Addendum No. 3
Tender No. CMRL / PHASE 1 / SYS / ARE05 / 2025
Design, Manufacture, Supply, Testing, Commissioning of Standard Guage Metro Rolling Stock (Electrical Multiple Units) and Depot Machinery & Plant and Training of Personnel

S. No.	Part	Section	Clause No.	Original / Amended Bid Condition	Revised Bid Condition
1	Part 1	Section – IV Bidding Forms	2. SCHEDULE OF ADJUSTMENT DATA	2. SCHEDULE OF ADJUSTMENT DATA	2. SCHEDULE OF ADJUSTMENT DATA is replaced by Annexure 01 to Addendum No.3
2	Part 1	Section – IV Bidding Forms (BF)	3.2.1	Price adjustment is applicable on all the Price Centre payable to the Contractor excluding taxes & duties, excluding 'Price Centre RS-H - Training, operation and maintenance manuals', 'Price Centre DM&P-Q - Major machinery & plant', 'Price Centre DM&P-R - Other machinery & plant', 'Price Centre DM&P-S - Storage items', and 'Price Centre DM&P-T - Tools & Minor items' in accordance with the Contract, during performance of the Contract to reflect changes in the cost of labor, copper, carbon steel, stainless steel / aluminium components and other inputs to the Works, in accordance with the following general formula specified; Price Adjustment for Coaches with Stainless Steel Car-body: Pn = R x { a + b (Sn/So) + c (Cn/Co) + d (Fn/Fo) + f (Ln/Lo) } – R Price Adjustment for Coaches with Aluminium Car-body: Pn = R x { a + e (An/Ao) + c (Cn/Co) + d (Fn/Fo) + f (Ln/Lo) } – R Where: "Pn" is the Price adjustment amount payable to or deductible from the Contractor against the respective certified milestone payment during the period 'n' under consideration. "R" is the certified payment against the respective milestone during the period under consideration. "a" is a fixed coefficient as specified in the Schedule of Adjustment Data shown in Bidding forms, Section IV, representing the non-adjustable portion in contractual payments; "b", "c", "d", "e" and "f" are coefficients representing the estimated proportion of each cost element (Stainless steel / Aluminium, Copper, Carbon steel and Labor) in the Works or sections thereof, as quoted by the bidder in 'Schedule of Adjustment Data' in Section IV - Bidding forms. "Sn", "An", "Cn" "Fn" and "Ln" are the current cost indices for the period "n", determined pursuant to Schedule of Adjustment Data in Bidding forms, Section IV of PART 1, applicable to each cost element; and "So", "Ao", "Co" "Fo" and "Lo" are base cost indices corresponding to the above cost elements at the date specified in Schedule of Adjustment Data in Section IV - Bidding forms. To the extent that full compensation for any rise or fall in Costs is not covered by the provisions of this or other Clauses, the Accepted Contract Amount shall be deemed to have included amounts to cover the contingency of other rises and falls in costs.	Refer Annexure 02 to Addendum No.3
3	Part 1	Section – IV Bidding Forms (BF)	3.2.2 (h)	If the currency of the index specified in 'Schedule of adjustment data' of Section IV – Bidding Forms is different from the currency of payment, the value of the index on the Base date will be converted into a notional index in the currency of payment using the exchange rate on the base date between the currency of the index and the currency of payment. This notional index value will be used as "So", "Ao", "Co" "Fo" and "Lo" as applicable. The value of the index on the adjustment date in notional terms will be computed likewise using the exchange rate on the date of adjustment. These notional index values will correspond to "Sn", "An", "Cn" "Fn" and "Ln" as applicable. For instance, consider currency of index as 'USD' and currency of Payment as 'JPY'. Here, currency of index is different from Currency of payment, Exchange rate of USD to JPY on base date = Xo Exchange rate of USD to JPY on date of adjustment = Xn "Exchange rate" means equivalent value of JPY for 1 USD Cost index of stainless-steel Sn and So considered for calculation. The cost Index fraction of stainless steel is Sn/So. Notional Index fraction calculated is = (Sn / So) x (Xn / Xo) = (Sn notional / So notional).	If the currency of the index specified in 'Schedule of adjustment data' of Section IV – Bidding Forms is different from the currency of payment, the value of the index on the Base date will be converted into a notional index in the currency of payment using the exchange rate on the base date between the currency of the index and the currency of payment. This notional index value will be used as "So", "Ao", "ELo" and "Co" as applicable. The value of the index on the adjustment date in notional terms will be computed likewise using the exchange rate on the date of adjustment. These notional index values will correspond to "Sn", "An", "ELn" and "Cn" as applicable. For instance, consider currency of index as 'USD' and currency of Payment as 'JPY'. Here, currency of index is different from Currency of payment, Exchange rate of USD to JPY on base date = Xo Exchange rate of USD to JPY on date of adjustment = Xn "Exchange rate" means equivalent value of JPY for 1 USD Cost index of stainless-steel Sn and So considered for calculation. The cost Index fraction of stainless steel is Sn/So. Notional Index fraction calculated is = (Sn / So) x (Xn / Xo) = (Sn notional / So notional).

<table>
<tr><th>S. No.</th><th>Part</th><th>Section</th><th>Clause No.</th><th>Original / Amended Bid Condition</th><th>Revised Bid Condition</th></tr>
<tr><td>4</td><td>Part 1</td><td>Section – IV Bidding Forms PRICE CENTRE ‘RS-C’</td><td>4.4.6

(Addendum No.1, S.No.22)</td><td>4.4.6 PRICE CENTRE ‘RS-C’ – INDIGENOUS MANUFACTURE, TESTING, INSPECTION, TRANSPORTATION AND DELIVERY TO CMRL DEPOT

DETAILS NOT TO BE SUBMITTED IN TECHNICAL BID. IT SHALL BE FILLED AND UPLOADED ONLY IN THE PRICE BID DOCUMENT OF E-PROCUREMENT PORTAL.

<table>
<tr><th rowspan="2">MILESTONE NUMBER</th><th rowspan="2">WORK DESCRIPTION</th><th colspan="3">APPORTIONED AMOUNT</th><th rowspan="2">PERIOD OF COMPLETION OF MILESTONE FROM COMMENCEMENT DATE (QUANTITY)</th><th rowspan="2">ALLOWABLE APPORTIONMENT (under Lumpsum Price (Rolling Stock) – Project)</th></tr>
<tr><th>INR</th><th>FC1</th><th>FC2</th></tr>
<tr><td></td><td>MILESTONE ACTIVITY</td><td>COLUMN A</td><td>COLUMN B</td><td>COLUMN C</td><td></td><td>%</td></tr>
<tr><td colspan="8">Obtain the “No Objection With Comments (NOWC)” / “Notice of No Objection (NONO)” from the Employer / Engineer for:
a. Issue of Inspection/ clearance Certificate on satisfactory completion of all Factory Tests;
b. Transit Insurance;
c. Dispatch documents
d. Delivery of cars to CMRL’s property.</td></tr>
<tr><td>RS-C1</td><td>First 6-car rake (Pilot Rake)</td><td></td><td></td><td></td><td>NTP + 630</td><td>2.5 %</td></tr>
<tr><td>RS-C2</td><td>Obtain as above for first 3 train sets</td><td></td><td></td><td></td><td>NTP + 780</td><td>7.5 %</td></tr>
<tr><td>RS-C3</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 840</td><td>7.5 %</td></tr>
<tr><td>RS-C4</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP +900</td><td>7.5 %</td></tr>
<tr><td>RS-C5</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 960</td><td>7.5 %</td></tr>
<tr><td>RS-C6</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 1020</td><td>7.5 %</td></tr>
<tr><td>RS-C7</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 1080</td><td>7.5 %</td></tr>
<tr><td>RS-C8</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 1140</td><td>7.5 %</td></tr>
<tr><td>RS-C9</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 1200</td><td>7.5 %</td></tr>
<tr><td>RS-C10</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 1260</td><td>7.5 %</td></tr>
<tr><td colspan="2">RS-C : PRICE CENTRE TOTAL (RS-C1 ~ RS-C10)</td><td colspan="3">Carried over from Price Centre ‘RS-C’</td><td></td><td>70 %</td></tr>
</table>
Notes:
1. The apportioned amounts (both foreign currency and local currency) in the above Table shall in proportion to the number of trains in all Milestones relevant to the Price Centre.
2. Specify ‘Not Applicable’ against each of the rows which are not applicable under this milestone.
3. Bidders shall quote for the above Price Centres including all taxes and duties.
4. In the event that the values entered in above table mismatch with the BOQ values submitted by the bidder; the BOQ values shall be considered.
5. Payment against the above milestones may be considered on a train set-wise basis.</td><td>4.4.6 PRICE CENTRE ‘RS-C’ – INDIGENOUS MANUFACTURE, TESTING, INSPECTION, TRANSPORTATION AND DELIVERY TO CMRL DEPOT

DETAILS NOT TO BE SUBMITTED IN TECHNICAL BID. IT SHALL BE FILLED AND UPLOADED ONLY IN THE PRICE BID DOCUMENT OF E-PROCUREMENT PORTAL.

<table>
<tr><th rowspan="2">MILESTONE NUMBER</th><th rowspan="2">WORK DESCRIPTION</th><th colspan="3">APPORTIONED AMOUNT</th><th rowspan="2">PERIOD OF COMPLETON OF MILESTONE FROM COMMENCEMENT DATE (QUANTITY)</th><th rowspan="2">ALLOWABLE APPORTIONMENT (under Lumpsum Price (Rolling Stock) – Project)</th></tr>
<tr><th>INR</th><th>FC1</th><th>FC2</th></tr>
<tr><td></td><td>MILESTONE ACTIVITY</td><td>COLUMN A</td><td>COLUMN B</td><td>COLUMN C</td><td></td><td>%</td></tr>
<tr><td colspan="8">Obtain the “No Objection With Comments (NOWC)” / “Notice of No Objection (NONO)” from the Employer / Engineer for:
a. Issue of Inspection/ clearance Certificate on satisfactory completion of all Factory Tests;
b. Transit Insurance;
c. Dispatch documents
d. Delivery of cars to CMRL’s property.</td></tr>
<tr><td>RS-C1</td><td>First 6-car rake (Pilot Rake)</td><td></td><td></td><td></td><td>NTP + 690</td><td>2.5 %</td></tr>
<tr><td>RS-C2</td><td>Obtain as above for first 3 train sets</td><td></td><td></td><td></td><td>NTP + 780</td><td>7.5 %</td></tr>
<tr><td>RS-C3</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 840</td><td>7.5 %</td></tr>
<tr><td>RS-C4</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP +900</td><td>7.5 %</td></tr>
<tr><td>RS-C5</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 960</td><td>7.5 %</td></tr>
<tr><td>RS-C6</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 1020</td><td>7.5 %</td></tr>
<tr><td>RS-C7</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 1080</td><td>7.5 %</td></tr>
<tr><td>RS-C8</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 1140</td><td>7.5 %</td></tr>
<tr><td>RS-C9</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 1200</td><td>7.5 %</td></tr>
<tr><td>RS-C10</td><td>Obtain as above for next 3 train sets</td><td></td><td></td><td></td><td>NTP + 1260</td><td>7.5 %</td></tr>
<tr><td colspan="2">RS-C : PRICE CENTRE TOTAL (RS-C1 ~ RS-C10)</td><td colspan="3">Carried over from Price Centre ‘RS-C’</td><td></td><td>70 %</td></tr>
</table>
Notes:
1. The apportioned amounts (both foreign currency and local currency) in the above Table shall in proportion to the number of trains in all Milestones relevant to the Price Centre.
2. Specify ‘Not Applicable’ against each of the rows which are not applicable under this milestone.
3. Bidders shall quote for the above Price Centres including all taxes and duties.
4. In the event that the values entered in above table mismatch with the BOQ values submitted by the bidder; the BOQ values shall be considered.
5. Payment against the above milestones may be considered on a train set-wise basis.</td></tr>
<tr><td>5</td><td>Part 3</td><td>Section - VIII Particular Conditions (Part A: Contract Data)</td><td>Table 1.1: Summary of Sections: Key Date - Rolling Stock</td><td>Note:
1. Please refer Part 2 – VIA: Employer’ Requirement Technical Specification – Rolling Stock, Chapter 21 for target dates related to Design Deliverables.</td><td>Note:
1. Please refer Part 2 – VIA: Employer’ Requirement Technical Specification – Rolling Stock, Chapter 21 for target dates related to Design Deliverables.
2. Any imposition of Delay damages (Sub clause 8.7) for Non-achievement of Key date No. KD-RS-1-2 will be waived and delay damages amount if deducted will be returned (without interest) provided, the Contractor is able to accomplish the Key date No. KD-RS-1-3 (as per Contracted Schedule).
3. Any imposition of Delay damages (Sub clause 8.7) for Non-achievement of Key date No. KD-RS-2-1 to KD-RS-2-9 will be waived and delay damages amount if deducted will be returned (without interest) provided, the Contractor is able to accomplish the corresponding Key date No. KD-RS-3-1 to KD-RS-3-9 (as per Contracted Schedule).</td></tr>
<tr><td>6</td><td>Part 2</td><td>Section VI A Chapter 17 – Test Program</td><td>17.5.2.5 b)</td><td>One of the jacks supporting the car section being tested shall be lowered until the load on that jack is 10% of its original load.</td><td>One of the jacks supporting the car section being tested shall be lowered by 10 mm.</td></tr>
<tr><td>7</td><td>Part 2</td><td>Section VI A Chapter 19 – Materials and Workmanship</td><td>19.44.3</td><td>Stranding shall be at least 26 strands.</td><td>Stranding shall be at least 19 strands.</td></tr>
<tr><td>8</td><td>Part 2</td><td>Section VI A Chapter 2 – System Requirements</td><td>2.2.27</td><td>All electrical and electronic components shall comply with the EMC and EMI requirements of EN 50121 (all parts), IEEE 16, EN 55011 and IEC 61000 standards or other equivalent international standards. The requirements of EMC EMI requirements referred in clause 10.19 & clause 2.18 of the Rolling Stock shall be met.</td><td>All electrical and electronic components shall comply with the EMC and EMI requirements of EN 50121 (all parts), IEEE 16, EN 50500, EN 55011 and IEC 61000 standards or other equivalent international standards. The requirements of EMC EMI requirements referred in clause 10.19 & clause 2.18 of the Rolling Stock shall be met.</td></tr>
</table>

S. No.	Part	Section	Clause No.	Original / Amended Bid Condition	Revised Bid Condition
9	Part 2	Section VI A Chapter 2 – System Requirements	2.13.3 e) and f)	e)The Sperling ride index of the rake at 80 kmph shall not exceed 2.5 in both vertical and horizontal directions in inflated condition of secondary suspension and 3.0 in deflated condition for both vertical and horizontal directions f) The oscillation trials shall be conducted with tare and fully loaded cars in both inflated and deflated conditions up to maximum design speed of 90 kmph starting from 40 kmph in the incremental order of 10 kmph for inflated condition and up to 80 kmph for deflated conditions.	e) The new Rolling Stock on the existing track shall satisfy the following maximum values. 1a) Maximum Sperling ride index of the rake for both vertical & lateral modes in Inflated conditions = 2.5 1b) Maximum Sperling ride index of the rake for both vertical & lateral modes in Deflated conditions = 3.0 2) Maximum value of vertical acceleration = 0.27 g 3) Maximum value of lateral acceleration = 0.27 g 4) Maximum $\Delta Q/Q = 0.5$ 5) The accelerations and spring displacements should decay within 2 to 3 cycles 6) There should be no hunting tendency noticeable up to the maximum speed of 90 kmph. f) The Oscillation Trials are to be conducted with tare and fully loaded vehicles, in both inflated and deflated conditions up to maximum designed speed starting from 40 kmph in the incremental order of 10 kmph; up to 90 kmph for inflated conditions. The Sperling ride index of the rake at 80 kmph shall not exceed 2.5 in both vertical and horizontal directions in inflated condition of secondary suspension. As far as operation with deflated springs are concerned, trials will be conducted up to the speed where the above (e) maximum level of parameters are experienced, and based upon the results, the maximum speed of operation with deflated springs will be decided.
10	Part 2	Section VI A Chapter 2 – System Requirements	2.14.2.5	New Clause Added	2.14.2.5 One serviceable AW4 loaded 6-car train with one motor car inoperative/cut out shall be capable of pushing a AW4 loaded defective 6-car train respectively without parking brakes applied, on all Lines including a section of 4% up gradient up to the next station. Thereafter, the healthy train shall, after all the passengers have been de-trained at the station, continue to push the defective train up to the terminal station. There shall be no equipment damage or degradation, while maintaining safe operation. Train shall be also able to start and move on a up gradient of 4% on above condition including the conditions specified in ERTS clause 2.14.1 (x) and (y). The defective and healthy train can either be new or existing rolling stock or vice versa.
11	Part 2	Section VI A Chapter 3 – Vehicle Body	3.2.1.4	The car structure material shall be Stainless Steel or Aluminium. Stainless steel shall conform to ASTM A666 / EN 10088-2 / JIS G4305 or equivalent. Aluminium shall conform to ALCOA Specification or Equivalent International standards Covering Use of Aluminium in Passenger Carrying Railroad Vehicles Aluminium Association Aluminium Standards and Data. The end under frame may be constructed of low alloy high tensile strength (LAHT) structural steel complying with EN 10025-2 / EN 10025-5 / JIS G3114 or equivalent to satisfy the strength requirements.	The car structure material shall be Stainless Steel or Aluminium. Stainless steel shall conform to ASTM A666 / EN 10088-2 / JIS G4305 or equivalent. Aluminium shall conform to ALCOA Specification/ EN 755-2/EN 485-2 or Equivalent International standards Covering Use of Aluminium in Passenger Carrying Railroad Vehicles Aluminium Association Aluminium Standards and Data. The end under frame may be constructed of low alloy high tensile strength (LAHT) structural steel complying with EN 10025-2 / EN 10025-5 / JIS G3114 or equivalent to satisfy the strength requirements.
12	Part 2	Section VI A Chapter 3 – Vehicle Body	3.4.7.1	Flooring shall remain non-slip and not present a hazard to passengers when wet.	Flooring shall remain non-slip and not present a hazard to passengers when wet. The Minimum thickness of floor structure shall be 80 mm.

S. No.	Part	Section	Clause No.	Original / Amended Bid Condition	Revised Bid Condition
13	Part 2	Section VI A Chapter 3 – Vehicle Body	3.6.1.22	All internal panels (side panels, ceiling panels, end-ceiling panels, inspection cover panels, door coving panels, ceiling coving panels, etc) shall be of aluminium material with proven record in Metro / EMU application. Coating system shall be proposed by the Contractor shall be proven and conform to the requirements in clause 3.6.1.21, subjected to CMRL approval. Flatness of Aluminium side panels shall be controlled within 0.5 mm per 1m length. The Contractor shall ensure adequate measure have been taken to prevent and mitigate the risk of bi-metallic corrosion and rattling. Suitable damping and Insulation shall also be provided to reduce noise and thermal conductivity especially at metal-to-metal contact points.	All internal panels (side panels, ceiling panels, end-ceiling panels, inspection cover panels, door coving panels, ceiling coving panels, etc) shall be of Ceramic coated aluminium material with proven record in Metro / EMU application. Coating system shall be proposed by the Contractor shall be proven and conform to the requirements in clause 3.6.1.21, subjected to CMRL approval. Flatness of Aluminium side panels shall be controlled within 0.5 mm per 1m length. The Contractor shall ensure adequate measure have been taken to prevent and mitigate the risk of bi-metallic corrosion and rattling. Suitable damping and Insulation shall also be provided to reduce noise and thermal conductivity especially at metal-to-metal contact points. Minimum thickness of ceramic coating on aluminium panel: 50 µm (front), 20 µm (back)
14	Part 2	Section VI A Chapter 4 – Coupler and Draft Gear	4.4.2.2	The Contractor shall prove CMRL that automatic coupling between two rakes (mechanical, pneumatic and electrical) shall be possible without any manual intervention in the ruling curve (sharpest curve), ruling gradient (sharpest gradient) in mainline as well in depot (for all GoA2 & GoA4 operation network) based on the alignment drawing provided by CMRL.	The Contractor shall prove CMRL that automatic coupling between two rakes (mechanical, pneumatic and electrical) shall be possible from either one side of the train without any manual intervention and the other side with manual intervention in the ruling curve (sharpest curve), ruling gradient (sharpest gradient) in mainline as well in depot (for all GoA2 & GoA4 operation network) based on the alignment drawing provided by CMRL.
15	Part 2	Section VI A Chapter 4 – Coupler and Draft Gear	4.4.4.2	The supporting device shall provide a suitable means for vertical height adjustment of the coupler head to compensate for wheel wear, operating levels of the primary suspension, failure of air suspension and coupler assembly wear.	The supporting device shall provide a suitable means for vertical / angular height adjustment of the coupler head.
16	Part 2	Section VI A Chapter 5 – Operator's Desk	5.2.8 (Addendum No.1, S.No. 132)	The Operator's Desk layout and its facilities shall be designed for train operation in GoA4 and shall also meet all the existing modes of operation including all UTO & Non-UTO, degraded modes, rescue mode, Manual Driving in main-line / depots / stabling yards, shunting lines and during testing & commissioning.	The Operator's Desk layout shall confirm to UIC 651 or GMRT 2100 and its facilities shall be designed for train operation in GoA4 and shall also meet all the existing modes of operation including all UTO & Non-UTO, degraded modes, rescue mode, Manual Driving in main-line / depots / stabling yards, shunting lines and during testing & commissioning.
17	Part 2	Section VI A Chapter 7 – Ventilation and Airconditioning	7.3.2	The VAC units shall be roof mounted.	The VAC units shall be roof mounted and each VAC unit shall have a minimum cooling capacity of 50 kW.
18	Part 2	Section VI A Chapter 7 – Ventilation and Airconditioning	7.3.20	New Clause Added	Employer expects that an energy efficient system comparable with the best available in the market shall be provided. Good energy efficiency shall be achieved in cooling and de-humidification operations of the HVAC. Contractor shall furnish Energy Efficiency Ratio (EER) for the offered system. In cooling mode, the Coefficient of Performance (COP) of HVAC shall be at least 2.5 in summer ambient conditions under AW4 loading conditions which may be achieved by utilizing variable frequency control (if required) of compressors or any other control mechanism. The COP shall be validated as per IS 8148, ASHRAE 37 or any other relevant standard, as agreed by the Employer. The Contractor shall submit the record of proven system already functional in any metros with the specified COP. The Contractor shall furnish expected COP, cooling capacity and power consumption of the HVACs per car for peak Summer, Monsoon and Winter ambient conditions for AW0, AW1, AW2, AW3 and AW4 passenger loads.

<table>
<tr><th>S. No.</th><th>Part</th><th>Section</th><th>Clause No.</th><th>Original / Amended Bid Condition</th><th>Revised Bid Condition</th></tr>
<tr><td>19</td><td>Part 2</td><td>Section VI A Chapter 7 – Ventilation and Airconditioning</td><td>7.4.1</td><td>Ventilation of the car shall be provided by overhead fan-coil units or rotary fans in diffusers or with any better design. Outside air shall normally be supplied into each saloon as per EN 14750 Category B whenever the system is energized at the nominal line voltage. The VAC system shall however reduce the fresh air intake proportionately based on the passenger loading in each car.

In order to minimize energy consumption, fresh air intake volume control shall be based on coach load weight signal. The fresh air intake shall be rated for at least 2.2 liters / sec / passenger (8m³ / hour / passenger) @ AW4 load condition. The proposal of levels of opening of fresh air dampers shall be finalized during detailed design stage with the approval of CMRL.</td><td>Ventilation of the car shall be provided by overhead fan-coil units or rotary fans in diffusers or with any better design. Outside air shall normally be supplied into each saloon as per EN 14750 Category B whenever the system is energized at the nominal line voltage. The VAC system shall however reduce the fresh air intake proportionately based on the passenger loading in each car.

In order to minimize energy consumption, fresh air intake volume control shall be based on coach load weight signal and CO2 level inside the car . The fresh air intake shall be rated for at least 2.2 liters / sec / passenger (8m³ / hour / passenger) @ AW4 load condition. The proposal of levels of opening of fresh air dampers shall be finalized during detailed design stage with the approval of CMRL.</td></tr>
<tr><td>20</td><td>Part 2</td><td>Section VI A Chapter 9 – Auxiliary Electrical Equipment</td><td>9.2.2</td><td>New Clause Added</td><td><u>Add the following at the end of para:</u>
The auxiliary power supply equipment(s) shall be capable of supplying the specified loads under Normal and Failure mode as explained below:
<table>
<tr><th>Failure condition</th><th>Load fed by Auxiliary Converter Inverter</th><th>No. of healthy Auxiliary Converter Inverter</th><th>3-phase bus line isolation contactor status</th></tr>
<tr><td>Normal</td><td>Full auxiliary load</td><td>4</td><td>Close</td></tr>
<tr><td>One Aux. CI (SIV) failure</td><td>Full auxiliary load</td><td>3</td><td>Close</td></tr>
<tr><td>Two Aux. CI (SIV)failure</td><td>Full auxiliary load except 50% of HVACs in cooling mode in each car. (50% VAC units shall be operated in cooling mode and other 50% VAC units shall be operated in ventilation mode with fresh air damper closed condition)</td><td>2</td><td>Close</td></tr>
<tr><td>Three Aux. CI (SIV) failure</td><td>Full auxiliary load except all HVACs in ventilation mode</td><td>1</td><td>Close</td></tr>
<tr><td>Ground fault or short circuit of bus line</td><td>Full auxiliary load in healthy 3-car unit</td><td>2</td><td>Open</td></tr>
</table></td></tr>
<tr><td>21</td><td>Part 2</td><td>Section VI A Chapter 7 – Ventilation and Airconditioning</td><td>7.3.10</td><td>Air filter elements shall be replaceable from roof / outside the car.</td><td>Air filter elements shall be replaceable from inside the car.</td></tr>
<tr><td>22</td><td>Part 2</td><td>Section VI A Chapter 11 – Bogie Assembly</td><td>11.4.10 (e)</td><td>The Helical springs shall have a fatigue life of not less than 10,00,000 kms and shall be designed and tested as per EN 13298 and EN 13906. The service life of rubber bonded metal components / rubber of spring type primary suspension shall be OEM rated for not less than 8 years. The Contractor shall ensure that the chosen supplier provides a warranty for the same.</td><td>The Helical springs shall have a fatigue life of not less than 10,00,000 kms and shall be designed and tested as per EN 10089, EN 13298 and EN 13906. The service life of rubber bonded metal components / rubber of spring type primary suspension shall be OEM rated for not less than 8 years.</td></tr>
<tr><td>23</td><td>Part 2</td><td>Section VI A Chapter 11 – Bogie Assembly</td><td>11.4.11 (a)</td><td>All bogie assemblies shall have a pneumatic secondary suspension system. The secondary suspension system shall have supplemental resilient stops capable of supporting the appropriate proportion of an AW4 loaded car in the event of a failure. Resilient stops shall be designed to allow continued operation of the car without wheel climb as noted in clause 11.4.13.</td><td>All bogie assemblies shall have a pneumatic secondary suspension system. The secondary suspension shall confirm to EN 13597, EN 14817. The secondary suspension system shall have supplemental resilient stops capable of supporting the appropriate proportion of an AW4 loaded car in the event of a failure. Resilient stops shall be designed to allow continued operation of the car without wheel climb as noted in clause 11.4.13.</td></tr>
<tr><td>24</td><td>Part 2</td><td>Section VI A Chapter 11 – Bogie Assembly</td><td>11.4.18.1</td><td>The Contractor shall submit calculations to confirm that the derailment quotient Y/Q shall not exceed 1.0 under the most adverse conditions, where Y & Q are the instantaneous lateral force on the wheel flange and the instantaneous vertical load on that wheel tread respectively under the most adverse conditions.

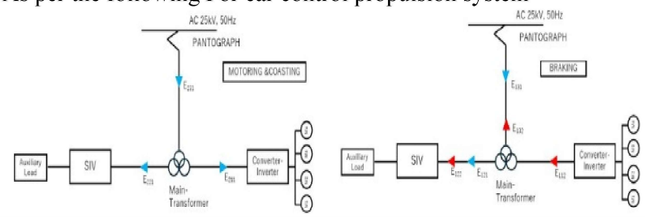
The Sperling ride index of the rake at 80 kmph shall not exceed 2.50 in both vertical and horizontal directions in inflated condition of secondary suspension and 3.0 in deflated condition.</td><td>The Contractor shall submit calculations to confirm that the derailment quotient Y/Q shall not exceed 1.0 under the most adverse conditions, where Y & Q are the instantaneous lateral force on the wheel flange and the instantaneous vertical load on that wheel tread respectively under the most adverse conditions.

The Sperling ride index of the rake at 80 kmph shall not exceed 2.5 in both vertical and horizontal directions in inflated condition of secondary suspension.
As far as operation with deflated springs are concerned, trials will be conducted up to the speed where the maximum level of parameters as mentioned in 2.13.3 (e) are experienced, and based upon the results, the maximum speed of operation with deflated springs will be decided.</td></tr>
</table>

S. No.	Part	Section	Clause No.	Original / Amended Bid Condition	Revised Bid Condition
25	Part 2	Section VI A Chapter 11 – Bogie Assembly	11.4.18.3 (c)	ΔQ / Q for track twist (Testing method & test condition with track twist values shall be in accordance with EN14363 Method 3)	ΔQ / Q for track twist (Test condition, with track twist values shall be as per maximum specified track twist. The testing method followed shall be in accordance with EN14363 Method 3)
26	Part 2	Section VI A Chapter 11 – Bogie Assembly	11.4.23 (a)	The bogie suspension, in conjunction with the car body, shall be designed to enable cars to operate satisfactorily on track with the maximum specified track twist. The maximum off-loading of wheels 'ΔQ/Q' shall not exceed 50% of nominal wheel load in inflated up to maximum permissible speeds and shall not exceed 60% of nominal wheel in deflated conditions up to maximum permissible speeds at AW0 and AW4 loading condition. Test shall be conducted in accordance with clause 17.5.2.10.9	The bogie suspension, in conjunction with the car body, shall be designed to enable cars to operate satisfactorily on track with the maximum specified track twist. The maximum off-loading of wheels 'ΔQ/Q' shall not exceed 50% of nominal wheel load in inflated and in deflated conditions up to maximum permissible speeds at AW0 and AW4 loading condition during oscillation trials on actual track conditions. Test shall be conducted in accordance with clause 17.5.2.10.9.
27	Part 2	Section VI A Chapter 11 – Bogie Assembly	11.4.23 (b)	Test method & test condition requirements assessment for Safety against derailment on twisted track, with track twist values of bogie and vehicle body test twist shall be in accordance with EN14363 Method 3 (Railway applications - Testing for the acceptance of running characteristics of railway vehicles) with above acceptance criteria.	Test method shall be in accordance with EN14363 Method 3 & test condition requirements assessment for Safety against derailment on twisted track, with track twist values of bogie and vehicle body test twist as per maximum specified track twist. The testing method shall be in accordance with EN14363 Method 3 (Railway applications - Testing for the acceptance of running characteristics of railway vehicles) with above acceptance criteria.
28	Part 2	Section VI A Chapter 11 – Bogie Assembly	11.9.1	The wheels shall be mono-block-forged steel, complying with the requirements of UIC Code 812- 3 / EN 13262 (for 1435 gauge) or AAR M-107 Class B, grade ER8 or equivalent international Standard. However final selection of the grade shall be based on suitability for the type of brake system proposed and the rails used by the CMRL and shall be decided during design review and approved by CMRL.	The wheels shall be mono-block-forged steel, complying with the requirements of EN 13979-1, UIC Code 812- 3 / EN 13262 (for 1435 gauge), or AAR M-107 Class B, grade ER8 or equivalent international Standard. However final selection of the grade shall be based on suitability for the type of brake system proposed and the rails used by the CMRL and shall be decided during design review and approved by CMRL.
29	Part 2	Section VI A Chapter 11 – Bogie Assembly	11.11.6	The fine-tuning of WFL custom profiles using TCMS shall be achievable using regular diagnostic laptops that are already provided to CMRL under the scope of this Contract. No additional proprietary software shall be required for this purpose.	The fine-tuning of WFL custom profiles through TCMS shall be possible by CMRL without the need of changing the software. Necessary training and special tool required shall be provided to CMRL under the scope of this Contract.
30	Part 2	Section VI A Chapter 11 – Bogie Assembly	11.12.4	The Contractor shall submit the methodology of detection, detailed calculation of design proof load, installation arrangement, safety against derailment, energy absorbing capabilities etc. conforming to Table 3 — Obstacle deflector performance requirements of EN 15227 and EN 13749 during detailed design for CMRL review and approval. Provisions shall be made to avoid false detection. The Contractor shall submit the detailed calculation of design proof load, installation arrangement, safety against derailment, energy absorbing capabilities etc. during PFDR stage	The Contractor shall submit the methodology of detection, detailed calculation of design proof load, installation arrangement, safety against derailment, energy absorbing capabilities etc. conforming to Table 6 — Obstacle deflector performance requirements of EN 15227 and EN 13749 during detailed design for CMRL review and approval. Provisions shall be made to avoid false detection. The Contractor shall submit the detailed calculation of design proof load, installation arrangement, safety against derailment, energy absorbing capabilities etc. during PFDR stage
31	Part 2	Section VI A Chapter 12 – Pneumatic and Brake Equipment	12.3.12	The drive motor shall conform to the requirement of IEC 60349-2 and the temperature rise of the windings of the motor shall be limited to temperature index of the insulation minus 70 ºC. The motor shall have at least IP65 protection.	The drive motor shall conform to the requirement of IEC 60349-2 and the temperature rise of the windings of the motor shall be limited to temperature index of the insulation minus 70 ºC. The motor shall have at least IP55 protection.
32	Part 2	Section VI A Chapter 12 – Pneumatic and Brake Equipment	12.5.2	Main reservoir with a capacity adequate for the 6 car rake consist shall be provided on each car, which shall be supplied from the main reservoir pipeline.	Main reservoir with a capacity adequate for the 6 car rake consist shall be provided on each car, which shall be supplied from the main reservoir pipeline. The Quantity and location of Main reservoir(s) shall be proposed during design phase for approval of the Engineer.
33	Part 2	Section VI A Chapter 12 – Pneumatic and Brake Equipment	12.13.6	New Clause Added	12.13.6 Suitable colour coding shall be applied to all isolation valves and cock for identification. The Contractor shall submit the color-coding scheme during design stage for review and approval by the Engineer.

S. No.	Part	Section	Clause No.	Original / Amended Bid Condition	Revised Bid Condition
34	Part 2	Section VI A Chapter 13 – Communications	13.13.3	Each car shall be provided with conduit to be able to connect each video camera to the central video recorder (one in each operator's cab of a train). Central Video Recorder shall be redundant to each other. The connection between the cars of a train shall be by jumper conduit with weather- proof quick disconnects at both ends. The memory of each central video recorder shall support to store seven full days of video recordings of all the interior & exterior cameras of the train. After seven days the video recordings shall be overwritten on First in First out (FIFO) basis. Provision shall be available to download video recordings of any camera from a single point in the train. Necessary software for downloading video recordings shall be provided to CMRL.	Each car shall be provided with conduit to be able to connect each video camera to the central video recorder (one in each operator's cab of a train). Central Video Recorder shall be redundant to each other. The connection between the cars of a train shall be by jumper conduit with weatherproof quick disconnects at both ends. The memory of each central video recorder shall support to store Thirty (30) full days of video recordings of all the interior & exterior cameras of the train. After Thirty (30) days the video recordings shall be overwritten on First in First out (FIFO) basis. Provision shall be available to download video recordings of any camera from a single point in the train. Necessary software for downloading video recordings shall be provided to CMRL.
35	Part 2	Section VI A Chapter 13 – Communications	13.13.6	All the interior and exterior cameras shall support for a video resolution of minimum 1920x1080 HD and minimum 30 frames per second, minimum illumination of 0.3 lux (colour), iris control, minimum 90 dB wide dynamic range (WDR) and Power Over Ethernet (POE) compliant. Cameras shall be of proven design in railway applications. The recordings from these cameras must be clear in dark, daytime, night-time and in all hours of operation even in case of non-availability of any exterior lighting. All the Exterior train cameras shall be Infra-red type or latest better type. Camera and Recorder shall comply CCTV Industry standards like onvif. The Visual images from each camera shall be recorded in non-volatile memory without any limitation of repetitive writing of the data. Each camera shall have recorded capacity for at least 7 days. The records shall be easily downloadable.	All the interior and exterior cameras shall support for a video resolution of minimum 1920x1080 HD and minimum 30 frames per second, minimum illumination of 0.3 lux (colour), iris control, minimum 90 dB wide dynamic range (WDR) and Power Over Ethernet (POE) compliant. Cameras shall be of proven design in railway applications. The recordings from these cameras must be clear in dark, daytime, night-time and in all hours of operation even in case of non-availability of any exterior lighting. All the Exterior train cameras shall be Infra-red type or latest better type. Camera and Recorder shall comply CCTV Industry standards like onvif. The Visual images from each camera shall be recorded in non-volatile memory without any limitation of repetitive writing of the data. Each camera shall have recorded capacity for at least Thirty (30) days. The records shall be easily downloadable.
36	Part 2	Section VI A Chapter 17 – Test Program	17.5.2.10.9	A load equalization test shall be performed on one motor bogie and one trailer bogie installed on the first completed married pair at AW0 and AW4 load conditions. For this test, one wheel of the bogie shall be raised and then lowered 63.5 mm with respect to the plane formed by the other three wheels of the same bogie as they rest on level track, and additionally wheel unloading testing method & test condition with track twist values of bogie and vehicle body test twist shall conform to method 3 of EN 14363. An alternative design and service proven load equalization test may be presented to CMRL for approval during design review. During the test, the other three-wheel treads shall maintain contact with the rails. Additionally, with one wheel raised and lowered 51mm with respect to the plane formed by the other three wheels, the neutral wheel load of the other three wheels shall not change by more than 50%.	A load equalization test shall be performed on one motor bogie and one trailer bogie installed on the first completed married pair at AW0 and AW4 load conditions. For this test, one wheel of the bogie shall be raised and then lowered 63.5 mm with respect to the plane formed by the other three wheels of the same bogie as they rest on level track, and additionally wheel unloading test condition with track twist values of bogie and vehicle body test twist as per maximum specified track twist. The testing method shall be in accordance with EN14363 Method 3. An alternative design and service proven load equalization test may be presented to CMRL for approval during design review. During the test, the other three-wheel treads shall maintain contact with the rails. Additionally, with one wheel raised and lowered 51mm with respect to the plane formed by the other three wheels, the neutral wheel load of the other three wheels shall be in accordance with and comply APTA PR-M-S-014-06 standard.
37	Part 2	Section VI A Chapter 17 – Test Program	17.10 (Addendum No.1, S.No. 385 to 390)	New Clause Added	**17.10.8** Burn-in trials / Service trials in ATO (GoA2) will be considered for Revenue Operation / Employer's Taking Over. Burn-in trials / Service trials in UTO (GoA4) is for the purpose of demonstration and payment for Price Centre RS-F2
38	Part 2	Section VI A Chapter 18 – Systems Assurance	18.6.5.6	It is clarified that even if trainsets are not deployed to the network to the extent that is required to earn the design mileage (defined in Clause 1.4.5) the same MDBF targets and respective calculations taken for Reliability demonstration shall prevail.	The Targets mentioned below are based on the assumed average train travel per year as specified in 1.4.5 of Chapter 1, as 1,50,000 km per year. For every 10% reduction in Actual Average Train Travel of fleet with respect to specified values as referred in 1.4.5, i.e. 1,50,000 km, the Reliability Targets as mentioned in Table 18-2, shall be reduced by 5%. As an illustration, in case actual train travel per year is 1,35,000 KM then Level 1 MDBF Target shall be 76,000 KM instead of 80,000 KM.
39	Part 2	Section VI A Chapter 19 – Materials and Workmanship	19.32.6	New clause added	iii) All the air filters shall be of metallic mesh construction and shall be made of stainless steel material. Any change in this shall require prior approval of the Engineer.

S. No.	Part	Section	Clause No.	Original / Amended Bid Condition	Revised Bid Condition
40	Part 2	Section VI A Chapter 19 – Materials and Workmanship	19.38.12	General Car body wiring insulation shall be flame-retardant, halogen-free, extra-flexible, cross-linked polyolefin material, phosphorus, sulphur, and nitrogen combined to less than 1% by weights.	General Car body wiring insulation shall be flame-retardant, halogen-free, extra- flexible, cross-linked polyolefin material phosphorus, sulphur, and nitrogen combined to less than 1% by weights and shall comply with EN50264, EN50382,EN50306 and EN45545. The contractor shall submit the details for review and approval by the Engineer during the design phase.
41	Part 2	Section VI A Chapter 19 – Materials and Workmanship	19.55.1	Printed circuit boards (PCBs) shall be of glass epoxy construction, complying with ANSI/IPC-4101 and PCB's shall generally comply with IEC 60326-3: 1991 Printed Boards – Part 3: Design and Use of Printed Boards.	Printed circuit boards (PCBs) shall be of glass epoxy construction, complying with IEC 60721-3-3/ANSI/IPC-4101 and PCB's shall generally comply with IEC 60326-3: 1991 Printed Boards – Part 3: Design and Use of Printed Boards.
42	Part 2	Section VI A Chapter 19 – Materials and Workmanship	19.55.2	PCBs shall be uniformly coated.	PCBs shall be uniformly coated. The coating shall be 3C3 conformal coating (minimum) against sea salt, SO2, H2S, CI, HCI, HF, NH3, O3, and Nox
43	Part 2	Section VI A Appendix C – Interface	2.2.41 (Addendum No.1, S.No. 408)	RS Contractor shall provide CCTV cameras in the trains which will cover cab, saloon, front of train, rear view camera, area for passenger-initiated alarm, platforms of each station etc. Also the view from real-time CCTV view , integrated with inbuilt video analytics functions to continuously monitor the track, OHE, pantograph, and surrounding environment. The CCTV cameras video shall be recorded in suitable NVR on board train for a minimum seven continuous days of recording.	RS Contractor shall provide CCTV cameras in the trains which will cover cab, saloon, front of train, rear view camera, area for passenger-initiated alarm, platforms of each station etc. Also the view from real-time CCTV view , integrated with inbuilt video analytics functions to continuously monitor the track, OHE, pantograph, and surrounding environment. The CCTV cameras video shall be recorded in suitable NVR on board train for a minimum thirty (30) continuous days of recording.
44	Part 2	Section VI A Appendix C – Interface	2.9.7 (Addendum No.1, S.No. 408)	New Clause Added	xxvii Compressor control (on /off/isolation) xxviii High pressure and low pressure values of HVAC xxix Wash mode (set / reset) xxx Brake pipe (BP) pressure switch relay (set / reset)
45	Part 3	Section VIII Particular Conditions (Part A: Contract Data)	Table 1.1 A. Delay Damages for Non-achievement of Main Key Dates	1. Prototype Train KD-RS-1-3 | Manufacturing, Factory Testing, Delivery (including shipment) and receipt of prototype train in Depot | 630	1. Prototype Train KD-RS-1-3 | Manufacturing, Factory Testing, Delivery (including shipment) and receipt of prototype train in Depot | 690
46	Part 3	Section VIII Particular Conditions (Part B: Specific Provisions)	14.7	New Clause Added	**<u>Replace the paragraph 14.7 (b) with the following:</u>** After preliminary scrutiny and certification by the Engineer, payment of 80% of the certified interim amount shall be made by the Employer within 28 days of receiving the IPC from the Engineer. The amount certified shall account for all deductions, including statutory deductions, recoveries for Advances and any amounts due from the Contractor. The balance 20% shall be paid within 56 days, after the Employer receives the IPC from the Engineer. If during the pendency of the Contract, the above facility shall be withdrawn in case the interim payment certification by the Engineer falls below 80% of the payment application by the Contractor in a maximum two applications. On withdrawal of such facility, the amount certified in each Interim payment Certificate shall be paid within 56 days after the Engineer receives the statement and supporting documents.
47	Part-2	Chapter 2 – System Requirements	2.14.2.4	Means shall be provided to isolate locally each set of traction equipment in the rake. In case of failure of One Motor car, only that Motor coach bogie shall be isolated and still the rake shall be capable of continuing to work until the peak period is over.	Means shall be provided to isolate locally each set of traction equipment in the rake. In case of failure of One Motor car, only that Motor coach bogie shall be isolated in bogie control propulsion system and in case of failure of One Motor car, only that Motor coach car shall be isolated in car control propulsion system. In either case, still the rake shall be capable of continuing to operate in passenger service operation.

S. No.	Part	Section	Clause No.	Original / Amended Bid Condition	Revised Bid Condition
48	Part-2	Chapter 2 – System Requirements	2.15.4.2	The main traction equipment of motor cars for 67% powering arrangement shall include two (2) independent power circuits for bogie control.	The main traction equipment of motor cars for 67% powering arrangement shall include one(1) power circuit /two (2) independent power circuits for car control propulsion/bogie control propulsion respectively.
49	Part-2	Chapter 2 – System Requirements	2.15.9.2 (Addendum No.1, S.No. 78)	A system shall be provided to detect and control wheel slide on all axles and detect slip at axle level with control at bogie level, to ensure that any reduction in requested tractive effort or brake retardation during wheel spin/slide is kept to a minimum.	A system shall be provided to detect and control wheel slide on all axles. Detection of slip at axle level with control at bogie or at car level for bogie/car control propulsion respectively, to ensure that any reduction in requested tractive effort or brake retardation during wheel spin/slide is kept to a minimum.
50	Part-2	Chapter 2 – System Requirements	2.15.9.7	The correction of slide by the pneumatic brakes system shall act independently on a per axle basis. Whereas, dynamic braking shall correct slide a per bogie basis. The overall blended brakes system shall be fully adaptive to optimise braking in varying adhesion conditions.	The correction of slide by the pneumatic brakes system shall act independently on a per axle basis. Whereas, dynamic braking shall correct slide a per bogie basis for bogie control propulsion system or per car basis for car control propulsion system. The overall blended brakes system shall be fully adaptive to optimise braking in varying adhesion conditions.
51	Part-2	Chapter 2 – System Requirements	2.15.9.8	Wheel spin on any individual axle must always be detected. However, correction of wheel spin need only be applied at a whole bogie level . When wheel spin is corrected, traction power shall be gradually increased to meet performance requirements.	Wheel spin on any individual axle must always be detected. However, correction of wheel spin need only be applied at a whole bogie level for bogie control propulsion system and correction of wheel spin need to be applied at a whole car level for car control propulsion system . When wheel spin is corrected, traction power shall be gradually increased to meet performance requirements.
52	Part-2	Chapter 2 – System Requirements	2.25.11 c) i.	New Clause added	**Add the following at the end of para:** As per the following For car control propulsion system 
53	Part-2	Chapter 10 – High Voltage & Propulsion System	10.11.1	There shall be one Converter-Inverter per bogie in each motor car. The Converter-Inverter shall be of proven design, four quadrant IGBT or any other latest metro rail proven technology-based unit, with VVVF control. The equipment shall conform to IEC 61287-1. Natural or forced (air / water) cooling shall be adopted. However, if forced (air / water) cooling is offered, complete details of the arrangement including the method of dust filtration (if applicable) shall be furnished. The Contractor shall provide the details of variation of power factor with power and variation of power with catenary voltage.	There shall be one Converter-Inverter per bogie or per car in each motor car for bogie control propulsion system or car control propulsion system respectively. The Converter-Inverter shall be of proven design, four quadrant IGBT or any other latest metro rail proven technology-based unit, with VVVF control. The equipment shall conform to IEC 61287-1. Natural or forced (air / water) cooling shall be adopted. However, if forced (air / water) cooling is offered, complete details of the arrangement including the method of dust filtration (if applicable) shall be furnished. The Contractor shall provide the details of variation of power factor with power and variation of power with catenary voltage.
54	Part-2	Appendix – I: Train Withdrawal Scenarios for 6 Car Train	Sl.No 11	11 | Traction converters | Isolation of more than Two traction inverter.	11 | Traction converters | Isolation of more than Two traction inverter incase of bogie control propulsion system or Isolation of more than One traction inverter incase of car control propulsion system.

<table>
<tr><th>S. No.</th><th>Part</th><th>Section</th><th>Clause No.</th><th>Original / Amended Bid Condition</th><th>Revised Bid Condition</th></tr>
<tr><td>55</td><td>Part 1</td><td>Section – II
Bid Data Sheet (BDS)</td><td>ITB 7.1</td><td>For clarification purposes and for any update / addendum / corrigendum / pre-bid queries the Employer’s address is:
Attention: Chief General Manager (RS, S&T).
Address: 3rd Floor, METROS,
No: 327, Anna Salai, Nandanam, Chennai-600035, Tamil Nadu, India.
Telephone: +91 44 24378000 Extn. 28939
E-Mail Address: rajendran.ar@cmrl.in
Web page: https://chennaimetrorail.org/
E-tendering portal: https://eprocure.gov.in/eprocure/app
Responses to any request for clarification, if any, will be published on the Employer’s web page / e-tendering portal indicated above.
Should the Bidder for any reason whatsoever, be in doubt about the meaning of anything contained in the Bid Documents or the extent of detail in the Employer’s Requirements and the Technical Specifications, the Bidder shall seek clarification from the Employer in the format attached in Section IV A: Bidding Forms (PDF and editable copy) while seeking clarifications.
The last date for seeking clarification shall be as per the date mentioned in CPP portal and the Employer shall not be obligated to respond to query received after the due date.</td><td>For clarification purposes and for any update / addendum / corrigendum / pre-bid queries the Employer’s address is:
Attention: Chief General Manager (S&T, RS).
Address: 4th Floor, METROS,
No: 327, Anna Salai, Nandanam, Chennai-600035, Tamil Nadu, India.
Telephone: +91 44 24378000 Extn. 28099
E-Mail Address: mani.k@cmrl.in
Web page: https://chennaimetrorail.org/
E-tendering portal: https://eprocure.gov.in/eprocure/app
Responses to any request for clarification, if any, will be published on the Employer’s web page / e-tendering portal indicated above.
Should the Bidder for any reason whatsoever, be in doubt about the meaning of anything contained in the Bid Documents or the extent of detail in the Employer’s Requirements and the Technical Specifications, the Bidder shall seek clarification from the Employer in the format attached in Section IV A: Bidding Forms (PDF and editable copy) while seeking clarifications.
The last date for seeking clarification shall be as per the date mentioned in CPP portal and the Employer shall not be obligated to respond to query received after the due date.</td></tr>
<tr><td>56</td><td>Part 1</td><td>Section – II
Bid Data Sheet (BDS)</td><td>ANNEXURE TO BDS

16</td><td>The Name and Designation of Officer for submission of Bid Security, Bid document cost, Pre bid Meeting and for clarification Purposes is:

“Chief General Manager (RS, S&T)
3rd Floor, METROS,
No: 327, Anna Salai, Nandanam, Chennai-600035, Tamil Nadu, India
Telephone: +91 44 24378000 Extn. 28939
Email: rajendran.ar@cmrl.in</td><td>The Name and Designation of Officer for submission of Bid Security, Bid document cost, Pre bid Meeting and for clarification Purposes is:

“Chief General Manager (S&T, RS)
4th Floor, METROS,
No: 327, Anna Salai, Nandanam, Chennai-600035, Tamil Nadu, India
Telephone: +91 44 24378000 Extn. 28099
Email: mani.k@cmrl.in</td></tr>
<tr><td>57</td><td>Part 2</td><td>Section VI A Chapter 14 – Train Control Management System (TCMS)</td><td>14.15</td><td>New Clause added (On-Board Track Condition Monitoring & Warning System)</td><td>Refer Annexure 03 to Addendum No.03</td></tr>
<tr><td>58</td><td>Part 2</td><td>Section VI A Appendix C – Interface</td><td>2.13.2</td><td>New Clause added</td><td><u>Add the following end of the table</u>
<table><tr><td>29</td><td>On-Board Track condition monitoring and warning system:</td><td>STC Contractor shall provide network and power interface for RSC console in OCC, BCC & DCC from the RTR-DMS central server installed in OCC.
STC Contractor shall transmit the data of the central RTR-DMS server to DCCs and BCCs located at geographically different locations.
The DCCs shall be available in all Designated Depot(s) of the CMRL phase 1 & phase 1 extn network.</td><td>RS Contractor shall install all necessary system for data acquisition and process the Data. RS contractor shall provide all information’s to STC contractor. RS Contractor shall install a RTR DMS central server in OCC to store the data of all trains of the system.</td></tr></table></td></tr>
</table>

S. No.	Part	Section	Clause No.	Original / Amended Bid Condition	Revised Bid Condition
59	Part 2	Section VI A Appendix C – Interface	6.4.3	New Clause added	Add the following end of the table 20 | On-Board Track condition monitoring and warning system: | RS contractor shall incorporate the details and design the conditional monitoring system accordingly. | The TRW Contractors shall provide all the necessary information's related to Track mentioned in the ERTS.
60	Part 2	Section VI A Chapter 14 – Train Control Management System (TCMS)	14.11.1 (b)	Remote downloading of complete TCMS data & trains' sub-system data to the central server located in OCC. The provision of this central server shall be part of Rolling Stock contract scope.	Remote downloading of complete TCMS data & trains' sub-system data and On-Board Track Condition Monitoring and Warning system data to the central server located in OCC. The provision of this central server shall be part of Rolling Stock contract scope.
61	Part 2	Section VI A Chapter 14 – Train Control Management System (TCMS)	14.11.1 (d)	Real time remote data transmission from Trains and to central server shall occur seamlessly from all locations of elevated, underground & at-grade sections, from all Designated Depot(s) of the CMRL Phase 1 & Phase 1 Extn. network. To achieve this function, RS Contractor shall connect to the Signalling systems of train for so that Signalling system can transmit the data from train. In case of future extensions/ modifications in any corridor, the RTR-DMS system shall be functional without any change in Software or Hardware of train	Real time remote data transmission from Trains and On-Board Track Condition Monitoring and Warning system data to central server shall occur seamlessly from all locations of elevated, underground & at-grade sections, from all Designated Depot(s) of the CMRL Phase 1 & Phase 1 Extn. network. To achieve this function, RS Contractor shall connect to the Signalling systems of train for so that Signalling system can transmit the data from train. In case of future extensions/ modifications in any corridor, the RTR-DMS system shall be functional without any change in Software or Hardware of train
62	Part 2	Section VI A Chapter 14 – Train Control Management System (TCMS)	14.11.1 (j)	RS Contractor shall install the hardware and software for Rolling Stock Controller (RSC)'s console in OCC, BCC and in DCC of each depot in CMRL Phase 1 & Phase 1 Extn. This RSC display shall provide the access for viewing of all train related real time remote fault diagnostic data & events as described in clause 14.11 and 14.13. This RSC display shall also provide the access for controlling of all train related functions in real time during UTO mode as described in clause 14.4. The GUI of this RSC display shall be similar to the Train TCMS – DDU. This RSC console shall be connected to the Central server data placed in OCC. The RS Contractor shall provide all inputs to the Signalling & telecom Contractors to match RSC console with the power & network configuration being used on the OCC, BCC and DCC. In addition to the requirements as per clause 14.11 and 14.13, this RSC displays in OCC, BCC and DCC shall provide all remote train system controls requested in all Chapters and Appendix C. The size and information GUI of this RSC console shall be designed such that the OCC / BCC / DCC operator is able to access data and control the functions of the complete fleet of trains from this console. RS Contractor shall interface with Signalling & Telecommunication Contractors for the installation and network configuration for this RSC console in OCC, BCC and in DCC	RS Contractor shall install the hardware and software for Rolling Stock Controller (RSC)'s console in OCC, BCC and in DCC of each depot in CMRL Phase 1 & Phase 1 Extn. This RSC display shall provide the access for viewing of all train related real time remote fault diagnostic data & events as described in clause 14.11 ~~and,~~ 14.13 and 14.15. This RSC display shall also provide the access for controlling of all train related functions in real time during UTO mode as described in clause 14.4. The GUI of this RSC display shall be similar to the Train TCMS – DDU. This RSC console shall be connected to the Central server data placed in OCC. The RS Contractor shall provide all inputs to the Signalling & telecom Contractors to match RSC console with the power & network configuration being used on the OCC, BCC and DCC. In addition to the requirements as per clause 14.11 ~~and~~ ,14.13 and 14.15, this RSC displays in OCC, BCC and DCC shall provide all remote train system controls requested in all Chapters and Appendix C. The size and information GUI of this RSC console shall be designed such that the OCC / BCC / DCC operator is able to access data and control the functions of the complete fleet of trains from this console. RS Contractor shall interface with Signalling & Telecommunication Contractors for the installation and network configuration for this RSC console in OCC, BCC and in DCC
63	Part 2	Section VI A Chapter 14 – Train Control Management System (TCMS)	14.11.10 (b)	Remote downloading of TCMS data (as defined in clause 14.11) to OCC central server and AMMS server through wireless communication network of signalling Contractor / telecommunication Contractor and their access in OCC, BCC, DCC and various diagnostic maintenance laptops provided to CMRL (in accordance with the requirements specified in ERTS Clause 15.6). The Contractor shall conduct necessary interface and shall be responsible for complete set up, commissioning and satisfactory working of the system before Revenue operation.	Remote downloading of TCMS data (as defined in clause 14.11 and 14.15) to OCC central server and AMMS server through wireless communication network of signalling Contractor / telecommunication Contractor and their access in OCC, BCC, DCC and various diagnostic maintenance laptops provided to CMRL (in accordance with the requirements specified in ERTS Clause 15.6). The Contractor shall conduct necessary interface and shall be responsible for complete set up, commissioning and satisfactory working of the system before Revenue operation.

ANNEXURE 01 to ADDENDUM NO.3

2. SCHEDULE OF ADJUSTMENT DATA

Table A: Local Currency (Indian Rupees)

DETAILS ARE NOT TO BE SUBMITTED WITHIN THE TECHNICAL BID. THEY ARE TO BE FILLED AND UPLOADED IN THE PRICE BID DOCUMENT OF E-PROCUREMENT PORTAL ONLY.

(a)	(b)	(c)	(d)	(e)	(f)	(g)
Index Code	**Index Description**	**Source of Index**	**Base value and date**	**Currency of Index**	**Weightage**	**Weightage to be filled by Bidder**
	Non-adjustable (Fixed)	—	—		0.33	0.33
L_n L_0	Labour	All India Consumer Price Index for Industrial Workers Published by RBI Bulletin (base year 2016)			0.10 ~ 0.25	
S_n S_0 A_n A_0	Stainless steel (Or) Aluminium	~~CRU~~ ~~ALCOA~~ WPI (Comm_Code: 1314000000)			0.15 ~ 0.25	
EL_n EL_0	~~Carbon Steel~~ Electronics/ computer items, Software etc.	~~CRUspi~~ WPI (Comm_Code: 1316000000)			~~0.10 ~ 0.30~~ 0.05 ~ 0.10	
C_n C_0	~~Copper~~ Electrical Machines (Motors, Transformer etc.)	~~LME~~ WPI (Comm_Code: 1317000000)			~~0.04 ~ 0.10~~ 0.10 ~ 0.20	
F_n F_0	Fabricated Metal products	WPI (Comm_Code: 1315000000)			0.01 ~ 0.06	
J_n J_0	Wholesale price index	WPI (Comm_Code: 1000000000)			0.10 ~ 0.20	
Total					**1.00**	**1.00**

Legend:
RBI – Reserve Bank of India

Price adjustment shall be calculated as per the above table and as per Cl. 3.2 of "Part 1 – Bidding Forms – Instructions for Completing the Pricing document".

Note:

a) *Bidders shall quote the applicable weightage / co-efficient against each component listed above within the range specified therein and the sum-total of all the components (including Non-adjustable (Fixed) component) shall be equal to 1 (100%).*
b) *Bidders shall duly fill and submit the above table (Column d, Column e & Column g) and include along with their Price Bid and necessary proof. Indices values which are not available during the bid submission date shall be submitted before signing of Contract Agreement.*

c) *Bidders shall fill 'Column d' with the value as on 28 days prior to last date of bid submission.*
d) *In cases where a Bidder fills in weightages that are not within the range specified, CMRL will adjust the weightage according to the limits of the range specified.*
e) *In cases where a Bidder fills in weightages whose sum is not equal to 0.67 (excluding Nonadjustable), then CMRL will adjust the indices on prorated basis based on the Bidder's submission.*
f) *Not used.*
g) *The Applicable Indices for INR shall be as published by the Office of the Economic Advisor, Ministry of Commerce, and Industry, GOI website https://eaindustry.nic.in/. Except Consumer Price Index for Industrial Workers shall be as published by Labour Bureau, Government of India*

Table B. Foreign Currency 1 (FC1)

DETAILS ARE NOT TO BE SUBMITTED WITHIN THE TECHNICAL BID. THEY ARE TO BE FILLED AND UPLOADED IN THE PRICE BID DOCUMENT OF E-PROCUREMENT PORTAL ONLY.

(a)	(b)	(c)	(d)	(e)	(f)	(g)
Index Code	**Index Description**	**Source of Index**	**Base value and date**	**Currency of Index**	**Weightage**	**Weightage to be filled by Bidder**
	Non-adjustable (Fixed)	—	—		~~0.33~~ 0.68	~~0.33~~ 0.68
S_n S_0 A_n A_0	Stainless steel (Or) Aluminium	~~CRU~~ WPI / equivalent indices issued by the government of the country of manufacturer ~~ALCOA~~			~~0.15~~ 0.10~ 0.25	
EL_n EL_0	~~Carbon Steel~~ Computer, Electronic, Software and Optical products	~~CRUspi~~ WPI / equivalent indices issued by the government of the country of manufacturer			~~0.10 ~ 0.30~~ 0.05 ~ 0.10	
C_n C_0	~~Copper~~ Electrical Equipment (Motors, Transformer etc.)	~~LME~~ WPI / equivalent indices issued by the government of the country of manufacturer			~~0.10 ~ 0.20~~ 0.10 ~ 0.20	
Total					**1.00**	**1.00**

Price adjustment shall be calculated as per the above table and as per Cl. 3.2 of "Part 1 – Bidding Forms – Instructions for Completing the Pricing document".

Note:

a) *Bidders shall quote the applicable weightage / co-efficient against each component listed above within the range specified therein and the sum-total of all the components (including Non-adjustable (Fixed) component) shall be equal to 1 (100%).*

b) *Bidders shall duly fill and submit the above table (Column d, Column e & Column g) and include along with their Price Bid and necessary proof. Indices values which are not available during the bid submission date shall be submitted before signing of the Contract Agreement.*

c) *Bidders shall fill 'Column d' with value as on 28 days prior to last date of bid submission.*

d) *In cases where a Bidder fills in weightages that are not within the range specified, CMRL will adjust the weightage according to the limits of the range specified.*

e) *In cases where a Bidder fills in weightages whose sum is not equal to ~~0.67~~ 0.32 (excluding Nonadjustable), then CMRL will adjust the indices on prorated basis based on the Bidder's submission.*

f) *Not used.*

g) *The Applicable Indices for Foreign Currency shall be as equivalent indices issued by the government of the country of manufacturer of the respective item under the index description tabulated above.*

h) *Source agency and base indices shall be submitted by the contractor prior to the signing of the contract agreement.*

i) *If the price index quoted by the bidder do not match with the WPI / equivalent indices issued by the Govt. of the manufacturing Country (Foreign Country), the same shall be reviewed by the Engineer and incorporated in the agreement before signing the Contract.*

Table C. Foreign Currency 2 (FC2)

DETAILS ARE NOT TO BE SUBMITTED WITHIN THE TECHNICAL BID. THEY ARE TO BE FILLED AND UPLOADED IN THE PRICE BID DOCUMENT OF E-PROCUREMENT PORTAL ONLY.

(a)	(b)	(c)	(d)	(e)	(f)	(g)
Index Code	**Index Description**	**Source of Index**	**Base value and date**	**Currency of Index**	**Weightage**	**Weightage to be filled by Bidder**
	Non-adjustable (Fixed)	–	–		~~0.33~~ 0.68	~~0.33~~ 0.68
S_n S_0 A_n A_0	Stainless steel (Or) Aluminium	~~CRU~~ WPI / equivalent indices issued by the government of the country of manufacturer ~~ALCOA~~			~~0.15~~ 0.10~ 0.25	
EL_n EL_0	~~Carbon Steel~~ Computer, Electronic, Software and Optical products	~~CRUspi~~ WPI / equivalent indices issued by the government of the country of manufacturer			~~0.10 ~ 0.30~~ 0.05 ~ 0.10	
C_n C_0	~~Copper~~ Electrical Equipment (Motors, Transformer etc.)	~~LME~~ WPI / equivalent indices issued by the government of the country of manufacturer			~~0.10 ~ 0.20~~ 0.10 ~ 0.20	
Total					**1.00**	**1.00**

Price Adjustment shall be calculated as per the above table and as per Cl. 3.2 of "Part 1 – Bidding Forms – Instructions for Completing the Pricing document".

Note:

a) *Bidders shall quote the applicable weightage / co-efficient against each components listed above within the range specified therein and the sum-total of all the components (including Non-adjustable (Fixed) component) shall be equal to 1 (100%).*

b) *Bidders shall duly fill and submit the above table (Column d, Column e & Column g) and include along with their Price Bid and necessary proof. Indices values which are not available during the bid submission date shall be submitted before signing of the Contract Agreement.*

c) *Bidders shall fill 'Column d' with value as on 28 days prior to last date of bid submission.*

d) *In cases where a Bidder fills in weightages that are not within the range specified, CMRL will adjust the weightage according to the limits of the range specified.*

e) *In cases where a bidder fills in weightages whose sum is not equal to ~~0.67~~ 0.32 (excluding Nonadjustable), then CMRL will adjust the indices on prorated basis based on bidder's submission.*

f) *Not used.*

g) *The Applicable Indices for Foreign Currency shall be as equivalent indices issued by the government of the country of manufacturer of the respective item under the index description tabulated above.*

h) *Source agency and base indices shall be submitted by the contractor prior to the signing of the contract agreement.*

i) *If the price index quoted by the bidder do not match with the WPI / equivalent indices issued by the Govt. of the manufacturing Country (Foreign Country), the same shall be reviewed by the Engineer and incorporated in the agreement before signing the Contract.*

3.2.1 Price adjustment is applicable on all the Price Centre payable to the Contractor excluding taxes & duties, excluding 'Price Centre RS-H - Training, operation and maintenance manuals', 'Price Centre DM&P-Q - Major machinery & plant', 'Price Centre DM&P-R - Other machinery & plant', 'Price Centre DM&P-S - Storage items', and 'Price Centre DM&P-T - Tools & Minor items' in accordance with the Contract, during performance of the Contract to reflect changes in the cost of labor, ~~copper, carbon steel~~, stainless steel / aluminum components, Electrical Equipment, Computer, Electronic, Software and Optical products and other inputs to the Works, in accordance with the following general formula specified;

(i) For Indian Rupees

Price Adjustment for Coaches with Stainless Steel Car-body:

~~Pn = R x { a + b (Sn/So) + c (Cn/Co) + d (Fn/Fo) + f (Ln/Lo) } - R~~

Pn = R x {a + b (Sn/So) + c (Cn/Co) + d (Fn/Fo) + f (Ln/Lo) + g (ELn/ELo) + h (Jn/J0)}-R

Price Adjustment for Coaches with Aluminium Car-body:

~~Pn = R x { a + e (An/Ao) + c (Cn/Co) + d (Fn/Fo) + f (Ln/Lo) } - R~~

Pn = R x {a + e (An/Ao) + c (Cn/Co) + d (Fn/Fo) + f (Ln/Lo) + g (ELn/ELo) + h (Jn/Jo)}-R

Where:

"Pn " is the Price adjustment amount payable to or deductible from the Contractor against the respective certified milestone payment during the period 'n' under consideration.

"R" is the certified payment against the respective milestone during the period under consideration.

"a" is a fixed coefficient as specified in the Schedule of Adjustment Data shown in Bidding forms, Section IV, 2. SCHEDULE OF ADJUSTMENT DATA, Table A, representing the non-adjustable portion in contractual payments;

"b", "c", "d", "e", "f", "g" and "h" are coefficients representing the estimated proportion of each cost element (Stainless steel / Aluminium, ~~Copper, Carbon steel~~, Labor, Electrical Equipment, Computer, Electronic, Software and Optical products) in the Works or sections thereof, as quoted by the bidder in 'Schedule of Adjustment Data', Table A, in Section IV - Bidding forms.

"Sn", "An", "Cn" "Fn", "Ln", "ELn" and "Jn" are the current cost indices for the period "n", determined pursuant to Schedule of Adjustment Data, Table A, in Bidding forms, Section IV of PART 1, applicable to each cost element;

and

"So", "Ao", "Co" "Fo", "Lo", "ELo" and "Jo" are base cost indices corresponding to the above cost elements at the date specified in Schedule of Adjustment Data, Table A, in Section IV - Bidding forms.

Subscript 'o' refers to indices as on 28 days prior to date of submission of bid. Subscript 'n' refers to indices as on 28 days prior to date of submission of bill.

(ii) For Foreign Currency (FC1 & FC2)

Price Adjustment for Coaches with Stainless Steel Car-body:

Pn = R x {a + b (Sn/So) + c (Cn/Co) + g (ELn/ELo) } - R

Price Adjustment for Coaches with Aluminium Car-body:

Pn = R x {a + e (An/Ao) + c (Cn/Co) + g (ELn/ELo) } - R

Where:

"Pn " is the Price adjustment amount payable to or deductible from the Contractor against the respective certified milestone payment during the period 'n' under consideration.

"R" is the certified payment against the respective milestone during the period under consideration.

"a" is a fixed coefficient as specified in the Schedule of Adjustment Data shown in Bidding forms, Section IV, 2. SCHEDULE OF ADJUSTMENT DATA, Table B / C, representing the non-adjustable portion in contractual payments;

"b", "c", "e" and "g" are coefficients representing the estimated proportion of each cost element (Stainless steel / Aluminium, Copper, Carbon steel, Labor, Electrical Equipment, Computer, Electronic, Software and Optical products) in the Works or sections thereof, as quoted by the bidder in 'Schedule of Adjustment Data', Table B / C, in Section IV - Bidding forms.

"Sn", "An", "Cn" and "ELn" are the current cost indices for the period "n", determined pursuant to Schedule of Adjustment Data, Table B / C, in Bidding forms, Section IV of PART 1, applicable to each cost element;

and

"So", "Ao", "Co" and "ELo" are base cost indices corresponding to the above cost elements at the date specified in Schedule of Adjustment Data, Table B / C, in Section IV - Bidding forms.

Subscript 'o' refers to indices as on 28 days prior to date of submission of bid. Subscript 'n' refers to indices as on 28 days prior to date of submission of bill.

To the extent that full compensation for any rise or fall in Costs is not covered by the provisions of this or other Clauses, the Accepted Contract Amount shall be deemed to have included amounts to cover the contingency of other rises and falls in costs.

ANNEXURE 03 to ADDENDUM NO.3

14.15 On-Board Track Condition Monitoring and Warning system:

14.15.1 The provision for condition-based track monitoring and warning systems shall be made to monitor the health of rail bed structure. All the parameters/raw data/refined data obtained from these systems shall be sent to RTR-DMS server and same will be communicated to AMMS system. The requirements under different condition-based monitoring system are as below and the details shall be discussed and finalized during design stage.

14.15.2 The systems are intended to be provided on Rolling Stock to monitor health of rail bed structure including Track conditions. The Rolling Stock contractor shall provide suitable number of Cameras/sensors/laser devices with automatic real-time detection and warning system including time-stamp, locations/chainage etc., capable of functioning up to 95 kmph of train speed. Additionally, the on-board condition monitoring system shall have the configuring provisions for adding/altering track chainages by the maintenance personnel, from the on board monitoring system controllers or from TCMS , in the event of any future extension/alteration of the section during the DNP period. The on board condition monitoring system shall have the ability to precisely incorporate the track chainages fed by maintenance personnel. The real-time high-priority data with image shall be relayed to the common condition monitoring system server via Signaling network/ public commercial telecom networks as back up. The on-board condition monitoring system shall be capable to monitor self health on start-up and shall report the status to TCMS/OCC.

14.15.3 The system shall be capable of monitoring & measuring different parameters & defects of track as detailed below and shall be installed in two (02) different trainsets. The functionalities required by this system shall be as detailed under:

a) Detection of Broken rail, Rail Corrugation, Surface Rail Defects, Edge defects, Missing Fasteners, chunking in the rail surface , periodical imprints , wheel slip points , insulated joints , corrugation , Head Checks in the final stage (with the extension module Head-Check, the system is also able to detect Head Check in the early stage), type-independent detection of missing fasteners, rail fractures of at least 1 mm wide i.e. the least count of the rail break detection shall be 1 mm or less, etc.

b) Track geometry, Rail Profile, Rail Wear.

c) False alarms due to oil/water spillage/rain drops, etc must be prevented.

d) In the Sleepers- safety-relevant spallings, safety-relevant crack formations, Crack Check cracks of up to 0.5mm in width can be detected automatically or can be visualized up to 0.3mm in width.

e) In the Ballast – overfilling, underfilling,

f) Turnout detection- automatic detection of the cross frog, storage of the area of the turnout in a separate file

d) The Track monitoring System shall be integrated with TCMS. In the event of track defect(s)/abnormalities, the alarm shall be displayed on TCMS,OCC and recorded at TCMS. The time and location of each event of track defect(s)/ abnormalities encountered shall be recorded. Historic data shall also be available for a period of at least one week on the onboard storage.

e) The system shall be capable to function in both daylight and night at desired accuracy and efficacy/efficiency.

14.15.4 Server requirements

i. All the data captured/generated shall be relayed and stored in the RTR-DMS server .

ii. All the parameters/raw data obtained from these condition monitoring systems shall be stored for 7 days in local server and the refined/processed data shall be stored for 30 days in common condition monitoring system server.

vi. The graphical user interface shall be designed to allow users to access processed data, events, historical data, MIS report, etc. from a single common application. The contractor shall be responsible for providing all necessary hardware and software, including the server, desktop, and application software.

vii. All the condition monitoring system shall be integrated with Asset maintenance management system (AMMS).

14.15.5. General

(a) The OEM of On Board & Wayside Condition based Monitoring Systems shall also provide Training to Employer's maintenance personnel and shall provide the training materials, training kits and relevant equipment.

(b) The integration of the TCMS with the condition monitoring system shall ensure functional independence. It shall be design in such away that it does not compromise the functionality, performance or availability of the TCMS and its interface with other RS systems. Further, the condition monitoring system supplier shall coordinate and interface with the TCMS supplier to ensure that any software updates do not adversely affect the interface between the condition monitoring system and the TCMS.