

ADDENDUM - 2

BEML SRM E-Tender No: 6300040415 dated 16/03/2026

Subject: Engaging of Testing agency for carrying out "Vehicle Level Bogie Type Test activities" for Standard Gauge High Speed Train Project (Chair Car - Design/Operating Speed 280/249 kmph).

Addendum Details:

- 1) Scope of Work (SoW) is revised and revised SoW document ref: FPIIC/TD/020 dated 30/03/2026 (Rev 02) is enclosed.
- 2) As per the revised SoW, the following changes in tendered line item may please be noted:

FOR (Tendered line item)			
Services Line Item	Description	Qty	UoM
1	<p>ENGAGING OF TESTING AGENCY</p> <p>Engaging of Testing agency for carrying out "Vehicle Level Bogie Type Test activities" for Standard Gauge High Speed Train Project (Chair Car - Design/Operating Speed 280 / 249 kmph).</p> <p>NOTE:</p> <p>1) Bidders to submit consolidated price for carrying out Testing Services for 3 Cars consists of 1DTC+1TC+1MC</p> <p>2) Scope of Work (SoW) as per PTS ref: FPIIC/TD/020 dated 29/01/2026 (Rev 01)</p>	1	AU

READ AS (Revised tender line items)			
Services Line Item	Description	Qty	UoM
1	<p>ENGAGING OF TESTING AGENCY</p> <p>Engaging of Testing agency for carrying out "Vehicle Level Bogie Type Test activities" for Standard Gauge High Speed Train Project (Chair Car - Design/Operating Speed 280 / 249 kmph).</p>	1	AU

	<p>NOTE:</p> <p>1) Bidders to submit consolidated price for carrying out Testing Services for 3 Cars consists of 1DTC+1TC+1MC</p> <p>2) Scope of Work (SoW) as per PTS ref: FPIIC/TD/020 dated 30/03/2026 (Rev 02) - Wheel unloading & sway test (as per clause 5.2 & 5.3 of PTS ref: FPIIC/TD/020 rev 01 dated 29.01.2026):</p>		
2	<p>ENGAGING OF TESTING AGENCY</p> <p>Engaging of Testing agency for carrying out "Vehicle Level Bogie Type Test activities" for Standard Gauge High</p> <p>Speed Train Project (Chair Car - Design/Operating Speed 280 / 249 kmph).</p> <p>NOTE:</p> <p>1) Bidders to submit consolidated price for carrying out Testing Services for 3 Cars consists of 1DTC+1TC+1MC</p> <p>2) Scope of Work (SoW) as per PTS ref: FPIIC/TD/020 dated 30/03/2026 (Rev 02) - Safety Against Derailment with 6 Numbers of Instrumented wheelsets (IWS) (as per 5.1 of PTS ref: FPIIC/TD/020 rev 01 dated 29.01.2026):</p>	1	AU
3	<p>ENGAGING OF TESTING AGENCY</p> <p>Engaging of Testing agency for carrying out "Vehicle Level Bogie Type Test activities" for Standard Gauge High</p> <p>Speed Train Project (Chair Car - Design/Operating Speed 280 / 249 kmph).</p> <p>NOTE:</p> <p>1) Bidders to submit consolidated price for carrying out Testing Services for 4 Cars consists of 1DTC+1 TC_PRM+1TC_EX+1MC</p> <p>2) Scope of Work (SoW) as per PTS ref: FPIIC/TD/020 dated 30/03/2026 (Rev 02) - Safety Against Derailment with 8 Numbers of Instrumented wheelsets (IWS) (as per 5.1 of PTS ref: FPIIC/TD/020 rev 01 dated 29.01.2026):</p>	1	AU

- i) M/s. BEML Ltd will finalize the tender requirement /scope for the following services in subsequent stages.

Services line item **1** + Services line item **2**

(or)

Services line item **1** + Services line item **3**

Accordingly, Commercial Evaluation / Ranking will be done as per BEML requirement and BEML's decision is final.

- ii) Bidder has to quote for all the line items. Commercial evaluation will be based on total bid value as per BEML requirement (i.e., Services line item **1** + Services line item (**2 or 3**)).
- iii) Commercial Ranking shall be arrived based on the Grand Total of the tendered line items in above Table (i.e., Services line item **1** + Services line item (**2 or 3**)). The bidder whose offer is lowest will be considered as L1.
- iv) The commercial bids of the vendors will be opened subject to technical acceptance based on Technical bid evaluation.
- v) Bidder should quote for all tendered line items. Bidders / Bids having partial participation will be rejected.
- vi) Reverse Auction shall be conducted if Minimum 2 technically accepted firms received & Reverse auction will be as per BEML SRM norms. (refer document ReverseAuction_Terms)

3) Tender closing date for the above tender is extended **from 30/03/2026 to 06/04/2026**

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TRAIN B28

Scope of Work (SoW) for Vehicle Level Bogie Type Tests

Approved	30.03.2026	Mahanthesh. G M	
Reviewed	30.03.2026	Dhananjaya B	
Prepared	29.03.2026	Ashwani Goyal	
	Date	Name	Signature

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REVISION HISTORY

REV. NO.	PAGE	DETAILS		DATE
		FROM	TO	
Nil	-	First Issue		18.07.2025
01	All	Updated the method of testing in section 5.1		29.01.2026
02	8 & 9	Updated section 5.1.2 d, e, f & h, updated section 5.1.4 e & f, added section 5.1.2 g,		29.03.2026

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1. Introduction

1.1. General

- a) This Scope of Work (SoW) describes the technical requirements of "Vehicle Level Bogie Type Tests" to be carried out for complete Train B28 project of 8-Car formation with operating speed of 249 kmph and test speed of 280 kmph for NHRCL/ICF (MAHSR Section) contract.
- b) All tests carried out shall comply in all respects to latest revision of EN 14363:2016+A2:2022.
- c) BEML will carry out all required works and activities as "Contractor" to the Employer for this project, while the "Testing Agency" shall be responsible for carrying out all tests required in this Scope of Work (SoW).

1.2. Definitions

The following definitions are applicable to the SoW:

- 1) "**Employer**" means ICF, Chennai, its legal successors and assignees.
- 2) "**Nominated Agency**" shall mean NHRCL and its representatives deployed by NHRCL for the purpose of carrying out Design approvals, Tests, Trials etc.
- 3) "**BEML**" means the contractor for Design, Development, Manufacture, Testing and Commissioning of Trains for the project.
- 4) "**TESTING AGENCY**" means the executer of vehicle level bogie type tests of Train B28 project and hereafter it is termed as TA.
- 5) "**Factory**" refers to site/location where testing will be done, in this case it refers to:
 - a) BEML Bangalore Complex, New Thippasandra Post, Bengaluru-560075, Karnataka, India.
 - b) NHRCL-Surat Depot, Surat, Gujarat.

1.3. Abbreviations

- ICF : Integral Coach Factory, Chennai
- MAHSR : Mumbai Ahmedabad High Speed Rail
- NHRCL : National High Speed Rail Corporation Limited
- PRM : Passengers with Restricted Mobility
- EN : European Norms

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1.4. Trainset Configuration

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

* DTC1 + MC1 + TC1 (PRM) + MC2 + MC1 + TC2 (Exe-PRM) + MC2 + DTC2 *

DTC1/DTC2 - Driving Trailer Car,

MC1/MC2 - 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



Figure 1: Train Formation

●●	Motor Bogie
○○	Trailer Bogie
∩	Auxiliary Life Guard
>	Sanding Nozzle

1.5. Principal Notion Vehicle Dimensions/Leading Particulars

Description		Values
Wheel Diameters	New	910 mm
	Full Worn	840 mm
Maximum operational speed during service		249 kmph
Maximum Design speed		280 kmph
Gauge		Standard Gauge 1435 mm
Maximum permissible cant		180 mm
Maximum permissible cant deficiency		90mm

1.6. 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.

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1.7. Applicable reference Standards

SI No.	Standard No./ Code No.	Title
1	EN 14363:2016+A2:2022	Testing and Simulation for the acceptance of running characteristics of railway vehicles - Running Behaviour and stationary tests

1.8. Car Weights

The car weight is as set out in the Carbody Weight Management Calculation (FPIIC/TD/262).

	DT Car	M Car	T Car_PRM	T Car-Exe
Tare weight, in kg	51806	57872	58534	57428
Fully loaded, in kg	60294	68204	68468	66450
Passenger Load, in kg	Max.7808	Max.9632	Max.9184	Max.8272
Max. Axle load, in kg	Max.17,000	Max.17,000	Max. 17,000	Max. 17,000

2. Defining of unclear aspects

- a) If any term or clause is not described or not clear in the SoW, TA shall seek clarification from design team in BEML, prior to making bid submission.
- b) After awarding the contract, TA shall follow the SoW & all relevant latest revision EN ISO standards.

3. Precedence of Documents

1. All subcontractors providing services to BEML shall comply with SoW & all relevant EN ISO standards.
2. TA must comply with the requirements stated herein unless otherwise agreed to in writing by BEML. Any conflict with this SoW shall be brought to BEML's immediate notice for resolution prior to bid submission. After awarding the bid, the quality assessment agency 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	Scope of Work (SoW) for Vehicle level Bogie Type Tests to doc No: FPIIC/TD/020

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4. Qualification Criteria

Qualification Criteria for selection of reputed TA for carrying out the vehicle level bogie type tests are as follows:

- a) TA shall be internationally accredited for carrying out vehicle level bogie type tests.
- b) TA shall have the possession of portable test rigs, fixtures, instrumentation and/or other necessary hardware/software.
- c) TA shall possess experience record of carrying out at least 3 tests/projects at car builders works in India & at least 5 projects/tests globally in past 10 years. Supporting documents/satisfactory certificates from train manufacturers shall be submitted during tendering.

5. Scope of Work (SoW)

Scope of work for the TA for carrying out the vehicle level bogie type tests are detailed in this section:

5.1. Safety Against Derailment (as per Clause 6.1.5.2 of EN 14363)

As per clause 6.1.5.2 of EN 14363 method-2 the risk of flange climbing is assessed by the ratio of the *horizontal guiding force-Y* and *vertical wheel force-Q*. The assessment is carried out in two stages.

5.1.1. Stage 1:

The measurement of the reduction of the vertical wheel force Q_a , on a **test rig** which simulates twisted track.

- a) This test will be carried out as per section 5.2 & reduction of the vertical wheel force Q_a values is obtained.
- b) This test will be carried out at site location: BEML Bangalore Complex, New Thippasandra Post, Bengaluru-560075, Karnataka, India.

5.1.2. Stage 2:

The measurement of the guiding force Y_a on an appropriate **test track (Curve Test)** using Instrumented Wheelsets (IWS).

- a) Test procedure to be prepared by TA based on the inputs provided by BEML. Test procedure duly approved by BEML/NHSRCL shall only be used for testing.

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- b) Standard EN 14363 calls for conducting the above test on R150m curve. But, as Train B28 vehicle is designed to a minimum curve radius of 200m. So, as discussed with ECE, NHRCL, DB & BEML it was concluded and decided to accept the deviation from the standard and to test in a 200m curve instead of the 150m curve.
- c) This test will be carried out on test curve of R200m at site location: NHRCL Surat Depot, Surat, Gujarat.
- d) Cleaned R200m curve without dirt and/or mud at test location will be provided to TA for carrying out the test.
- e) In order to achieve the friction condition required by the standard it may be necessary to use sand (for trains) or water and the availability of sand/water for testing will be made available by BEML/NHRCL at testing site.
- f) Curve test shall be carried out using the Instrumented wheelsets as per method-2 of EN 14363 as given below.
- g) Instrumented wheelsets:
- i. The number of wheelsets (06 or 08 wheelsets) to be instrumented will be provided by BEML to TA along with all the required modifications on wheelsets if any suggested by TA for carrying out the instrumentation of wheelsets.
 - ii. TA will instrument and calibrate the wheelsets.
 - iii. Transportation of the wheelsets to and from the place of TA which carry out the Instrumentation of wheelsets will be under the scope of BEML.
- h) Using Instrumented wheelsets testing activity has to be carried out as given below:
- i. Curve test using 06 Instrumented wheelsets or
 - ii. Curve test using 08 Instrumented wheelsets.
 - iii. BEML will finalise the requirement of 06 or 08 instrumented wheelsets, Accordingly, the scope will be considered either for 06 or 08 IWS.
- i) TA shall bring all other accessories like compatible data acquisition system for acquisition of data compliant to EN14363, sensors etc. along with any other specialized equipment / rig / instrumentation / software which are required for conducting the test.
- j) The calculation of the ratio $(Y/Q)_a$ is based on the test results.
- k) A vehicle is considered to be safe against derailment if the condition:

$$(Y/Q)_{j,a} \leq 1,2$$

is fulfilled for a flange angle of 70° (this corresponds to $\mu = 0,36$ from A.2).

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5.1.3. Clearances test in the bogie, and between bogie and carbody

This test shall be carried out by stopping the train in the R200m curve track & checking for any infringements or interferences between bogie, bogie & car body. This shall be part of test carried out in section 5.1.

5.1.4. Testing condition & procedure

- a) Time schedule chart shall be shared by the TA along with dates.
- b) Test cars will be provided by BEML and loading & unloading will be carried out by BEML.
- c) **Test Condition:** The test to be carried out for the below mentioned vehicle conditions:
 - DTC, MC and TC car bogies shall be tested as per standard condition.
 - Inflated air springs: under tare & fully loaded/seated condition.
 - Deflated air springs: under tare & fully loaded/seated condition.
- d) The results shall be tabulated for all the tested conditions.
- e) TA shall share the raw data and tabulated data collected during testing to BEML along with the test report.
- f) Draft report shall be submitted by the TA for BEML review. Only after approval of draft report by NHSRCL/BEML, TA shall submit final report with all the necessary changes suggested by NHSRCL/BEML within 15 days in compliance with the applicable standards.
- g) TA shall submit final test report in 3 hard copies (colour) and a soft copy.
- h) TA shall provide a detailed review presentation of test for BEML/NHSRCL.
- i) TA shall be available for technical discussions via tele-conferencing / Video-conferencing (as required).

5.2. Wheel Unloading Test

This section briefs SoW for evaluating the Wheel unloading test for new car units designed and manufactured by BEML. Wheel unloading test intends to *evaluate the safety against derailment of a vehicle during negotiating on curvature track with limit conditions of twist.*

1. Standard EN 14363:2016+A2:2022 must be used as a reference for conducting and assessing the Wheel Unloading Test.
 - a) As per para 6.1.5 & para-A.9 of EN 14363:2016+A2:2022 the bogie suspension, in conjunction with the car body, shall be designed to enable cars

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to operate satisfactorily on track with the maximum specified track twist. The maximum off-loading of wheels ' $\Delta Q/Q$ ' shall not exceed 50% of nominal wheel load in inflated condition up to maximum permissible speeds and shall not exceed 60% of nominal wheel in deflated condition up to maximum safe permissible speeds.

- b) The Contractor shall perform a wheel-unloading test to verify the calculations submitted. The test shall be conducted in the most disadvantageous combination of unloading and suspension conditions.
2. Test procedure to be prepared by TA based on the inputs provided by BEML. Test procedure duly approved by BEML/NHSRCL shall only be used for testing.
 3. Portable test rigs along with necessary calibrated instrumentation & power pack to be brought by TA on returnable basis to BEML facility.
 4. All hardware/software/instrumentation brought-in shall be declared in the packing list and shall be submitted to BEML. Missed out items shall be at the risk of TA.
 5. Any additional fixtures, load carrying equipment's, electrical requirements & equipment's, manpower, etc, required should be intimated to BEML well in advance.
 6. TA shall be responsible for setting up of the rig.
 7. Time schedule chart shall be shared by the TA along with dates.
 8. Test car will be provided by BEML & loading will be carried out by BEML.
 9. Material handling facilities and power source will be provided by BEML.
 10. The twist heights to be calculated based on the inputs provided by BEML.
 11. **Test Condition:** The test to be carried out for the below mentioned vehicle conditions.
 - DTC, MC and TC car bogies shall be tested as per standard condition.
 - Inflated air springs: under tare & fully loaded/seated condition.
 - Deflated air springs: under tare & fully loaded/seated condition.
 12. The results shall be tabulated for all the tested conditions.
 13. TA shall share the raw data and tabulated data collected during testing to BEML on daily basis.
 14. Draft report shall be provided by the TA for BEML review. Only after approval of draft report by NHSRCL/BEML, TA shall submit final report with all the necessary changes suggested by NHSRCL/BEML within 15 days.
 15. TA shall submit final test report in 3 hard copies (colour) and a soft copy.
 16. TA shall provide a detailed review presentation of test for NHSRCL/BEML.

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17. TA shall be available for technical discussions via tele-conferencing / Video-conferencing (as required).

5.3. Suspension Flexibility Test (Sway Test)

This test is also termed as *co-efficient of flexibility test or Souplesse test or Sway test*. This section briefs SoW for evaluating the coefficient of flexibility test for new car units designed and manufactured by BEML. The coefficient of flexibility test *intends to measure the lateral and roll displacements of a vehicle when subjected to cant excess or deficiency*.

1. Standard EN 14363:2016+A2:2022 must be used as a reference for conducting and assessing the coefficient of flexibility test. This test shall be carried out at the BEML factory under tare and loaded conditions as detailed in EN 14363:2016+A2:2022.
2. Test procedure to be prepared by TA based on the inputs provided by BEML. Test procedure duly approved by NHSRCL/BEML shall only be used for testing.
3. Portable test rigs along with necessary calibrated instrumentation & power pack to be brought by TA on returnable basis to BEML facility.
4. All hardware/software/instrumentation brought-in shall be declared in the packing list and shall be submitted to BEML. Missed out items shall be at the risk of TA.
5. Any additional fixtures, load carrying equipment's, electrical requirements & equipment's, manpower, etc, required should be intimated to BEML well in advance.
6. TA shall be responsible for setting up of the rig.
7. Time schedule chart shall be shared by the TA along with dates.
8. Test car will be provided by BEML & loading will be carried out by BEML.
9. Material handling facilities and power source will be provided by BEML.
10. Coefficient of flexibility test to be checked for maximum cant permissible in curves of 180mm and or maximum cant deficiency permissible of 90mm.
11. **Test Condition:** The test to be carried out for the below mentioned vehicle conditions.
 - DTC, MC and TC car bogies shall be tested as per standard condition.
 - Inflated air springs: under tare & fully loaded/seated condition.
 - Deflated air springs: under tare & fully loaded/seated condition.
12. The results shall be tabulated for all the tested conditions.
13. The hysteresis graph shall be provided as a part of the test result.

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14. TA shall share the raw data and tabulated data collected during testing to BEML on daily basis.
15. Draft report shall be provided by the TA for BEML review. Only after approval of draft report by NHRCL/BEML, TA shall submit final report with all the necessary changes suggested by NHRCL/BEML within 15 days.
16. TA shall submit final test report in 3 hard copies (colour) and a soft copy.
17. TA shall provide a detailed review presentation of test for NHRCL/BEML.
18. TA shall be available for technical discussions via tele-conferencing / Video-conferencing (as required).
19. The limit value of co-efficient for Souplesse test will be provided by BEML during detail design stage.

6. Submittals with Technical Offer

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

1. Clause-by-Clause (CbC) compliance for Scope of work to document no. FPIIC/TD/020 and compliance shall be given only in the following form:
 - a) Complied: where the supplier is able to comply with the clause.
 - b) Noted: where the clause merely provides information.
 - c) Any clauses with status as "Not Complied / partially complied" are liable for rejection.
2. Certificate indicating the international accreditation for carrying out vehicle level bogie type tests.
3. Declaration of possession of portable test rigs, fixtures, instrumentation and/or other necessary hardware/software.
4. List and details of test rig/instruments along with applicable calibration certificates.
5. Declaration of exposure of carrying out tests at car-builder's works. Credentials related to at least 3 such type tests shall be submitted.
6. Declaration of exposure of carrying out test at 5.1.2 above on test track. Credentials related to at least 3 such type tests shall be submitted.

*******End of Document*******