

1.0 SCOPE

This Technical Delivery Condition specifies the additional requirements for the delivery of cold drawn seamless austenitic stainless steel tubes conforming to Grade 316 Ti (Latest), upto wall thickness 4 mm.

This TDC is supplementary to the mandatory requirements covered in the specification.

The size and quantity shall be as specified in the purchase order.

2.0 CHEMICAL COMPOSITION AND PROCESS

The tubes shall be made from silicon killed steel made by any one of the electric furnace processes.

The tubes shall be made by cold drawing only.

The chemical composition of the steel shall conform to the requirements given below:

Element	%_Composition
C	0.08 max.
Mn	2.00 max.
Si	0.75 max.
P	0.045 max.
S	0.035 max.
N	0.10 max.
Cr	16 - 18
Mo	2 - 3
Ni	10 - 14
Ti	(C+N) x 5 min. & 0.70 max.

3.0 DIMENSIONAL TOLERANCES

All tubes shall conform to dimensional tolerances of cold finished tubes as specified in ASME SA 450.

4.0 HEAT TREATMENT

All tubes shall be supplied in the solution heat treated conditions. The solution annealing temperature shall be 2000 deg.F minimum.

5.0 MECHANICAL TESTS

The tubes shall be subjected to mechanical tests as specified in SA 213/SA 450.

The acceptance standards shall be as given below:

Tensile strength : 75000 Psi min.

Yield strength : 30000 Psi min.

% Elongation : 35 min.

Other tests : As per SA 213.

6.0 NON DESTRUCTIVE TESTS

Each length of tube shall be subjected to eddy current testing as per ASTM E309 with a longitudinal calibration notch of depth 5% of the tube wall thickness.

In addition, each length of tube shall be hydraulically tested to the pressure indicated in the purchase order.

7.0 REPAIR

Repairs involving fusion welding is prohibited.

Wherever defects are rectified by mechanical means, the wall thickness requirements shall be satisfactory

met with and the surfaces shall be smoothly dressed up without any sharp edges.

8.0 WORKMANSHIP

The tubes shall be free from mill scales both on the inside and outside and shall present a workman like finish.

9.0 MARKING AND PACKING

The tubes shall be marked and despatched as given below:

The marking shall be legibly done in ENGLISH language only.

9.1 PRESERVATION

The ends of the tube shall be closed with end caps, which should be securely held so that it will not fall off during transit.

9.2 PACKING

All the tubes shall be supplied in bundles, properly packed in wooden crates to avoid any dent formation and other transit damages to the tubes. The weight of each consignment shall not exceed 2 tons.

A metal tag with Purchase Order number, tube specification and grade, outside diameter, nominal wall thickness, length of tubes in the bundle, no. of tubes in the bundle, serial no. and light stamped shall be securely fastened in each bundle.

A packing list should be sent along with each consignment, with the following details:

1. Purchase order number
2. Number of bundles (indicating serial no. also)
3. No. of tubes in each bundle
4. Material specification and grade
5. Size of tube.

10.0 INSPECTION AND CERTIFICATION

All the tests mentioned here shall be conducted at the works and the tubes must be supplied along with the Test certificates legibly written in English and furnishing the following details:

The test certificate shall furnish:

1. Purchase Order reference (BHEL).
2. Test Certificate number.
3. Specification and Grade.
4. Quantity & Size.
5. Melt Number.
6. Steel making process.
7. Ladle analysis meltwise.
8. Heat treatment details.
9. Mechanical test results.
10. NDT results with reference standard.

11.Hydraulic test results.

All the tubes must be inspected at the works and the test certificates shall be countersigned by an Inspecting Authority as specified in the purchase order.

Document No.: **TDC:0:107**

Rev. No.: **00**

Page: 3

11.0 END USE

These tubes are intended for use in valves.

U.Revisankaran
Prepared

K.S.Modak K.Rengachari D.Krishanmoorthy
Reviewed

SM/QA
Approved