

### **TECHNICAL DELIVERY CONDITIONS**

**Project** : Mumbai Metro cars - L2 & L7  
**Item** : Seamless Tubes to Standard ASTM A618 Gr.1a

SI No.	Part No.	Item Description
1	R109632003	Ø190.7mm x 15mm Wall Thickness Seamless steel Tube to Spec: ASTM A618, Gr.1a of L=7060mm(+10,-0)mm length tolerance maintaining perpendicular with tube axis on both ends.

1. All seamless tubes shall be supplied conforming to **current edition of ASTM A618 Gr.1a in hot finished normalized condition**. The firm shall carry out the following test & submit all test certificates along with each supplies.
2. The tubes shall be manufactured by the seamless process only(welding not permitted) conforming to ASTM A618 Gr.1a (Clause-5.1).

SI. No.	Tests	Reference Test Standard
1	Raw Material Analysis a) Chemical Composition	ASTM A618 Gr. 1a(Clause-6)
2	Heat Treatment Details	ASTM A618 Gr. 1a
3	Heat & Product Analysis a) Chemical Composition	ASTM A618 Gr. 1a(Clause-6)
4	Mechanical Tests	ASTM A618 Gr. 1a(Clause-7)
a	Tensile Strength & Elongation	ASTM A618 Gr. 1a(Clause-7)
b	Bend Test	ASTM A618 Gr. 1a(Clause-7)
c	Impact Test (1 set /heat /Size)	Charpy V notch, test Temp: 18°C. required impact energy 40 joules for full size specimen
d	Crushing Test	ASTM A618 Gr.1a & ASTM A370
5	Non destructive test (NDT) 100% (Ultrasonic Test or Eddy current Test)	ASTM E213 or ASTM E570

3. The firm shall be a original manufacturer of Seamless tubes.
4. Dimensions & permissible variations shall conform to ASTM A618 Gr. 1a (Clause-8)
5. Micro structure: Grain size shall be fine (ASTM Number-5 or more).
6. Workmanship, finish, appearance shall conform to ASTM A618 Gr. 1a (Clause-9)
7. Atmospheric corrosion resistance Index shall be calculated as per guide ASTM G101 & conform to ASTM A618 Gr. 1a clause 6.1.1.
8. All tubing shall be Inspected at the place of manufacture & shall conform to shall conform to ASTM A618 Gr. 1a (Clause-10)
9. Packing, marking & loading shall conform to ASTM A618 Gr. 1a (Clause-13).
10. The finished seamless tubes shall be cleaned, deburred at the ends and shall be coated completely with rust preventive oil or black lacquer and supplied without any dents and wrinkles with plastic caps covering the open ends of the tubes.
11. Firm will be evaluated technically / assessed by BEML or customer before technical bid clearance. This evaluation includes raw material manufacturing or sourcing facility, heat treatment facility, all lab test facilities, seamless tube manufacturing facility, NDT facility & other quality inspection facilities.
12. The supplier shall submit confirmation for the above points along with their technical offer.

