



**Technical Delivery Condition (TDC)**  
 FOR  
**Electric Resistance Welded (ERW)**  
**Plain Carbon Steel Tubes for Structural Purposes**

|          |             |
|----------|-------------|
| Doc Ref: | TDC:RTE:202 |
| Rev.No.  | 00          |
| Date:    | 16.09.2013  |
| Page No  | 1 of 5      |

**1.0 SCOPE**

1.1 This Technical Delivery Condition (TDC) covers the requirements for the supply of **Electric Resistance Welded (ERW)** plain carbon steel tubes for structural purposes.

**2.0 MATERIAL SPECIFICATION**

- 2.1 The applicable specification is IS: 1161 : 1998
- 2.1 The size, length, quantity and specification are as per the purchase order
- 2.2 The ERW tubes shall be manufactured from hot rolled steel strip for welded tubes and pipes conforming to IS 10748.

**3.0 DESIGNATION**

- 3.1 ERW Tubes covered by this standard shall be designated with following information:
  - 3.1.1 Nominal Bore,
  - 3.1.2 Classification of Wall thickness as Light, Medium and Heavy and
  - 3.1.3 Grade of Material as Y St 210, Y St 240 and Y St 310 depending on the yield stress of the material.

**4.0 DIMENSIONS AND WEIGHTS**

4.1 The standard sizes and weights of tubes for structural purposes shall be as given in Table-1 of IS:1161.

**5.0 SPECIAL REQUIREMENT ON TOLERANCES FOR BHEL' S APPLICATIONS**

- 5.1 **Outside Diameter :**
  - 5.1.1 Up to and including 48.3mm shall be (+) or (-) 0.2 mm
  - 5.1.2 Over 48.3mm shall be (+) or (-) 1.0 (One) percent.
- 5.2 **Thickness (for all sizes) :**  
Welded Tubes shall be (+) not limited (-) minus 2.0 (Two) percent.
- 5.3 **Weight :**  
Weight of 10 Tonne Lots - restricted to two (2) percent i.e., the difference between the table-1 (of IS:1161-1998) weight and the corresponding actual weight shall be restricted to 2% (two percentage).
- 5.4 **Straightness :**  
Straightness of tubes shall be 1mm for a length of 1000mm and subject to maximum of 4 mm for a length of 6.0 Mtr.

| Prepared by (QA) | Reviewed by       | Signature | Approved by |
|------------------|-------------------|-----------|-------------|
|                  | Engg (AQCS)       |           |             |
|                  | Material Planning |           |             |
|                  | Purchase          |           |             |
|                  | QC (Proc)         |           |             |
|                  | QA                |           |             |
|                  |                   |           | Head / QA   |



Technical Delivery Condition (TDC)  
FOR  
Electric Resistance Welded (ERW)  
Plain Carbon Steel Tubes for Structural Purposes

|          |             |
|----------|-------------|
| Doc Ref: | TDC:RTE:202 |
| Rev.No.  | 00          |
| Date:    | 16.09.2013  |
| Page No  | 2 of 5      |

#### 5.5 Lengths

- 5.5.1 **Random Length:** The tubes shall be supplied in 6.0 Mtr lengths unless otherwise specified and the length tolerance for the same shall be plus (+) or minus (-) 10 mm
- 5.5.3 **Exact Length:** For specific length (exact length) of each tube the tolerance shall be (+) 6mm and (-) minus 0.0 mm.

#### 6.0 WORKMANSHIP

- 6.1 Plain End - The ends of the tubes shall be finished clean and supplied with square cut.
- 6.2 For welded tubes, the height of the internal weld fin shall not be greater than 60 percent of the specified wall thickness.
- 6.3 The tube shall be cleanly finished and reasonably free from scale. Further tube shall be free from cracks, surface flaws, laminations and other defects. The ends shall be cut cleanly and square with the axis of tube.
- 6.4 Surface imperfections such as handling marks, light die or roll marks, or shallow pits shall be removed without affecting wall thickness.
- 6.5 Welded tubing shall be free of protruding metal on the outside surface of the weld seam.

#### 7.0 GALVANIZING

- 7.1 If the tubes are required in galvanizing condition the zinc coating on the tubes shall be conforming to the requirements and tested as per methods specified in IS: 4736.

#### 8.0 MECHANICAL TESTS

- 8.1 The mechanical test shall be carried out on the selected tube, strip or plate. The tensile strength, Yield stress and the percentage of Elongation shall be as per the table-2 of IS:1161 and the tubes shall be sampled in accordance with IS 4711.
- 8.2 Ductility Test (Cold Bend Test - Up to and including 50 mm NB) and Flattening Test (Tubes Above 50mm NB) shall be tested as per clause no. 11.3 .2 of IS: 1161.

#### 9.0 SAMPLING OF TUBES

- 9.1 Sampling of tubes in accordance with IS 4711 for the purpose of drawing samples all mild steel tubes bearing same designation and manufactured under a single process shall be grouped together to constitute a lot.
- 9.2 Each lot shall be sampled separately and assessed for conformity to this specification.
- 9.3 Scale of sampling and permissible number of defectives for Mass and DR shall be as per table 1 of IS:4711:2008 - refer page 4 of 5 of this TDC.
- 9.4 Scale of sampling and permissible number of defectives for physical tests (Tensile, Bend, Flattening and Drift) shall be as per table 2 of IS:4711:2008 - refer page 4 of 5 of this TDC.



**Technical Delivery Condition (TDC)**  
 FOR  
**Electric Resistance Welded (ERW)**  
**Plain Carbon Steel Tubes for Structural Purposes**

|          |             |
|----------|-------------|
| Doc Ref: | TDC:RTE:202 |
| Rev.No.  | 00          |
| Date:    | 16.09.2013  |
| Page No  | 3 of 5      |

- 9.5 The Process Inspection to be carried out by the manufacturer shall be as per the Annexure-A of IS:4711:2008 - refer page 5 of 5 of this TDC.
- 10.0 **MARKING**
- 10.1 Each tube shall be marked with manufacturer's name or trade mark and class of tube like L, M and H with IS number.
- 11.0 **OILING**
- 11.1 All the tubes shall be oiled externally to protect the surfaces from rusting for a minimum Coating of 20 microns.
- 12.0 **BUNDLING AND PACKING**
- 12.1 Tubes are to be bundled for transport and shall be packed in accordance with IS:4740
- 13.0 **TEST CERTIFICATE**
- 13.1 Detailed correlated Test Certificates to be submitted along with the supply, for the tests conducted as required in the specification and in this TDC.
- 14.0 BHEL reserves the right to carry out tests and to reject the items wherever non conformance to the TDC / IS specification is observed in the supply.

!!!@@###

| 00      | 16.09.2013     | --         | <p>Fresh Release - The earlier TDC RTE 262 Rev 00 Dtd.16.02.2011 has been withdrawn and a separate TDC (TDC RTE 202) released for ERW Tubes for Structural purpose based on IS : 1161 - 1998.</p> <p>Similarly, separate TDC (TDC RTE 203) has been released for ERW Tubes for use of Water, Non-Hazardous Gas, Air and Steam based on IS: 1239 (Part -1) - 2004.</p> |
|---------|----------------|------------|---|
| Rev No. | Effective Date | Clause No. | Revision Details  |

RECORD OF REVISIONS

*Issued By Quality Assurance*



Technical Delivery Condition (TDC)  
FOR  
Electric Resistance Welded (ERW)  
Plain Carbon Steel Tubes for Structural Purposes

|          |             |
|----------|-------------|
| Doc Ref: | TDC:RTE:202 |
| Rev.No.  | 00          |
| Date:    | 16.09.2013  |
| Page No  | 4 of 5      |

IS 4711 : 2008

**Table 1 Scale of Sampling and Permissible Number of Defectives for Mass and Dimensional Characteristics**  
(Clause 5.3)

| SI No. | Lot              | Pipes or Tubes<br>(Outside Dia ≤ 200 mm) |            | Others |            |
|--------|------------------|--|------------|--------|------------|
|        |                  | Sample                                   | Acceptance | Sample | Acceptance |
| (1)    | (2)              | (3)                                      | (4)        | (5)    | (6)        |
| i)     | Up to 100        | 3  | 0          | 2      | 0          |
| ii)    | 101-150          | 5  | 0          | 3      | 0          |
| iii)   | 151-300          | 8  | 0          | 5      | 0          |
| iv)    | 301-500          | 13                                       | 0          | 8      | 0          |
| v)     | 501-1 000        | 20                                       | 1          | 13     | 0          |
| vi)    | 1 001-3 000      | 32                                       | 2          | 20     | 1          |
| vii)   | 3 001-10 000     | 50                                       | 3          | 32     | 2          |
| viii)  | 10 001 and above | 80                                       | 5          | 50     | 3          |

IS 4711 : 2008

**Table 2 Scale of Sampling and Permissible Number of Defectives for Physical Tests (Tensile, Bend, Flattening and Drift)**  
(Clause 5.5)

| SI No. | Lot Size       | Stage of the Sample | Sample Size for Each Physical Test | Acceptance Number | Rejection Number |
|--------|----------------|---------------------|------------------------------------|-------------------|------------------|
| (1)    | (2)            | (3)                 | (4)                                | (5)               | (6)              |
| i)     | Up to 100      | First               | 1                                  | 0                 | See Note 1       |
| ii)    | 101-150        | First               | 2                                  | 0                 | See Note 1       |
| iii)   | 151-300        | First               | 3                                  | 0                 | 2                |
|        |                | Second              | 3                                  | 0                 | 1                |
| iv)    | 301-800        | First               | 5                                  | 0                 | 2                |
|        |                | Second              | 5                                  | 1                 | 2                |
| v)     | 801-3000       | First               | 8                                  | 0                 | 2                |
|        |                | Second              | 8                                  | 2                 | 3                |
| vi)    | 3001 and above | First               | 13                                 | 1                 | 3                |
|        |                | Second              | 13                                 | 3                 | 4                |

**NOTES**

- 1 If one sample fails to meet the requirement, the purchaser may select 2 samples randomly from the same lot and both the samples should comply with the requirements except the original failed length.
- 2 The test pieces for physical tests may be cut from the same item wherever possible.

Issued By Quality Assurance



Technical Delivery Condition (TDC)  
FOR  
Electric Resistance Welded (ERW)  
Plain Carbon Steel Tubes for Structural Purposes

|          |             |
|----------|-------------|
| Doc Ref: | TDC:RTE:202 |
| Rev.No.  | 00          |
| Date:    | 16.09.2013  |
| Page No  | 5 of 5      |

IS 4711 : 2008

ANNEX A

(Foreword, and Clause 4)

RECOMMENDED LEVELS OF INSPECTION/TESTING

| Sl No. | Characteristics for Inspection/Testing                  | Frequencies of Inspection/Testing Pipes and Tubes Manufactured |                                       |
|--------|---|--|---------------------------------------|
|        |   | Seamless Process   | Other Process Like Fretz-Moon and ERW |
| i)     | Chemical composition                                    | A ladle analysis from every cast                               | A ladle analysis from every cast      |
| ii)    | Visual inspection for surface defects and steel defects | Each pipe and tube   | Each pipe and tube                    |
| iii)   | Outside diameter  | All pipes and tubes  | 1/h                                   |
| iv)    | Thickness   | All pipes and tubes  | 1/h                                   |
| v)     | Length  | All pipes and tubes  | 1/h                                   |
| vi)    | Tensile test  | One coil from each cast  | One coil from each cast               |
| vii)   | Bend test   | One for every 100 cast or part thereof                         | One test every hour                   |
| viii)  | Flattening test   | One for every 20 cast or part thereof                          | One test every half hour              |
| ix)    | Drift test  | One for every 20 cast or part thereof                          | One test every half hour              |
| x)     | Hydraulic test  | Each pipe and tube   | Each pipe and tube                    |



**Technical Delivery Conditions (TDC)**  
**For**  
**Electric Resistance Welded (ERW) or**  
**High Frequency Induction Welded (HFIW) Steel Tubes**  
**(Intended for Water, Non-hazardous Gas, Air and Steam)**

|          |                |
|----------|----------------|
| Doc Ref: | TDC: RTE : 203 |
| Rev.No.  | 00             |
| Date:    | 20.09.2013     |
| Page No  | 1 of 5         |

**1.0 SCOPE**

1.1 This Technical Delivery Condition (TDC) covers the requirements for the supply of **Electric Resistance Welded (ERW)** steel tubes intended for use for Water, Non-Hazardous Gas, Air and Steam. This TDC is applicable to tubes of size 6 mm to 150 mm nominal bore.

**2.0 MATERIAL SPECIFICATION**

- 2.1 The applicable specification is IS 1239 (Part-1):2004
- 2.1 The bore size, length, end condition, class of tube (L, M & H) quantity and specification are as per the purchase order.
- 2.2 The ERW tubes shall be manufactured from hot rolled steel strip for welded tubes and pipes conforming to IS 10748 or Cold-rolled low carbon steel sheets and strips conforming to IS 513.
- 2.3 Steel tubes shall be manufactured through the process of Electric Resistance Welded or High Frequency Induction Welded (ERW or HFIW)

**3.0 DESIGNATION**

- 3.1 ERW Tubes covered by this standard shall be designated with following information:
  - 3.1.1 Nominal Bore,
  - 3.1.2 Classification as Light, Medium and Heavy depending on the wall thickness
  - 3.1.3 Screwed and socketed or plain end / bevel end to denote end condition and
  - 3.1.4 Black or Galvanized to denote surface condition.

**4.0 DIMENSIONS AND WEIGHTS**

4.1 The dimensions and nominal mass of tubes shall be in accordance with table 3, 4, and 5 of IS 1239 (Part-1) 2004 subject to the tolerances mentioned in clause no. 5.0 of this TDC.

**5.0 SPECIAL REQUIREMENT ON TOLERANCES FOR BHEL' S APPLICATIONS**


**5.1 Thickness (for all sizes) :**

Welded Tubes shall be (+) not limited (-) minus 2.0 (Two) percent.

**5.2 Weight :**

Weight of 10 Tonne Lots - restricted to two (2) percent i.e., the difference between the weights mentioned in table-3, 4 & 5 of IS 1239 (Part 1): 2004 and the corresponding actual weight shall be restricted to 2% (two percentage).

| Prepared by (QA) | Reviewed by       | Signature | Approved by |
|------------------|-------------------|-----------|-------------|
|                  | Engg (AQCS)       |           |             |
|                  | Material Planning |           |             |
|                  | Purchase          |           |             |
|                  | QC (Proc)         |           |             |
|                  | QA                |           | Head / QA   |

|   |  |          |                |
|---|--|----------|----------------|
|  | <b>Technical Delivery Conditions (TDC)</b><br><b>For</b><br><b>Electric Resistance Welded (ERW) or</b><br><b>High Frequency Induction Welded (HFIW) Steel Tubes</b><br><b>(Intended for Water, Non-hazardous Gas, Air and Steam)</b> | Doc Ref: | TDC: RTE : 203 |
|   |  | Rev.No.  | 00             |
|   |  | Date:    | 20.09.2013     |
|   |  | Page No  | 2 of 5         |

**5.3 Straightness :**

Straightness of tubes shall be 1mm for a length of 1000mm and subject to maximum of 4 mm for a length of 6.0 Mtr.

**5.4 Lengths**

5.4.1 **Random Length:** The tubes shall be supplied in 6.0 Mtr lengths unless otherwise specified and the length tolerance for the same shall be plus(+) or minus(-) 10 mm.

5.4.3 **Exact Length:** For specific length (exact length) of each tube the tolerance shall be (+) 6mm and (-) minus 0.0 mm.

**6.0 WORKMANSHIP**

6.1 Plain End - The ends of the tubes shall be finished clean and supplied with square cut.

6.2 For welded tubes, the height of the internal weld fin shall not be greater than 60 percent of the specified wall thickness.

6.3 The tube shall be cleanly finished and reasonably free from scale. Further tube shall be free from cracks, surface flaws, laminations and other defects. The ends shall be cut cleanly and square with the axis of tube.

6.4 Surface imperfections such as handling marks, light die or roll marks, or shallow pits shall be removed without affecting wall thickness.

6.5 Welded tubing shall be free of protruding metal on the outside surface of the weld seam.

6.6 ERW tubes used for steam services shall be normalized. Only medium and heavy class of tube shall normally be used for steam services.

**7.0 GALVANIZING**

7.1 If the tubes are required in galvanizing condition the zinc coating on the tubes shall be conforming to the requirements and tested as per methods specified in IS: 4736.


**8.0 LEAK PROOF TEST**

8.1 Each tube shall be tested for leak tightness as an in-process test at manufacturer's works either by hydrostatic test or alternatively by eddy current test in accordance with Annex.B of IS 1239 (Part-1) : 2004

**9.0 MECHANICAL TEST**

9.1 The tensile test shall be carried out on full section or strip cut from the selected tubes, and elongation percentage,

9.2 Bend Test on tubes up to and including 50mm Nominal bore as per IS 2329 and Flattening Test on tubes above 50 mm nominal bore.

|   |   |          |                |
|---|---|----------|----------------|
|  | <b>Technical Delivery Conditions (TDC)</b><br>For<br><b>Electric Resistance Welded (ERW) or<br/>         High Frequency Induction Welded (HFIW) Steel Tubes</b><br>(Intended for Water, Non-hazardous Gas, Air and Steam) | Doc Ref: | TDC: RTE : 203 |
|   |   | Rev.No.  | 00             |
|   |   | Date:    | 20.09.2013     |
|   |   | Page No  | 3 of 5         |

#### 10.0 SAMPLING OF TUBES

- 10.1 The procedure for sampling of tubes for various test and criteria for conformity, IS 4711 shall be followed. Lot for the purpose of drawing samples all tubes bearing same designation and manufactured under a single process shall be grouped together to constitute a lot.
- 10.2 Each lot shall be sampled separately and assessed for conformity to this specification.
- 10.3 Scale of sampling and permissible number of defectives for Mass and DR shall be as per table 1 of IS 4711 : 2008 - refer page 4 of 5 of this TDC.
- 10.4 Scale of sampling and permissible number of defectives for physical tests (Tensile, Bend, Flattening and Drift) shall be as per table 2 of IS:4711-2008 - refer page 5 of 5 of this TDC.
- 10.5 The Process inspection to be carried out by the manufacturer shall be as per the Annexure - A of IS:4711 - 2008 - Refer page 5 of 5 of this TDC.

#### 11.0 MARKING

- 11.1 Each tube shall be marked with manufacturer' s name or trade mark and class of tube like L, M, and H with IS number ie., IS 1239 (Part 1)
- 11.2 The different classes of tubes shall be distinguished by colour bands which shall be applied as follows before the tubes leaves the manufacturer' s works:
- Light Tubes - Yellow
  - Medium Tubes - Blue
  - Heavy Tubes - Red

#### 12.0 OILING

- 12.1 All the tubes shall be oiled externally to protect the surfaces from rusting for a minimum coating of 20 microns.

#### 13.0 BUNDLING AND PACKING


- 13.1 Tubes are to be bundled for transport and shall be packed in accordance with IS:4740

#### 14.0 TEST CERTIFICATE

- 12.1 Detailed correlated Test Certificates to be submitted along with the supply, for the tests conducted as required in the specification and in this TDC.

- 15.0 BHEL reserves the right to carry out tests and to reject the items wherever non conformance to the TDC / IS specification is observed in the supply.

!!!@@###

|   |   |          |                |
|---|---|----------|----------------|
|  | <b>Technical Delivery Conditions (TDC)</b><br>For<br><b>Electric Resistance Welded (ERW) or<br/>         High Frequency Induction Welded (HFIW) Steel Tubes</b><br>(Intended for Water, Non-hazardous Gas, Air and Steam) | Doc Ref: | TDC: RTE : 203 |
|   |   | Rev.No.  | 00             |
|   |   | Date:    | 20.09.2013     |
|   |   | Page No  | 4 of 5         |

|                |                       |                   |   |
|----------------|-----------------------|-------------------|---|
| 00             | 13.08.2013            | ---               | <p>Fresh Release - The earlier TDC RTE 262 Rev 00 Dtd.16.02.2011 has been withdrawn and a separate TDC (TDC RTE 202) released for ERW Tubes for Structural purpose based on IS : 1161 - 1998.</p> <p>Similarly, separate TDC (TDC RTE 203) has been released for ERW Tubes for use of Water, Non-Hazardous Gas, Air and Steam based on IS: 1239 (Part -1) - 2004.</p> |
| <b>Rev No.</b> | <b>Effective Date</b> | <b>Clause No.</b> | <b>Revision Details</b>   |


RECORD OF REVISIONS

IS 4711 : 2008

**Table 1 Scale of Sampling and Permissible Number of Defectives for Mass and Dimensional Characteristics**

(Clause 5.3)

| Sl No. | Lot              | Pipes or Tubes<br>(Outside Dia ≤ 200 mm) |            | Others |            |
|--------|------------------|--|------------|--------|------------|
|        |                  | Sample                                   | Acceptance | Sample | Acceptance |
|        |                  | (3)                                      | (4)        | (5)    | (6)        |
| i)     | Up to 100        | 3  | 0          | 2      | 0          |
| ii)    | 101-150          | 5  | 0          | 3      | 0          |
| iii)   | 151-300          | 8  | 0          | 5      | 0          |
| iv)    | 301-500          | 13                                       | 0          | 8      | 0          |
| v)     | 501-1 000        | 20                                       | 1          | 13     | 0          |
| vi)    | 1 001-3 000      | 32                                       | 2          | 20     | 1          |
| vii)   | 3 001-10 000     | 50                                       | 3          | 32     | 2          |
| viii)  | 10 001 and above | 80                                       | 5          | 50     | 3          |

|   |   |           |                |
|---|---|-----------|----------------|
|  | <b>Technical Delivery Conditions (TDC)</b><br>For<br><b>Electric Resistance Welded (ERW) or<br/>         High Frequency Induction Welded (HFIW) Steel Tubes</b><br>(Intended for Water, Non-hazardous Gas, Air and Steam) | Doc Ref : | TDC: RTE : 203 |
|   |   | Rev.No.   | 00             |
|   |   | Date:     | 20.09.2013     |
|   |   | Page No   | 5 of 5         |

IS 4711 : 2008

**Table 2 Scale of Sampling and Permissible Number of Defectives for Physical Tests  
 (Tensile, Bend, Flattening and Drift)**  
 (Clause 5.5)

| Sl No. | Lot Size       | Stage of the Sample | Sample Size for Each Physical Test | Acceptance Number | Rejection Number |
|--------|----------------|---------------------|------------------------------------|-------------------|------------------|
| (1)    | (2)            | (3)                 | (4)                                | (5)               | (6)              |
| i)     | Up to 100      | First               | 1                                  | 0                 | See Note 1       |
| ii)    | 101-150        | First               | 2                                  | 0                 | See Note 1       |
| iii)   | 151-300        | First               | 3                                  | 0                 | 2                |
|        |                | Second              | 3                                  | 0                 | 1                |
| iv)    | 301-800        | First               | 5                                  | 0                 | 2                |
|        |                | Second              | 5                                  | 1                 | 2                |
| v)     | 801-3000       | First               | 8                                  | 0                 | 2                |
|        |                | Second              | 8                                  | 2                 | 3                |
| vi)    | 3001 and above | First               | 13                                 | 1                 | 3                |
|        |                | Second              | 13                                 | 3                 | 4                |

NOTES


- 1 If one sample fails to meet the requirement, the purchaser may select 2 samples randomly from the same lot and both the samples should comply with the requirements except the original failed length.
- 2 The test pieces for physical tests may be cut from the same item wherever possible.

**ANNEX A**

(Foreword, and Clause 4)

**RECOMMENDED LEVELS OF INSPECTION/TESTING**

| Sl No. | Characteristics for Inspection/Testing                  | Frequencies of Inspection/Testing Pipes and Tubes Manufactured |                                       |
|--------|---|--|---------------------------------------|
|        |   | Seamless Process   | Other Process Like Fretz-Moon and ERW |
| i)     | Chemical composition                                    | A ladle analysis from every cast                               | A ladle analysis from every cast      |
| ii)    | Visual inspection for surface defects and steel defects | Each pipe and tube   | Each pipe and tube                    |
| iii)   | Outside diameter  | All pipes and tubes  | 1/h                                   |
| iv)    | Thickness   | All pipes and tubes  | 1/h                                   |
| v)     | Length  | All pipes and tubes  | 1/h                                   |
| vi)    | Tensile test  | One coil from each cast  | One coil from each cast               |
| vii)   | Bend test   | One for every 100 cast or part thereof                         | One test every hour                   |
| viii)  | Flattening test   | One for every 20 cast or part thereof                          | One test every half hour              |
| ix)    | Drift test  | One for every 20 cast or part thereof                          | One test every half hour              |
| x)     | Hydraulic test  | Each pipe and tube   | Each pipe and tube                    |

|   |   |          |                      |
|---|---|----------|----------------------|
| <br>Ranipet | <b>Technical Delivery Condition (TDC)</b><br>For<br>ERW TUBES | Doc Ref: | <b>TDC: RTA: 401</b> |
|   |   | Rev.No.  | <b>03</b>            |
|   |   | Date:    | <b>15 02 07</b>      |
|   |   | Page No  | <b>Page 1 of 2</b>   |

## 1.0 SCOPE

1.1 This TDC covers the requirement of ERW Tubes used in Tubular Air Heater as per the specification below

- a) EN 10305 –Part 3, E195 EW +A (Carbon steel)
- b) ASTM A423Grade I, ASTM A 714 CLASS 4 Type E, GRADE VII (Low Alloy Steel)

## 2.0 Chemical & Mechanical Properties

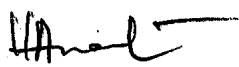
- 2.1 a) Chemistry for carbon steel shall be as per Table 2 of EN 10305 –Part 3.
- b) Mechanical property shall be as per Table 4 - EN 10305 –Part 3
- 2.2 Chemistry & Mechanical Properties for LOW ALLOY STEEL shall be as per respective specification and it should meet the requirement of Atmospheric corrosion index of 6.6 to 9.1 based on the chemical composition as per ASTM G101.


## 3.0 Supply Condition.

- 3.1 Fins on the entire length of outer diameter and minimum 300 mm on Inner diameter (both ends) to be removed.
- 3.2 The tube straightness shall be within 1mm/meter subject to a max of 5mm and length tolerance for tube shall be -0 mm to +3 mm.
- 3.3 The tube shall be coated with rust preventive fluid for protection against corrosion **for a minimum period of 6 months.**

## 4.0 Hydro Test

- 4.1 Each tube shall pass hydraulic test at a pressure of 50 bar for a duration of not less than 5 seconds

|  |                          |                       |   |
|--|--------------------------|-----------------------|---|
| Prepared by<br><br><i>Er. V. V. V.</i> | Reviewed by              | Signature             | Approved by<br><br><br><br>(SDGM/QA&OLI) |
|  | Engineering (APH)        | <i>P. Kumar Reddy</i> |   |
|  | Purchase                 | <i>[Signature]</i>    |   |
|  | MPL                      | <i>[Signature]</i>    |   |
|  | QC/proc.                 | <i>P. Lakshmi</i>     |   |
| QA                                     | <i>B. Srinivas Reddy</i> |                       |   |
| Issued by QUALITY ASSURANCE            |                          |                       |   |

|   |   |          |                      |
|---|---|----------|----------------------|
| <br>Ranipet | <b>Technical Delivery Condition (TDC)</b><br>For<br>ERW TUBES | Doc Ref: | <b>TDC: RTA: 401</b> |
|   |   | Rev.No.  | <b>03</b>            |
|   |   | Date:    | <b>15 02 07</b>      |
|   |   | Page No  | <b>Page 2 of 2</b>   |

### 5.0 Marking

5.1 Each tube shall be clearly stenciled with paint /pasted with stickers containing Specification & Grade and Maker's identification. In addition, a metallic tag shall be provided on the bundle with PO reference, Material Specification, size and No. of tubes.

### 6.0 Packing

6.1 The tubes shall be end capped and packed in bundles suitably to facilitate safe handling till they reach BHEL Stores.

### 7.0 Test Certificate

7.1 TC will be in English and it shall contain

- a) Purchase order number and date
- b) TDC number
- c) Specification and grade
- d) Chemical composition (Melt wise)
- e) Mechanical properties
- f) Size, Number & Weight
- g) Hydro Test (compliance TC for hydro)

8.0 BHEL reserves the right to carryout test and reject the items wherever non-Conformance to the Contract is noticed.

| Rev.No | Date       | Changes made  |
|--------|------------|---|
| 00     | 26 02 2002 | TDC RTA/001/01 IS REVISED AND RE NUMBERED AS RTA 401  |
| 01     | 10 05 2002 | TDC REVIEWED & UPDATED AND REQUIREMENTS OF TDC: RTA: 402 ARE INCLUDED, TDC RTA 402 DELETED. |
| 02     | 24 11 2004 | Clause 4.1 corrected.   |
| 03     | 15 02 07   | Revised to include Grade EN 195 of EN 10305-3 in place of BS6323--5                         |