

## ADDENDUM TO TECHNICAL SPECIFICATION NO. CET/3.4/SP0018/T07 (Rev.05) ,Dt. 30.12.2023

**Original Specification:** Specification No. CET/3.4/SP0018/T07 (Rev.05) ,Dt. 30.12.2023

**Document No.:** CET/1.1/G/A02

**Addendum No.:** 01

**Date:** 04.07.2026

| Sl.no. | Reference Specification Clause | Amended/ New clause                                                                                                                                                                                                                                                                                                                                                                                                                                | To be confirmed by supplier | Remarks/Any deviation |
|--------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------|
| 1      | Clause no.14.1                 | <b><u>WARRANTY/GUARANTEE:</u></b><br><br>Warranty will be 42 months after the date of delivery of Aux. Alternator with all accessories at BHEL Bhopal or 30 months from Installation and commissioning at IRPU/shed and completion of field trial at site/shed, whichever is later.<br><br>Note: Date of commissioning for warranty purpose shall be considered as the date of signing of commissioning report by the User Railway representative. | Supplier to confirm         |                       |
| 2      | New clause                     | In case of contradiction in addendum & specification, the requirement of addendum shall supersede.                                                                                                                                                                                                                                                                                                                                                 | Supplier to confirm         |                       |

**Note:** All other clauses of the original specification remain unchanged and continue to be applicable.

|                                                                                     |                                                                                      |                                                                                       |
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|  |  |  |
| <b>RAHUL SINGH PATEL</b><br>Mgr./CET                                                | <b>ABHIDEEP CHOUDHURY</b><br>Sr.Mgr/CET                                              | <b>RAKESH VISHNOI</b><br>AGM/CET                                                      |

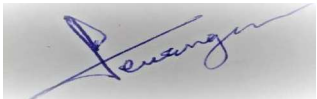
BHARAT HEAVY ELECTRICAL LIMITED  
TRANSPORTATION SYSTEMS GROUP & CENTRE FOR ELECTRIC TRANSPORTATION  
UNIT'S ADDRESS: PIPLANI, BHOPAL

**SPECIFICATION CUM COMPLIANCE CERTIFICATION**

**FOR**

**AUXILIARY ALTERNATOR WITH RR Unit FOR APPLICATION IN 700HP (2x350HP) DETC**

**SPECIFICATION NO: CET/3.4/SP0018/T07 (Rev.05)**

| REVISION | DATE       | PREPARED BY                                                                                                     | CHECKED BY                                                                                                        | APPROVED BY                                                                                                     |
|----------|------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| 05       | 30/12/2023 | <br><b>Kuleshwar Prasad</b> | <br><b>RAHUL SINGH PATEL</b> | <br><b>I CHATTOPADHYAY</b> |



| <b>ADDRESS OF THE SUPPLIER :</b> |                                                                                                                                                                                                                                                                              |                                      |         |            |         |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------|------------|---------|
| <b>TELEPHONE NOS.:</b>           |                                                                                                                                                                                                                                                                              |                                      |         |            |         |
| <b>FAX NOS.:</b>                 |                                                                                                                                                                                                                                                                              |                                      |         |            |         |
| <b>E-MAIL ADDRESS :</b>          |                                                                                                                                                                                                                                                                              |                                      |         |            |         |
| SNO                              | DESCRIPTION                                                                                                                                                                                                                                                                  | SPECIFIED / TO<br>BE CONFIRMED<br>BY | OFFERED | DEVIATIONS | REMARKS |
| <b>1.0</b>                       | <b>PURPOSE :</b>                                                                                                                                                                                                                                                             |                                      |         |            |         |
| 1.1                              | The proposed Auxiliary alternator with Rectifier Regulator Unit (RRU) shall be utilized for under slung 700hp (2x350hp) Diesel Electric Tower Car (DETC) for Indian Railways.                                                                                                | vendor to confirm                    |         |            |         |
| 1.2                              | Each DETC shall be fitted with two auxiliary alternators with RRU. Auxiliary alternator shall be driven by diesel engine through carden shaft.                                                                                                                               | vendor to confirm                    |         |            |         |
|                                  |                                                                                                                                                                                                                                                                              |                                      |         |            |         |
| <b>2.0</b>                       | <b>SCOPE OF SUPPLY</b>                                                                                                                                                                                                                                                       |                                      |         |            |         |
| 2.1                              | 1. Auxiliary Alternator- 01 no.<br>2. Rectifier Regulator Unit- 01 no.                                                                                                                                                                                                       | vendor to confirm                    |         |            |         |
|                                  |                                                                                                                                                                                                                                                                              |                                      |         |            |         |
| <b>3.0</b>                       | <b>TECHNICAL DETAILS:</b>                                                                                                                                                                                                                                                    |                                      |         |            |         |
| 3.1                              | <b>Climatic conditions:</b> Climatic conditions shall be as below:<br><br>a) <b>Atmospheric</b> temperature: Metallic surface temperature under Sun: 75° C max. and in shade: 55 °C max. Minimum temperature: - 10°C (Also snow fall in certain areas during winter season). | vendor to confirm                    |         |            |         |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |
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| 13 | <p>b) <b>Humidity:</b> 100% saturation during rainy season</p> <p>c) <b>Reference site conditions</b></p> <p>i) Ambient Temp. : 50° C</p> <p>ii) Humidity: 100%</p> <p>iii) Altitude: 1000m above mean sea level.</p> <p>d) <b>Rain fall:</b></p> <p>i) Ranging from 1750 mm to 6250 mm.</p> <p>ii) Number of rainy days/annum 120.</p> <p>e) <b>Atmosphere during hot weather:</b> Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6 mg/m<sup>3</sup>. In many iron ore and coalmine areas, the dust concentration is very high affecting the filter and air ventilation system.</p> <p>f) <b>Coastal area:</b> Auxiliary Alternator and RRU shall be designed to work in coastal areas in humid and salt laden atmosphere with maximum. pH value of 8.5, sulphate of 7mg per liter, max. concentration of chlorine 6 mg per liter and maximum conductivity of 130 micro siemens/cm.</p> <p>g) <b>Vibration:</b> The equipment, sub-system and their mounting arrangement shall be designed to withstand satisfactorily the vibration and shocks encountered in service as specified below:</p> <p>i. Maximum vertical acceleration 3.0g</p> <p>ii. Maximum longitudinal acceleration 5.0g</p> <p>iii. Maximum train acceleration 2.0g</p> <p>(g – acceleration gravity)</p> <p>High level of 50g vibration and shocks. Accelerations over 500 m/s<sup>2</sup> have been recorded at axle box levels for long periods during run. Vibrations during wheel slips are of even higher magnitude.</p> <p>h) <b>Wind speed:</b> High wind speed in certain areas, with wind pressure reaching 200kg/m<sup>2</sup>.</p> <p>i) The OHE car and its principal assemblies shall be designed and</p> |  |  |  |  |
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|              | manufactured to give satisfactory performance in the tropical climate, having very dry & dusty regions in arid zones of the country, to humid coastal areas and extreme cold climate of the northern region.                                                                                                                                                                                                                                                                   |                   |  |  |  |
| <b>3.2</b>   | <b>Technical Requirements</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |  |  |  |
| <b>3.2.1</b> | <b>Auxiliary Alternator:</b><br>Self-cooled, brushless carden shaft driven auxiliary alternator of RDSO/Railway approved make, one with each engine shall be provided in the each inspection OHE Car (DETC) with suitable regulating equipment and Battery Charger to supply 122 V dc $\pm$ 5% regulated voltage from idle (700RPM) to max speed (2100 RPM). The alternator shall have a rating of minimum 8 kW. The Alternator shall be suitable for under slung application. | vendor to confirm |  |  |  |
| <b>3.2.2</b> | The insulation of the alternator shall be Class “F” or better and the same shall not be affected by the Engine area environment, which may have traces of Diesel and Lube oil fumes.                                                                                                                                                                                                                                                                                           | vendor to confirm |  |  |  |
| <b>3.2.3</b> | Mounting: For dimension refer attached sketch at Fig. 1&2. The complete drawing shall be submitted to BHEL for approval from RDSO/railway, if already not approved by RDSO/Railway and manufacturing shall be taken up only after of Drawings. Driving flange details, material specification, box dimensions etc. shall be furnished in a drawing and got approved.                                                                                                           | vendor to confirm |  |  |  |
| <b>3.2.4</b> | <b>Rectifier-Regulator:</b><br>The rectifier-regulating equipment will be on-board and will be mounted on frame. The crimping sockets shall be of Dowell’s make only. The rectifier regulator box shall have an openable front cover, which shall be capable of being closed and locked in position by suitable hinged bolts of M12 size and wing nuts. Tentative outline placed at Fig. 2.                                                                                    | vendor to confirm |  |  |  |
| <b>3.2.5</b> | The Rectifier-Regulator box shall be of protection level IP: 65 (Completely protected against dust and jet of water from all directions).                                                                                                                                                                                                                                                                                                                                      | vendor to confirm |  |  |  |
| <b>3.2.6</b> | The Rectifier-Regulator box shall be Electro-galvanized and painted gray.                                                                                                                                                                                                                                                                                                                                                                                                      | vendor to confirm |  |  |  |

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| 3.2.7  | The Regulator shall have provision of potentiometers for current and voltage setting for adjustment depending upon the service conditions.                                                                                        | vendor to confirm |  |  |  |
| 3.2.8  | The overall efficiency of the alternator along with its Rectifier-Regulator shall not be less than 70%.                                                                                                                           | vendor to confirm |  |  |  |
| 3.2.9  | The Rectifier-Regulator shall conform to IEC: 60-571.                                                                                                                                                                             | vendor to confirm |  |  |  |
| 3.2.10 | Following details of the equipment shall be furnished by vendor:<br>a) Make & Model<br>b) Continuous and short time rating & details of voltage and current regulation<br>c) Bearing life and shaft size calculation<br>d) Weight | vendor to confirm |  |  |  |
| 4.0    | <b>COMPLIANCE WITH NATIONAL / INTERNATIONAL STANDARD:</b>                                                                                                                                                                         |                   |  |  |  |
| 4.1    | It shall meet the standards as mentioned in clause 3.2.                                                                                                                                                                           | vendor to confirm |  |  |  |
|        |                                                                                                                                                                                                                                   |                   |  |  |  |
| 15 5.0 | <b>TOOLS:</b>                                                                                                                                                                                                                     |                   |  |  |  |
|        | Supplier shall offer separately any special gigs, tools, instruments or testing kit which shall essentially be required for maintenance of Auxiliary Alternator& RRU.                                                             | vendor to confirm |  |  |  |
|        |                                                                                                                                                                                                                                   |                   |  |  |  |
| 6.0    | <b>QUALIFYING CRITERIA</b>                                                                                                                                                                                                        |                   |  |  |  |
| 6.1    | Offered Auxiliary alternator & RR unit is already type tested and approved by Indian railway.                                                                                                                                     | vendor to confirm |  |  |  |
| 6.2    | The OEM/supplier should have Indian Railway approved and supplied min. 10 nos. auxiliary alternators & RR Unit for similar application to Indian Railways. Documentary proof for the same shall be submitted by the supplier.     | vendor to confirm |  |  |  |
| 6.3    | Indian Railways approved vendors who do not fulfill requisite eligibility criteria as per clause no. 6.1 & 6.2, but are found to be otherwise technically suitable, may be considered for placement of developmental              | vendor to confirm |  |  |  |

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|            | order only subjected to concurrence/acceptance from Indian Railways. Development order will be for maximum 6 nos. However, balance quantity shall be supplied only after prototype approval of 2 nos. from Railway. In case no offer is found suitable for placing a developmental order, full quantity will be ordered on the bulk suppliers. Detailed delivery schedule of such developmental order will be different from bulk order, which will be finalized while placing the purchase order as this will require prototype clearance as per acceptance process.                                                                                     |                   |  |  |  |
|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |  |  |  |
| <b>7.0</b> | <b>ERECTION AND COMMISSIONING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NA                |  |  |  |
|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |  |  |  |
| <b>8.0</b> | <b>INSPECTION AND TESTING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |  |  |  |
| 16<br>8.1  | <b>Type Test:</b><br>1. Verification of dimensions of assemblies of alternator, rectifier and regulating equipment.<br>2. Temperature rise test at minimum speed for full output as well as the maximum speed without Air over the auxiliary Alternator and the rectifier regulator box.<br>3. Insulation resistance test.<br>4. High voltage test<br>5. Load test<br>6. Mechanical over speed and induced voltage test.<br>7. Drooping voltage characteristics test.<br>8. Current limiting characteristics test.<br>9. Surge protection test.<br>10. Measurement of stator and field resistance.<br>11. Water tightness test for rectifier – regulator. | vendor to confirm |  |  |  |
| 8.2        | <b>Routine Tests:</b><br>All tests other than those indicated at serial nos. 2, 7 and 9 of type tests mentioned above shall be carried out.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | vendor to confirm |  |  |  |
| <b>8.3</b> | <b>Acceptance Process for development order:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |  |  |  |

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| 8.3.1       | The offer received will be technically scrutinized as per specification. Clarifications will be obtained from vendor, if required.                                                                                                                             | vendor to confirm |  |  |  |
| 8.3.2       | Technical accepted proposal will be submitted to railways for their in principle approval for development.                                                                                                                                                     | vendor to confirm |  |  |  |
| 8.3.3       | Type testing of Auxiliary Alternator and RRU shall be conducted by Railway and/or BHEL at vendor's premises. In case Auxiliary Alternator and RRU is already type tested, report and approval shall be submitted to Railway's for their in principle approval. | vendor to confirm |  |  |  |
| 8.3.4       | Auxiliary Alternator and RRU after duly tested and approved by Railway will be fitted in DETC as stipulated by Railway for field trial.                                                                                                                        | vendor to confirm |  |  |  |
| 8.3.5       | After successful field trials vendor may be considered for bulk order in future tenders.                                                                                                                                                                       | vendor to confirm |  |  |  |
|             |                                                                                                                                                                                                                                                                |                   |  |  |  |
| <b>9.0</b>  | <b>APPROVALS FOR DESPATCH CLEARANCE:</b>                                                                                                                                                                                                                       |                   |  |  |  |
| 9.1         | Material shall be dispatched only after dispatch clearance from BHEL.                                                                                                                                                                                          | vendor to confirm |  |  |  |
|             |                                                                                                                                                                                                                                                                |                   |  |  |  |
| <b>10.0</b> | <b>MARKING</b>                                                                                                                                                                                                                                                 |                   |  |  |  |
| 10.1        | Following particulars shall be provided at name plate:<br>1. Name of Vendors<br>2. Year of Manufacturing<br>3. Serial number<br>4. Normal and overload voltage, current and power rating.                                                                      | vendor to confirm |  |  |  |
|             |                                                                                                                                                                                                                                                                |                   |  |  |  |
| <b>11.0</b> | <b>DOCUMENTATIONS</b>                                                                                                                                                                                                                                          |                   |  |  |  |
|             | Following documents required to be supplied along with Alternator :<br>1. Operation and maintenance manual<br>2. OGA drawings in Autocad /editable format.<br>3. Spares parts catalogue<br>4. Any other documents required by Railway                          | vendor to confirm |  |  |  |



|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |                   |  |  |  |
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|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |                   |  |  |  |
| <b>12.0</b> | <b>TRAINING:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |                   |  |  |  |
| 12.1        | Vendor shall arrange to provide training in working, operation & maintenance at their manufacturing works to Railways. The charges for travel, boarding and lodging shall be borne by the Railways.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  | vendor to confirm |  |  |  |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |                   |  |  |  |
| <b>13.0</b> | <b>SPARES:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |                   |  |  |  |
| <b>13.1</b> | Supplier shall offer list of unit exchange spares, mandatory, maintenance and consumable spares each separately.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | vendor to confirm |  |  |  |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |                   |  |  |  |
| <b>14.0</b> | <b>WARRANTY/GUARANTEE:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |                   |  |  |  |
| 14.1        | The Manufacturer/supplier shall, at his expense, replace any part of the equipment failing or proving unsatisfactory in service and attributed to defective/faulty design, defective material or bad workmanship within a period of 30 months from date of supply of the equipment as a set dully inspected at railway production unit. The period of warranty shall stand extended by the duration for which the device inoperative under exercise of this clause. Further, should any design modification be made in the equipment as a defect /fault/shortcoming in the original design, the period of warranty would commence from the date of the modified part is commissioned into service. |  | vendor to confirm |  |  |  |
| <b>15.0</b> | <b>INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |                   |  |  |  |
| 15.1        | <b>UNDERTAKING BY EQUIPMENT MANUFACTURE:</b><br>All respondents shall provide a signed copy of the undertaking on “INFRINGEMENT OF PATENT RIGHTS”. The undertaking shall be under:<br><i>rights arising due to similarity in design, manufacturing process, use of similar components in the design &amp; development of this item and any other factor not mentioned herein which may cause such a dispute. The entire responsibility to settle any such disputes/ matters lies with the</i>                                                                                                                                                                                                      |  | vendor to confirm |  |  |  |

|      | <i>OEM/supplier.<br/>Details/ design/documents given by them are not infringing any IPR and responsible in absolute and full measure instead of railways for any such violations. Data, specifications and other IP as generated out of interaction with railways shall not be unilaterally used without the consent of RDSO and right of Railways/RDSO on such IP is acceptable to them. Indian Railways shall not be responsible for infringement of patent.</i>                                                                                                                                                                                                                                                                                  |                   |                                                                                       |      |                     |    |    |          |                             |    |    |           |                                                                                       |  |  |  |  |
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| 15.2 | <b>DECLARATION OF CONFIDENTIALITY OF SUBMITTED DOCUMENTS BY OEM:</b><br><i>While submitting a new proposal /design, OEM must classify their documents confidentiality declaration, such as: This document and its contents are the property of M/s XYZ (name of the OEM) or its subsidiaries. This document contains confidential proprietary information. The reproduction, distribution, utilization or the communication of this document or any part thereof, without express authorization is strictly prohibited. Offenders will be held liable for the use for the payment of damages. Indian Railways/RDSO is granted right to use, copy and distribute this document for the use of inspection, operation, maintenance and repair etc.</i> | vendor to confirm |                                                                                       |      |                     |    |    |          |                             |    |    |           |                                                                                       |  |  |  |  |
| 16.0 | <b>REVISION HISTORY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |                                                                                       |      |                     |    |    |          |                             |    |    |           |                                                                                       |  |  |  |  |
| 16.1 | <table><tr><th>S.No</th><th>Revision No</th><th>Date</th><th>Reason for Revision</th></tr><tr><td>1.</td><td>01</td><td>Sept' 18</td><td>Technical details modified.</td></tr><tr><td>2.</td><td>02</td><td>March' 19</td><td>Technical details modified. Qualification criteria modified. Acceptance process added</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                               | S.No              | Revision No                                                                           | Date | Reason for Revision | 1. | 01 | Sept' 18 | Technical details modified. | 2. | 02 | March' 19 | Technical details modified. Qualification criteria modified. Acceptance process added |  |  |  |  |
| S.No | Revision No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Date              | Reason for Revision                                                                   |      |                     |    |    |          |                             |    |    |           |                                                                                       |  |  |  |  |
| 1.   | 01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Sept' 18          | Technical details modified.                                                           |      |                     |    |    |          |                             |    |    |           |                                                                                       |  |  |  |  |
| 2.   | 02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | March' 19         | Technical details modified. Qualification criteria modified. Acceptance process added |      |                     |    |    |          |                             |    |    |           |                                                                                       |  |  |  |  |

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|  | 3. | 03 | June'20 | Qualification criteria modified                |  |  |  |  |  |
|  | 4. | 04 | Sep'20  | Qualification criteria modified                |  |  |  |  |  |
|  | 5. | 05 | Dec'23  | Cl no 3.1 i) added & Change in warranty terms. |  |  |  |  |  |

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**Fig 2: Outline of RR Unit**

