



CORPORATE PURCHASING SPECIFICATION

AA 120 15

Rev. No. 07

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SOLID DRAWN COPPER TUBES AND PIPES- ANNEALED

1.0 GENERAL:

This specification governs the quality requirements of annealed solid drawn copper tubes and pipes.

2.0 APPLICATION:

General engineering purposes.

3.0 CONDITION OF DELIVERY: Annealed.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

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

IS: 2501- 1995 : Solid drawn copper tubes for general engineering purposes
Gr: Cu DHP

5.0 DIMENSIONS AND TOLERANCES:

5.1 Sizes:

The tubes and pipes shall be supplied as per the dimensions specified in BHEL order/drawing. Unless otherwise specified, tubes/ pipes shall be supplied in random lengths of 3 of 6 meters.

5.2 Tolerances:

The tolerances on out side diameter, wall Thickness, length, roundness and straightness of tubes/pipes shall be as per IS: 5493, given below:

5.2.1 Tolerance on mean outside diameter:

Outside diameter, mm	Over	Upto and incl.	Tolerances, mm
-		10	0.08
10		18	0.10
18		32	0.12
32		50	0.15
50		80	0.20
80		125	0.25
125		200	0.50
200		250	0.80
250		315	1.00

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5.2.2 Tolerance on wall thickness:

The mean thickness of the tube shall not vary from the specified thickness by more than $\pm 12.5\%$ of the specified wall thickness.

5.2.3 Tolerance on length:

Length, meters		Tolerance on length, mm
Over	Upto and incl.	
-	5	+4
5	7	+5
7	-	+6

5.2.4 Roundness Tolerance:

The difference between major and minor diameters as determined at any one cross section expressed in terms of % of specified O.D of the tube shall be as follows:

*t / D, mm	Roundness Tolerance on O.D%
Over 0.01 - 0.03	1.5
Over 0.03 - 0.05	1.1
Over 0.05 - 0.10	0.8 or 0.05 mm Whichever is greater
Over 0.10	0.7

* Where t is wall thickness and D is outside diameter (O.D).

5.2.5 Tolerance on Straightness:

Permissible maximum deflection shall be 3 mm on any one meter length,

6.0 MANUFACTURE:

The tubes shall be solid drawn and subsequently annealed. In no case tubes shall be redrawn from used tubes. The ends shall be cut clean and square with the axis of the tubes.

7.0 FREEDOM FROM DEFECTS:

The tubes shall be reasonably straight, round, clean, smooth, uniform in diameter and free from cracks, seams, scales, slivers and other harmful defects.



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8.0 CHEMICAL COMPOSITION:

The chemical composition of the material. When analyzed in accordance with IS:440 (Methods for chemical analysis of copper) or any other conventional/ instrumental method shall be as follows:

Element	Percent	
	min	max
Copper (Any Silver to be counted as copper)	99.80	-
*Antimony	-	0.005
*Arsenic	-	0.05
*Bismuth	-	0.003
*Iron	-	0.03
*Lead	-	0.01
*Nickel	-	0.10
*Selenium and Tellurium	-	0.02
*Tellurium	-	0.01
*Tin	-	0.01
Phosphorus	0.015	0.10
*Total impurities excluding Silver, Nickel, Arsenic and Phosphorus	-	0.06

***Note:** These elements need not be determined when the material supplied conforms with the mechanical 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:

9.1 The chemical analysis shall be performed on each heat.

9.2 Tubes of one size and thickness shall be grouped in batches of 300 tubes or 1000kg or part Thereof and BHEL or its representative may select at random one tube from each batch for mechanical testing.

Note: For tubes with wall thickness <1mm, lot will be of 2000 tubes or part thereof.

9.3 For embrittlement test one tube shall be selected from a lot of 100 tubes or part thereof.

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10.0 MECHANICAL PROPERTIES:

10.1 Tensile test:

A piece of tube selected for test, suitably plugged or flattened sufficiently for gripping, when tested in accordance with IS:1608 shall show the following tensile properties.

Property	As such	Strip cut from tube
Tensile strength, N/mm ² , min.	205	195
Elongation on 5.65 √So gauge length, percent, minimum	40	45

10.2 Flattening And Doubling Over Test:

The test pieces shall not crack when tested in accordance with IS: 2501.

10.3 Drift Expanding Test (For tubes not exceeding 100 mm in O.D)

The tubes, when tested as per IS: 2501 shall be capable of undergoing drifting without showing either crack or flaw.

11.0 NON DESTRUCTIVE TEST:

All tubes shall meet the requirement of eddy current or hydraulic / pneumatic test as per IS: 2501.

12.0 OPTIONAL TESTS:

12.1 MICROSCOPIC EXAMINATION:

Samples in longitudinal direction of tubes selected for the test shall be subjected to microscopic examination in accordance with IS: 4748 (METHOD for estimating average grain size of metals) at magnification of 75 X and shall show uniform & complete recrystallisation with an average grain size of 0.025 - 0.050 mm. Examination of unetched specimen shall show reasonable freedom from direct slag or foreign matter.

12.2 HYDROGEN EMBRITTLEMENT TEST:

Test specimen of tubes shall be capable of meeting the requirements of hydrogen embrittlement test as per IS: 6243 (Method of hydrogen and embrittlement test of copper)

13.0 RETESTS:

Should any of the test pieces first selected, fail to pass the prescribed tests mentioned under various clauses in this specification, two further samples from the same batch shall be selected for testing, one of which shall be from the same component from which the original test sample was taken, unless that component has been withdrawn by the supplier.



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Should the test pieces from both these additional samples pass the batch represented by the test sample shall be accepted. Should the test pieces from either of these additional samples fail, the batch represented by the test sample shall be rejected.

Should any specimen fail under above tests, all the tubes referred by the sample shall stand rejected. However, they may be resubmitted for inspection after stress relief treatment.

14.0 CHECKLIST:

The supplier shall fill up the enclosed check list as per Annexure-A and submit the same along with each batch.

15.0 INSPECTION AT SUPPLIER'S WORKS:

Tests and inspection are to be conducted in the presence of the customer's representative. The representative shall have free access at all times while the work on the contract is being performed, to all parts of the manufacturer's works. The supplier shall offer the purchaser'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 arrangement for carrying out the prescribed test elsewhere.

16.0 TEST CERTIFICATES:

Unless otherwise specified on order, three copies of test certificates shall be supplied. In addition, supplier shall sure to enclose one copy of test certificate along with despatch documents to facilitate quick clearance of material.

The test certificate shall bear the following information:

BHEL Order No.

AA 12015, Rev. No. 07: Solid Drawn Copper Tubes / Pipes - annealed

Batch No.

Identification Mark / No.

Weight

Supplier's Reference and Name

Results of Chemical, mechanical, hydraulic and all other tests called for in the specification /order.

17.0 PACKING AND MARKING:

The material shall be suitably packed in wooden crates to prevent corrosion and damage during transit. Each crate shall be legibly marked with the following information.

BHEL Order No.

AA 12015

Batch No.

Identification Mark /No.

Weight

Supplier's Reference and Name

18.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1) IS: 440 2) IS: 2501 3) IS: 1608 4) IS:4748 5) IS: 5493 6) IS: 6243.

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ANNEXURE - A (Clause 14.0)

CHECK LIST FOR AA 120 15: SOLID DRAWN COPPER TUBES / PIPES -ANNEALED (To be filled by Supplier)

- A. Name of Principal Supplier :
- B. Name of Indian Agent :
1. Grade of material as per specification : Yes/No
 2. Tolerance on diameter/ Width/thickness/ length and flatness as per specification and drawing : Yes/No
 3. Chemical composition as per specification : Yes/No
 4. Mechanical properties as per specification : Yes/No
 5. Microscopic examination, Hydrogen Embrittlement: Yes/No
 6. Tests :
 - (1) Drift expanding
 - (2) Flattening
 - (3) Doubling over test
 7. NDT tests offered :
 - (1) Hydraulic test
 - (2) Eddy Current test
 - (3) Pneumatic.
 8. Details of previous experience enclosed : Yes/No.
(For New suppliers only)
 - C. Deviations taken (Please specify clearly, if any) : Yes/No.
 - 1
 - 2
 - 3

Date:

Place:

Signature
and
Seal of Supplier