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STEEL TUBES - ELECTRIC RESISTANCE WELDED / SUBMERGED ARC WELDED														
1.0 GENERAL: This specification governs the quality requirements of light, medium and heavy grades of Electric Resistance Welded/Submerged Arc Welded steel tubes with plain ends in ungalvanized and galvanized condition in the range of 60mm to 150mm NB. 2.0 APPLICATION: For general purpose, suitable for bending, welding and screwing for flanges and fittings. Not suitable for steam services. 3.0 CONDITION OF DELIVERY: Tubes shall be supplied with plain ends. The ends shall be cut cleanly and square with the axis of the tube. Unless otherwise specified, tubes shall be supplied in ungalvanized condition. 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 : 1239(part 1) - 2004: Steel Tubes, Tubular and other Wrought Steel Fittings Gr: ERW 5.0 DIMENSIONS AND TOLERANCES : 5.1 Sizes: BHEL order shall clearly state the maximum outside diameter, and wall thickness of the tube. 5.2 Tolerances: 5.2.1 Thickness: <table style="width: 100%; border: none;"> <tr> <td style="width: 40%;">Light tubes</td> <td style="width: 10%; text-align: center;">+</td> <td style="width: 50%;">Not limited</td> </tr> <tr> <td></td> <td style="text-align: center;">-</td> <td>8 percent</td> </tr> <tr> <td>Medium and Heavy tubes</td> <td style="text-align: center;">+</td> <td>Not limited</td> </tr> <tr> <td></td> <td style="text-align: center;">-</td> <td>10 percent</td> </tr> </table>			Light tubes	+	Not limited		-	8 percent	Medium and Heavy tubes	+	Not limited		-	10 percent
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5.2.2 Weight:

Single tube (light series)	+ 10 percent - 8 percent
Single tube (medium and heavy series)	± 10 percent
For quantities per load of 10 tonnes, min (light series)	+ 7.5 percent - 5 percent
For quantities per load of 10 tonnes, min (medium and heavy series)	± 7.5 percent

5.2.3 Internal Weld Fin:

Height of the internal weld fin shall not be greater than 60 percent of the specified thickness.

5.2.4 Length:

5.2.4.1 Random Length:

Tubes shall be supplied in random lengths of 4 to 7 metres, unless otherwise specified and in the line with IS: 1239, Pt. 1.

5.2.4.2 Exact Length:

When exact lengths are called for, the tolerances shall be + 6mm, - 0 mm of the specified length.

6.0 MANUFACTURE:

Tubes shall be made from tested quality steel manufactured by any approved process and shall be fully killed.

Tubes shall not be manually welded.

7.0 FREEDOM FOR DEFECTS :

Tubes shall be cleanly finished and reasonably free from injurious defects. They shall be reasonably straight. The ends shall be cut cleanly and reasonably square with the axis of the tube.

8.0 CHEMICAL COMPOSITION :

The melt analysis of steel shall be as follows:

Element	Percent, max.	Permissible variation over specified limit, ± max
Carbon	0.20	0.02
Manganese	1.30	0.04
Sulphur	0.040	0.005
Phosphorus	0.040	0.005

**9.0 GALVANIZING:**

When galvanized tubes are ordered, the Zinc coating on the tubes shall be in accordance with IS: 4736.

10.0 TEST SAMPLES:

All tubes bearing the same designation and manufactured under a single process shall be grouped together to constitute a lot. Each lot shall be sampled separately in accordance with IS: 4711.

11.0 MECHANICAL PROPERTIES :**11.1 Tensile:**

The tensile strength of strips cut from selected tubes, when tested in accordance with IS:1608 shall be as follows:

Tensile strength : 320 N/mm² , min.

Elongation on 5.65 √ So gauge length:

Upto and Incl. 25 mm NB : 12 percent, min.

Over 25 mm upto incl. 150 mm NB : 20 percent, min.

- Note:** 1. For welded tubes, the strip tensile test specimen shall not contain the weld.
2. For galvanized tubes, zinc coating may be removed by stripping prior to tensile test.

11.2 Bend Test (On tubes upto and including 50mm Nominal bore):

When tested in accordance with IS:2329, the tubes shall be capable of withstanding the bend test without showing any signs of fracture or failure.

Tubes shall be bent with the weld at 90° to the plane of bending. The tubes shall not be filled for this test.

Ungalvanized tubes shall be capable of being bent cold without cracking, through 180° around a former having a radius at the bottom of groove in the plane of bending equal to at least six times the outside diameter of the tube.

Galvanized tubes shall be capable of being bent cold without cracking of the steel, through 90° round a former having a radius at the bottom of the groove equal to at least eight times the outside diameter of the tube.

11.3 Flattening Test (On tubes above 50mm Nominal bore):

Rings not less than 40mm in length, cut from the end of each selected tubes shall be flattened between parallel plates with the weld at 90° (point of maximum bending) in accordance with IS:2328. No opening shall occur by fracture in the weld until the distance between the plates is less than 75 percent of the original outside diameter of the tube and no cracks or breaks on the metal elsewhere than in the weld shall occur until the distance between the plates is less than 60 percent of the original outside diameter.

Test rings may have the inner and outer edges rounded.

**11.4 Hydraulic Test/Eddy Current Test:**

Each tube shall withstand a test pressure of 5 N/mm² without showing leakage defects of any kind. The pressure shall be applied and maintained for a minimum period of 30 seconds for proof and inspection.

Note: Eddy current test may be done in place of Hydrostatic test as per the procedure in Annexure-B of IS: 1239, Part-1.

12.0 TEST CERTIFICATES :

Three copies of test certificates shall be supplied, unless otherwise stated on the order.

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

The test certificate shall bear the following information:

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BHEL order No,

Supplier's Reference :

Name

Identification No.

Melt No.

Results of Tests :

Results of Chemical, Mechanical tests and Hydraulic/Eddy Current test,

13.0 PROTECTIVE COATING

The shall be protected with a rust preventive coating of varnish, externally throughout the length.

14.0 PACKING AND MARKING :

Each tube shall be plugged at both ends by means of tight fitting end caps.

The tubes shall be suitably packed in bundles/packages to prevent corrosion and damage during transit.

Each bundle/package shall bear the following information:

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BHEL Order No.

Consignment/Identification No.

Out side Diameter and Wall Thickness.

Supplier's Name

15.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS: 1239

2. IS : 1608

3. IS:2328

4. IS:2329

5. IS:4711

6. IS : 4736