\pm$ mm
Over	Upto&Incl.		
6	25	2.5	0.25
25	50	3.2	0.25
50	As agreed.....		

6.0 MANUFACTURE:

The materials shall be manufactured from copper of ETP grade conform to IS:191.

7.0 FREEDOM FROM DEFECTS:

The material shall be clean, bright, smooth and free from fins, spills, scaling blisters, cracks and other harmful defects.

8.0 CHEMICAL COMPOSITION

The analysis of copper when analysed in accordance with IS: 440, shall as follows.

Element	Percent	
	Min.	Max
Copper and Silver	99.90	-----
Bismuth*	-----	0.001
Lead*	-----	0.005
Total of all impurities excl. silver and oxygen	-----	0.030



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*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 (SAMPLING AND CRITERIA FOR CONFORMITY):

Sampling, number of tests, criteria for conformity and retest shall be as per CI 12 of IS:613.

10.0 MECHANICAL PROPERTIES:

10.1 Tensile:

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

Cross - sectional dimension, mm		Tensile strength, maximum	Elongation on 5.65 of gauge length
Over	upto & incld	N/mm ²	% minimum
6	10	250	32
10	12	240	40
12	90	230	45
Over 90		 as agreed	

10.2 HARDNESS:

When tested in accordance with IS: 1501, the material shall have a Vickers hardness 60 HV, max.

11.0 ELECTRICAL RESISTIVITY (AS RECEIVED)

When measured in accordance with IS: 3635, the electrical resistivity at 20⁰.C shall not be greater than 0.01737 ohm-mm²/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.

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12.0 INSPECTION AT SUPPLIER ' WORKS:

When ever 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 works, the supplier shall make Necessary arrangements for carrying out the prescribed test 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. 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 works, the supplier shall make necessary arrangement for carrying out the prescribed test elsewhere.

13.0 TEST CERTIFICATES:

Unless other wise stated, three copies of certificates shall be supplied along with each consignment.

In addition, the supplier shall ensure to send one copy of test certificates along with the dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

AA 12008 (Rev.05) Copper Rods - Annealed.

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.



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14.0 PACKING AND MARKING:

The material shall be suitably packed to prevent damage during transit.
Each package shall be legibly marked or labeled with the following information:

AA 12008 : Copper Rods - Annealed

BHEL Order No.

Manufacturer's/Supplier's Name :

Lot/Identification/Batch/Melt No.

Sizes and Quantity Supplied

15.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS:191

2. IS:440

3. IS:613

4. IS: 1501

5. IS:1608

6. IS:3635

7. ASTM E 1004

8. AA 120 22