High Speed Train
Procurement Technical Specification of Seamless Stainless-Steel Tubes

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REVISION DETAILS

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1. Introduction

1.1. General

This document specifies the technical requirements / specifications of seamless stainless-steel tubes to grade SUS316L procured by BEML for High-Speed trains of 8 car formation for NHSRCL (MAHSR Section) Project.

The bidder shall be responsible for all works required in this PTS with regard to seamless stainless-steel tubes and shall be responsible for supporting BEML activities as a supplier to BEML for High-Speed train of NHSRCL (MAHSR Section) Project.

1.2. Climatic Conditions

The High-Speed Trains of NHSRCL (MAHSR Section) has to operate reliably and safely under below mentioned climatic & environmental conditions shown in Table.

Description	Limiting Values
Atmospheric Temperature	Minimum temperature -5°C Maximum temperature 50°C Maximum touch temperature of metallic surface under the sunlit and shade shall be considered and calculated as per ASHRAE 2021.
Humidity	100% saturation during rainy season
Solar radiation	Value and calculation method shall be based on ASHRAE 2021.
Altitude	1000 meter above mean sea level
Rainfall	Very heavy and continuous rainfall in certain areas (heavy continuous rainfall up to 2500mm, rainy season is as long as 5 months in some stretches)
Atmosphere conditions	Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6 mg/m3.
Coastal area	Humid, salt laden and corrosive atmosphere as prevailing in coastal

	region.
Wind speed	High wind speed in certain areas, with wind pressure reaching 216 kg/m2. [Note-2]
Flood level	The Train shall function in accordance with these Specifications and Standards in the event of flooding up to 50 mm above Rail Level as follows: • In the event of flooding at any level below Rail Level, the Train shall operate in full compliance with these Specifications and Standards. • In the event of flooding at a height between Rail Level and 50 mm above Rail Level, the Train shall operate in full compliance with these Specifications and Standards with the exception that it is permissible to restrict the operation of the Train to a maximum of 10 km/h. Allowance is to be made in addition for increase in the height of water level due to the “bow wave” effect of the Train passing through the water.

Note 2: Depending on the operational rule, special speed limits shall be imposed on the Train Sets in conditions where wind speed is 20 m/s or greater. Train Set operation shall cease at wind speeds of 30 m/s or greater.

In developing the detailed design, the supplier shall acquaint himself and take note of the environmental operating conditions prevailing on the Trial Section during heavy monsoon, track flooding conditions, saline, humid and dusty atmosphere etc.

The temperature of the metal surfaces when exposed directly to the sun, for long periods of time, may be assumed to rise up to 70º C.

The Cold rolled Seamless Stainless Steel tubes manufactured must withstand to adverse weather conditions. They can be kept outdoors regardless of the atmospheric conditions.

Tunnel walls may be wet and seepage water will normally be present in the invert. Cold rolled Seamless Stainless Steel tubes supplied must therefore be capable of withstanding the effects of seepage (if any) and continue to withstand in such wet and humid conditions.

Any moisture condensation shall not lead to any malfunction or failure.

2. Definitions and Abbreviations

The following definitions and abbreviations are applicable to the PTS.

2.1. Definitions

a) "**Purchaser"** means Integral Coach Factory (ICF), Chennai, Indian railways, its legal successors and assignees.

b) **"Supplier"** means the supplier who supplies the required cold rolled seamless stainless-steel tubes to BEML for NHSRCL High Speed Rail Project. Supplier shall carry out the works in accordance with PTS.

c) **"Contract"** means the contract between Supplier and BEML in relation to the supply of cold rolled seamless stainless-steel tubes for NHSRCL High Speed Rail project.

d) "**Nominated Agency"** shall mean NHSRCL and its representatives including an ISA (if any) deployed by NHSRCL.

Or

Agency Nominated by Purchaser for the purpose of carrying out Design approvals, Tests, Trials etc. required as per the agreement. Such agency will act on behalf of purchaser and guide purchaser.

e) "**BEML**" means the Contractor to procure the cold rolled seamless stainless-steel tubes for NHSRCL High Speed Rail Project.

f) **"PTS"** means BEML's Procurement Technical Specification.

g) **"Tubes"** means seamless stainless-steel tubes.

2.2. Abbreviations

a) PO : Purchase Order

b) HSR : High Speed Rail

c) HST : High Speed Train

d) QAP : Quality Assurance Plan

e) FAI : First Article Inspection

3. Qualifying criteria

a) The Supplier shall be an OEM (Original Equipment Manufacturer) & have manufactured and supplied cold rolled Seamless Stainless-Steel tubes, shall have been in use atleast 3 Railway Rolling stock applications. The bidder shall provide PO copies (earlier supplies) along with offer.

b) The Supplier shall provide the details of national/international standards used for manufacturing and testing of seamless stainless-steel tubes along with offer.

4. General Requirements

a) The Supplier shall supply seamless stainless-steel tubes in conformance to this PTS, purchase order requirements, applicable drawings and standards. The Supplier shall be responsible and ensure that the items supplied meets the environmental condition specified at Clause 1.2 and do not deteriorate/ fail during the life time (30 years).

b) During the life time of cars, if any manufacturing defects (leakages etc.) are observed in any of the supplied tubes, then it will be the comprehensive responsibility of sub-contractor to repair/replace the tubes.

4.1. Defining of unclear aspects

If any term or clause is not clear or not described in the specification, bidder shall discuss those with Design Team in BEML, prior to making an offer/ contract, to confirm their definitions and opinions.

After making an offer/contract, bidder/sub-contractor shall follow the definition and opinions of Design Team in BEML.

4.2. Responsibility of Supplier

The Supplier shall be responsible for manufacturing, testing and supply of seamless stainless-steel tubes in conformance to the PTS, purchase order requirements, applicable standards and BEML drawings.

The Supplier shall procure raw material from reputed manufacturer and shall provide mechanical and chemical test reports.

5. Standards

The standards applicable for the seamless stainless-steel tubes shall conform to the JIS G 3459 SUS316LTP S-C / ASTM A269 TP 316L unless otherwise specified in the BEML drawings.

6. Scope of Supply

6.1. General

The Supplier has to supply cold rolled seamless stainless-steel tube as per the guidelines of the JIS G 3459 SUS316LTP S-C / ASTM A269 TP 316L, purchase order requirements and confirming to the technical requirements of clause 7. All types of tube shall be supplied in standard lengths of 6 meters unless otherwise specified in the BEML drawings.

6.2. Submission of Documents

The Supplier shall submit the following documents as a minimum along with every batch of supplies

a) Raw material test certificates viz. Chemical and mechanical properties from the sources for the stainless steel along with supplies according to JIS G 3459 SUS316LTP S-C / ASTM A269 TP 316L shall be submitted during product delivery.
b) Type test, routine test and all other applicable certificates as per the standards mentioned in the drawing and international standard followed.
c) Dimensional check sheets along with supplies.

6.3. Quality Assurance Program

6.3.1. General

The Supplier shall hold ISO 9001 certification and shall manufacture the product accordingly. The supplier shall submit a copy of ISO 9001 certification along with the offer. The sub-contractor shall monitor and control the quality systems as per ISO 9001 certification guidelines. BEML and/or NHSRCL/his representative may periodically conduct compliance audits of the supplier’s quality management systems. Also, the tubes produced under QAP shall be audited by the ASME.

6.3.2. Quality Assurance Plan

The Supplier shall develop and submit a Quality Assurance Plan (QAP) to BEML for review and approval based on ISO 9001 certification guidelines.

The Supplier shall submit the following documents conforming to the Technical Specification along with every batch of supplies.

a) Dimensional check sheets
b) Material Test certificates

6.4. Marking & Packing

Each tube shall be marked/embossed with the following details

a) Symbol of grade
b) Symbol indicating the manufacturing method
c) Dimension

Each tube shall be wrapped separately with plastic cover so as to avoid scratch marks on surface.

The stainless-steel tubes shall be properly packed and due care shall be taken to ensure that no damage occurs during transit.

7. Technical Requirements

7.1. General

a) The Supplier has to manufacture and supply cold rolled seamless stainless-steel tube. The finish of the tubes shall be of bright annealing finish.
b) The stainless-steel tubes shall confirm to JIS G 3459 SUS316LTP S-C / ASTM A 269 TP316L. The Supplier shall submit material test certificates viz. chemical and mechanical properties for stainless-steel tubes along with the supplies. Also, the Supplier shall provide all the material test certificates for raw material, type and routine test certificates as mentioned in the section 8.1 for seamless stainless tubes of previous projects supplies during the tender stage tested from NABL accredited labs.
c) All the stainless-steel tubes shall be supplied in standard lengths of $6^{\pm 0.25}$ meters unless otherwise specified in the BEML drawings.
d) The tubes shall be cleaned and deburred at the ends and shall be supplied without any dents and wrinkles.
e) The tubes shall be subjected to cold bending with the tube bending machine during installation, which shall not produce any wrinkles on the inner radius of bend.
f) Dimensional check sheet for the tubes shall be submitted along with the supplies.

g) The open ends of the tubes shall be covered with air tight protection plastic caps.
h) Swaging operation will be done on all tubes for future assembly.
i) The finish of the tubes shall be bright annealed finish
j) Samples shall be submitted to BEML before Bulk Production and after the approval of the samples bulk production shall be taken up.
k) Final inspection, Packing and dispatch:
The material grade in respect of chemical composition, heat treatment, microstructure and mechanical properties shall be as stipulated in the drawing and applicable standards.

The chemical composition of stainless steel SUS316L shall confirm to

Unit: %

Designation	C	Si	Mn	P	S	Ni	Cr	Mo
SUS316L	0.03 max.	1.00 max.	2.00 max.	0.045 max.	0.03 max.	12.0 - 16.0	16.0 - 18.0	2.0 - 3.0

The mechanical properties of stainless steel SUS316L shall confirm to

Designation	Tensile strength (N/mm^2)	Proof stress (N/mm^2)	% Longitudinal Elongation
SUS316L	480 min.	175 min.	35 min.

The Supplier shall carryout the all tests mentioned in the standards and shall submit the certificates for the above.

8. Testing

8.1. General

The Supplier shall perform following type test, routine tests as per JIS G 3459 SUS316LTP S-C / ASTM A 269 TP 316L standard and shall submit the certificates along with the supplies.

Sl. No.	Type Test / Routine Test	Reference test standard
1	Product Analysis a) Chemical Composition	JIS G 3459 / ASTM A 269
2	Solution Annealing Heat Treatment	JIS G 3459 / ASTM A 269
3	Mechanical Tests a) Tensile Strength, Proof Stress & Elongation	JIS G 3459 / ASTM A 269

	b) Flattening test b) Flaring Test c) Hardness test	
4	Hydrostatic or Non-Destructive Test (NDT: Ultrasonic Test, Eddy current Test)	JIS G 3459 / ASTM A 269
5	Corrosion Resistance	JIS G 3459 / ASTM A 269
6	Pressure Resistance Performance	JIS G 3459 / ASTM A 269
7	Leaching Performance	JIS G 3459 / ASTM A 269
8	Dimensions, Mass & Dimensional Tolerances	JIS G 3459 / ASTM A 269

The performance of all the supplies shall be satisfactory for the entire service life. BEML and/or NHSRCL's representative have the right to witness any of these tests at any stage of test progress.

8.2. Inspection

a) Visual inspection

Every stainless-steel tube irrespective of lot size shall be examined visually for surface defects and irregularities. The stainless-steel tube shall be free from defects that would impair the utility of it.

b) Chemical Composition & Mechanical properties

The chemical composition and mechanical properties of the stainless-steel tubes shall conform to grade SUS316L as per the JIS G 3459 / ASTM A 269 standard. The sub-contractor shall submit test reports for every batch of supplies.

9. First Article Inspection

All types of seamless stainless-steel tubes shall be offered for First Article Inspection (FAI) at the place of manufacturer to BEML and/or NHSRCL/his representative. During FAI, the supplier has to demonstrate/ carry out all the type and routine tests as mentioned in the section 8.1 in presence of BEML and/or NHSRCL/his representative. Bulk production shall be taken up, only after obtaining clearance from BEML.

10. Submittals with Technical Offer

The Supplier shall provide as a minimum, the following along with the technical offer:

a) Details of the existing infrastructure facilities for manufacturing & testing of cold rolled seamless stainless-steel tubes.
b) ISO 9001 certificate.
c) Quality acceptance plan (QAP)/ Inspection Test Plan (ITP)
d) Material test certificates for raw material, type and routine test certificates for pipes of previous projects as per clause 7.1.
e) Supporting documents for qualification criteria as per clause 3 (PO copies of the earlier supplies to railway Rolling Stock).
f) Compliance to be provided for this PTS document (FPIIC/TD/HSR0019) with sign and seal across each page.