TRAIN B28

Procurement Technical Specification of Fresh Water Tank with Water Circulation Pump System / Pressurized System for Modular Toilets

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1. Introduction

1.1. General

a) This document describes the technical requirements of **Fresh Water Tank with Water Circulation Pump System / Pressurized System** for modular toilets to be supplied for Train B28 project (2-Train sets of 8-Car formation) designed to operate at 249 kmph and test speed of 280 kmph for NHSRCL/ICF contract.

b) BEML will carry out all required works and activities as Contractor to the Employer for this project, while the firm shall be responsible for all works required in this PTS with regard to Fresh Water Tank with water Circulation Pump System / Pressurized System for modular toilets & shall be responsible for supporting the BEML activities as contractor for Train B28 project.

c) The scope of work covers design, development, manufacture, supply, commissioning & Integrated testing of Fresh Water Tank with water Circulation Pump System / Pressurized System for modular toilets along with training of Operation and Maintenance personnel of NHSRCL/ICF/ BEML.

d) The scope also covers supply of spares, special tools, testing and diagnostic equipment's for maintenance, repair and overhaul of Fresh Water Tank with water Circulation Pump System / Pressurized System for modular toilets.

e) The scope of work includes all items of work which will be required to meet the performance requirements, reliable and efficient operation of trains and meeting the best international practices even if not specifically mentioned in this PTS.

1.2. Definitions

- "**Employer**" means ICF-Chennai, its legal successors and assignees.
- "**Nominated Agency**" shall mean NHSRCL and its representatives deployed by NHSRCL for the purpose of carrying out Design approvals, Tests, Trials etc.
- "**BEML**" means the contractor for Design, Development, Manufacture, Testing and Commissioning of Trains for Train B28 project.
- "**Subcontractor**" means the firm who supplies the required Fresh Water Tank with water Circulation Pump System / Pressurized System for modular toilets to BEML for Train B28 project. They shall carry out all the works in accordance with this PTS.

- **"Contract"** means the contract between Subcontractor and BEML in relation to the supply of Fresh Water Tank with water Circulation Pump System / Pressurized System for modular toilets for Train B28 project.
- "**Fresh Water Tank with water Circulation Pump System / Pressurized System for modular toilets**" hereafter referred to as "FWT with WCPS/PS" for Train B28 project.

1.3. Abbreviations

- ICF : Integral Coach Factory, Chennai
- MAHSR : Mumbai Ahmedabad High Speed Rail
- NHSRCL : National High Speed Rail Corporation Limited
- PRM : Passengers with Restricted Mobility
- PTS : Procurement Technical Specification

1.4. Climatic and Environmental Conditions

- **Atmospheric Temperature**: Min -5℃, Max Temp 50℃
- **Rainfall**: Very heavy and continuous rainfall upto 2500 mm with rainy season as long as 5 months
- **Coastal area**: Humid, salt laden and corrosive atmosphere as prevailing in coastal region

1.5. Trainset Configuration

The 8-car trainset configuration for Train B28 project is as follows:

* DTC1 + MC1 + TC1(PRM) + MC1 + MC1 + TC2 (Exe-PRM) + MC1 + DTC2 *

DTC1 / DTC2 - Driving Trailer Car,

MC1 - Motor Car,

TC1 (PRM) - Trailer Car (Standard car with PRM toilet),

TC2 (Exe-PRM) - Trailer Car (Executive Car with PRM toilet)

* Automatic Coupler

\+ Semi-permanent Coupler

1.6. Leading Particulars

Description	Values
Maximum operational speed during service	249 kmph
Maximum Design speed	280 kmph
Gauge	1435 mm
Length of Car DTC	26085 mm
Length of Car MC	25000 mm
Length of Car TC	25000 mm
Width of Car	3300 mm
Height of Car above rail level	4100 mm

1.7. Design Life

The Train shall be designed for a life of 30 years. The Train shall be designed so as to minimize the risks posed by obsolescence.

1.8. Data & documents sharing with consultant and verification agency

The firm is required to submit the required technical data & drawings to the Design Consultant & Design Verification Agency appointed by BEML Limited.

2. Defining of unclear aspects

a) If any term or clause is not described or not clear in the PTS, firm shall seek clarification from BEML, prior to making bid submission.

b) After making a contract, firm shall follow the PTS & all relevant latest revision of EN ISO standards.

3. Precedence of Documents

1. All firms providing equipment or services to BEML shall comply with this PTS & all relevant latest revision of EN/ISO/UIC/IEC standards.
2. Firm must comply with the requirements stated herein unless otherwise agreed to in writing by BEML. Any conflict with this PTS shall be brought to BEML's immediate notice for resolution prior to bid submission. After awarding the bid, the firm shall comply with BEML's Interpretation for any discrepancies.
3. In case of conflict among contract documents, the following order of priority shall govern:

Order of Precedence	Document Title
1	PTS to doc No: FPIIC/TD/051
2	General Terms & Condition (GTC)

4. Qualification Criteria

a) The firm should be a reputed OEM who is having an experience in with rolling stock requirements and applicable ISO/EN/UIC/IEC standards. Firm shall submit company profile, infrastructure facilities, product range & their earlier supply records along with technical bid.

b) The firm should submit the concept design of FWT with WCPS/PS which shall include water tank design, dimensions, envelope, pump and controller system or pressurized system and its accessories details along with tentative plumbing arrangement for pump system or pressurized system, with working principle and mounting details & earlier supply records of FWT with WCPS/PS along with technical bid.

c) The firm should submit the preliminary design document within 15 days from the date of award of contract.

d) The Proposed FWT with WCPS/PS shall be designed based on sound, proven, reliable engineering practices and establish its reliability & maintenance requirement.

e) The firm shall submit ISO:9001-2015 certificate along with technical bid.

f) The firm shall submit EN 15085 certificate along with technical bid.

g) The firm should provide full support during the integration of FWT with WCPS/PS during proto car manufacturing, support during Testing & Commissioning, service trials and revenue service either by themselves or through sister company or a partner in India. The firm shall submit detailed proposal in this regard.

h) In case the firm does not meet all the above requirements directly they can leverage capability/ credentials of its competent business partner/firm (local / global) with whom they have an JV/Consortium partnership for these water supply systems who is having a prior experience of supplying water supply systems for rolling stocks. Supporting documents shall be submitted along with technical bid.

i) The firm/supplier shall demonstrate, to the satisfaction of the Purchaser, that the Sub-systems proposed to be used in the Train are based on proven technology and design. In case of new development for the application in high-speed Rolling Stock, by a proven OEM can be considered subject to proper justification, comprehensive validation and additional warranty of at least 03 years of DNP beyond 02 years of project DNP. Development of any subsystem based on proven technology may be verified and validated by design verification agency.

5. Technical requirements

5.1. Car Layout

The details of train set formation and the Variants of Coaches used are as described below:

a) **Driving Trailer Car (DTC)**: Each DTC has one Toilet & has one 350 L Tank mounted in the Underslung. System shall include pumping system/ pressurized System including controller, plumbing & piping arrangement to maintain the required pressure in the water line.

b) **Motor Car (MC)**: Each MC has two toilets & has two 350 L Tanks mounted in the Underslung with an approx. distance of 8 Meters between tanks and the same has to be interconnected. System shall include pumping system/ pressurized System including controller, plumbing & piping arrangement to maintain the required pressure in the water line.

c) **Trailer Car (TC)**: Each TC has one Toilet & has one 350 L Tank mounted in the Underslung. System shall include pumping system/ pressurized System including controller, plumbing & piping arrangement to maintain the required pressure in the water line.

5.2. Tank

a. **Material**: material grade SUS 316L suitable for service life of the train

b. **Capacity**: Proposed tank capacity is 350 Litres

c. **Mounting Type**: Underslung

d. **Mass:** The firm shall ensure that the complete system design should be optimized to reduce the weight and to be kept minimum (Tentatively <250 kg as per Carbody weight management calculations)

e. **Strength**: Steel structure of tank and framing as per EN 12663, vehicle category P-II for Shock & Vibrations for Electro mechanic components as per EN 61373 Cat. 1, Class B. This shall include simplified fluid mechanics to specify loads on structure when fluid is under load cases derived from EN 12663. Fluid creates loads on tank skin and baffles. Mechanical strength shall also meet the requirement as per para 2.1.4 of UIC 566 & the structural requirement for equipment attachment along with strength analysis

through FEA/ calculations.

f. **Connectors**: Stainless steel connectors in compliance with EN 16362

g. **Ports**: Water Filling Ports shall be provided on both sides of the coach, with anti-backflow valves & Drainage Ports shall be accessible for maintenance and emergency emptying. Overflow protection shall be provided to prevent spillage during refilling.

h. **Quality Requirement**: All the tanks and piping should be leak proof at the required operating pressure during static and dynamic train operation also must resist vibration, shock. The complete FWT with WCPS / PS should be free from any air lock during the operation by providing suitable arrangement.

i. The water tank shall have level indicators and an indication or an alarm or both shall be generated for the Train Crew in the event water tank level is low. The details shall be submitted during the detailed design.

5.3. Pump System

a. **Pump System**: The firm shall submit the technical specification of pump for Proposed FWT with WCPS / PS.

b. **Type**: Pump should be of Self priming mono block type.

c. **Ingress Protection**: All equipment shall be suitably protected from dust and water. All the electrics, sensors shall be with IP65 & IP67 protection as per standards.

d. **Power supply available in Train:** 415V AC (3 phase), 110V DC (77V-137.5V DC).

e. Pump System should be able to operate from battery supply (110V DC) in case of outrage of 3 phase supply through an inverter which is also part of scope of supply.

f. **Standards:** The pump system should comply at minimum to EN 50155, EN-12663-1, EN 45545-2, IEC 61373 & EN 60529 Standards. Any other standards applicable for pump system to be operated in high-speed trains should be listed and complied accordingly.

g. The pump system should be built with suitable redundancy design. For example, in the event of a pump failure, the other pump should be able to pump the water immediately.

h. The pump controller is required to optimize the performance of the pumping system with suitable operating modes, indicators and potential free contacts. Details will be discussed and finalized during the design stage.

i. The electrical and electronic systems shall be properly protected as per IEC 60077, EN 50155 standards.

j. Fresh water tank components include air regulator, level sensor, level indicator, solenoid valves, over flow valves, safety valves…etc.

5.4. Pressurized System

a. **Pressure System**: The firm shall submit the technical specification of Pressure System for Proposed FWT with WCPS / PS.

b. **Ingress Protection**: All equipment shall be suitably protected from dust and water. All the electrics, sensors shall be with IP65 & IP67 protection as per standards.

c. **Power supply available in Train:** 415V AC (3 phase), 110V DC (77V-137.5V DC).

d. Pressurized System should be able to operate from battery supply (110V DC) in case of outrage of 3 phase supply through an inverter which is also part of scope of supply.

e. **Standards:** The Pressurized system and its aggregates should comply at minimum to EN 50155, EN-12663-1, EN 45545-2, IEC 61373 & EN 60529 Standards. Any other standards applicable for Pressurized system and its aggregates to be operated in high-speed trains should be listed and complied accordingly.

f. The Pressurized system and its aggregates should be built with suitable redundancy design. For example, in the event of a Pressurized system and its aggregates failure, the water should be delivered to Modular toilet without stopping.

g. The controller is required to optimize the performance of the Pressurized system with suitable operating modes, indicators and potential free contacts. Details will be discussed and finalized during the design stage.

h. The electrical and electronic systems shall be properly protected as per IEC 60077, EN 50155 standards.

i. Fresh water tank components include air regulator, level sensor, level indicator, solenoid valves, over flow valves, safety valves…etc.

5.5. Water routing items

a. Seamless Stainless-Steel tube:

   i. Cold rolled seamless stainless-steel tube to standard JIS G 3459 SUS 316 LTP S-C / ASTM A269 TP 316L material grade SUS 316L suitable for service life of the train.

   ii. 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 for tubes being used.

   iii. Proper clamping arrangement shall be provided for mounting the pipes to the underframe and inside the coach outside the toilet.

b. End Fittings:

i. Single ferrule flareless bite type double compression fittings conforming to DIN 2353 standards shall be used.

ii. Supplier shall submit material test certificates viz. chemical and mechanical properties for fittings along with the supplies. Also, the Supplier shall provide all the material test certificates for raw material, type and routine test certificates for fittings being used confirming to DIN 2353 standards.

iii. Water routing piping/plumbing system should be leak proof at the required operating pressure during static and dynamic train operation.

iv. Standards: should comply to DIN 2353, EN 13480, EN ISO 1127

5.6. Supply of coupling connectors

Supplier shall supply coupling connectors equivalent to six (06) Trains for the connection of hoses to water tank at stations as well as at depot. Supplier shall submit design details of coupling connector to the Nominated Agency during detailed design

5.7. Maintenance Schedule

a. Firm shall submit the basic maintenance schedules of the proposed FWT with WCPS / PS on the Train. Minimum interval between two maintenance schedules in the depot for the Train should be based on international standards/norms. Average running distance of a rake may be considered 2000 kilometers per day.

b. The maintenance program prepared by Firm shall have the following objectives:
   - Enhancement of availability
   - Minimization of maintenance costs
   - Minimization of Car downtime / MTTS (meantime to restore serviceability).

6. Tests

The tests on controller unit shall be conducted as follows:

6.1. Type Tests

All the type tests mentioned in table given below shall be carried out on a proto type unit at firm's premises at the manufacture's cost. the firm manufacturing for first time shall get proto type approval from NHSRCL/BEML/ICF.

6.2. Acceptance Tests

Acceptance test mentioned in table given below is to be carried out by an inspecting authority nominated by the purchaser at the works of the manufacture, on the samples picked up by the inspecting authority.

6.3. Routine Tests

Routine test mentioned in table given below shall be carried out on unit by the manufacture at his works to ensure compliance with the specification and the drawing.

6.4. List of Tests to be performed is as given below

Sl. No.	Test Description	Type Test	Acceptance Test	Routing Test
1	Visual inspection and performance test	✓	✓	✓
2	Insulation resistance	✓	✓	✓
3	Dielectric test	✓	✓	✓
4	Test for all protections	✓	✓	✓
5	Degree of protection test	✓	✓	✓

6.5. Visual inspection and performance Tests

- Check for general workmanship, overall dimensions, mounting details, fabrication, finish as per approval drawings.
- The controller shall be tested for its performance to verify requirements.

7. Scope of Work & Supply

a. The firm shall design the complete FWT with WCPS / PS including water tank, water pump with control system /PS, piping, plumbing, sensors, mounting details, water flow rate etc. for 3 variants viz DT, M & T cars.

b. The firm shall submit water refilling arrangement for 350 L Fresh water tank.

c. The complete system design to be finalized in coordination with BEML & Design consultant.

d. Firm shall submit 3D model and detail design / drawings along with the technical specification of the components / part drawings of complete FWT with WCPS / PS to BEML.

e. The modifications suggested by BEML & Design consultant during design phase shall be incorporated in the design and the proposal to be resubmitted for approval.

f. The Firm shall undertake to provide support during Testing & Commissioning, service

trials, revenue service & maintenance.

g. The Firm shall submit list of unit exchange spares (UES) along with quantity required, spares & consumables required during warranty period of 36 months from the date of supply or 24 months from the date of commissioning

h. Comprehensive maintenance requirement is for 15 years after DNP. The Firm shall also submit the list of Spares and Consumables required during comprehensive maintenance of 15 years after warranty period.

i. The firm has to provide the technical support when there is any issue is raised & clear the issue / fault during warranty period.

8. Deliverables

a) Complete 3D models and 2D manufacturing drawings pertaining to FWT with WCPS / PS, plumbing & schematic of Piping System with all the end fittings, Clamps, control system, mounting hardware's & other accessories

b) Supply of special tools, testing and diagnostic equipment for maintenance, repair and overhaul of FWT with WCPS / PS if any required.

c) FEM Analysis of Fresh water tank including internal fluid analysis

d) Complete final design, drawings and documents shall be submitted to BEML.

e) Coupling connectors for the connection of hoses to water tank at stations & at depot

f) Pump Logic and test reports

g) Operation & Maintenance Manuals

h) Test protocol for testing of tank, pump system & integrated FWT with WCPS / PS.

i) Test report of SS tank, pump system & integrated FWT with WCPS / PS

j) Supply of mandatory spares & consumables required during warranty period of 36 months from the date of supply or 24 months from the date of commissioning

k) List of Spares with quantity and Consumables required during comprehensive maintenance of 15 years after warranty period.

l) Supply of complete system to meet 1st Trainset within 6 months of placement of order and 2nd Trainset by Dec-2026.

m) RAMS & LCC Analysis

9. Submittals with Technical Offer

The firm shall provide the following along with the technical offer / tender submission:

1. Clause-by-Clause (CbC) compliance for PTS to document no. FPIIC/TD/051, shall be

given only in the following form:

a) **Complied**: where the firm is able to comply with the clause.

b) **Noted**: where the clause merely provides information.

c) Any clauses with status as "Not Complied" are liable for rejection.

2. Firm shall submit all supporting documents as stipulated in Clause 4 of this PTS.

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