

Specification No. 12

**Self-Propelled Wiring Train Consisting of Multipurpose
Vehicles for Un-Rolling/Re-Rolling of Contact & Catenary
Wire including adjustment of Over Head Lines on B.G.
(1676mm) Routes of Indian Railways**





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TECHNICAL SPECIFICATION

For

Self-Propelled Wiring Train Consisting of Multipurpose Vehicles for Un-Rolling/Re-Rolling of Contact & Catenary Wire including adjustment of Over Head Lines on B.G. (1676 mm) Routes of Indian Railways

Specification No. TI/SPC/OHE/WIRING/0091

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Self-Propelled Wiring Train Consisting of Multipurpose Vehicles for Un-Rolling/Re-Rolling of Contact & Catenary Wire including adjustment of Over Head Lines on B.G. (1676 mm) Routes of Indian Railways

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SELF-PROPELLED WIRING TRAIN CONSISTING OF MULTI-PURPOSE VEHICLES FOR UN-ROLLING/RE-ROLLING OF CONTACT & CATENARY WIRE INCLUDING ADJUSTMENT OF OVER HEAD LINES (OHL) ON B.G. (1676MM) ROUTES OF INDIAN RAILWAYS

1.0 GENERAL

- 1.1 This specification is for a Self Propelled Wiring Train consists of multi-purpose Vehicles for un-rolling/re-rolling of Contact & Catenary Wire (messenger wire) of Over Head Lines (OHL) on B.G. (1676mm) Routes of Indian Railways. Each Vehicle of the Wiring Train shall be self-propelled. The wiring train shall be capable of simultaneously laying out (un-rolling) new contact and catenaries wires. It shall also be capable of simultaneously re-rolling of contact and catenary wires during replacement.
- 1.2 While laying out new contact and catenary wires, it shall be capable for erection of tensioning equipment and droppers. It shall also be capable for providing proper tension in contact and catenary wires, adjustment of droppers and OHE profile for proper height of contact wire and stagger etc. Laying out of contact and catenary wires are to be done under traffic block for a tension length varying from 400 m to 1550 m and the over head line (OHE) to be handed over after completion of all works including adjustment (i.e laying of new contact and catenary wires, provision of tensioning equipment, droppers and their adjustment for proper OHE profile) and the same is to be handed over to the traffic department for train movement. The above entire process is to be completed within a sanctioned/granted traffic block and duration shall vary depending upon the various circumstances.
- 1.3 While replacing contact and catenary wires, it shall be capable for removal of droppers/jumpers and then re-rolling of contact and catenary wires simultaneously. It shall be capable for laying contact and catenary wires with tensioning equipment and droppers and shall provide proper tension in contact and catenary wires, adjustment of droppers and proper OHE profile for height of contact wire and stagger etc. Replacement of contact and catenary wires are to be done under power and traffic block for a tension length varying from 400 m to 1550 m and the over head line (OHE) to be handed over after completion of all works including adjustment (i.e. replacement of contact and catenary wires, laying of new contact and catenary wires, provision of tensioning equipment, droppers and their adjustment for proper OHE profile) and the same is to be handed over to the traffic department for train movement. The above entire process is to be completed within a sanctioned/granted power and traffic block and duration shall vary depending upon the various circumstances. However, it is expected that the above process shall complete in all respect within a period of two (2) hours (from start to finish the erection work) for a full tension length of about 1500 meters.



- 1.4 Generally, continuous block of more than 2 hours may not be available at a stretch. In such circumstances, short block of say of 45/60/75 minutes, if made available, then partial work may have to be done. Tenderer may furnish block availability wise activity details, which can be taken up in the manner given below:

Traffic Block duration in minutes	Role of front tower car	Role of front platform carrier car	Role of reel wagon in the middle	Role of rear platform carrier car	Role of rear tower car	Remarks including extent of work which can be finished	Total staff requirement
45 to 75							
75 to 120							
120 to 180							
More than 180							

The above table shall be applicable for new electrification as well as during replacement of contact and catenary wires. The tenderes shall submit the information in separate table.

- 1.5 Tenderers shall furnish a detailed scheme indicating approximate time require to complete all above activities for laying and replacement of one tension length of both contact and catenary wires.
- 1.6 Each vehicle of the wiring train shall be robust, sturdy and capable of operating under the conditions prevailing on Indian Railways.
- 1.7 Tenderers are requested to carefully study the specifications and ensure that their equipment fully complies with the specifications.
- 1.8 The tenderer shall specify the model(s) offered and furnish their details technical description. Systems/sub-systems and working mechanisms of the wiring train shall be described with necessary details in the "Technical Description", alongwith the sketches to depict the manner in which the requirements of the specifications are accomplished by the wiring train (model) offered.
- 1.9 Details including sketches/photographs of the similar wiring train having been supplied to others shall be enclosed with the offer. The photographs shall also show close-ups of various working assemblies/ systems and the full wiring train. The tenderer shall furnish a video CD showing the working of wiring train under field conditions. The tenderer shall submit a sketch of rough layout of the wiring train while quoting in the tender.



- 1.10 The offered equipment meets the performance and quality requirements of the wiring 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.
- 1.11 Type test report of engine, Alternator, Traction Motors, Rectifiers, Crane, transmission, cardan shaft and axle drive gear box at the time of approval shall be submitted. If the mentioned tests are not conducted in the past, fresh test shall be conducted for final acceptance.
- 2.0 QUALITY ASSURANCE PLAN
- 2.1 The contractor should possess valid ISO-9001:2000 certificate for his work's address, covering the items for which he is participating in the contract. The contractor shall formulate Quality Assurance program (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 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. The preparation of necessary charts and proforma shall be to IS: 7200 (Part-III)-2009.
- 2.2 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" has been approved by RDSO.
The above shall apply to the main contractor as well as sub-contractors.
- 3.0 ANNUAL MAINTENANCE CONTRACT (AMC)
- 3.1 The tenderer shall quote for AMC comprehensive of all equipments including Diesel Engine complete with transmission and cooling system, alternators, traction motors, rectifiers, Air Brake system with compressor unit, Control System, Elevating and Rotating platforms, cranes and cradles, Guiding /Re-Rolling mast etc. The Annual Maintenance shall be applicable after warranty period for 5 years. The tenderer shall quote year wise rates of AMC detailing the various schedule 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 preventing 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.

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.

3.2 In case of failure of any of the equipment covered under maintenance contract, it shall be repaired or replaced within reasonable time not exceeding 05 days from the day of reporting by the consignee. After this period of 05 days, penalty at the rate of Rs.5000 per day (flat) shall be imposed on the contractor for each day, or its part thereof.

3.3 The AMC agreement shall be entered with the Zonal Railways as per the accepted rate in the contract.

4.0 SYSTEM'S REQUIREMENTS

4.1 The profile of the equipped Wiring Train longitudinally and in cross section during movement shall be within the maximum moving dimensions show in the Indian Railways Standard BG Schedule of Dimensions (metric)-Rev-2004. These dimensions are shown at Annexure-I. The tenderer shall provide sketches of the equipped Wiring Train in plan and shall give calculations to prove that the equipped Wiring Train does not cause infringement while moving on a 10° curve at any cross section.

4.2 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.

4.3 Wherever applicable, axle load shall be less than 20.32 tonne for 8-Wheeler. The minimum axle spacing of 1.83 m. Load per metre shall not exceed 7.67 t for 8-Wheeler.

4.4 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 ⁰ C to 50 ⁰ 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
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.
Vibration	The equipment, subsystem and their mounting arrangement shall be designed to withstand satisfactorily the vibration and shocks encountered in service as specified High level of vibration and shocks. Accelerations over 500 m/s ² have been recorded at axle box level for long periods during run. Vibrations during wheel slips are of even higher magnitude.
Wind Pressure	High wind speed in certain areas, with wind pressure reaching 200 kgf/m ²

4.5 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 |
- (g: Acceleration Gravity)

4.6 INDIAN TRACK PARAMETERS

S.N.	Description	Specified Values
1.	Gauge	1676 mm Broad Gauge (BG)
2.	Maximum Gradient	1: 30



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 Permanent Way Manual and para 607 (I) gives details of track Category for various parameters. The extract for Broad Gauge track as of now is given in Clause 4.6.1 below, However, any amendments in this regard at later stage shall be applicable.
7.	Third report of criteria committee shall be considered for number of peaks per kilometer, if specified any.	

4.6.1 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: 4o -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	Upto 1.39 mm per m (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
	B	Upto 2.08 mm per m (7.5 mm) on chart)		
	C	Upto 2.78 mm per m (10.0 mm on chart)		
	D	Upto 1.39 mm per m (5.0 mm) on chart)		
Alignm ent (7.2 m base)	A	≤ 3 mm	(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
	B	> 3 mm ≤ 5mm		
	C	> 5 mm		
		Notes: 1)10 points exceeding 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.		

4.7 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, if within the limits shown in SOD 1676 mm gauge (BG) revised 2004 (Annexure-I).
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4.8 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
7.	Mechanical Tension	The actual tension requirement shall be 2000 kgf. However, 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 Un-Rolling/ Re-Rolling Car shall be capable to wire conventional and high rise type OHE.	

5.0 SCOPE OF SUPPLY:

5.1 The Wiring Train shall consist of self-propelled multi-purpose vehicles. A Block diagram showing the composition of train formation of these multipurpose vehicles is given below.



A brief of the above vehicles is given as under

5.2 TOWER CAR-1 & 2:

The 8 wheeler tower car 1 & 2 shall have diesel electric transmission and generally conform to the technical specification No.TI/SPC/OHE/8WDETC/0090 (02/09) Rev.1. Alternatively, the supplier may offer Hydraulic Transmission System for Tower Car 1 & 2. Broad details of Hydraulic Transmission System are attached as Annexure-VI & VII. The power and traction equipments shall be designed and manufactured to meet the requirement to start and haul the trailing load of two platform carrier cars, one un-rolling /re-rolling car and one tower car. Each tower car shall work independently and shall be capable to haul the train formation in loaded condition at a speed of 80 kmph on level track. When the tower car-1 is hauling the wiring train, the tower car-2 shall be in trailing position unpowered and vice-versa. The tower cars shall be used for erection of counter weights/ tensioning devices, cantilevers and other OHE fittings and



unloading of Contact and Catenary Wires drums. Unrolling/re-rolling shall be possible in both the directions. It shall have provision to move at creep speed of (0-5) kmph on its own power while working and can run at a speed of 5-10 kmph for clearing the block section. The car shall be suitable to run at a towing speed of 80 kmph in train formation. The standards, specification and other design details along with list of machinery and equipments to be provided in the tower cars are detailed in para 6.1 & 6.4.

5.5 SAFETY FEATURES

All the multipurpose vehicles shall be provided with following UIC approved safety features:

1.	Standard VCD of approved make.
2.	Emergency stop switches
3.	Horn
4.	Flasher Units
5.	Marker light
6.	Head lights
7.	Speed Recorder
8.	Emergency brake valves
9.	Parking brake
10.	Electrically operated wipers
11.	Fire extinguishers

5.6 OTHER SAFETY FEATURES

- 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 and platforms must react in failsafe manner if the hydraulic supply system fails.
- The machine shall have guaranteed stability even with their platforms and/or cranes fully extended.
- Cranes 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 equipments, access doors and line equipment shall be provided to ensure.
 - (i) Safety of men and.
 - (ii) Stability of the multipurpose vehicles while in operation.
(The tenderer shall indicate the proposed interlocking and safety aspects.)



5.7 REQUIREMENT FOR EXECUTION OF WORK:

- It shall be possible to move the machines without jolting while their platform and/or cranes are not fully extended.
- Platform shall have supply points (Electrical and Pneumatic) on them for operating any tools that may be used for erection of OHE
- Adequate lighting having minimum illumination level of 250- 300 Lux shall be provided for working in the night.
- The work of wiring train shall start after erection of masts and brackets in the section to be wired.
- Each vehicle of the Wiring Train shall be self-propelled and shall run independently at the creep speed of 0 – 5 kmph at work site.
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 Wiring Train or its any part shall not infringe the adjoining track as per Schedule of Dimensions of Indian Railways.

6.0 SPECIFICATION OF MULTI PURPOSE VEHICLES

6.1 TECHNICAL SPECIFICATION COMMON FOR PLATFORM CARRIER CAR AND REEL WAGON OF WIRING TRAIN.

Para	Subject	Item	Technical specification
1.	Vehicle Parameters	Cab	One Driving cab with two driver's control desk having compete operating and driving control shall be available in front of the driving seat with easy access and full view of the driver in both direction (details to be submitted along with offer)
		Dimensions	As per Indian railways Schedule of Dimensions 1676 mm Gauge (BG), Revised 2004 (with latest revision)
		Coupling and Buffer Arrangement.	Centre Buffer Transition with screw coupling conforming RDSO's Specification No. 56-BD 07 along with the side buffer arrangement to RDSO's Drawing Number SK-98145.
		Axle	Generally shall conform to RDSO's Drawing No. IRS R-43/92
		Maximum Axle load.	20.32 Tonne (The maximum axle load shall not exceed 20.32 tonne in any case and preferably shall be as less as possible)
		Wheels	Generally shall conform to RDSO's Drawing No. IRS R-19/93
		Wheel Profile	Generally shall conform to RDSO drawing No



Para	Subject	Item	Technical specification
			SK-91146
		Frame, frame components and bogie.	As per standards of the manufacturer suitable for mentioned applications (details to be submitted along with the offer)
		Brake system	UIC/RDSO approved Air brake system, suitable for mentioned applications (The supplier shall submit details of brake system covering brake schematic diagram, working principle, brake power diagram calculation for EBD, dimension and type of brake blocks and literature on brake equipment's proposed alongwith offer and get the brake system approved from RDSO before manufacture of the prototype.)
		Parking Brake	Parking Brake shall be provided as per standard.
		Wheel base and wheel diameter	As per Chapter IV-(A) of Indian railways Schedule of Dimensions 1676 mm Gauge (BG), Revised 2004 (with latest revision)
		Central control console, Manual backup	Detailed layout of cubicle with control equipment for central controls of vehicles shall be submitted.
		Batteries	As per standards of the manufacturer suitable for mentioned applications (details to be submitted)
		Other Features	The following features or suitable alternatives shall be supplied in the vehicle: <ul style="list-style-type: none"> • Fire Extinguisher in Cab & First Aid Kit • Twin Beam Head Light, Marker Lights (Red Aspect) & Tail Lights, Flasher Light. • Working lights- Flood lights, Orientable Search light. Detachable search light. • Cordless Public Address System. • Close circuit TV(LED) screen with video Camera. • Standard Mobile charging socket. • Speedometer • Lockable Tool Box
2.	Portable DG set		Sound proof 7.5 kVA, 3 phase, DG set shall be provided to cater the power requirement of Electrical System.
3.	Pantograph		An electro pneumatically operated, insulated and an earthing pantograph fitted with a knife connector, suitable for 25 kV ac of reputed make. The knife connector located



Para	Subject	Item	Technical specification
			on the roof is actuated by means of an electro pneumatic device, coupled to the vehicle compressed air circuit. The earthing pantograph ensures perfect equipotential continuity between contact wire and rail
4.	Pneumatic Auxiliaries	Horns	The tower car shall be fitted with two horns of dual tone at the roof of the car.
5.	Electrical Auxiliaries		<ul style="list-style-type: none"> All components shall comply with applicable IEC standard. The electrical wires shall be oil and fire resistant. All electrical and electronic components shall be suitably protected as per standards and with requirement suitable for the climate prevailing in India (refer para 4.4). All control system shall be preferably 110 V DC
6.	Painting		Detailed painting and colour schemes shall be submitted
7.	Documents	Machine Manuals (in both soft and hard copy)	<p>The following manuals (two sets each) shall be supplied with the machine:</p> <ul style="list-style-type: none"> Operators Manual Maintenance Manual Spare Part List Detailed Drawings of all major parts Hydraulic Scheme & Part List Electrical Scheme & Part List Engine Book & Spare Part List Load Chart of the crane with slew angle
8.	Spare parts		<p>The list of standby spare parts along with price shall be submitted</p> <p>The list of recommended spare parts for maintenance along with their prices shall be submitted.</p>
9.	Service Tools		A List of service tools free of cost shall be submitted along with offer.
10.	Warning/Sign Boards		The warning/ sign boards, as applicable shall be provided. Details shall be submitted with the offer.
11.	Vehicle 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)



Para	Subject	Item	Technical specification
12.	Specifications/ Standards		A list of standards and specifications for manufacturing, testing and commissioning of various equipment shall be submitted along with offer.

6.2 Self-propelled 8-wheeler Tower Car for Over Head Equipment (OHE) works.

Para	Subject	Item	Technical specification
1	General		<p>The 8 wheeler tower car 1 & 2 shall have diesel electric transmission and generally conform to the technical specification No.TI/SPC/OHE/8WDETC/0090 (02/09) Rev.1. Alternatively, the supplier may offer Hydraulic Transmission System for Tower Car 1 & 2. Broad details of Hydraulic Transmission System are attached as Annexure-VI & VII. The power and traction equipments shall be designed and manufactured to meet the requirement to start and haul the trailing load of two platform carrier cars, one un-rolling /re-rolling car and one tower car. Each tower car shall work independently and shall be capable to haul the train formation in loaded condition at a speed of 80 kmph on level track.</p> <p>The general design of the 8 wheeler tower car shall be as per standard industry practices, 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 the tower car such that it is acceptable to the buyer. The tower car shall be manufactured so that it can be used for working under all weather conditions in India.</p>
2	Purpose of use (applications)		<p>1) The tower cars shall be used for various railway Electrification works i.e.</p> <ul style="list-style-type: none"> • The tower car 1&2 shall be designed and manufactured to meet the requirement to start and haul the trailing load of two platform carrier cars, one un-rolling /re-rolling car and one tower car. • Each tower car shall work independently and shall be capable to haul the train formation in loaded condition at a speed of 80 kmph on level track. • Inspection, erection and maintenance of OHE. • Erection of counter weight/tensioning devices • Cantilever and OHE adjustment works. • It shall have one hydraulic swivelling and lifting platform. • It shall have workshop equipped with necessary equipment. <p>2) The tower car 2 shall have following additional features and shall be equipped for measuring and recording OHE parameters such as -</p>



Para	Subject	Item	Technical specification	
		d) Height of contact wire. e) Stagger of contact wire f) Thickness of contact wire g) Gradient of the contact wire.	All measured data shall be made available on the onboard microprocessor based data acquisition and analyser system. It shall be possible to generate suitable reports and print them on a printer provided in equipment room on the car. The tenderer shall submit a detailed scheme along with the measuring equipment with offer	
3	Vehicle parameters	Vehicle Type	8 -wheeler with two bogie	
		Max Speed with trailing load	80 kmph	
		Max Speed when running alone.	110 kmph	
		Creep Speed	0-5 kmph	
		Diesel Engine	<ul style="list-style-type: none"> Fuel efficient Diesel Engine of suitable capacity with all accessories including safety devices from reputed manufacturer (details to be submitted) The diesel engine shall be of Common Rail Direct Injection (CRDI) type. Exhaust emission shall be below the limit laid down in UIC/ORE No. B13/RP22/E Clause 4. The total engine power shall be adequate to start and haul the complete wiring train at 1 in 60 up gradients. Tenderer shall furnish the train 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. 	
4		SAND BOX	i) Four sand boxes of approximate 25 liters with water tight cover shall be provided ii) Four ejectors actuated by electro-distributors, controlled by means of push-buttons from the control panel in the cab.	
5	Elevating and Rotating Platform	Dimensions and Capacity	Length	-5700 mm (Approx.)
			Width	-1500 mm (Approx.)
			Rotation	±90°
			Capacity - (5 Persons with tools)-	500 kg.



Para	Subject	Item	Technical specification
		Accessories	It shall be equipped with foldable railing of 1100 mm height with access gate and locking arrangement, anti skid flooring, a hydraulic rotating and lifting devices, removable guiding rollers for support of contact wire, mechanical locking device for fixing the platform on the lowered position, a detachable control panel and two search lights, four number flood lights, two electrical socket, pneumatic outlets etc.,
		Control	The detachable Control Panel positioned inside platform includes controls and checks for – movements of the elevating platform (lifting, lowering, rotation and extension), work creep speed, brake/brake release, automatic & emergency brake. It shall have provision to bring back the platform in travelling position in case of hydraulic failure, engine failure etc.
		Safety devices	i) Using of elevating platform is allowed only if the suspension on the rear axle is locked. ii) Unlocking of suspension, travelling speed and lowering of pantograph are allowed only if the elevating platform and crane are closed in travelling position.
6	Pantograph		An electro pneumatically operated, insulated and an earthing pantograph fitted with a knife connector, suitable for 25 kV ac of reputed make. The knife connector located on the roof is actuated by means of an electro pneumatic device, coupled to the vehicle compressed air circuit. The earthing pantograph ensures perfect equipotential continuity between contact wire and rail
7	Work shop		Equipped with metal table fitted with necessary equipment such as bench vice, fixed drill machine, cutting machine, grinders ,hand tools etc.it shall also house a cabinet for storing maintenance spares
8	Testing	Type tests	<ul style="list-style-type: none"> Oscillation Trial-The Riding Quality Test shall be conducted at a speed which is 10% higher than the maximum specified operating speed. The test shall be conducted as per RDSO's conventional DAS method as mentioned in RDSO



Para	Subject	Item	Technical specification
			<p>Document No. MT-334.</p> <ul style="list-style-type: none"> Emergency Breaking Distance (EBD) and Haulage Capacity Test shall be conducted. Squeeze Load Test shall be carried out as per standards. <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 vehicle, assemblies, attachments Verification of submitted performance particulars of vehicle, assemblies, attachments Verification of safety features
		Weighment	Tower Car shall be weighed as per standards.

6.3 SELF-PROPELLED PLATFORM CARRIER CAR FOR OVER HEAD EQUIPMENT (OHE) WORKS

Para	Subject	Item	Technical specification
1	General		The general design of the platform carrier car shall be as per standard industry practices, 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 platform carrier car such that it is acceptable to the buyer. The platform carrier 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 as stipulated in para 4.7
2	Purpose of use (applications)		<p>The platform carrier car shall be used for various railway Electrification works i.e. for maintenance, erection of new and removal of old OHE, Cantilever and OHE adjustment works and shall have following features.</p> <ul style="list-style-type: none"> Self propelled vehicles for working at work site. Hydraulic swivelling and lifting platform. Telescoping and tilting mast. Storage space for storing OHE material/components.
3	Vehicle parameters	Vehicle Type	8 -wheeler with two bogie
		Max Towing Speed	80 kmph



Para	Subject	Item	Technical specification
		Creep Speed	0-5 kmph
		Transmission	<ul style="list-style-type: none"> Hydrodynamic/Hydrostatic transmission with creep speed gradually regulated (0-5 kmph). The driving mechanism shall be rugged and efficient to perform satisfactorily during operation and run. It shall have stand-still detector to avoid jerks during reversal of direction of motion. Details of all hydraulic equipment/fittings along with controls shall be submitted with the offer.
		Diesel Engine	<ul style="list-style-type: none"> Fuel efficient Diesel Engine of suitable capacity to operate at a working speed of 0-5 kmph with all accessories including safety devices from reputed manufacturer (details to be submitted) Exhaust emission shall be below the limit laid down in UIC/ORE No. B13/RP22/E Clause 4. Tenderer shall furnish the vehicle 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.
4	Elevating and Rotating Platform	Dimensions and Capacity	Length - 6000 mm (Approx.) Width - 1500 mm (Approx.) Maximum floor height - In lowered position-2600mm (Approx.) - In raised position -7500 mm (Approx.) Rotation $\pm 90^\circ$ Capacity - (Persons with tools)- 1500 kg (Approx)
			Accessories



Para	Subject	Item	Technical specification
			electrical socket, pneumatic outlets etc. (Details to be submitted with offer)
		Control	The detachable Control Panel positioned inside platform includes controls and checks for – movements of the elevating platform (lifting, lowering, rotation), work creep speed, brake/brake release, automatic and emergency brake. It shall have provision to bring back the platform in travelling position in case of hydraulic failure, engine failure etc.
		Safety devices	i) Using of elevating platform is allowed only if the suspension on the rear axle is locked. ii) Using of elevating platform is allowed only if the pantograph is in the raised position. iii) Unlocking of suspension, travelling speed and lowering of pantograph are allowed only if the elevating platform is closed in travelling position.
5	Crane and Cradle	Crane and cradle	<ul style="list-style-type: none"> Crane and cradle shall be mounted at a suitable location on car as per IRS-37, EN13000, EN13001 and ISO 4305. All safety provision for ensuring safety of equipment and its sub system, the material, the surrounding, the operator, helper and any other Rail/Road user etc shall be provided.
		Lifting capacity	8-tonne metre (Approx.)
		Height in folded condition	Should not infringe MMD of Indian railways Schedule of Dimensions 1676 mm Gauge (BG), Revised 2004 (with latest revision), as per Para 4.7
		Outreach	Horizontal - 7.5 Meter (Approx) Vertical - 11.0 Meter (Approx)
		Stabilisers/ Outriggers	As per requirement shall be provided
		Attachment (Bucket/cradle)	As per standards of the manufacturer suitable for OHE works. A special detachable cradle shall be provided. It shall be fitted at the end of the last telescopic boom of the crane.
		Dimensions	
		length	1000 mm (approx)
width	1600 mm (approx)		



Para	Subject	Item	Technical specification
		Height of handrail	1100 mm (approx)
		Capacity (number of persons, weight)	Two persons with tools, 300 kg (approx)
		Maximum lateral outreach from track centre	8 meters (approx)
		Vertical reach from the track centre	11 meters (approx)
		Horizontal rotation of the cradle.	$\pm 90^\circ$ (approx)
		Safety	<ul style="list-style-type: none"> The cradle shall be equipped with an electronic safety load device, electro hydraulic levelling device, rubber mats, two working flood lights and cradle device for tools. 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 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



Para	Subject	Item	Technical specification
			<p>valve (to protect sudden stoppage of any operation due to any reason), hose failure protection, cylinder protection etc. As applicable.</p> <ul style="list-style-type: none"> • Proper safety arrangement for lifting, slewing, lowering and antifall devices for telescopic cylinders of the boom and for derricking cylinders shall be provided. • Machine shall have locking arrangement feature for load in any position. Lowering shall not be allowed by gravity in any case. • Provision of Locking valves to lock hydraulic rams in any case of failure of hydraulic system due to any reason • Stability of machine in all operational position (loaded and unloaded condition, while moving, holding, lifting simultaneously or separately shall be ensured.
		Crane Controls	<p>All the controls of the crane movement shall be fitted at a convenient place for cradle remote control except the forward movement control. One separate control desk for operation and control of emergency brake, movement of crane with cradle, platform, creep speed, stabilizer, lights etc.</p>
		Crane fittings	<ul style="list-style-type: none"> • The crane shall be equipped four 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 with cradle . • 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.
		Safety Devices	<p>i. Unlocking of suspension and lowering of</p>



Para	Subject	Item	Technical specification
		of the Crane	<p>Pantograph are allowed only if the Crane with the Cradle is in travelling position.</p> <p>ii. The Crane with Cradle 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.</p> <p>iii. The advancement in creep speed, controlled by the Radio Remote Control of the elevating platform, is authorised only with crane with cradle in rest position or if the crane is open by the operator on the cradle.</p>
6	Telescopic and tilting mast		A telescopic and tilting mast of suitable design is to be installed in front of the platform to guide cables to the mast when anchoring is required.
7	Testing	Type tests	<ul style="list-style-type: none"> • Oscillation Trial-The Riding Quality Test shall be conducted as per requirement. • Squeeze Load Test shall be carried out as per standards. <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 vehicle, assemblies, attachments • Verification of submitted performance particulars of vehicle, assemblies, attachments • Verification of safety features
		Weighment	Platform carrier Car shall be weighed as per standards.



6.4 SELF-PROPELLED UN-ROLLING/RE-ROLLING CAR FOR OHE WORKS

Para	Subject	Item	Technical specification
1	General		The general design of the self-propelled Un-rolling/re-rolling Car for stringing of contact and catenary wires shall be as per standard industry practices, 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 self-propelled un-rolling/re-rolling Car such that it is acceptable to the buyer. The self-propelled 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 as stipulated in para- 4.7. Tenderer shall submit the detailed layout of Un-rolling/Re-rolling Car along with the offer.
2	Purpose of use (applications)		The self-propelled unrolling/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 their off. It shall be capable of simultaneously unrolling and re-rolling of 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. <ul style="list-style-type: none"> • Self propelled vehicles for working at work site. • Four unrolling/re-rolling reel stands. • Two main guiding masts. • Two auxiliary guiding masts. • Two re-rolling masts. • One reversible tensioner • One crane • Hydraulic power unit etc.
3	Vehicle parameters	Vehicle Type	8 – Wheeler with two bogie
		Max Towing Speed	80 kmph
		Creep speed	0-5 kmph
		Transmission	<ul style="list-style-type: none"> • Hydrodynamic/Hydrostatic transmission with creep speed gradually regulated (0-5 kmph). The driving mechanism shall be rugged and efficient to perform satisfactorily during operation and run. • It shall have stand-still detector to avoid jerks during reversal of direction of motion.



Para	Subject	Item	Technical specification
		Diesel Engine	<ul style="list-style-type: none"> • Details of all hydraulic equipment/fittings along with controls shall be submitted with the offer. • Fuel efficient Diesel Engine of suitable capacity to operate at a speed of 0-10 kmph with all accessories including safety devices from reputed manufacturer (details to be submitted) • Exhaust emission shall be below the limit laid down in UIC/ORE No. B13/RP22/E Clause 4. • Tenderer shall furnish the vehicle 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.
4	Reel stands	Un-rolling/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 un-rolling and re-rolling one wire and shall have independent control. • The length of contact and catenary wire in a drum shall be approximately 1500 and 3000 meters respectively. • 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 • 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.



Para	Subject	Item	Technical specification
			<ul style="list-style-type: none"> c) Gross Weight - 2800 kg (Max) d) Bore for mounting on the stand - 105 mm x 105mm
5	Rerolling Masts		<ul style="list-style-type: none"> • Two rerolling masts shall be fitted in front of reel stands. • These masts shall be fitted with horizontal and vertical rollers to ensure the movement of the wires from the main guiding masts to the reel stands. • Design and drawings of the rolling masts shall be submitted.
6	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, and smooth heads to ensure the movements of the wires. Heads shall be of nylon type material to prevent the damage of the wire.
7	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(A)	Reversible Tensioner		<ul style="list-style-type: none"> • A reversible tensioner shall be capable to un-roll/Re-roll one contact and one catenary wire simultaneously with independent control. It shall be capable of 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.



Para	Subject	Item	Technical specification
8	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 next telescopic elevating platform or to their final position. Each one shall be equipped with guiding rollers For un-rolling and re-rolling and slewing device. All the movements of these masts shall be actuated by means of hydraulic rams.
		Main Telescope column	<ul style="list-style-type: none"> Height of the guiding device (for contact wires) <ul style="list-style-type: none"> a) Minimum - 4150 mm (Approx) b) Maximum - 7500 mm (Approx) c) Horizontal Stroke- ±800 mm (Approx)
		Auxiliary Telescopic Column	<ul style="list-style-type: none"> Height of the guiding device (for catenary wires) <ul style="list-style-type: none"> a) Minimum - 4150 mm (Approx) b) Maximum - 9000 mm (Approx) c) Horizontal Stroke- ±500 mm (Approx) d) Horizontal Rotation-± 180⁰ Note: The controls of the columns shall be at the base of the masts and through wireless remote control.
9	Hydraulic Crane		<ul style="list-style-type: none"> A telescopic hydraulic crane of approximate 22 tonne meter capacity (Approximate), of reputed make shall be provided on board for loading/unloading of reels/drums on reel stands. The maximum horizontal outreach shall be 7.5 meter (approx.) and load shall be 3 tonne (approx.). and the vertical outreach shall be 12 meter (approximately) 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



Para	Subject	Item	Technical specification
			<p>testing agency.</p> <ul style="list-style-type: none"> • 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. <p>Design details shall be submitted along with the offer.</p>
		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



Para	Subject	Item	Technical specification
			<p>accessories for safe operation of crane.</p> <ul style="list-style-type: none"> 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.
10	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>Design details shall be submitted along with the offer.</p>
11	Testing	Type tests	<ul style="list-style-type: none"> Oscillation Trial-The Riding Quality Test shall be conducted as per requirement. Squeeze Load Test shall be carried out as per standards. <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 vehicle, assemblies, attachments Verification of submitted performance particulars of vehicle, assemblies, attachments Verification of safety features
		Weighment	<p>Un-rolling/re-rolling Car shall be weighed as per standards.</p>
12	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 the travelling mode within a reasonable time of 10 to 15 minutes. <p>The Tail Wire Compensation System:</p>



Para	Subject	Item	Technical specification
			The system shall have the function of tail wire compensation and it shall have all safety measures to avoid an accident.

7.0 DESIGN DEVELOPMENT: The wiring train shall be robust, reliable and suitable for working on Indian Railways. Quality assurance during manufacturing of the Wiring Train shall be according to ISO-9001.

- 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 wiring 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 individual units of Wiring Train superimposed on the Maximum Moving Dimensions (MMD), gauge etc. to ensure that no part of the Wiring 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 combinations of wiring 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 ambiguity in the interpretation of design and drawing, the decision of RDSO shall be final and conclusive.

8.0 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 proposals or 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 Auto CAD.
- d) soft copies on DVDs shall also be supplied to the consignee along with hard copies as mentioned above.
- e) Each set of tracings shall form a complete set of working drawings, the first sheet being 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 in to 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.

- 9.0 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.



10.0 CONTRACTOR'S RESPONSIBILITY:

The contractor 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.

11.0 STANDARD DRAWINGS AND SPECIFICATIONS:

- a) The Contractor shall procure RDSO specifications & drawings for manufacturing of the Wiring Train, including those referred to in this specification on payment basis from RDSO.
- b) Indian Railways standard (IRS) specifications and Schedule of Dimension 1676 mm gauge (BG) revised 2004 (SOD) may be obtained on payment from the Manager, Government of India Publications, Civil Lines, Delhi 110 006 (INDIA).

12.0 TOOLS AND INSTRUCTIONS MANUALS:

- i. Each wiring 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 Wiring 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 Wiring Train.
- iii. The manufacturer shall also supply schematic diagrams of electrical, hydraulic, pneumatic and electronic circuits used on the Wiring 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



Wiring Train as above, for operation, servicing, maintenance, assembly overhauling, periodical overhauling of the Wiring Train and troubleshooting guides.

- v While offering Wiring Train for first inspection the supplier shall submit three copies of complete technical literature including operation, service and field maintenance instructions and workshop manuals for overhauling of the assemblies and the Wiring 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.
- vi One portable welding plant of reputed make with a minimum 11 kW/16 HP capacity along with sufficient cable or lead shall be provided with the Wiring Train for day to day repairing of Wiring Train and its wearing parts.

13.0 SPARE PARTS:

- i. The expected life of the components shall be advised along with their condemning limits.
- ii. The tenderer, along with 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). Firm shall have to quote their spares prices. These prices of spares will however be not used for tender evaluation purpose.
- iii. The manufacturer shall be responsible for the subsequent availability of spare parts to ensure trouble free service for the life of the Wiring Train (for a minimum period of 15 years).
- iv. For indigenous parts and bought out components and assemblies, the source and other relevant technical details shall be supplied while offering the first Wiring Train for inspection.

14.0 MANUFACTURER'S TEST CERTIFICATE:

Copies of the Maker's certificate guaranteeing the performance of the Wiring Trains shall be supplied in duplicate along with the delivery of each equipped Wiring Train.

15.0 OPERATOR'S TRAINING:

The requirement of operators and allied staff for running the Wiring Train under normal working condition shall be indicated,



specifying their duties and minimum qualifications. The contractor shall provide training for the two such groups at site per Wiring Train.

16.0 OPTIONAL EQUIPMENT:

Tenderer is expected to quote for optional equipment separately for each item giving the advantages/ functions of such optional equipments. Tenderer shall also indicate whether such equipment is already in use on Wiring Trains elsewhere indicating the user Railway system.

17.0 INSPECTION OF THE WIRING TRAIN:

- a) Wiring Train shall be inspected and tested by the Director General/TI [DG/TI]/RDSO, Lucknow or his authorized representative. All the tests specified in the spec 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 Wiring 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 Wiring Train" as per Annexure- II enclosed
- 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) All critical steel welding joints shall be subjected to radiographic testing after manufacture/repair, to a suitable scheme/ standard suggested/approved by RDSO.



- g) The cost of inspection and testing charges shall be borne by the tenderer. However, lodging, boarding and travelling charges shall be borne by purchaser.

18.0 ACCEPTANCE TEST

- 18.1 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 Wiring Train. The pre-commissioning tests shall be completed and the Wiring Train shall be commissioned within 90 days of its arrival at the premises of the final consignee.
- 18.2 Dimensional check of loading gauge, i.e., maximum moving dimensions, buffer heights, clearances etc.
- 18.3 The riding quality tests shall be conducted at a speed which is 10% higher than the maximum specified operating speed on a section of mainline track over which there are no temporary speed restrictions and which is considered by the railway as being in a generally run down condition for main line standards but without speed restrictions. The tests shall be conducted from a reasonably low speed, which is considered safe by the Indian Railways, upwards in steps of 10-15 km/h to establish the performance at the specified speeds.
- 18.4 Construction and engineering of the Wiring Train and its ability to perform all the functions as laid down in the specifications above. These tests shall be conducted under field conditions. The procedure shall be as follows:
- a) The Wiring Train crew shall be either trained personnel of Indian Railways or the staff of the contractor.
 - b) Dry weather, ambient temperature between + 10⁰C to 40⁰C.
 - c) All individual units shall be checked for their desired function as per specification.
- 18.5 Emergency Braking Distance (EBD) and Haulage Capability Test shall also be conducted.



19.0 ISSUE OF PROVISIONAL SPEED CERTIFICATE

Whenever a new rolling stock is introduced in Indian Railways, a provisional speed certificate is issued by RDSO based on certain design parameters of the vehicle. Final speed clearance of the vehicle is given after conducting detailed oscillation trial of the vehicle, which is a time taking process. Therefore, issue of provisional speed certificate for the vehicle becomes a necessity and based on the same, the approval of running of the vehicle on Indian Railway track is taken from commissioner of Railway safety.

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

20.0 PERFORMANCE MONITORING

The performance of the wiring train shall be monitored at the level of JAG officer of electrical department in the Division/RE Project as per proforma at Annexure-V and the performance report shall be sent to Director General (TI) quarterly.

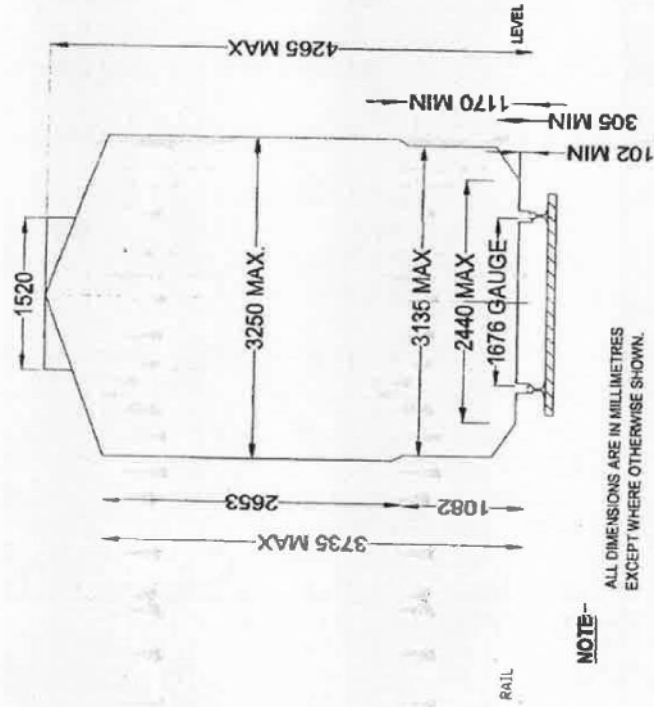


Annexure-I

INDIAN RAILWAYS SCHEDULE OF DIMENSIONS 1676 mm GAUGE (B.G)

DIAGRAM No. 1D (EDO/T-2202)
1676mm GAUGE

MAXIMUM MOVING DIMENSIONS



NOTE-
ALL DIMENSIONS ARE IN MILLIMETRES
EXCEPT WHERE OTHERWISE SHOWN.



ANNEXURE-II

INSPECTION CERTIFICATE

CERTIFICATE OF INSPECTION OF WIRING TRAIN BY INSPECTING OFFICIAL AND APPROVAL FOR DESPATCH OF WIRING TRAINS

(STRIKE OUT WHICHEVER NOT APPLICABLE)

This is to certify that I have inspected the Wiring Train (type) _____ bearing Sl. No. _____ from (date) _____ to date _____ at (place) _____ for its conformity with respect to the laid down Technical Specifications in contract Agreement No. _____ date _____ between President of India through Purchaser and M/s (Name of Supplier) _____

The detailed Inspection Note regarding its conformity/ non-conformity to the laid specifications is enclosed along with as Annexure. It is observed that (strike out whichever is not applicable):-

- a. The Wiring Train conforms to all the laid down specifications.
- b. The Wiring Train conforms to all the laid down specifications except those at Sl. No. _____. The above deviations are minor/ major affecting/ not affecting the performance of the equipment in substantial way.

The following T and P/ manuals/ drawings are to be supplied along with the Wiring Train: _____

Based on the above, the Wiring Train is certified/ not certified to be conforming to the specifications.

The Wiring Train is approved/ not approved for dispatch to _____ (consignee) Indian Railway.

SIGNATURE AND DATE

INSPECTING OFFICIAL For M/s _____ (NAME AND DESIGNATION)

For and on behalf of President of India.



ANNEXURE:III (FORM-2)

**PARTICULARS REQUIRED IN RESPECT OF THE ROLLING STOCK UNDER
CONSIDERATION**

(FOR EACH INDIVIDUAL UNIT)

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

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

- b)
 - i) Wheel base :
 - ii) Axle load (max) :
 - 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 :



ANNEXURE-IV FDRM-3

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

S. No.	Item
1.a)	Brake System details
b)	Gross Braking Ratio
2	Braking rigging arrangement drawing and calculation of
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,
5.	Characteristics of the dampers if used, and over all damping factors and locations of dampers. Calculation of the following frequency of the vehicle 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 vehicle on curve and turn out (enclose Vogels Diagram for negotiability on maximum degree of curve and turn out 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 vehicle supplied.
11.	Calculation of natural frequency.
12.	Calculation of spring characteristics and critical speed of the vehicle.
13.	Simulation result showing ride index, lateral force and acceleration results
14.	A certificate regarding the speed of the vehicle for which it has been designed.



Annexure-V

Proforma for performance feedback of Self-Propelled Wiring Train
 Railway.....
 Division.....

1. FRONT & REAR 8WDETC

Items	Type of Failure	Date of Failure	Reason of Failure/Remark
Traction Motor			
Power Rectifier			
Carbon Brush/Commutator/ Rocker Ring			
Traction Generator			
Auxiliary Alternator			
Diesel Engine			
Self Starter			
Transmission System			
Oil Leakage			
Compressor			
TM Bearing defects			
Suspension Bearing Defects			
Gear/Pinion Defects			
Radiator Defects			
OHE measuring Instruments.			
Elevating and Rotating platform.			
Safety Devices of Elevating and Rotating Platform.			
Brake Failure			
Miscellaneous			

2. FRONT & REAR PLATFORM CARRIER

Items	Type of Failure	Date of Failure	Reason of Failure/Remark
Diesel Engine			
Transmission System			
Oil Leakage			
Compressor			
Elevating and Rotating platform.			
Safety Devices of Elevating and Rotating Platform.			
Brake Failure			
Crane & Cradle			
Miscellaneous			

Sr.DEE (TrD)



3. REEL WAGON IN MIDDLE

Items	Type of Failure	Date of Failure	Reason of Failure/Remark
Hydraulic Crane			
Safety Devices of Crane			
Crane Control			
Telescopic and Tilting Mast			
Reel Stand			
Auxiliary Guiding Mast			
Guiding Rollers			
Reversible Tensioner			
Main Guiding Mast			
Brake Failure			
Transmission System			
Oil Leakage			
Compressor Failure			
Miscellaneous			

Sr.DEE (TrD)



Annexure- VI**Alternate Hydraulic Transmission System of Tower Cars for Wiring Train****1.0 HYDRAULIC TRANSMISSION**

- 1.1 Hydraulic transmissions complete shall be offered as per clause 1.2. In case hydro-mechanical power shift transmission is offered, the gear shifting shall be automatic and it shall not call for any attention from the operator. The transmission shall be offered with all the necessary accessories, standard attachments and safety devices.
- 1.2 The supplier shall the total horsepower required for auxiliaries with break-up of power requirements for each of the auxiliary machine at rated output and also indicate net power input to the transmission.
- 1.3 The supplier shall carryout torsional vibration analysis of the matched power equipment system to ensure that there is no secondary vibration in the system that can lead to failure of any component of the transmission during operation at idle or under loaded condition.
- 1.4 The transmission shall be suitable for cardan shaft connection with the diesel engine (if remotely connected) and axle drive gearbox.
- 1.5 Special care shall be taken to ensure reliable and efficient performance of the transmission without developing a temperature beyond the safe permitted limit during full load operation. The system shall not call for any special care on the part of the driver to protect the transmission from damage under any circumstances.
- 1.6 The tenderer shall furnish a copy of Type Test Report of the transmission from a statutory body in support of their claim regarding performance and reliability.
- 1.7 To minimize the secondary vibrations in under-slung power pack, mounting of engine and transmission on Skid mounting shall be preferred.
- 1.8 The combined performance of the twin power equipment shall not be inferior to the tractive effort curve No. G.DP- 1165, placed at annexure – VII-A. Supplier shall submit TE Vs speed curve superimposed with above curve alongwith complete matching calculation of offered power equipments and equipment lay out drawing.
- 1.9 Transmission shall have provision of secondary lubrication arrangement to protect the transmission from damage during towing in train formation.



2.0 CARDAN SHAFT

- 2.1 Cardan Shaft of robust design shall be offered as per clause 2.2. It shall be well proven and suitable for transmitting rated horsepower and maximum torque encountered during operation.
- 2.2 The detailed torsional vibration analysis of the complete dynamic system under normal engine working as well as under condition of one cylinder misfiring for the complete operation range including 10 % over speed shall be furnished.
- 2.3 The resultant angularity of Cardan Shaft shall be maintained within 5°.

3.0 AXLE DRIVE GEAR BOX WITH POWERED AXLE

- 3.1 Axle drive gear box of suitable gear ratio, complete with powered axles & torque reaction arm as per clause 3.2 shall be offered. The tenderer shall take care that the offered power equipment is well matched with the axle drive and meets the performance requirements.
- 3.2 The engine shall be provided with a fly wheel mounted flexible coupling. The coupling shall be of adequate capacity to withstand high deflection and torque (at starting, stopping and due to any misfiring of the cylinders) so that no damage is caused to transmission and engine components in service.
- 3.3 The axle drive gearboxes shall be robust in construction and designed to transmit continuous rated horse power/ maximum torque with adequate safety margin. The tenderer shall furnish the maximum torque transmission capacity of the axle drive gearbox at start. The tenderer shall indicate the final drive gear ratio.
- 3.4 The input flange of the axle drive shall be oil injection mounted.
- 3.5 The powered axle shall conform to IRS specification R-43 latest version.

4.0 Gauges, and Safety Devices

4.1 TRANSMISSION

- (i) Transmission oil temperature gauge
- (ii) Transmission oil pressure gauge
- (iii) Forward/ Reverse/ Neutral indicator
- (iv)

All gauges shall be of proven make and reliable design. Graduations of the gauges shall be in metric units.



4.2 SAFETY DEVICES

- I. Transmission oil - Engine to idle & Transmission to temperature high neutral
- II Vigilance Control Device - Engine to idle & Transmission to application neutral



Annexure-VII

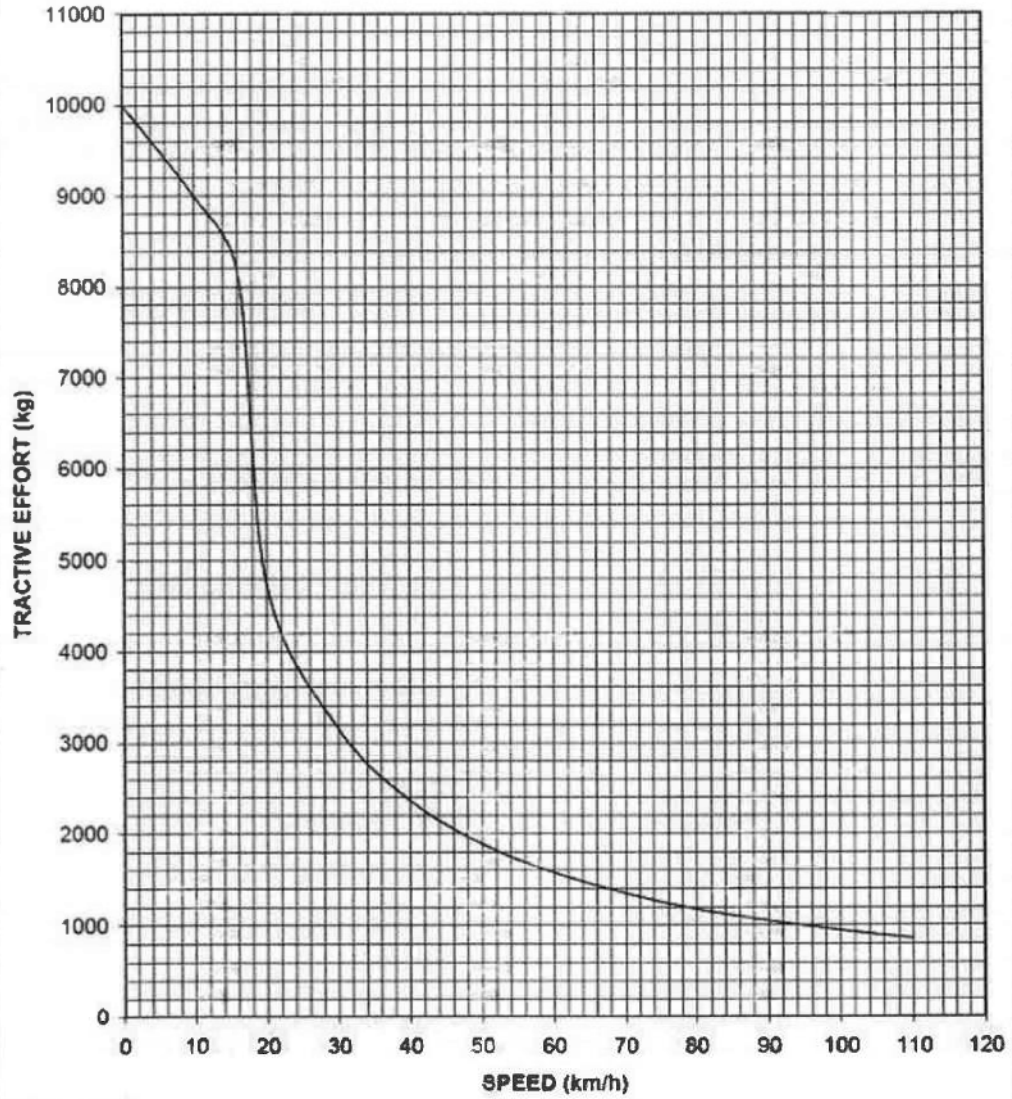
Particulars of Hydraulic Transmission

- 1.13 Hydraulic Transmission
 - i) Make
 - ii) Type
 - iii) Maximum input hp
 - iv) Complete transmission characteristic curves including input power, output power, input & output torque, transmission efficiency for 100%, 75%, 50% & 25% of full load, against output speed.
 - v) Basic characteristic curve of torque converter/hydraulic coupling.
 - vi) Weight of transmission dry & with full supply.
- 1.14 Reversing Arrangement
 - i) Method of reversing with full details.
- 1.15 Axle Drive Gear Box
 - i) Make & Type
 - ii) Gear ratio
 - iii) Installation and detail design drawings
 - iv) Horse power rating & torque and speed characteristic
 - v) Maximum torque at start
 - vi) Details of torque arm with mounting details
- 1.16 Cardan Shaft
 - i) Make & Type
 - ii) Torque rating, life rating and permissible angularity
 - iii) Minimum compressed length with permissible length compensation
 - iv) Installation drawings
- 1.17 Hydraulic Pump for Cooling system
 - i) Type (fixed/variable)
 - ii) Model
 - iii) Make
 - iv) Flow rate (LMP @ speed)
 - v) Pressure settings
 - vi) Maximum permissible leak-off
 - vii) HP consumed
- 1.18 Hydraulic motor for cooling system
 - i) Type (fixed/variable)
 - ii) Model
 - iii) Make
 - iv) Flow rate (LMP @ speed)
 - v) Pressure settings
 - vi) Maximum permissible leak-off
 - i) HP consumed



Annexure -VIII

TRACTIVE EFFORT Vs. SPEED CURVE FOR SELF-PROPELLED DIESEL HYDRAULIC 8-WHEELER OHE CAR



D	
C	
A	

Applicable for the
Specification No. MP-0.0800.69(Rev.-00)

RDSO G.DP-1165

