

GOVERNMENT OF
MINISTRY OF



INDIA
RAILWAYS

Self-propelled Over-Head-Equipment-Laying-Train for
Broad Gauge (1676 mm)
Routes of Indian Railways

No. TI/SPC/OHE/ SPOLT/0140
(.....10/2019)

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Self-propelled Over-Head-Equipment-Laying-Train for
B.G. (1676 mm)

Routes of Indian Railways

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BG (1676 mm) Routes of Indian Railways

1.0 General:-

- 1.1 This specification is for a Self-propelled Over-Head-Equipment-Laying-Train for BG (1676 mm) Routes of Indian Railways. The OHE Laying Train shall be 8-Wheeler Stock. It shall be used for simultaneous stringing of contact & catenary wire which would save the block requirement making the composition (to & fro-**Bidirectional**) and would obviate the need for using diesel loco, as per the existing practice. The OHE Laying Train shall consist of 8-Wheeler Diesel Electric Tower Car (8-WDETC) and Un-Rolling/Re-Rolling Car. The 8-WDETC shall conform to RDSO's Specification No. TI/SPC/OHE/8WDETC/0092. This modern OHE-Laying - Train shall consists of automatic tensioning arrangement, guide masts, instrumentation for ensuring proper tension and uniform rotation of the wiring drums etc. The OHE-Laying-Train shall be robust, sturdy and capable of operating under the conditions prevailing on Indian Railways. Herein, after it will be called OHE Laying Train throughout the Specification.
- 1.2 Tenderers are requested to carefully study the specifications and ensure that their equipment fully complies with the specifications.
- 1.3 The tenderer shall specify the model (s) offered and furnish their details technical description. Systems/sub-systems and working mechanisms of the OHE-Laying-Train shall be described with necessary details in the "Technical Description", along with the sketches to depict the manner in which the requirements of the specifications are accomplished by the OHE-Laying-Train (model) offered.
- 1.4 Details including sketches/photographs of the similar OHE Laying Train supplied to others shall be enclosed with the offer. The photographs shall also show close-ups of various working assemblies/ systems. The tenderer shall furnish a video CD showing the working of OHE-Laying-Train under field conditions. The tenderer shall submit a sketch of rough layout of the OHE-Laying-Train while quoting in the tender.
- 1.5 The offered equipment meets the performance and quality requirements of the OHE Laying Train substantially but does not fully satisfy a few system specifications clauses, the tenderer shall mention the variation in a statement of deviation from the technical specifications, giving the details how the functional requirements are going to be met with. The tenderer may seek clarifications, if any, from the purchaser prior to submission of the bids.

1.6 GENERAL REQUIREMENTS

EXPLANATORY

| SN | Abbreviation | Explanation |
|-----|--------------------|---|
| 1. | RDSO | Research Designs and Standards Organization, Manak Nagar |
| 2. | IR | Indian Railways is hereafter referred to as IR. |
| 3. | Engineer | Director of RDSO or technical representative of RDSO is hereafter referred to as Engineer. |
| 4. | IRS | Indian Railway Standard is hereafter referred to as IRS. |
| 5. | IS | Indian Standard is hereafter referred to as IS. |
| 6. | ICF | Integral coach factory, Chennai is hereafter referred to as ICF. |
| 7. | Purchaser | 'Purchaser' means Railway Board on behalf of The President of Republic of India. |
| 8. | Inspecting Officer | Inspecting Officer' means the persons, firms or departments nominated by the Purchaser to inspect the work on his behalf and the deputies of the Inspecting Officer so nominated. |
| 9. | Contractor | 'Contractor' means the person, firm or company from whom the Purchaser may obtain any material or fittings to be used for the work. |
| 10. | Contract Drawings | 'Contract Drawings' means the drawings, which are included in Annexure - I of this specification for the guidance of the contractor. |
| 11. | IEC | International Electro-technical Commission. |
| 12. | UIC | Union International Des Chemins defer (International Union of Railways) |
| 13. | Horse Power | Horse Power (HP) shall be taken as metric horse power. |
| 14. | Tonnes (T) | Tonnes (T) shall be taken as metric ton i.e.1000kg. |
| 15. | OHE | Overhead equipment |
| 16. | SPOLT | Self-propelled Over-Head-Equipment-Laying-Train |

1.7 QUALITY ASSURANCE PLAN (QAP)

1.7.1 The contractor should possess valid ISO-9001:2015 certificate for his work's address, covering the items for which he is participating in the contract. The contractor shall formulate Quality Assurance Plan (QAP) detailing the methodology proposed to be followed to ensure a quality product. QAP shall cover quality assurance procedures and procedures to be followed during all stages of design, manufacture, testing and

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commissioning of the equipment. The Contractor shall define the role of each functional group in the Organisation for achieving the required quality of the product and submit a comprehensive document "Quality assurance manual" in accordance with IS:10201/14001.

- 1.7.2 The Tenderer whose bid is accepted, shall be required to submit a "Quality Assurance Manual" by giving details as to how the quality of specific product is proposed to be assured. Supply of the equipment shall commence only after "Quality Assurance Plan" have been approved by RDSO.

1.8 Annual Maintenance Contract (AMC)

- 1.8.1 The tenderer shall quote for AMC comprehensive of all equipments including Hydraulic/Hydrostatic System, Control System, Crane, Tensioner & Safety devices etc.

The AMC of 8-Wheeler Diesel Electric Tower car (8-WDETC) shall be applicable as laid down in RDSO's Specification No. No.TI/SPC/OHE/8WDETC/0092. The Annual Maintenance shall be applicable after warranty period for 5 years. The tenderer shall quote year wise rates of AMC detailing the various schedules enlisting the requirement of material/spare parts, consumables and services to be rendered by him after regular intervals. The AMC shall be comprehensive for all equipments for preventive as well as break down maintenance. The tenderer shall keep adequate spares in stock for regular schedule of AMC so that maintenance schedules are completed timely. AMC shall be all inclusive of replacement of parts if required either due to breakdown or wear and tear. The AMC cost shall be considered while evaluating the inter-se tender position. It shall be compulsory for the tenderer to quote for AMC. However, the decision to enter into AMC shall vest with Railway alone.

- 1.8.2 The AMC agreement shall be entered with the Zonal Railways.

- 1.9 A tentative conceptual diagram of OHE-Laying-Train is shown in Annexure-IV. Final design and drawing of the Vehicle shall be submitted to RDSO at Design/Drawing approval stage

2.0 OHE-LAYING-TRAIN :

The 8-Wheeler self- propelled OHE-Laying-Train shall be used for simultaneous stringing of contact & catenary wire which would save the block requirement making the composition and would obviate the need for using diesel loco, as per the existing practice. It shall be equipped with crane for loading and unloading of Contact and Catenary Wires drums and Un-rolling/Re-rolling shall be possible in both the directions. The standards, specification and other design details along with list of machinery and equipments to be provided in the Un-rolling/Re-rolling Car are detailed in para 4.0 below.

3.0 SYSTEM's REQUIREMENTS:

- 3.1 The profile of the equipped Self-Propelled OHE-Laying-Train longitudinally and in cross section during movement shall be within the maximum moving dimensions shown in the Indian Railways Schedule of

Dimensions 1676 mm Gauge (Revised, 2004) with latest revision. These dimensions are shown at Annexure-I. The tenderer shall provide sketches of the equipped Self-Propelled OHE-Laying-Train in plan and shall give calculations to prove that the equipped Self-Propelled OHE-Laying-Train does not cause infringement while moving on a 10° curve at any section.

- 3.2 Adequate clearance shall be allowed so that no component infringes the minimum vertical clearance of 102 mm from rail level while travelling under worst operating condition.
- 3.3 Wherever applicable, axle load shall be 16 to 20 tonne for 8-Wheeler. The minimum axle spacing shall be 1.83 m. and Load per meter shall not exceed 7.67 t for 8-Wheeler.
- 3.4 It shall be capable of continuous operation during the varying atmospheric and climatic conditions occurring throughout the year in India. The range of climatic conditions is as follows:-

| | |
|-------------------------------|--|
| Atmospheric Temperature | Metallic surface temperature under sun: 75°C max and in shade 55 °C max. |
| Humidity | 100% saturation during rainy season |
| Reference site condition | i) Ambient Temp : -10° to 50° C ii) Humidity : 100% iii) Altitude : 1000 m above mean Sea level, 2000 m in J&K area. |
| Rain fall | Very heavy in certain areas. The Vehicle shall be designed to permit its running at 10 kmph in flood water level of 102 mm above rail level |
| Atmosphere during hot weather | Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6 mg/m ³ . In mainly iron ore and coalmine areas, the dust concentration is very high affecting the filter and air ventilation system |
| Coastal area | The vehicle and its component shall be deigned to work in coastal areas in humid and salt laden atmosphere with maximum pH value of 8.5, sulphate of 7 mg per litre, max. concentration of chlorine 6 mg per litre and max conductivity of 130 micro Siemens/cm. |

| | |
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| <p>Vibration</p> | <p>The equipment, subsystem and their mounting arrangement shall be designed to withstand satisfactorily the vibration and shocks encountered in service as specified.</p> <p>High level of vibration and shocks, accelerations over 500 m/s² have been recorded at axle box level for long periods during run. Vibrations during wheel slips are of even higher magnitude. Bogie suitable to sustain the specified level of vibration and shocks.</p> |
| <p>Wind Pressure</p> | <p>High wind speed in certain areas, with wind pressure reaching 200 kgf/m²</p> |

3.5 The equipments and their arrangement shall withstand satisfactorily, the vibration and shocks normally encountered in service which are as below:-

- (a) Maximum Vertical Acceleration 3.0 g
 - (b) Maximum Longitudinal Acceleration 5.0 g
 - (c) Maximum Train Acceleration 2.0 g
- (Where g is Acceleration due to Gravity)

3.6 INDIAN RAILWAYS TRACK PARAMETERS

| S.N. | Description | Specified Values |
|------|--|---|
| 1. | Gauge | 1676 mm Broad Gauge (BG) |
| 2. | Maximum Gradient | 1: 30 33 |
| 3. | Minimum radius of curve | Normally 175 meters, sharper curves with radius less than 175 meter are also available at isolated locations. Regarding minimum radius of curvature for slip points, turnouts or crossover roads, para 17 of chapter II of Schedule-I of IRSOD (BG) Revised 2004 shall be applicable which provides for minimum of 175 m radius curves in case of 1 in 8.5 scissors cross over. |
| 4. | Maximum super elevation | 165 mm |
| 5. | Track Structure | The track shall be to a minimum standard of 90 R rail on sleepers with M+4 density and minimum depth of ballast cushion below sleeper of 200 mm, which may consist of at least 75 mm clean and the rest in caked up condition on compact and stable formation. However speed will depend on axle load, Axle spacing, dynamic augment value of the rolling stock etc. |
| 6. | Permitted irregularities | The track is maintained as per Indian Railway Permanent Way Manual and para 607 (1) gives details of track Category for various parameters. The extract for Broad Gauge track as of now is given at annexure-V. However, any amendments in this regard at later stage shall be applicable. |
| 7. | Third Report of the Standing Criteria Committee or latest shall be considered for number of peaks per kilometer, if specified any. | |

3.7 MAXIMUM MOVING DIMENSION :

| | |
|---------------------------|--|
| Maximum moving Dimensions | Maximum moving dimensions shall conform to diagram 1D of Indian Railway Schedule of Dimension (SOD) 1676 mm gauge (BG) revised 2004 (With Latest Amendments) with the pantograph and platform in lock down condition. Infringements, if unavoidable and fully justified, may be considered, only after sanction of condonation from Railway Board to the IRSOD (BG) revised 2004 by the rolling stock. |
|---------------------------|--|

3.8 OHE PARAMETERS :

| S.N. | Description | Specified Values |
|------|--------------------------------|--|
| 1. | Contact Wire | 107 mm ² Hard Drawn Grooved Copper Contact Wire as per RDSO Specification No.ETI/OHE/76 (6/97) with latest Amendments |
| 2. | Catenary Wire (Messenger Wire) | 65 mm ² (19/2.1 mm) Stranded Cd-Cu Catenary Wire as per RDSO Specification No. ETI/OHE/50 (6/97) with latest Amendments |

| | | |
|----|-------------------------|---|
| 3. | Height of Contact Wire | Conventional Height -5500 mm, |
| 4. | Height of Catenary Wire | 7200 mm |
| 5. | Stagger | ±200 mm on tangent track ±300 mm on curves |
| 6. | Implantation | 4750 mm at platforms 2360 mm to 3300 mm – on main line |
| 7. | Mechanical Tension | The system shall be designed for 2500 kgf. settable for 2000 kgf to 2500 kgf. |
| 8. | Note: | (i) Provisions shall have to be kept for 150 mm ² Contact Wire and 125 mm ² catenary Wire. (ii) The OHE-Laying-Train shall be capable to wire conventional and high rise type OHE. In high rise OHE, the height of contact wire and catenary wire shall be 7.57 m. & 8.97 m. respectively. |

3.9 SAFETY FEATURES :

A. The Un-Rolling/Re-Rolling Car shall be provided with following UIC approved safety features:

| | |
|-----|---|
| 1. | Stand alone Vigilance Control Device (VCD) conforming to RDSO's specification No.MP-0.34.00.04 (Rev-03), Aug' 2006 may be provided. |
| 2. | Emergency stop switches |
| 3. | Horn conforming to RDSO's prevailing specification. |
| 4. | Flasher Units conforming to RDSO's spec No ELRS/ SPEC/LFL/0017 (Rev-1) Sept, 2004 |
| 5. | Marker light conforming to RDSO's spec No ELRS/ SPEC/PR/0022 (Rev-1) Oct. 2004 |
| 6. | Twin Beam Head lights conforming to RDSO's spec No RDSO's Specification No ELRS/SPEC/PR/0024 (Rev-1) Oct. 2004. |
| 7. | Speed recorder conforming to RDSO's specs No No.MP-0.3700-07 (Rev.03) of April'2003. |
| 8. | Emergency brake valves conforming to RDSO's spec No MP.0.01.00.13 (Rev- 0.00) January 2004. |
| 9. | Parking brake conforming to RDSO's spec No CK 408 (latest revision) |
| 10. | Wind screen wipers conforming to RDSO's spec No C-K306 (Rev 01). |
| 11. | Fire extinguishers conforming to RDSO's specification No RDSO/PE/CP/ EMU/0001 Rev.0 or latest. |

B. The Safety Features of 8-WDETC shall be provided as per RDSO's Specification No. TI/SPC/OHE/8WDETC/0092.

3.10 OTHER SAFETY FEATURES of Un-Rolling/Re-Rolling Car:

- It must be possible to reach all parts of Contact/catenary installation from a safe working position.
- Work on Contact/catenary must remain safe even during train movements on adjacent track.

- Hydraulic cranes must react in fail safe manner if the hydraulic supply system fails.
- The machine shall have guaranteed stability even with their crane fully extended.
- Crane shall be built in such a way as to minimise the risk of their touching Contact/Catenary Wires.
- It shall be possible to earth the Contact/Catenary Wire through the Machine itself
- Microprocessor based Fitted with load sensors for sensing snap in wire and audio alarm in case of wire getting stuck
- Suitable safety measures including interlocks between various equipment shall be provided to ensure.
 - (i) Safety of men and.
 - (ii) Stability of the OHE-Laying-Train while in operation.
(The tenderer shall indicate the proposed interlocking and safety aspects.)

3.11 REQUIREMENT FOR EXECUTION OF WORK:

- OHE-Laying-Train shall be self-propelled and shall run independently at the working speed (creep speed) of 0 – 20 kmph at work site.
- Adequate lighting having minimum illumination level of 250- 300 Lux shall be provided for working in the night.
- While working on double line sections, it shall not infringe the adjoining track and it shall be possible to permit trains at full speed on that track. Minimum track centre spacing is 4.265 m. The Self-Propelled OHE-Laying-Train or its any part shall not infringe the adjoining track as per Schedule of Dimensions of Indian Railways.

4.0 TECHNICAL SPECIFICATIONS FOR UN-ROLLING/RE-ROLLING CAR OF OHE-LAYING-TRAIN:

| Para | Subject | Technical specification |
|------|-------------------------------|--|
| 1. | General | The general design of the Un-Rolling/Re-Rolling Car shall be as per standard industry practices. It shall be used for simultaneous stringing of contact & catenary wire and fit for the purpose. It shall be manufactured with adequate running stability and suitable for use on Indian Railways. All standard materials shall be used to manufacture Un-Rolling/Re-Rolling Car such that it is acceptable to the buyer. The Un-Rolling/Re-Rolling Car shall be manufactured so that it can be used for working under all weather conditions in India. It shall meet all governing regulations, maximum moving dimensions. Tenderer shall submit the detailed layout of Un-Rolling/Re-Rolling Car along with the offer. The Design Life of Un-Rolling/Re-Rolling Car shall be 30 years. |
| 2. | Purpose of use (applications) | The Un-Rolling/Re-Rolling Car shall be used for various railway Electrification works i.e. for erection of new and removal of old contact and catenary wires (Messenger wire) and maintenance thereof. It shall be capable of simultaneously un-rolling and re-rolling of |

| Para | Subject | Technical specification | |
|-------------------------|---|--|---|
| | | <p>one contact and one catenary wire. During un-rolling/re-rolling, the contact/catenary wires shall remain in constant tension and no twisting shall take place in contact wire in any condition. It shall have following features.</p> <ul style="list-style-type: none"> ■ Self propelled vehicles for working at work site. ■ Four un-rolling/re-rolling reel stands ensuring uniform rotation of wiring drums. ■ Two main guiding masts. ■ Two auxiliary guiding masts. ■ Two re-rolling masts. ■ One reversible tensioner ■ One crane ■ Hydraulic power unit etc. ■ It shall be capable to wire conventional & high rise OHE. | |
| 3. | Unrolling/Re rolling Car Parameters | Car Type | 8 -wheeler with two bogies |
| | | Max Towing Speed | 110 kmph |
| | | Working Speed (Creep Speed) during un-rolling/re-rolling. | 0-20 kmph |
| | | Diesel Engine | <ul style="list-style-type: none"> ■ Fuel efficient Diesel Engine of suitable capacity to operate in self-propelled mode at a speed of 0-20 kmph at work site and maximum towing speed in the section shall be 110 kmph. (details to be submitted) ■ Exhaust emission shall be below the limit laid down in UIC-624. ■ Tenderer shall furnish the Car performance characteristic and calculations. ■ The fuel and lubricating oil consumption in liters/Hours at 75 % of the rated output of the diesel engine shall be submitted. ■ The diesel engine shall meet the acceptance criteria of UIC or similar international standards. |
| Unrolling/Rerolling Cab | One Driving cab with two driver's control desk having complete operating and driving control. The sitting arrangement for four persons shall be provided in the driving cab (details to be submitted along with offer). | | |

| Para | Subject | Technical specification | |
|------|---------|----------------------------------|---|
| | | Material for construction | <ol style="list-style-type: none"> 1. Material for body bolster, lifting pads & head stock shall be of copper bearing steel plates to IS 2062 Fe 410 Cu WC. 2. Material for under frame and sole bar shall be IRS M 41. 3. Material for draw and Buff Gear shall be as per RDSO's specification No. 56-BD-07 and side buffer arrangement to RDSO's drawing No. SK-98145. 4. The material for super structure shall be IRS M-41. |
| | | Dimensions | As per Indian Railways Schedule of Dimensions 1676 mm Gauge (Revised, 2004) with latest revision. The length of vehicle shall not be more than 21340 mm over body. |
| | | Coupling and Buffer Arrangement. | Centre Buffer with Transition Screw Coupling conforming RDSO's Specification No. 56-BD- 07 along with the side buffer arrangement to RDSO's Drawing No. SK-98145. |
| | | Axle | Shall conform to RDSO's Specification No.IRS R-43/92 |
| | | Maximum Axle load. | Maximum Axle Load 20.32 Tonnes. |
| | | | Shall conform to RDSO's Specification No.IRS R-19/93 Part-II (Rev.4) or latest for Solid forged Wheels. |
| | | Wheel Diameter | 952 mm |
| | | Wheel Profile | Generally shall conform to RDSO drawing No. Sketch-91146. |
| | | Transmission | Hydrostatic transmission suitable for gradual speed of 0-20 kmph at work site and maximum towing speed in the section shall be 110 kmph. (Details to be submitted) |

| Para | Subject | Technical specification |
|------|---|--|
| | Underframe, frame components and bogie. | <p>As per standards of the manufacturer suitable for mentioned applications. "Bogie shall be two 4-Wheeled Bogies of robust welded design suitable for taking brake gear, suspension etc. and capable of withstanding the maximum static and dynamic stresses under its full load condition. The weight of the Bogie shall be as low as possible, consistent with strength and robustness. The bogie frame shall be of copper bearing steel plates to IS 2062 Fe 410 Cu WC and shall be fabricated by welding. Manufacturer shall follow RDSO's specification No. C-9202 Rev.2 or Latest for fabricated bogie.</p> <p>The Bogie Design shall preferably be as per ICF Drawing No DMU/DPC-0-0-001 with latest Alteration. Bogie suspension Design shall be coil steel suspension in primary and secondary stage to ICF drawings only.</p> <p>The tenderer shall design the under frame keeping in view the provision of equipment of OHE-Laying-Train. If the design requirement is generally meeting the parameters of the under frame arrangement of RCF drawing No. EM 11100 with latest alteration for Motor Coach, the same shall be submitted to RDSO for scrutiny and approval at design approval stage. Alternatively, tenderer shall submit his own design for approval.</p> <p>The under frame shall be designed to meet the following loads:</p> <ul style="list-style-type: none"> i) A vertical load of 3 t/meter run uniformly distributed. The weight of the various equipment mounted in the vehicle shall be considered as concentrated load and shall be simulated as such during load/strain testing. ii) A horizontal squeeze load of 100 t applied at each buffers. iii) A combination of loads specified at (i) & (ii). iv) FEA in this regard shall be submitted at the design approval stage for approval. <p>The stresses estimated by an approved method shall not exceed 139.3 MPa (14.2 kgf /sq.mm) for members made from Steel to IS:2062 Fe 410CuWC and 221.7 Mpa (22.6Kgf/</p> |

| Para | Subject | Technical specification | |
|------|---------|-------------------------|--|
| | | | <p>Main reservoirs of adequate capacity shall be provided. In addition, a separate braking reservoir and a non – return valve are provided for braking only. Suitable drain valve/cocks shall be provided to drain off the condensate in the reservoir(s). An automatic drain valve shall be provided where feasible in addition to manually operated drain valves/ cocks.</p> |
| | | | <p>Air dryer of approved make conforming to Spec. No. MP-0.01.00.06 (Rev-05), March'2011 should be provided in line with latest equipment on EMU/DEMU Coaches.</p> |
| | | | <p>The tenderer shall be required to supply the detailed drawings, specifications and testing procedure for rubber components/ parts of all the valves/cocks used in the brake system and shall guarantee for satisfactory working of the components at least for 24 months from the date of supply and or 18 months from the date of commissioning whichever is later. The supplier shall also get the brake schematic approved by the RDSO.</p> |
| | | | <p>The car shall be provided with a suitable air-cooled compressor, directly driven by the diesel engine. The capacity of the compressor at idling speed of engine shall be adequate to meet the requirement of braking, horn and wipers when operated simultaneously. The tenderer shall give a technical justification for the compressor capacity such that the requirements of braking, wipers, horns and other accessories are fully met. (The bed plate of compressor unit shall be sufficiently strong to withstand the vibrations during run).</p> |
| | | | <p>A filter of adequate capacity shall be provided at the compressor inlet to protect the machine from dirt and dust entering into it. Additional filters, if considered necessary, by the suppliers for particular valves, shall be provided in the system.</p> |
| | | | <p>Suitable inter-coolers and after coolers shall be provided to cool the compressed air delivered by the compressor.</p> |

| Para | Subject | Technical specification | |
|------|-------------|---|---|
| | | | <p>The compressor shall be provided with suitable governor/un-loader to cut in and cut out at a nominal pressure of 7.0 kg/cm² and 8.0 kg/cm² respectively. In addition a safety valve of sufficient/capacity set at 8.5 kg/ cm² shall be provided to safeguard the system against over- charging.</p> |
| | | Parking Brake | <p>Parking Brake shall be provided as per RDSO Specification No. C-K 408 and to be submitted to RDSO for approval. It shall be capable to hold the unrolling/Re-rolling car at Max down gradient 1:33 under gross load condition.</p> |
| | | Central control console, Manual backup | <p>Detailed layout of cubicle with control equipment of Car shall be submitted.</p> |
| | | Batteries | <p>As per standards of the manufacturer suitable for mentioned applications (details to be submitted)</p> |
| | | Other Features | <p>The following additional features shall be supplied in the Car:</p> <ul style="list-style-type: none"> ■ First Aid Kit ■ Working lights- Flood lights, Orientable two 100 watt each Search light. Detachable search light. ■ Cordless Public Address System. ■ Standard Mobile charging socket. ■ Lockable Tool Box |
| 4. | Reel stands | Unrolling/re-rolling reel stand | <ul style="list-style-type: none"> ■ Four reel stands for the contact and catenary wire (messenger wire) shall be mounted on the frame of the car. Each one shall be capable of unrolling and rolling one wire and shall have independent control. ■ Each reel stand shall includes : <ol style="list-style-type: none"> a) One main frame b) One rotational hydraulic drive which includes, hydraulic motor and brake for providing suitable tension while un-rolling/re-rolling. Provision of Hand brake for each drum stand shall be made as an additional safety. c) The design of the reel stand shall be easy and fast to load /unload the reel. d) The reel stand shall have automatic lateral movement capability (auto align device) in order to guarantee 0° angle of the wires. e) Suitable measuring device for measurement of length of catenary and |

| Para | Subject | Technical specification | |
|------|-------------------------|-----------------------------|--|
| | | | <p>contact wire laid as well as recovered shall be provided.</p> <ul style="list-style-type: none"> ■ Reel support which allows mounting of reels with the following feature. <ol style="list-style-type: none"> a) Flange Diameter – up to 1900 mm. b) Traverse/Width - up to 900 mm. c) Gross Weight - 2800 kg (Max) d) Bore for mounting on the stand - 105 mm x 105mm. |
| 5. | Auxiliary Guiding Masts | | <ul style="list-style-type: none"> ■ Two auxiliary masts guiding the wires shall be provided on each side of the tensioner. ■ Each mast shall be provided with two fully enclosed, four rollers, fairlead heads to ensure the movements of the wires. Fairlead heads shall be of nylon type material to prevent the damage of the wire. |
| 6. | Guiding Rollers | | <ul style="list-style-type: none"> ■ Guiding devices fitted with horizontal and vertical rollers ensure the guiding of the wires from the reels to the tensioner shall be provided. ■ The rollers shall be of nylon type material to avoid damage of the wires. |
| 7. | Main Guiding masts | | <ul style="list-style-type: none"> ■ Two hydraulic telescopic guiding masts shall be provided (one on each end of the car) to ensure the guiding of the wires from the unrolling system of the car to the elevating platform or to their final position. ■ Each one shall be equipped with guiding rollers. ■ For un-rolling and re-rolling and slewing device. <p>All the movements of these masts shall be actuated by means of hydraulic rams.</p> |
| 8. | | Main Telescope column | <ul style="list-style-type: none"> ■ Height of the guiding device (for contact wires) <ol style="list-style-type: none"> a) Minimum - 4150 mm (Approx) b) Maximum - 7500 mm (Approx) c) Horizontal Stroke- ±800 mm (Approx) |
| 9. | | Auxiliary Telescopic Column | <ul style="list-style-type: none"> ■ Height of the guiding device (for catenary wires) <ol style="list-style-type: none"> a) Minimum - 4150 mm (Approx) b) Maximum - 9000 mm (Approx) c) Horizontal Stroke- ±500 mm (Approx) d) Horizontal Rotation-± 180° <p>Note: The controls of the columns shall be at the base of the masts and through wireless remote control.</p> |

| Para | Subject | Technical specification |
|------|-----------------|---|
| 10. | Hydraulic Crane | <ul style="list-style-type: none"> ■ A telescopic hydraulic crane of approximate 22 tonne meter capacity, maximum horizontal outreach shall be 7.5 meter approx. and the vertical outreach may be 12 m approximately, of reputed make, shall be provided on board for loading/ unloading of reels/ drums on reel stands. ■ Boom of the crane shall be heavy duty, sturdy design, hydraulically operated, capable of extended/squeeze (telescopically) during material handling operations. The structure sturdiness, strength and other performance capability of the boom have to be proved through analytical methods/FEM etc and type approval of authorised testing agency. ■ Detailed justification of the choice of particular type of boom, its operation and its mechanism shall be provided before its approval ■ It shall be fully covered against the weather and shall be able to retract and extend on rated capacity of load and speeds. ■ The performance of hydraulic items such as cylinders, pumps, motors, valves, hoses, seals etc shall be of international standards with reputed make & compatibility with each other for better system performance. ■ Proper arrangements of boom locking while vehicle moving on light run from section to section. ■ Slewing shall be provided with hydraulic motor. The slewing shall remain locked under normal condition unless operated by operator. ■ Wire ropes, chains and shackler as in case of wire ropes are provided by the manufacturer, the breaking strength of the hoisting ropes shall not be less than 6 times the maximum static load on the rope. ■ When the load is supported more than one part of the rope, the tension parts of the rope shall be equalised. ■ The hoisting ropes shall be of sufficient length and shall provide not less than the two dead turns at the anchor end and rope anchors shall be accessible. (Design details shall be submitted |

| Para | Subject | Technical specification |
|------|----------------|--|
| | Crane Controls | All the controls of the crane movement shall be fitted at a convenient place. One separate control desk for operation and control of emergency brake, movement of crane, stabilizer, lights etc. |

FINAL DRAFT

| Para | Subject | Technical specification |
|------|--------------------------------|--|
| | <p>Safety Devices of Crane</p> | <ul style="list-style-type: none"> ■ Unlocking of suspension and lowering of Pantograph are allowed only if the Crane is in travelling position. ■ The Crane can work simultaneously to the elevating platform, but the lifting capacity and the working area are automatically reduced to guarantee the Vehicle stability on all working conditions. ■ The crane shall be equipped with an electronic safety load device, electro hydraulic levelling device, rubber mats, two working flood lights. It shall be fitted with one electric socket of 24 V, 10 Amp DC and two compressed air connections for operation of tools. ■ Provision of over load and over outreach visual and audible devices for crane operator and in cabin operator ■ Full load chart with slew angle and outreach along with crane stability calculations (in all condition of the crane) and drawings shall be submitted at the time of approval ■ Crane hook and wire rope test certificate at 33% over load from any national or regional test house before the final test shall be produced. ■ Overloading i.e. when the load being lifted shall exceeds 95% of the rated capacity at the radius; automatic-audio-visual warning shall be available. It shall also cut off the hoist operation if the load exceeds 105 % of the rated load at the radius. Between 98% and 105 % load of the rated capacity, the audio- visual warning pressure signals shall be continuous. ■ Pressure relief valve, safety check valve (to protect sudden stoppage of any operation due to any reason), hose failure protection, cylinder protection etc. As applicable. ■ Proper safety arrangement for lifting, slewing, lowering and anti-fall devices for telescopic cylinders of the boom and for derricking cylinders shall be provided. ■ Machine shall have locking arrangement feature for load in any |

| Para | Subject | Technical specification | |
|------|-----------------------|-------------------------|---|
| | | Crane Fittings | <ul style="list-style-type: none"> ■ The crane shall be equipped with hydraulic extensions, Load hook, Hydraulic stabilizer jacks with outriggers, stabilizers pad, electro hydraulic height limiting device, adjacent track limitation device, electronic control of lifting capacity and range management system, earth bonding of all components and other accessories for safe operation of crane. ■ Lifting Hook- A standard forged hook with proper locking arrangement. The safe working load shall legibly stamped on a non- vital part of the hook, an authentic test certificate shall be supplied. |
| 11. | Hydraulic Power Unit | | <ul style="list-style-type: none"> ■ A hydraulic power unit of suitable capacity and reputed make shall be provided on board/under slung in a noiseless enclosure with all necessary equipment to cater hydraulic power required for tensioner, reel stands, masts and winch etc. <p style="margin-left: 40px;">Design details shall be submitted along with the offer.</p> |
| 12. | Reversible Tensioner | | <ul style="list-style-type: none"> ■ An automatic tensioning arrangement for reversible tensioner shall be capable to un-roll/Re-roll one contact and one catenary wire simultaneously with independent control. It shall be capable to adjust tension without stopping the train. ■ It shall have tension measuring device and devices for other working parameters such as pre- set & real time tension, un-rolling speed etc. The accuracy of these parameters along with control and operational scheme shall be furnished along with the offer. |
| 13. | Other safety features | | <ul style="list-style-type: none"> ■ In case of failure of system like electrics, engine failure etc., the wire shall not break and the ongoing operation shall have to be completed. ■ In normal working condition, an automatic and manual control system can be switched over either manual or automatic. ■ Under manual control system, the working parameters shall be settable, adjustable and measurable. ■ In case of failure of system, it shall be possible to bring back the system in |

| Para | Subject | Technical specification | |
|------|---------------------------|---|---|
| | | | <p>the travelling mode within a reasonable time of 10 to 15 minutes.</p> <ul style="list-style-type: none"> ■ The Tail Wire Compensation System: The system shall have the function of tail wire compensation and it shall have all safety measures to avoid an accident. |
| 14. | Testing | Type tests | <ul style="list-style-type: none"> ■ Oscillation Trial-The Riding Quality Test shall be conducted as per requirement. ■ Squeeze Load Test at 200 t buffing load as per RDSO's test scheme shall be carried out. <p>Details of proposed Factory Acceptance Tests (FAT) protocol to be submitted for approval. This should include:</p> <ul style="list-style-type: none"> ■ Verification of dimensions of Car, assemblies, attachments ■ Verification of submitted performance particulars of Car, assemblies, attachments ■ Verification of safety features ■ Acceptance of vehicle shall be done as per Third Report of the Standing Criteria Committee or latest. |
| 15. | | Weighment | Un-Rolling/Re-Rolling Car shall be weighted as per standards. |
| 16. | Spare parts | The list of standby spare parts along with price shall be submitted | |
| | | The list of recommended spare parts for maintenance along with their prices shall be submitted. | |
| 18. | Service Tools | A List of service tools free of cost shall be submitted along with offer. | |
| 19. | Warning/ Sign Boards | The warning/ sign boards, as applicable shall be provided. Details shall be submitted with the offer. | |
| 20. | Car rail use regulations | Maximum Moving Dimensions | The machine shall not infringe the Maximum Moving Dimensions, as per Diagram 1-D of Indian Railways Schedule of Dimensions 1676 mm Gauge (BG), Revised 2004 (with latest revision) |
| 21. | Specifications/ Standards | | A list of standards and specifications for manufacturing, testing and commissioning of various equipment shall be submitted along with offer. |
| 22. | Mechanical Design | | Mechanical design shall be as per RDSO Specification No. TI/SPC/OHE/8WDETC/0092 for 8WDETC and shall be finalised during design approval stage. |

| Para | Subject | Technical specification |
|------|---------------------|--|
| 23. | Pay Load | 15 Ton (Approximately). |
| 24. | Acceptance Criteria | The acceptance of the un-rolling/Re-rolling car for operation/working on Indian Railway Track shall be based upon stipulations given under the RDSO document named as "3 rd report of Standing Criteria Committee with latest revision/alteration." |

5.0 DESIGN DEVELOPMENT:

The Self-Propelled OHE-Laying-Train shall be robust, reliable and suitable for working on Indian Railways. Quality assurance during manufacturing of the self-Propelled OHE-Laying-Train shall be according to **ISO-9001:2015**.

- a) The contractor shall develop the design based on the details given in this specification and sound engineering practices.
- b) The design shall be based on S.I.Units.
- c) From the information given in this specification and instructions of RDSO, the contractor shall prepare a full set of engineering drawings and submit the same to RDSO for approval in three copies.
- d) The successful tenderer, hereafter called contractor shall submit the entire technical data, design calculations to RDSO for approval before commencing construction of OHE-Laying-Train or placing orders on sub-contractors. Data pertaining to the rating of functional sub-assemblies and stresses in the main structural members, mounting etc. shall also be made available.
- e) Assumptions made with regard to live load, impact load etc. with the stipulated calculations of the design as finally developed to satisfy RDSO that the requirement of the specification are fully complied with.
- f) Material specifications, manufacturing tolerances and other details, which are necessary for manufacture for each component shall be indicated on the drawings and three copies (in English) of such drawings & specifications shall be supplied to RDSO along with the drawings.
- g) The technical specification and drawings submitted shall include the following:
 - i) Complete overall dimensions of the self-Propelled OHE-Laying-Train super imposed on the Maximum Moving Dimensions (MMD), gauge etc. to ensure that no part of the OHE-Laying-Train goes beyond these dimensions.
 - ii) Life and weight of all the major subcomponents.
 - iii) Calculations to establish the adequacy of installed power for different functional of self-Propelled OHE-Laying-Train.
 - iv) Any calculations, designs, drawings, schedules, information, data, progress charts etc. required by the RDSO in connection with the contract shall be furnished by the Contractor at his own expenses. In case of any

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ambiguity in the interpretation of design and drawing, the decision of RDSO shall be final and conclusive.

- v) FEA of major components like super structure, underframe and bogie shall be done and submitted to RDSO for approval during design approval stage.
- h) All critical steel welding joints shall be subjected to ultrasonic testing after manufacture/repair, to a suitable scheme/standard suggested/ approved by RDSO.
- i) If contractor deviates from existing drawings of ICF/RCF/RDSO for bogie & its components, FEA of components deviating from the drawings shall be done & submitted to RDSO.
- j) If firm is offering design as per international standard, the same will be accepted subject to compliance of this specification no. TI/SPC/OHE/SPOLT/0140 Rev.1, IRSOD and will required complete design & prototype clearance by RDSO as per extant procedure.

6.0 APPROVAL OF DRAWINGS:

- a) Approval to the drawing means the approval to the general adoptability of the design features. The contractor shall be wholly and completely responsible for correctness of dimension, materials, strength and performance of components. The contractor, when submitting proposals or designs for approval of the RDSO, shall draw attention to any deviation or departure from the specification involved in his proposal so drawings.
- b) Drawings for approval shall be submitted in standard size (s) along with main calculation details in triplicate.
- c) Three sets of tracings of the RDSO approved drawings/calculations and six sets of their prints shall be supplied by the contractor to the consignee. The tracings shall be on mylar (polyester paper) of durable quality. Drawings shall be made on AutoCAD. 3 soft copies on DVDs shall also be supplied to the consignee along with hard copies as mentioned above.
- d) Each set of tracings shall form a complete set of working drawings, the first sheet be i.e. the index and the following sheets being arranged properly to show the various assemblies, sub- assemblies and components of complete works in the following sequence:
 - (i) Lists of all parts grouped into major assembly with details of numbers per set, weight, specification material and drawing reference against each item (Bill of material).
 - (ii) General arrangement drawings of complete equipment sets. Diagram of lubrication points indicating type of lubricant. Sub-assembly arrangement in proper and logical sequence.
 - (iii) Detailed drawings:-On detailed drawing sheets, each part shall be identified by an alphabetic letter and the list of all parts forming the

sub-assembly shall be tabulated just above the title block on the same sheet giving details against each alphabetic letter.

- e) The tenderer whose bid is accepted, shall be required to submit a "Quality Assurance Plan" by giving details as to how the quality of specific product is proposed to be assured. Supply of the equipment shall commence only after "Quality Assurance Plan" has been approved by RDSO.

7.0 CONTRACTOR'S RESPONSIBILITY:

The contract or shall be entirely responsible for the execution of the contract strictly in accordance with the terms of this specification and the conditions of contract, notwithstanding any approval which RDSO or the Inspecting officer may have given:

- (a) Of the detailed drawing prepared by the contractor.
- (b) Of the sub-contractors for materials.
- (c) Of other parts of the work involved by the contractor.
- (d) Of the tests carried out either by the contractor or by the RDSO or the Inspecting Officer.

8.0 STANDARD DRAWINGS AND SPECIFICATIONS:

- a) The Contractor shall procure RDSO specifications & drawings for manufacturing of the self-Propelled OHE-Laying-Train including those referred to in this specification on payment basis from RDSO.
- b)
 - i) Indian Railways standard (IRS) specifications may be obtained on payment from the Manager, Government of India Publications, Civil Lines, Delhi-110006 (INDIA)
 - ii) Indian Railways Schedule of Dimension 1676 mm gauge (BG) Revised, 2004 may be obtained on payment from RDSO, Lucknow (INDIA).

9.0 TOOLS AND INSTRUCTIONS MANUALS:

- i) Self-Propelled OHE-Laying-Train shall be supplied with a complete kit of tools required by the operator in emergency and for normal working. The list of tools to be provided shall also include all tools necessary for maintenance and repair of the entire OHE-Laying-Train including specialized equipment. All special tools shall be listed and catalogued illustrating the method of application.
- ii) Detailed operating manual, maintenance, service and assembly overhauling manuals shall be specifically prepared in English language and three copies of these shall be supplied with each "self-Propelled OHE-Laying-Train".
- iii) The manufacturer shall also supply schematic diagrams of electrical, hydraulic, pneumatic (for Brake System etc.) and electronic circuits used on the self-Propelled OHE-Laying-Train. Trouble shooting diagram/table shall also be supplied. Main features of items like hydraulic pumps- motors and such other bought out items shall be furnished by the supplier.

- iv) The tenderer shall, along with his offer, submit the list of tools, manuals, circuit diagrams and other technical literature/ drawings to be supplied along with each self-Propelled OHE-Laying-Train mentioned as above, for operation, servicing, maintenance, assembly overhauling, periodical overhauling of the self-Propelled OHE-Laying-Train and troubleshooting guide lines.
- v) While offering self-Propelled OHE-Laying-Train for first inspection the supplier shall submit three copies of complete technical literature including operation, service and field maintenance instructions and work shop manuals for overhauling of the assemblies and the self-Propelled OHE-Laying-Train complete electrical, hydraulic and pneumatic circuit diagrams, trouble shooting charts, component drawings/description and other relevant technical details for the reference of inspection officer.

10.0 SPARE PARTS:

- i) The expected life of the components shall be advised alongwith their condemning limits.
- ii) The tenderer, alongwith the offer, shall furnish the required spare parts details in a separate list indicating description, part number, quantity, price, cost, whether imported or indigenous and their source of supply (OEM details)
- iii) The manufacturer shall be responsible for the subsequent availability of spare parts to ensure trouble free service for the life of the Un-Rolling/Re-Rolling Car (for a minimum period of 15 years). The Spare parts of 8-WDETC shall be supplied as per the Specification mentioned above.
- iv) For indigenous parts and bought out components and assemblies, the source and other relevant technical details shall be supplied while offering the first "Self-Propelled OHE-Laying-Train". for inspection.

11.0 MANUFACTURER'S TEST CERTIFICATE:

Copies of the Maker's certificate guaranteeing the performance of the equipments shall be supplied in duplicate alongwith the delivery of each equipped "self-Propelled OHE-Laying-Train".

12.0 OPERATOR'S TRAINING:

The requirement of operators and allied staff for running the "self-Propelled OHE-Laying-Train" under normal working condition shall be indicated, specifying their duties and minimum qualifications.
The contractor shall provide training for the two such groups of four persons for four days in their works as well as at site free of cost.

13.0 INSPECTION OF THE SELF-PROPELLED OHE-LAYING-TRAIN :

- a) Self-Propelled OHE-Laying-Train shall be inspected and tested by the Director General/TI/RDSO, Lucknow or his authorized representative. All

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the tests specified in the specifications shall be carried. The firm shall arrange, all the necessary apparatus, labour and assistance required to get the specified tests conducted in the presence of purchaser's representative. If certain facilities are not available for the tests, manufacturer may arrange these tests outside, with the approval of RDSO.

- b) Before giving call to RDSO for prototype testing, the manufacturer shall submit a detailed test schedule having details of each test and nature of the test, venue of the test and the duration of each test and the total number of days required to complete the test at one stretch. Once the test schedule is approved, the test shall invariably be done accordingly.
- c) In case, any dispute or disagreement arises between the manufacturer and RDSO/Purchaser during the process of testing, as regards to the type test and/or the interpretation and acceptability of the type test results, it shall be brought to the notice of DG/TI/RDSO, whose decision shall be final and binding.
- d) The Self-Propelled OHE-Laying-Train's conformity/ non-conformity with respect to each item shall be jointly recorded, before the issue of the Inspection certificate and approval for dispatch of the self-Propelled OHE-Laying-Train .
- e) No material shall be dispatched or packed until it has been passed by the Inspecting Officer. Such passing shall in no way exonerate the contractor from their obligation in respect of quality and performance of the car.
- f) The cost of inspection & testing charges shall be borne by successful tenderer. However, for lodging and boarding and travelling charges shall be borne by purchaser."

14.0 ACCEPTANCE TEST:

In addition to verification of the various items of specifications covered earlier the purchaser's nominee shall carry out the following tests in India at the purchaser's premises at the time of the commissioning of the OHE-Laying-Train.

- 14.1 Dimensional check of loading gauge, i.e. maximum moving dimensions, buffer heights, clearances etc.
- 14.2 The riding quality tests shall be based on detailed oscillation trial conducted at a speed 10% higher than the maximum specified operating speed on a section of main line track conforming to test stretch as mentioned in the Third Report of the Standing Criteria Committee or latest to establish the performance at the specified maximum operating speed.
- 14.3 Construction and engineering of the OHE-Laying-Train and its ability to perform all the functions as laid down in the specifications above shall be fulfilled. These tests shall be conducted under field conditions. All individual units shall be checked for their desired function as per specification.

| | | |
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14.4 The emergency braking distance (EBD) for fully loaded car from maximum speed of 80 km/h shall not be more than 350m.

15.0 ISSUE OF PROVISIONAL SPEED CERTIFICATE :

15.1 Whenever a new rolling stock is introduced in Indian Railways, there is a provision in policy Circular No. 6 to issue provisional speed certificate by RDSO based on proven design parameters of the Car, successful completion of prototype and simulation study. Final speed clearance of the vehicle is given after conducting detailed oscillation trial of the Car, which is a time taking process. Therefore, issue of provisional speed certificate for the Car becomes a necessity and based on the same, the approval of running of the Car on Indian Railway track is taken from Commissioner of Railway safety.

15.2 As soon as the supplier completes the design of the "self-Propelled OHE-Laying-Train " as per specifications, the technical details as per Annexure (II & III) shall be supplied for processing of provisional speed certificate for the "self-Propelled OHE-Laying-Train " so that it can be permitted to move on track. On case to case basis, more technical details (other than mentioned in Annexure II & III) can also be asked for issue of provisional speed certificate for the machine.

16.0 INSPECTION :

16.1 The whole of the materials or fittings used for works covered by this specification shall be subjected for inspection by the Inspecting officer to be nominated by the purchaser and shall be to his entire satisfaction.

16.2 The Inspecting officer shall have the power to: -

16.3 Adopt any means he may think advisable to satisfy him-self that the materials for fittings specified are actually used throughout the construction.

16.4 Take samples for such tests as he may consider necessary by an approved Metallurgist selected by him, whose report shall be final and binding on the contractors.

16.5 Visit at any reasonable time and without previous notice the contractor's works to inspect the progress and quality of the work and the contractor shall provide free of charge all equipment and labour required by him for this purpose.

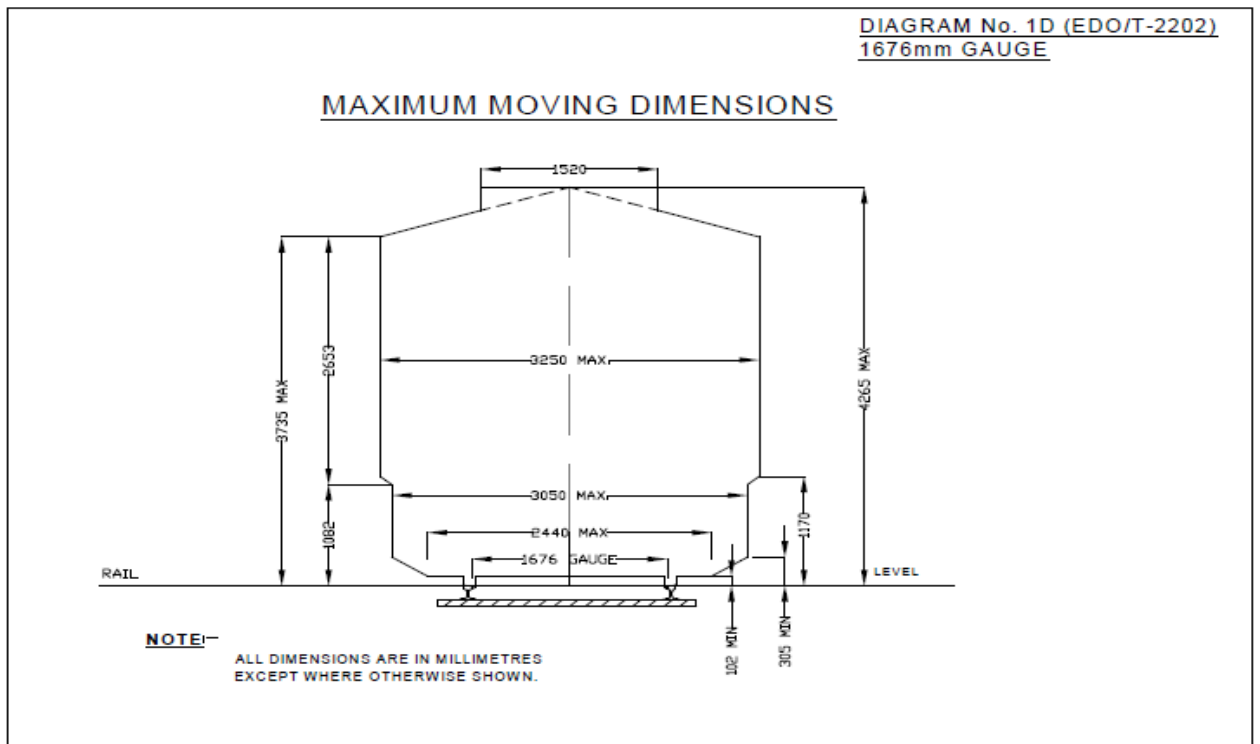
16.6 Reject any material or fittings that do not conform to the relevant specification or good practice, which shall be marked in a distinguishable manner, and shall be disposed off in such a manner as the Inspecting Officer directs. Such rejected parts shall be replaced by the contractor without extra charge.

16.7 Tests of materials and fittings shall as far as possible be carried out at the works of the makers of the materials or fittings. The contractor shall provide such additional materials or fittings as may be required or arrange for test pieces to be incorporated in forgings and castings as required by the Inspecting Officer and for their removal in his presence for test purposes. All tests in the works of the contractors and their sub-Contractors shall be at the cost of the contractors.

- 16.8 No material shall be dispatched or packed until it has been passed by the Inspecting Officer. Such passing shall in no way exonerate the contractor from their obligation in respect of quality and performance of the OHE-Laying-Train and 8-WDETC.
- 16.9 In the event of dispute between the Inspecting Officer and the Contractor, the decision of the purchaser shall be final and binding.

FINAL DRAFT

Annexure-I



Annexure-II

**PARTICULARS TO BE SUPPLIED FOR IN RESPECT OF OHE
LYING TRAIN WITH THE TENDER OFFER**

1. A diagram showing elevation with salient dimensions, Wheel spacing, Wheel diameter, bogie centres and axle load. :

- a)
 - i) Overall length of the Car:
 - ii) Length overhead stock :
 - iii) Length over buffers :
 - iv) Distance apart for Centre of buffers above rail level

- b)
 - i) Wheelbase :
 - ii) Axle load (max/min) :
 - iii) Bogie Centres :

2. Wheel dimension
 - i) New :
 - ii) Worn out :

3.
 - i) Tread and flange profile of the wheel Indicating clearly whether it is Indian Railway standard profile or differs from standard flange profile. :
 - ii) Wheel gauge dimension- (back to back of tyre flange). :

4. Whether the stock is designed to be used As a general purpose or in a closed circuit in specified sections under defined conditions. :

5. Maximum design speed
 - i) Own power :
 - ii) In train formation :

6. Un-sprung weight per axle in tones
 - i) Driving axle :

- ii) Running axle :
- 7. Expected lateral force in tones per axle at Maximum design speed :
- 8. Method of operation (Only Driving Cars) whether single only or coupling together is possible If coupling is possible, the number which can be coupled and what is trailing load? :
- 9. Maximum tractive effort at start and at the speed of Operation-
 - i) At working drive at start
at operation speed
 - ii) At transfer drive at start
at maximum speed
- 10. Maximum braking force coming on to the rails per wheel.
 - a) at working axle
:
 - b) at transfer axle.
:
- 11. Drawing indicating suspension arrangement details of bogie and axle.
- 12. Height of centre of gravity (COG) from rail level :
Height of floor from rail level
:
Type of coupler provided–Indian Railway standard
Coupling
: Buffer
- 13. Compliance of clause 3.9 Safety features
:
- 14. Compliance of clause 3.10 Other safety features
:
- 15. Compliance of clause 4.0(technical specification for unrolling/re rolling car of OHE laying train.
- 16. Make of the DETC offered as per latest RDSO Specification TI/SPC/OHE/8WDETC/0092.
- 17. Total weight of un-rolling/re-rolling car
 - in fully loaded condition (in Ton)
 - in empty condition (in ton)
- 18. Tools and instruction manual as per clause 9.0.
- 19. Make, type and Calculation for capacity adequacy for batteries.
- 20. Make, type and Calculation for capacity adequacy for diesel engine as per para 4.0(3)

21. Make, type and Calculation for capacity adequacy for Crane as per para 4.0(10).

Annexure-III

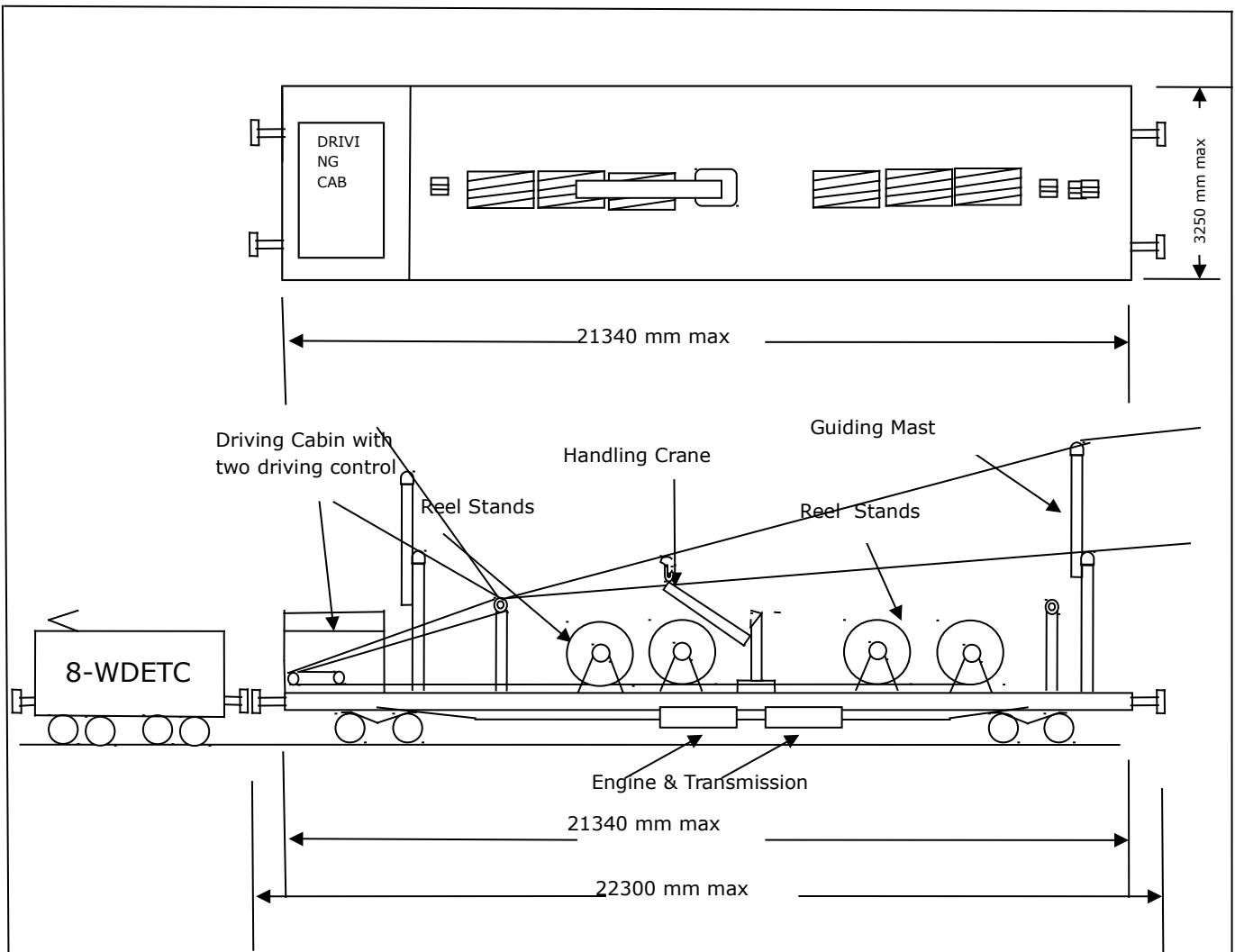
DATA REQUIRED FOR PROVISIONAL SPEED CERTIFICATE

Following information as detailed below is also required along with the information required as per Annexure -II for processing the case for issue of provisional speed certificate for new vehicle.

| S.No. | Item |
|-------|---|
| 1. a) | Brake System details |
| b) | The supplier shall submit details of brake system covering brake schematic diagram, working principle, brake power diagram calculation for EBD, number, dimension and type of brake blocks and literature on brake equipment's proposed along with offer and get the brake system approved from RDSO before manufacture of the prototype. |
| c) | Gross Braking Ratio |
| 2 | Brake rigging arrangement drawing and calculation of braking force |
| 3. | Maximum Braking Effort. At start and at the speed of operation- a) At working drive at start : at operation speed : b) At transfer drive at start : at maximum speed : |
| 4. | Characteristics of springs used in suspension indicating free height, working height, dynamic range stiffness and locations etc. |
| 5. | Characteristics of the dampers if used, and overall damping factors and locations of dampers. Calculation of the following frequency of the Car to be attached: i) Bouncing, ii) Pitching & iii) Rolling Wave length of free axle and bogie. |
| 6. | Write-up and salient design calculation on suspension system, type of suspension whether it is of coil suspension with or without dampers and laminated bearing springs and double link suspension. |
| 7. | What are lateral clearance of axle box/horn, wheel flange/rail and other locations for the negotiability of the Car on curve and turn out (enclose Vogels Diagram for negotiability on maximum degree of curve and turnout permitted on Indian Railways) of new and worn out wheel. |
| 8. | Wheel and axle assembly drawings |

| | |
|-----|--|
| 9. | Calculation for flange force |
| 10. | Technical specifications of Car supplied. |
| 11. | Calculation of natural frequency. |
| 12. | Calculation of spring characteristics and critical speed of the Car. |
| 13. | Simulation result showing ride index, lateral force and acceleration results |
| 14. | A certificate regarding the speed of the Car for which it has been designed |

Annexure-IV



Tentative Conceptual Sketch of Self-Propelled OHE-Laying-Train

Annexure

-V

TRACK TOLERANCES & CLASSIFICATION OF TRACK- B.G.

| Parameter | Category | Extent of track irregularity for different categories | Extent of Track Irregularity for High Speed Track C&M-1, Vol.I., Services Tolerances | High Speed Limiting category of Track |
|-------------------------|------------------|---|--|---------------------------------------|
| Gauge | A B C | Upto ± 3 mm Upto ± 6 mm above ± 6 mm | Same as in the Indian Railway & works Manual, reproduced/ vide/below para 622. On straight: $4^\circ -3$ mm to + 13 mm | B-category |
| Unevenness (3.6 m base) | A B C D | Upto 1.39 mm on chart Upto 1.39 mm on chart Upto 15 mm Above 15 mm | 6 mm in general and 10 mm for isolated locations. | A-category |
| Twist (3.6 m base) | A B C D | Upto 1.39 mm per m (a) (5.0 mm) on chart Upto 2.08 mm per m (7.5 mm) on chart Upto 2.78 mm per m (10.0 mm on chart) Upto 1.39 mm per m (b) (5.0 mm) on chart | On straight and curve track, other than on transition, 2mm/m except that at isolated locations, this may go upto 3.5 mm/m. On transition on curves, local defects should to exceed 1 mm/m except that at isolated locations, this may go upto 2.1 mm/m. | B-category |
| Alignment (7.2 m base) | A B C | ≤ 3 mm > 3 mm ≤ 5 mm > 5 mm Notes: 1) 10 points edceeding outer limit of an irregularity under each category is allowed in 1 km length of track. 2) The number of peaks in each km exceeding the outer limit for B-category to be indicated as suffix. | (a) On straight track 5 mm, values of 10 mm could be tolerated at a few isolated spots. (b) On curves ± 5 mm over the average versine, values upto ± 7 mm could be tolerated at a few isolated spots. A total change of versine from chord to chord should not exceed 10 mm | B-category |

Annexure-VI

Particulars to be supplied by Supplier

The following particulars pertaining to diesel engine and auxiliary equipment shall be submitted by the tenderer at design approval stage.

1.1 Diesel Engine

General Data

1. Exact description and model of the engine
2. Rated output of the engine under site condition
3. Rated engine speed
4. Number and arrangement of cylinders
5. Cylinder bore
6. Piston stroke
7. Compression ratios
8. Mean piston speed
9. BMEP at rated output
10. Normal no load idling speed
11. Peak firing pressure
12. Full test result and data pertaining to engine tests
13. Specific fuel consumption at various throttle position with tolerance band and site conditions Indicate the lower calorific value of the fuel used in arriving at the specific fuel consumption figure.
14. Fuel oil consumption at idle speeds (normal & low)
15. Lube oil consumption at rated output as percentage of fuel oil consumption
16. De-rating calculation for site condition
17. Safety devices provided
 - (i) Over speed
 - (ii) Overload
 - (iii) High cooling water temperature
 - (iv) High lube oil temperature
 - (v) High exhaust temperature
 - (vi) High intake temperature
 - (vii) Low lube oil pressure gauge
 - (viii) Low lube oil level gauge
 - (ix) Low cooling water level sensor
 - (x) Engine emergency stop switch
 - (xi) Low hydraulic oil level sensor
 - (xii) Any other
18. Number of engines of this type in traction service
19. Weight of engine excluding oil and water
20. Weight of water contained in the engine
21. Weight of oil contained in the engine
22. Weight of major equipment
 - Turbocharger
 - Charge Air cooler
 - Crank case bare

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- Piston and connecting rod
 - Cylinder liner
 - Cylinder head
23. Temperature of exhaust gas at turbo inlet at rated output under site conditions
 24. Method of starting giving details of equipment
 25. Estimated period between top and major overhaul
 26. Periodicity of overhauling the following critical items
 - Turbocharger
 - Piston and piston rings
 - Air and exhaust valve
 - Main bearings
 - Connecting rod bearings
 - Fuel injection pump
 - Fuel injectors
 27. Special design features of engine high-lighting the measures which have been taken to achieve : -
 - Lower specific fuel consumption
 - Lower lube oil consumption
 - Reduced thermal and mechanical loading of critical components
 - High reliability
 - Maximum availability
 28. General arrangement and dimensional details
 29. Characteristic curves for torque, output and specific fuel consumption for different setting of the fuel injection pump
 30. Torque-speed curve, which the manufacturer considers to be the maximum torque that, should be used for rail traction.
 31. The curve of fuel consumption for no-load running commencing from the minimum idling speed, expressed in kg/h.
21. Details of 8-Wheeler DETC Tower Car as per RDSO Specification TI/SPC/OHE/8WDETC/0092.

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**Annexure-
VII**

CERTIFICATE OF COMPLIANCE

This certificate is issued in the full knowledge that the proposal submitted is in clause by clause compliance with the purchaser's requirements and there is no material deviation from the tender specification.

Signed.....
Authorised representative

Annexure-

VIII

Statement of Deviations from Tender Specifications

| S.N. | Clause No. of Specification | Description | Deviations in the offer | Reason of Deviation |
|------|-----------------------------|-------------|-------------------------|---------------------|
| | | | | |

Signed.....
Authorised representative