



# BEML LIMITED BANGALORE

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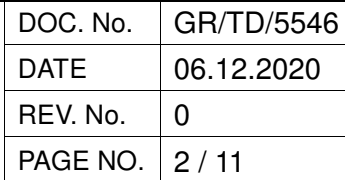
(BMRCL PROJECT)

**PROCUREMENT TECHNICAL SPECIFICATION  
FOR LASER BASED WHEEL PROFILE  
MEASUREMENT & RECORDING SYSTEM**

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## 1. Introduction

This document specifies the technical requirements of laser based wheel profile measurement & recording system to be supplied for Bangalore Metro under the 'BMRCL 3RS-DM Variation contract, also referred as BMRCL 42 Cars'.

BEML will carry out all required works and activities as a *contractor* for BMRCL 42 Cars project, while the *supplier* shall be responsible for all works required in this PTS with regards to laser based wheel profile measurement & recording and shall be responsible for supporting BEML activities.

## 2. Definitions and Abbreviations

### 2.1. Definitions

The following definitions shall be used as applicable:

- "Employer/end-user" means Bangalore Metro Rail Corporation Limited (BMRCL), its legal successors and assignees.
- "Engineer" means any person nominated or appointed from time to time by the Employer to act as Engineer for the purpose of the Contract and notified as such, in writing to the Contractor.
- "Engineer's Representative" means any Assistant of the Engineer appointed from time to time by the Engineer
- "BEML" means the contractor to procure laser based WPM for BMRCL 42-Cars Project.
- "Supplier/Sub-contractor/Vendor" means the supplier of laser based wheel profile measurement & recording system to BEML.

### 2.2. Abbreviations

The following abbreviations shall be used as applicable:

- GTC: General Terms & Conditions of BEML Tender
- PTS: Procurement Technical Specifications of BEML
- BMRCL: Bangalore Metro Rail Corporation Limited
- LCC: Life Cycle Cost
- RFQ: Request For Quotation from BEML
- WPM: Wheel Profile Measurement & recording system

## 3. General Specifications

The general specifications applicable to systems and sub-systems are given in the succeeding sections.

### 3.1. Car configuration

The configuration of train formation is as follows.

DMC: Driving Motor Car, MC: Motor Car (non-driving), TC: Trailer Car

DMC - TC - MC - MC - TC - DMC - (6 car train composition)

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### 3.2. Wheel diameter

Wheel diameter (new)	860 mm
Wheel diameter (half worn)	820mm
Wheel diameter (full worn)	780mm

### 3.3. Climatic conditions

The proposed system of sub-contractor shall satisfy climatic & environmental conditions as specified below:

Description	Limiting Values
Maximum ambient temperature	42°C
Minimum ambient temperature	8°C
Humidity	92% saturation during rainy season
Rainfall	Rain occurs generally from May to October. Average annual rainfall is approximately 1065 mm. Maximum rainfall in any 24h period is 178mm.
Atmosphere during hot season	Extremely dusty
Maximum wind load	125 Km/hr
SO <sub>2</sub> level in atmosphere	6.7 - 80 micro g/m <sup>3</sup>
NO <sub>x</sub> level in atmosphere	16 - 80 micro g/m <sup>3</sup>
Respiratory Suspended Particles Matter in atmosphere (RSPM)	49 - 120 micro g/m <sup>3</sup>
Total Suspended Particles Matter in atmosphere (TSPM)	111 - 360 micro g/m <sup>3</sup>
Altitude	1000 m
Conditions in stations	All underground stations will be fully air-conditioned. Above ground stations will have air-conditioning for certain designated rooms only.

**Note:**

- The temperature of the metal surfaces of the vehicles when exposed directly to the sun, for long periods of time, may be assumed to rise to +60°C.
- Any moisture condensation shall not lead to any malfunction or failure.
- Adequate margin shall specially be built into the design particularly to take care of the higher ambient temperatures, high humidity, dusty and corrosive conditions, abnormal wear due to adverse weather etc.
- In addition to the climatic aspect of surroundings, allowance must be made for variety of products carried in air such as grease, conducting dust, textile fluff, long fibres, various papers and sulphuric gas.

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### 3.4. Unclear aspects

If any term/clause/definition is unclear in this PTS or there is any conflict among the requirements of particular clauses of the PTS the sub-contractor shall seek clarification from design team in BEML prior to making the contract, to confirm the same. After signing the contract, supplier shall follow the definition and opinion of design team in BEML.

### 3.5. Responsibility of sub-contractor

### 3.6. Standards

- a. The design, manufacture & testing of the proposed aggregates by sub-contractor shall conform to the latest editions of UIC/EN standards or equivalent international standards on first priority. Metric system with SI units shall be used wherever applicable
- b. The sub-contractor's own standards shall be on second priority. The sub-contractor shall request and justify with reasonable, sufficient & necessary support documents for choosing alternate standards as compared to UIC/EN/any other international standards.
- c. BEML/Employer reserves the right to accept or reject any such request(s).

## 4. Qualifying Criteria

- a. The vendor shall submit documents to BEML as necessary for taking approval from Employer, if such requirements arises from Employer.
- b. Company profile, product description, catalogue, box contents etc shall be submitted along with offer. Operating and maintenance instructions must be submitted after placement of order.
- c. The submissions for vendor approval may require further modifications, additional documents & updates based on BEML/Employer feedback. The vendor shall provide the same within 5-7 working days to BEML/Employer.
- d. The vendor should undertake to provide support (as applicable) during testing & commissioning, service trials, revenue service and DLP period either by themselves or through sister company or a partner in India. The vendor shall submit detailed proposal in this regard.
- e. The vendor shall be a OEM or an authorized distributor of the proposed equipment. A letter of authorization shall be submitted for review along with technical offer. Validity of the authorization letter shall be clearly mentioned in the letter.
- f. The vendor shall also provide experience details of his supplies for his proposed equipment in India and/or abroad. Suggestively, a supply experience to an metro operator in India with satisfactory working for a minimum 2 years shall be preferred.

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## 5. Technical Requirements

The sub-contractor shall meet the technical requirements as given below to a minimum:

- a. The laser based WPM shall be a portable, reliable & proven system. The supplier shall provide details of his supply experience for the same.
- b. The supplier shall provide technical details & specifications of his proposed system which shall be approved by BEML.
- c. The proposed system should be capable of measuring the wheel profile and related parameters of interest with high degree of accuracy preferably 0.1mm or less. The related parameters of interest to a minimum are- flange height, flange thickness, flange slope (qr), rim thickness, entire wheel profile between tyre faces & on total circumference of wheel & wheel diameter.
- d. Measurements & recording shall be carried out on site without necessarily dismantling the wheelsets/wheels. The proposed system shall be capable of taking measurements on wheelsets which are free standing or in assembled condition with the bogie/vehicle in depot and/or main line.
- e. The proposed system shall be capable of taking measurements for wheelsets/wheels designed as per UIC (510-2, 812-2, 812-3), DIN, EN (13260, 13262) standards or any other internationally accepted standards.
- f. The propose system shall be capable of taking measurements for wheel tread profile of S1002/h28/e32.5/6.7% as per EN13715 for a standard gauge (1435m) wheelset.
- g. The WPM must have calibration tools & software so that calibration of measuring equipment can be done by the end-user/BEML itself.
- h. The WPM shall be capable of storing minimum 1000 recordings preferably.
- i. The proposed equipment shall be shock and vibration proof as per requirements of IEC 61371 & 61373 and water, dirt and dust proof as per IEC 60529 IP-65 rating or higher preferred.
- j. The wheelsets/wheels are often located at surroundings where high voltages and current exists. The supplier shall ensure electromagnetic compatibility for the same.
- k. The climatic and environment conditions must not have any impact on the accuracy and precision of the WPM.
- l. The proposed system shall be capable of getting interfaced with a laptop or personal computing device for the purpose of downloading profiles and exporting data.
- m. Updates for the software shall be provided without any financial implications on BEML/end-user till minimum period of 24months. The software provided shall be easy to install and compatible with a general computing device working on windows/Mac-OS/Linux system, without the need of a high end system configuration.
- n. The information & results from the measurement system shall be able to be exported in a format compatible with CAD software.

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- o. The supplier shall provide requisite training as per the needs & requirements of end user/BEML. The supplier shall submit a training program for the same for approval by BEML/end-user. Functionality demonstration along with video tutorial shall also be provided.
- p. The supplier shall provide operation & maintenance manual, user manual, software installation tutorial and training manual of the proposed system in 3 no's of paper bound copies in colour and soft copies (in colour compatible with adobe acrobat reader version 6 & above, in searchable pdf format).
- q. The supplier shall provide support and technical assistance for operation of the proposed system, post installation. The supplier shall submit a detailed proposal in this regard.

### 5.1. Material & Workmanship

The sub-contractor shall be responsible for meeting the requirements of constructional details, material and workmanship. All materials and workmanship in every aspect shall be as per proven up-to-date best international practices even if not specifically mentioned.

## 6. Scope of Supply

- a) The scope of supply includes supply of laser based WPM along with consumables (if applicable) for a minimum period of 2 years from date of commissioning.
- b) The supplier shall supply WPM with necessary subsidiary materials to ensure its functionality.
- c) The supplier shall be solely responsible for suitability of his proposed aggregate for the environmental conditions as specified in this PTS.
- d) The scope of work covers design, development, manufacture, supply, support during testing & commissioning and training of operation & maintenance personnel of the Employer and includes all items of work which may be required to meet the performance requirements, trouble free and efficient operation of WPM and meeting the best international practices even if not specifically mentioned in the PTS.
- e) The supplier shall provide all the documentation and support material associated with the operation and maintenance of the proposed system.
- f) The supplier shall provide technical support until the completion of the warranty period and post installation, and rectifying the defects and deficiencies as communicated by the Engineer.
- g) The supplier shall seek details from BEML and/or provide necessary information, for interfacing with other sub-system.
- h) The supplier shall provide training to engineers, operations and maintenance staff including providing the training materials, training kits and demonstration equipment, if asked.
- i) The supplier shall comply with PTS. Any doubts regarding scope of supply shall be resolved before submission of offer.



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### 6.1. Hardware

The supplier shall be responsible for supplying proposed aggregates with all necessary hardware/accessories (if any) required for meeting design functionality in compliance to 3RS-DM ERTS clause 10.10.14 ("*...shall provide two reliable and proven laser based wheel profile measuring and recording system to be used by BMRCL ...*"). The quantity is as given below:

SL	PART NO	ITEM	QTY	UOM
1	926-81011	Laser based Wheel Profile Measurement & Recording System	2	No's

## 7. Split of Responsibilities

- The supplier shall be primarily responsible for design and fitness of proposed aggregates and its sub components.
- The supplier shall send his engineer to BEML/Employer's designated place for technical meetings and interface related issues as and when required in reasonable time on his own cost.
- The procedure for assembly and installation shall be provided by supplier to BEML/Employer.

## 8. Operation & Maintenance Manual

- The supplier shall support BEML in meeting timelines for submission of manuals.
- It shall be the responsibility of supplier to provide O&M manual complete in all aspects which includes spare parts catalogue, general maintenance instructions, heavy maintenance instructions, details of special tools and test equipment, technical description, defects identification & rectification details etc
- The O&M manual provided by the supplier must contain all the information necessary to operate and maintain the equipment within his scope of supply in a safe and efficient manner.
- The supplier shall deliver 3 hard copies in colour in English language as well as soft copy strictly within timeline as specified by BEML. The hardcopy shall be submitted only if compulsorily insisted by Employer.
- The technical information provided in each volume of the O&M manual must be in sufficient detail to ensure that the different categories of readers/users are provided with all the information in the form of text, illustrations and tables which can be readily understood and assimilated.

## 9. Training Needs

The supplier shall meet training requirements as specified in this PTS. The supplier shall provide training and technical know-how on the application and usage of WPM along with calibration process.

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## 10. Warranty

The supplier shall be responsible for warranty of its supplies for a minimum period of 2 years from date of commissioning.

## 11. Delivery

- The supplier shall deliver proposed aggregates as per delivery schedule agreed by BEML.
- The supplier shall provide instructions for proper storage, handling and logistics of components two month before handing over the first shipment.
- The supplier shall pack & deliver the proposed aggregates suitably to avoid any damage during transit/transportation.
- The O&M manuals shall be supplied one month before the first supply of proposed aggregates to BEML.

## 12. Maintenance Interval

Maintenance Type	Interval (Service time or Running Distance)
A1 Service Check	Every 15 days or 6,000km
B1 Service Check	Every 45 days or 18,000km
B4 Service Check	Every 180 days or 72,000km
B8 Service Check	Every 360 days or 150,000 km
Intermediate Overhaul	Every 3 years or 450,000km
Periodic Overhaul	Every 6 years or 900,000 km

Preventive maintenance interval shall be compliant with the interval as specified in the table above.

### 12.1. Master Maintenance Schedule

- The master maintenance schedule shall be provided stating clearly the parts needing attention in service checks and major overhauls.
- The supplier shall submit work instructions/manuals for all scheduled maintenance activities, fault finding and corrective maintenance of all faults likely to be found during maintenance and servicing.
- The master maintenance schedule should be incorporated in maintenance manual and supplier shall provide the relevant chapter reference in maintenance manual against the each maintenance task in master maintenance schedule.

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## 12.2. Life Cycle Costs (LCC)

The supplier shall provide equipment that has minimum total LCC. The LCC which contains preventive & corrective maintenance activities shall be in compliance with the maintenance manuals submitted by the supplier.

## 13. Safety Requirements

The supplier shall indicate the magnitude and seriousness of events or malfunctions, which could result in damage to the equipment.

## 14. Compliance for PTS

- The supplier shall provide a valid and fully compliant proposal for the proposed aggregates as detailed in the PTS.
- The supplier shall submit a detailed clause by clause commentary (CBC) on the clauses of the PTS.
- Any clause of PTS and GTC for which no comments have been provided in CBC by the supplier shall be construed as favourable to BEML/Employer.

## 15. Submittals

The supplier shall submit following items along with technical offer:

- Technical data sheet
- Company brochure
- Supply experience in India & abroad
- Details of box content
- Clause by clause (CBC) replies to our PTS & compliance status for the same
- Authorization letter from OEM (if applicable)

Any other details as required will be intimated in case required.