TRAIN B28

Procurement Technical Specification of Weldable Primer

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1. Introduction

1.1. General

i. New Generation energy efficient Trainset variant is a high speed (design speed 280 Kmph) 8 car trainset is being design, developed, manufactured, testing, commissioning and maintenance by BEML.

ii. This Procurement Technical specification (PTS) specifies the technical requirements of 2K Zinc Phosphate Epoxy Weldable Primer required for all Carbon steel components of Underframe to be supplied for High Speed 8 car trainset (Chair car) designed for 280 kmph and to be operate at 249 kmph.

iii. The scope of work covers supply of Paints (2K Zinc Phosphate Epoxy Weldable Primer) with required subsidiary materials to ensure its performance e.g., Thinner, Hardener etc.,

1.2. Trainset Configuration

The rake formation shall generally be as follows:

8 Car Train formation : * DTC – MC –TC – MC – MC–TC1 – MC – DTC* where,

DTC : Driving Trailer Car
TC : Trailer Car with pantograph
MC : Non -Driving Motor Car
TC1 : Trailer Coach (Executive Coach)

1.3. Climatic & Environmental Conditions

The car shall operate reliably and safely under the climatic & environmental conditions. Accordingly, the 2K Epoxy Weldable primer shall be able to operate satisfactory performance under the following conditions:

Description	Limiting Values
Atmospheric temperature [Note-1]	Minimum temperature: - 5℃ Maximum temperature: 50℃ 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)
Atmospheric conditions	Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6 mg/m^3.
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/m^2. [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-1] Ambient temperature for HVAC calculations shall be based on the highest temperature of the Indian region specified in ASHRAE-2021.

[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.

1.4. Performance Requirements of Train

The performance requirements of the train shall be governed according to following table.

Item	Values
Maximum operational speed during service	249 Kmph
Maximum operational speed during testing	280 kmph

Minimum deceleration during full service braking followng jerk limit	0.8 m/s^2
Jerk rate (Maximum)	0.7 m/s^3 during full service braking (for all speed range) 1 m/s^3 during emergency braking (for speeds > 10kmph)
Average running distance of one train (for design purpose)	2,000 km / day

Vibration and Shocks: Vibration and Shock as defined in IEC 61373.

2. Definitions and Abbreviations

2.1. Definitions

The following definitions and abbreviations are applicable to the PTS.

- "**BEML**" means the Contractor to procure the weldable primer for underframe of High-Speed Rail project
- "**Subcontractor**" means the Supplier who supplies weldable primer required for Underframe to BEML for High-Speed Rail project.
- "**Engineer**" means any person nominated or appointed from time to time by the Employer to act as the Engineer for the purposes of the Contract and notified as such in writing to the Contractor.

2.2. Abbreviations

The following abbreviations shall be used as applicable:

- PTS: Procurement Technical Specifications of BEML

3. General Requirements

3.1. Defining of unclear aspects

If any term or clause described in the specification is not clear, Supplier shall discuss those with Design Team in BEML, prior to making a contract, to confirm their definitions and opinions.
After making a contract, Supplier shall follow the definition and opinions of Design Team in BEML

3.2. Responsibility of Supplier

Supplier shall have responsibility for manufacturing and to perform defined performance testing with regard to proposed 2K epoxy weldable primer paint for Underframe shall perform satisfactorily in the Indian environmental conditions specified at Clause 1.3.

4. Qualifying Criteria

a. Supplier shall be an Original Equipment Manufacturer (OEM) of the Paints for Rolling stock.
b. The subcontractors shall provide offer of Paint system (2K Epoxy Weldable Primer) with all subcomponents includes design, development, manufacture, supply, testing, and post execution support necessary to facilitate operation and maintenance of Painting System.
c. The supplier should give an undertaking to supply agreed paint system for a minimum period of 15 years from the date of last car supplied by BEML.
d. The subcontractor shall hold ISO 9001/ IRIS certification and shall manufacture the products accordingly.
e. The subcontractor shall submit Documents including QAP, ITP, company profile with infrastructure facilities, product range. Test Reports submitted shall be from NABL accredited laboratory.

5. Standard

Test and inspection standard applicable for the Paint shall conform to the international standards as per the technical specification.

6. Design Criteria

All painting processes shall be proven in railway application and suitable for the climate of this project and shall be subject to review. Such processes shall include surface preparation suitable for the material, corrosion preventive priming.

Contractor expects paint systems as per best international practices. Supplier shall submit the guaranteed life cycles for the paint systems for Carbon Steel substrates for contractor's review

7. Scope of supply

7.1. General

The supplier shall supply Paint system (2K Epoxy Weldable Primer) along with required subsidiary materials to ensure its performance e.g., Thinner, Hardener etc., The supplier shall be responsible and shall ensure that the items supplied

meet the Climatic & Environmental conditions specified at Clause 1.3 of this PTS.

The supplier shall submit painting procedure, briefly describing application process of epoxy weldable primer, mixing ratio, viscosity, nozzle size, spray gun specification, spraying pressure, Dry Film Thickness (DFT) achieved for each coating, pot life, drying time, recoat interval time etc.,

7.2. Submission of Documents

Supplier shall submit the following documents as a minimum along with the offer.

- ✓ Technical Specification in line with Clause 8
- ✓ Paint System recommendation & its painting procedure
- ✓ Technical Data Sheet (TDS) & Material Safety Data Sheet (MSDS) for the primer, activator & thinner

The supplier shall submit the following documents conforming to the technical specification along with every batch of supplies.

- ✓ Routine Test Reports
- ✓ Material test certificates

7.3. Packing

The supplier shall pack properly in order to avoid damage during transit and after supply of the paints no damage shall occur. The label on packing shall clearly indicates the shelf life of paints.

8. Technical Requirements

8.1. General

The paint system shall be applicable for areas where Galvanic corrosion is caused in Carbody Structure which is mainly caused due to the welding or joining of two dissimilar metals such as Carbon steel and Stainless-steel materials. Painting of 2K Zinc Phosphate Epoxy weldable primer is carried out for the carbon steel components which has a lap joint with Stainless steel components of underframe structure.

The paint system shall be of 2K Zinc Phosphate Epoxy Weldable primer. The paint systems shall have excellent weldability, inter-coat adhesion, long term corrosion protection.

8.2. Coating System

The recommended paint system is 2K Epoxy Weldable Primer. This product has been developed as a two-pack system for the weldability & long-term maintenance of Steel. The coating thickness is as per the below table:

Products		Nominal value	Minimum value	Maximum value
Carbon Steel Substrate	2K Epoxy Weldable Primer	20 µm	15 µm	25 µm

8.3. Surface preparation:

- Surfaces shall be degreased using Cleaning Solvent.
- The degreased surface shall be abrasive blasted to a minimum SA 2 ½ Standard for mild steel.
- All dirt and resultant debris if abrading shall be thoroughly removed prior to the application of 2K Epoxy Weldable primer. The mild steel surfaces shall be protected with 2K Epoxy Weldable primer within 4 hours of abrasive blasting.

8.4. Painting Parameters

The Painting parameters are shown in table below:

Sl. No.	Parameters	Values
1	Volume Solids (%/mass, min)	35± 2
2	Dry Film Thickness per coat (in µm)	15 - 25
4	Colour	Red oxide
5	Pot Life	4 hrs, min.
6	Theoretical Coverage	14-24 m^2/ltr
7	Shelf Life	12 months
8	Finish	Matt
9	Drying Time: a) Surface dry b) Hard dry	a) Max. 3-4 Mins b) 2-3 hrs
10	Flash point	Above 18° C

8.5. Application of 2K Zinc Phosphate Epoxy Weldable Primer

All surfaces to be primed must be completely clean of dust, dirt and grease and thoroughly dry. Room conditions should be checked before application of weldable epoxy primer. The humidity of the room shall be <85%. If the humidity is ≥ 85%, then oven heat or hot air blow the substrate.

Weldable Epoxy primer is a two-pack component of high-performance epoxy coating, supplied as a base component and an activator which would provide excellent anti corrosion and adhesion to steel. The primer shall be applied by spray painting for uniform smooth film.

Touch dry shall be achieved in dust free environment and the no. of coats to achieve the required dry film thickness of 20 ±5 µm shall be proposed by the paint supplier along with the offer. The DFT shall be measured using a paint coating thickness gauge.

The finish coat is a **2K Zinc Phosphate Epoxy Weldable Primer** with excellent colour and workability and durability.

8.6. Touch Up & Repair Procedure

The damaged area and the surrounding area should be cleaned and degreased with thinner or acetone.

Any loose flaking, coating of finish coat shall be abraded with either 120-240 grit grade sanding paper using mechanical or manual methods depending on the extent and degree of damage.

After abrading operation, any residual debris and dust must be removed using vacuum brush. The abraded area should be then further degreased with acetone.

If the substrate is exposed, apply primer as per respective coating system. When the repair area is very less, touch up with brush for repair, however when the area is large, spray coating to be adopted.

8.7. Service Life:

The supplier shall ensure that painted surfaces shall have a guaranteed revenue service life of at least 15 years.

9. Quality Assurance Program

9.1. 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 suppler shall monitor and control the Quality systems as per ISO 9001 guidelines. BEML and/or customer's representative may periodically conduct compliance audits of the supplier's Quality management system.

9.2. Quality assurance plan

The supplier shall develop and submit a Quality assurance plan (QAP) to BEML for review and approval based on ISO 9001:2015 guidelines.

10. Testing

10.1. Mechanical Performance Test

The mechanical performance tests shall be conducted on each of the parts painted and the test results shall meet the following requirements.

Property	Standards	Criteria
Scratch Resistant/Hardness	BS 3900 E2, BS EN ISO:1518:2001	No Failure
Impact Resistance	BS 3900 E7	No Failure
Salt Spray Test	ISO 9227	No Failure up to 300 hrs
Paint Adhesion	ASTM D 3359 (Method B)	5B

10.2. Type and Routine Test

Sl. No.	Description	Type test	Routine test
1	Scratch Resistant	●	
2	Impact Resistance	●	
3	Paint Adhesion	●	●
4	Salt Spray Test	●	●

10.3. First Article Inspection (FAI)

The subcontractor shall offer the Paint system (2K Zinc Phosphate Epoxy weldable primer) for First Article Inspection by BEML in accordance with the approved FAI plan prior to serial production.

At the FAI, the subcontractor shall make available all Test records, Technical Data Sheet (TDS) & Material Safety Data Sheet (MSDS) etc., for inspection.

During FAI, if any inspections or tests indicate that specific documentation does not meet the specified requirements, the noted deficiency shall be corrected by the Subcontractor at their own cost. After correction of deficiency, all tests necessary to verify the effectiveness of the corrective action shall be repeated.

Upon acceptance of the FAI by BEML, the subcontractor can proceed for bulk manufacturing.

At any point of time, during the execution of the contract, if BEML has any concerns about the quality of the product supplied, BEML reserves the right to randomly draw samples from any of the supply lots and the sub-contractor shall carryout the type tests at accredited outside labs and shall submit the reports.

11. Submittal with Technical Offer

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

1. Clause-wise comments against this PTS Doc. FPIIC/TD/064
2. Painting procedure & Repair procedure for Metallic substrate.
3. Technical Data Sheet (TDS) & Material Safety Data Sheet (MSDS).
4. Spreading rate (theoretical coverage) and solids by volume.
5. Type test reports along with supplies
6. Supporting documents for Qualification Criteria compliance.
7. Routine test report formats and samples from earlier supply records.
8. Duly filled Vendor approval form along with supporting documents including QAP & ITP for HSR project, company profile with infrastructure facilities, product range etc., and satisfactory revenue service performance certificate from end user corporations.