TECHNICAL SPECIFICATIONS FOR
UTILITY TRACK VEHICLE (48-WHEELER)
(Specification No. TM/HM/UTV/381 Rev. 01 of 2016 02 of 2019)

1.0 GENERAL

1.1 After completion of track renewal works and other similar works, a lot of materials including sleepers and rails, etc. remain at the work area. It is desirable to remove all surplus and leftover materials from site as early as possible. A self propelled machine with a crane facility is required to carry out this job. It would be desirable that the equipment is self-propelled and capable of pulling one fully loaded wagon with gross load of 90 MT (air braked) attached to it to pick up materials like rails and sleepers with the help of a crane. This specification has been framed to reflect the technical performance and quality requirements of the machine, hereinafter called UTILITY TRACK VEHICLE (UTV) Machine.

1.2 The technical specifications has been drafted to reflect the performance and quality requirements of the UTV in a neutral manner without bias to any specific manufacturer. Bidders are requested to carefully study the specifications and assure that their equipment machine fully comply with these specifications. Thereafter, if a bidder feels that his machine can substantially meet the performance and quality requirements of the machine but does not fully satisfy a particular specification, he shall mention the deviations if any, in the statement of deviation from the specifications, giving the details how the functional requirements are going to be met with.

1.3 The bidder shall specify the make/model offered and furnish a detailed technical description of the same. System/sub-systems of the working mechanisms of the machine as per para 3.0 in particular and all the items of the specifications in general shall be described in detail in the “Technical Description”, along with the sketches to show the manner in which the requirements of the specifications are accomplished by the UTV (model) offered.

1.4 Photographs of the type of the UTV offered, in working mode and technical literature shall be enclosed with the offer. The photographs shall also show close-ups of various working assemblies/systems and the full UTV. The tenderer shall also furnish compact disc or DVD or USB showing the working of UTV in real time under field conditions. Tenderer shall also submit the names of countries & Railways where the offered machines are working and where their working at site can be visited by Indian Railways officials.

2.0 DIMENSIONAL AND OPERATING REQUIREMENTS

2.1 The diesel-powered self propelled UTV shall be robust, of latest design, reliable and suitable for working on the Indian Railways Broad Gauge (1676 mm gauge). It is to be of 2-axle type with both the axles powered. The design and dimensions of the machine components shall be to metric standards and shall comply with provision of Indian Railways Schedule of Dimensions–1676 mm gauge (BG), revised, 2004 with latest corrigendum and up to date correction slips issued. Quality assurance during manufacturing of the UTV shall be according to ISO-9001. The welding standard followed for manufacturing of machine should conform to ISO:3834, EN:15085 or any other equivalent standard for welding Railways vehicles and components. The manufacturer shall specify the standard followed and certify that it meets the welding standard mentioned above. The UTV shall be suitable for working on straight, transition and curved track (up to 10°) and on Turn out broad gauge (1676 mm) of Indian Railways.
2.2 The machine shall be self-propelled bogie type vehicle with minimum 4-axles (2 bogies).

2.3 The profile of the UTV longitudinally and in cross section during transfer as self propelled vehicle or towed in train formation shall be within the maximum moving dimension shown in the Indian Railways Schedule of Dimensions –1676 mm gauge (BG), revised, 2004 with latest corrigendum and up to date correction slips issued. The maximum moving dimensions are shown in Annexure-I. The tenderer shall provide sketches of the UTV, both in plan and elevation and shall give calculations for moving dimensions on 10° curve to show the extent of lateral shift at the ends, centre and any other relevant cross section to prove that the UTV does not cause any infringement while moving on a 10° curve at any cross-section.

2.4 In the past Indian Railways have condoned certain infringements to the Indian Railways Schedule of Dimensions –1676 mm gauge (BG), revised, 2004 of such dimensions as Rigid wheel Base, Length of stocks, Distance apart of bogie centres and maximum height of floor above Rail level in certain track machines after due consideration of their design features vis-à-vis safety and operation requirements of Indian Railways. However, condonation of an infringement in another track machine in the past does not by itself entitle the manufacturer to assume acceptance of the same in other track machines by Indian Railways. Where an infringement to Indian Railways Standard BG schedule of Dimensions (metric)-2004 print is considered necessary by the manufacturer as intrinsic to the design of the machine for meeting the work performance requirements laid down in this specification while meeting the safety and operational requirements of Indian Railways, the condonation of the same may be permitted by Indian Railways. However, only those infringements which are acceptable shall be permitted.

2.5 Adequate clearance shall be allowed so that no component/part infringes the minimum vertical clearance of 102 mm from rail level while travelling on track up to condemnation limit of wheel.

2.6 Wherever applicable the axle load of UTV shall be less than 20.32 tonnes with minimum axle spacing of 1.83 m while moving on track. Load per meter shall not exceed 7.67 tonnes. Axle loads up to 22.82 tonnes and lower axle spacing may be permitted provided the load combinations do not cause excessive stresses in the track and bridges of Indian Railways. Stresses in the track and bridges shall be calculated by IR/RDSO based on design data submitted by the firm as per Annexure–II VII and decision of IR/RDSO shall be final in this regards.

2.7 The floor height of the open platform shall be within minimum 1145 mm (loaded) to maximum 1345 mm (unloaded).

2.8 It shall have a minimum wheel diameter of 914 mm (new wheel profile). However, lesser diameter up to 730 mm (new wheel profile) can also be considered, provided it meets the criteria condition laid down in Clause 2.4.2.5 at its condemnation limit and also rail wheel contact stresses for 72 UTS rails are within permissible limits. Forged wheels to Indian Railways profile shall be provided on the machine. It is desirable that 50 mm margin between new and permitted worn wheel diameter should be available, but this should not be less than 20 mm. The worn out wheel diameter (condemning worn out diameter) based on the criteria of rail wheel contact stresses for various maximum axle loads are as under:
<table>
<thead>
<tr>
<th>Maximum Axle load (tonne)</th>
<th>Minimum worn out wheel diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.82</td>
<td>908.00</td>
</tr>
<tr>
<td>22.00</td>
<td>878.00</td>
</tr>
<tr>
<td>21.50</td>
<td>860.00</td>
</tr>
<tr>
<td>21.00</td>
<td>841.00</td>
</tr>
<tr>
<td>20.32</td>
<td>816.00</td>
</tr>
<tr>
<td>20.00</td>
<td>805.00</td>
</tr>
<tr>
<td>19.50</td>
<td>787.00</td>
</tr>
<tr>
<td>19.00</td>
<td>768.00</td>
</tr>
<tr>
<td>18.50</td>
<td>750.00</td>
</tr>
<tr>
<td>18.00</td>
<td>732.00</td>
</tr>
<tr>
<td>17.50</td>
<td>713.00</td>
</tr>
</tbody>
</table>

Permitted worn out wheel diameter should be specified by the manufacturer. The diameter of wheel for assessment of permitted axle load will be the worn out wheel diameter.

2.9 The new wheel profile in the machine shall be as per Indian Railways standard drawing attached as Annexure-III which is titled as ‘WORN WHEEL PROFILE’

2.10 Wheels shall be conforming to Indian Railways Standard R-19/93 or European Standard EN13262 or any other equivalent standard (for product requirement) and design shall duly conform to European Standard EN 13979 or other equivalent standard. The supplier shall mention the standard followed & shall submit detailed design calculation along with material parameters at the time of supply of the machine.

2.11 The non-powered axles shall be conforming to Indian Railways Standard R-16/95 or European Standard EN 13261(EA1N) or any other equivalent standard. The supplier shall submit detailed design calculation along with material parameters at the time of supply of the machine.

2.12 The powered axles shall be conforming to Indian Railways Standard R-43/92 or European Standard EN 13261(EA4T) or any other equivalent standard (for product requirement). The design shall conform to EN: 13104 or any other equivalent standard. The supplier shall mention the standard followed & submit detailed design calculation along with material parameters at the time of supply of the machine.

2.13 It shall be capable of negotiating curves up to 10° curvature (1765 m radius), super elevation up to 185 mm and gradients up to 3% in travel mode. The supplier shall specify the minimum attainable speed by the machine (without trailing load) under the above limiting conditions, which in any case should not be less than 40 Kmph.

2.14 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:

- Ambient temperature: -5°C to -55°C
- Altitude: Sea level up to 1750 m above mean sea level
- Humidity: 40% up to 100%
- Maximum rail temperature: 70°C
All the system components on the machine, which are vulnerable to moisture ingress and adversely affected during rains, should be covered by roof or suitable arrangement so that the machine is able to work continuously even during rains.

2.15 It shall be capable of hauling one or more empty/loaded wagon or 8 wheeler coach (trailing load of 90 M.T) at a speed not less than 50 kmph. It should be able to negotiate steepest gradient of 1 in 33 prevailing on Indian Railways with this trailing load. During transfer from one station to another (self propelled travel mode without trailing load), it shall be capable of travelling on its own speed at 80 kmph. It should be capable of being hauled in train formation as last vehicle at a speed not less than 80 \( \text{kmph} \). During towing of the machine (UTV) simple neutral position of gears should be sufficient, no opening of cordon shaft etc should be required.

2.16 It shall be capable of working and travelling without requiring power block in electrified sections. On Indian Railways, 25 KV or 2x25 KV AC power supply is used for traction through an overhead wire at 5.5 m above rail level. On bridges and tunnels, the height is restricted to 4.8 m. On Indian Railways Schedule of Dimensions 1676 mm gauge (BG), revised-2004 with the latest corrigendum and up to date correction slips issued,

2.17 While working on double/multiple line sections, it shall not infringe the adjoining track and it shall be possible to permit trains at full speed on that track. Minimum spacing of track is 4265 mm centre to centre. The UTV or its any part shall not infringe adjoining track as per Indian Railways Schedule of Dimensions 1676 mm gauge (BG), revised-2004 with the latest corrigendum and up to date correction slips issued, during travelling or its operation including opening and closing of the work.

2.18 It shall be possible to drive the UTV in both directions at the same speed.

3.0 DESCRIPTION:

3.1 The UTV shall be self-propelled, bi-directional, 2 4-axles, fully rail borne vehicle for picking up of P.Way material from mid-section, and for transportation of men, material and equipment.

3.2 There should be a loading platform on the UTV machine itself so that it is possible to carry at least two numbers 6.5 meter long rails and one number CMS crossing along with fracture repair equipments loaded on the UTV machine itself. Weights, dimension of the Rails, CMS crossing and fracture repair equipments to be normally uploaded on UTV platform and attached wagons are given in Annexure IVA & IVB respectively. This requirement is important as in some cases UTV may be required to move in the block section alone, without any attached wagon, in that case it shall be possible to carry necessary equipment’s and materials loaded on the UTV machine itself. The crane fixed on the machine (UTV) should be capable of efficiently handling the equipment’s and materials thus loaded on UTV.

3.3 The loading platform should be provided all-around with a sidewall/Railing of about 45 to 60 centimeters height to protect the men and materials from falling.

3.4 The UTV shall be provided with adequate space on loading platform with proper lock and key arrangement for keeping the tools, equipments and spares required for on-site repair of the machine and other working requirements.

4.0 CRANE
4.1 The UTV shall have a fixed crane mounted on it. The crane shall be capable of lifting 3.0 t load over front at such a minimum radius so as the lifting hook to be 7.5 Mts. away from the end buffer of UTV on one side (non cabin side).

4.2 The crane operation shall be such that there is no infringement to over head electric equipment during crane maneuvering/extension/shortening and there is no infringement to the Indian Railways Schedule of Dimensions–1676 mm gauge(BG), revised, 2004 with latest corrigendum and up to date correction slips issued, on the adjacent track at 4265 mm track centers. In case there is a possibility of boom getting lifted to infringe the overhead electric equipment, suitable safety device, to prevent such an eventuality, shall be provided.

4.3 The crane shall be capable of loading and unloading P.Way materials viz. Rails, switches concrete sleepers from ground to the attached wagon and vice-versa. Suitable attachments for rail handling shall be provided along with the crane. Details of the same shall be submitted by the tenderer.

4.4 The tenderer shall submit the lifting capacities at various radii. The crane shall be capable of loading/unloading P. Way materials lying along the track on either side viz. rails, concrete sleepers, switches and SEJs etc. (the sizes & weight of some of the materials are given in Annexure-IVA & IVB), from ground and 1.2 m below rail level to UTV and attached flat wagon and vice-versa. Suitable attachments like loading platform, lifting tackles/lifting clamps for handling the heavy materials shall be provided along with crane. The tenderer shall submit the details of the same. Slings required for picking up rails, switches, sleepers or crossings shall also be supplied as part of the crane. Necessary make-up blocks (if required) shall be supplied by manufacturer/supplier for steady transfer of load during operation of the crane.

4.5 There shall be a proper seat on the loading platform for seating of the crane operator. The crane operator’s seat shall be ergonomically designed in such a manner that operation of all levers of crane is comfortably possible in seated condition. A good quality, light weight foldable/detachable shelter/cover shall be provided over crane operator's seat to protect him from rains and sun. In addition to crane operator's seat, there shall be provision of providing collapsible/detachable good quality durable sitting arrangement for 4 persons. The seat shall be suitably positioned on the platform so that it doesn’t infringe crane working/maintenance operation and visibility of operator during movement in opposite direction.

4.6 The crane and equipment operation shall be such that one wagon load (80 Nos. rails for 52 Kg./60 Kg. of 13 m length) are loaded in the attached flat wagon in not more than 90 minutes (1.5 hrs.) of net working time with rails lying along the track on either side. No infringement to the adjacent track shall occur either by crane or rails during the operation.

4.7 It shall be possible to start the loading/unloading operation at site within five minutes of arrival. No outriggers should be required to be extended/ixed during the normal crane operation (say up to 7 tonne-meter). In the case of handling of heavier loads use of outriggers may be required. Supply of necessary outriggers (Hydraulically operated) duly fixed on the proper location on the UTV machine with proper design calculations shall be ensured. The outriggers should be fitted with hydraulic lock to sustain the ram in the event of hydraulic failure so that automatic retraction of the rams cannot take place.
4.8 The working of the crane viz. Jig/boom/slewing system shall be hydraulically operated. The hydraulic system should have pumps, cylinders and other components of proven quality.

4.9 The system should be fitted with hydraulic lock to sustain the ram in the event of hydraulic failure and provide positively controlled boom retraction.

4.10 In case the crane is provided with an independent power source, it shall be diesel operated. The diesel-operated prime mover should preferably be of indigenous make. In case the same is of foreign origin, service/repair support for the same shall be available within India.

4.11 The tenderer may be required to show the working of the UTV under field conditions for which the names of the countries where such machines are in operation shall be given.

5.0 DIESEL ENGINE:

5.1 The UTV shall be powered by a diesel engine(s) of adequate capacity to meet the power requirement for speeds as mentioned in para 2.11 & 2.13 & 2.15 above, mounted on the vehicle. However the minimum horse power of the engine as per approved Indian Railway norms comes to 400 HP. The tenderer shall submit the engine characteristics (engine RPM vs. power output).

5.2 The UTV shall be powered by preferably indigenous diesel engine with proven record of service in tropical countries. The engine shall be of such design/brand which are being manufactured indigenously and/or such designs having after sale service facilities available in India. Robust construction and low maintenance cost are of particular importance. There shall be satisfactory service/repair support facilities available in India.

5.3 Adequate allowance shall be made for de-rating of diesel engine under the most adverse climatic conditions mentioned in this specification elsewhere.

5.4 The supplier shall furnish the information regarding make and model of the engine proposed to be used and details of agency which will provide after sales service support and availability of spares in India.

5.5 High speed diesel oil conforming to Indian Standard Specification shall be normally used.

5.6 A minimum fuel capacity sufficient for continuous operation for 8 hours but not be less than 900 litres will be desirable.

5.7 Sight glass type fuel measuring gauge preferably of full height shall be provided on the fuel tank.

5.8 For starting the engine, storage batteries of well-known indigenous make with wide service network in India shall be provided. The engine shall normally be push/pull button start type or key type.

5.9 There is a likelihood of dust deposition over the engine body and surrounding area over the lubricants spills over. These locations shall be easy to accessible for daily cleaning and routine maintenance. In case, air cooled engines are proposed by the supplier, maintenance equipment for cleaning and maintenance of the air cooling fins shall be provided by the supplier along with the machine.
5.10 Since the engine is has to work outdoor under extreme dusty conditions, the air intake system shall be designed suitably so as not to allow dust through air intake system.

5.11 The engine parameter monitoring gauges like temperature, rpm, and lube oil pressure shall be direct reading type mounted on the engine, backed up by electrical/mechanical gauges in the operator's cabin showing the absolute readings along with safe limits suitably colored. There shall be audio visual warning (safety mechanism) to the operators in case of any of these parameters exceeding the safe limit and engine will shuts down automatically circuit in case of operator's failure to respond.

5.12 Suitable and rugged mechanism should shall be provided to start the prime mover at no load and gradual loading after the start of the prime mover at no load/minimum load and gradual loading after the start of the prime mover. A fail-safe clutch mechanism, if required, may should be provided to meet this requirement. The engine power take off shall be coupled to the main gear box through flexible/cardon shaft (propeller shaft) The engine shall be mounted on suitable Anti vibration mountings.

5.13 The engine should shall have Electronic Control Module (ECM) or similar arrangement for taking out operating parameters on real time basis such as RPM, load, fuel consumption, temperature, pressure and diagnostic data as well as trip and historical data. These data should shall be displayed and stored on a panel/PC to be provided in operator's cabin. It should shall also be possible to transfer these data on USB device.

5.14 The engine should be enclosed in a weather protective, sound and dust resistant enclosure to minimize engine noise and to prevent oozing out of oil spills etc. from engine area to the adjacent machine components, hoses, electrical cables fittings as a protection against fire. All doors on the enclosure shall be strategically located in areas as to allow ease of maintenance of the engine and allow good access to and visibility of instruments, controls, engine gauges, etc. Sufficient louvers shall be provided to allow the total engine cooling air requirements used in this application.

5.15 In order to adhere to pollution Control norms, the diesel engine should be electronically controlled emissionized engine with minimum compliance of tier 2 stage.

5.16 The tenderer shall furnish the information regarding make and model of the engine proposed to be used and details of agency which will provide after sales service support and availability of spares in India, details of diesel engine and its controls to assess its conformity with the engines already operating on track machines on Indian Railways. If the machine design incorporates an engine, not already operating with the purchaser, the model of the engine is liable for change as per the technical requirements and the maintenance logistics with the purchaser after technical negotiations with the supplier. Nothing extra shall be payable on this account.

6.0 TRANSMISSION:

6.1 The power shift transmission shall preferably be hydrodynamic or any other suitable arrangement so that there is no wear and tear in field operation. The tenderer shall give the full technical data of the power transmission system.

6.2 The power pack and transmission equipment shall be mounted on the under frame so that whole assembly occupies as little space over floor as possible.
6.3 Transmission shall be either step less or minimum 3 steps bi-directional with maximum speed possible in both forward as well as in reverse direction.

6.4 The transmission shall provide smooth shifting at full power while shifting to higher or lower steps.

7.0 SPEEDS-TRACTIVE EFFORT CHARACTERISTICS:

7.1 The tenderer shall submit the Tractive Effort Vs. Speed characteristics for the UTV and submit the tractive effort requirement calculations for various configurations to assess the engine(s)/transmission adequacy to attain the required speeds.

8.0 COOLING SYSTEM:

8.1 The cooling system shall be efficient and designed for maximum ambient temperature of 55°C. Supplier may note that the UTV shall be working under extreme dusty conditions and the cooling mechanism should be maintainable under these conditions.

8.2 Adequate heat transfer arrangement for the hydraulic system shall be designed and provided so that under extreme heat conditions as mentioned in para 2.12 2.14 above, the system oil temperature does not go beyond the specified range specified by the supplier of the hydraulic oil.

9.0 BRAKES:

9.1 The UTV shall be fitted with compressed air brakes system which shall applying brakes equally on all wheels which can be applied from driving cabins and provision shall be made to connect air brake system of the machine to that of coach/attached wagon when the UTV is hauling it. Fail safe braking mechanism system shall be provided so that in case of any failure of brake, there shall be arrangement of circuit will result in automatic application of brake. The pneumatic parking brake shall also be spring loaded so that in case of drop in pneumatic pressure below certain value the brake will be automatically be applied. The brakes shall be protected from ingress of water, grease, oil or other substances, which may have an adverse effect on them. The brake shoe lining shall be suitable for high ambient temperature of 55°C. The force required for operating the brake shall not exceed 10 kg at the handle while applying by hand and 45 kg on the pedal, when applied by foot. In addition, mechanical brakes shall also be provided for parking.

9.2 The UTV shall be equipped with suitable arrangement of braking so that while attached in train formation as last vehicle, UTV can be braked by the traction vehicle having compressed air braking system.

9.3 There shall be provision of emergency brake application using the compressed air in the machine, either travelling alone or coupled with the camp coach or loaded wagon, in addition to the normal braking system of the machine using the compressed air. The emergency braking distance (EBD) of the machine (with braked trailing load of 90 t) on the Indian railway track at the maximum designed speed on a level track shall not be more than 600m. In this regard necessary design calculations for the braking effort and EBD at the maximum design speed of the machine on level track & at falling grade of 1 in 33 should be provided by the supplier. Brake design details are to be submitted as per annexure V.

9.4 Clearly visible brake lights shall be provided at both the ends of the machine, which will be automatically operated when brake is applied and switched off when brake is released.
will be required to alert the operator of machine following this machine when the machines are working in groups.

9.5 The braking system shall be designed so as to meet the air reserve requirement for repeated braking as required in normal operation. In addition, the machine shall be equipped with suitable air brake system in the driving cabins so that the coach while being hauled by the machine can be braked.

9.6 The pneumatic circuit shall be provided with air dryer for the smooth working of pneumatic components.

10.0 **HORN, HOOTER AND SAFETY SWITCHES:**

10.1 The UTV shall be provided with dual tone (low tone & high tone) electric/pneumatic horns facing outwards at each end of the UTV at suitable locations for use during travelling to warn the workmen of any impending danger. Controls shall be provided in close proximity to the driver permitting the driver to operate either horn individually or both horns simultaneously. The horns shall be distinctly audible from a distance of at-least 400 m from the machine and shall produce sound of 120-125 dB at a distance of 5 meter from horn (source of sound). The higher tone horn shall have fundamental frequency of 370 ±15 hertz. Minimum two nos. safety stop/switches in front on both side and two nos. in rear on both side-should be provided all around so that in case of any danger to worker as well as hitting of any obstructions by working unit like signaling cable, joggle fish plate etc. during working, the working can be stopped immediately.

10.2 In addition, separate electric horns with push button type switches shall be provided at suitable locations in all cabins(s) and on machine body for communication between the machine staff and operator about infringement/malfunctioning or any other trouble.

10.3 Pneumatically/electrically operated hooters capable of producing intensity of sound between 105-110 dB at a distance of 5 meter (when measured in still air in a closed room) and variation in intensity of sound shall not be more than 5 dB. The hooter shall be provided facing outwards at each end of the machine at suitable locations, operated by means of push buttons provided in the cabins to warn the staff working on/around the machine about approaching train on adjoining track. Additionally switches for such hooter shall be provided outside on the machine frame and near the both side exit gates so that it can be operated by staff present at work site near the machine. The hooter shall also be operatable by remote switch at a distance of at least 300 m from the hooter.

10.4 Safety equipment like jack, pullers, terfer and other such equipments specific to the machine for restoring failed units of the machine during working shall be provided on the machine. A proper interlocking arrangement of the out riggers with driving system shall be provided to ensure that machine shall move only when out riggers are lifted & properly locked. There should also be a mechanical arrangement for retracting and locking of the out riggers in case of failure of the hydraulic system.

10.5 The UTV shall be provided with emergency backup system to wind up the crane/out riggers etc. in the event of failure of prime mover or power transmission system of the machine. The emergency backup system shall be able to be operated manually also.

11.0 **HOOKS AND BUFFERS:**
11.1 The machine shall be fitted with transition coupling as per RDSO specification no. RDSO/2009/CG-22 56-BD-07 with latest revision along with side buffers to RDSO drawing no. RDSO/SK-98145 with latest alteration on both ends for coupling it with trailing wagons, coach & locomotives while running in train formation as last vehicle. As per Indian Railways schedule of dimensions, the maximum and minimum height of the buffer centre from rail level is 1105 mm and 1030 mm respectively.

12.0 HEAD LIGHT, FLASHER LIGHT, MARKER LIGHT AND OTHER LIGHTING ARRANGEMENTS:

12.1 The electrical equipment to be provided shall conform to relevant standard specifications and shall be suitable for Indian climatic conditions. The UTV shall be equipped with twin beam headlight assembly, conforming to RDSO’s specification no. RDSO/2017/EL/SPEC/0134 (Rev-0) ELRS/SPEC/PR/0024 revision-1, September, 2004 with the latest amendments ensuring a light intensity of 3.2 lux at ground level at track centre at a distance of 305 m away on a clear dark night, at each end and with two front and rear parking lights, which can be switched to red or white according to the direction of the travel. Powerful swiveling floodlights shall also be provided to illuminate the working area sufficiently bright for efficient working during night. In addition minimum eight power point locations (24 volt DC/15 amp socket) shall be provided on outside frame of the machine two in front, two in rear and two on both sides for providing lighting arrangements during night working. Specification for DC-DC converter for electric loco/diesel electric loco no. ELRS/SPEC/DC-DC converter/0021, (rev-1, Sept’2004 or latest). The amber colour LED based flasher light producing not less than 500 lux at 1 meter and 55 lux at 3 m in line measurement in axial direction from flasher light shall be provided at both ends in the machine to give indication to the train arriving on other line about any impending danger at both ends. Preferably electric power of 24 V (maximum up to 110 V) shall be used for operation of any electrical circuit.

12.2 The amber colour LED based flasher lights producing not less than 500 lux at 1 m and 55 lux at 3 m in line measurement in axial direction from flasher light to RDSO Spec No. ELRS/SPEC/LFL/0017 (Rev-1) of Sept-2004 or latest shall be provided at both ends in the machine to give indication to the train arriving on other line about any impending danger.

12.3 The Machine shall be provided with Marker light to RDSO specification no. ELRS/SPEC/PR/0022, (Rev-1) October’2004 or latest.

13.0 CHASSIS & UNDER FRAME:

13.1 The chassis shall be fabricated from standard welded steel sections and of steel sheets, so as to permit transportation of the UTV in train formation as the last vehicle, without endangering safety of the train. The under frame shall be constructed with rolled steel section and/or plates shall be designed to withstand a maximum static horizontal squeeze test load test of 102 t i.e., 51 t at each buffing point without any permanent distortion. The under frame shall be sufficiently robust for safe travel of the machine in train formation and not necessarily as the last vehicle.

14.0 CABINS:

14.1 The UTV shall be equipped with fully enclosed sound and heat insulated cabins with safety glass window. In view of the high ambient temperature prevailing in India, special attention should be paid to free circulation of air and ventilation in the driver’s cabin. Cabin fans of
adequate capacity shall be provided in the cabins. It shall be possible to have a clear view of the track ahead while driving the UTV in either direction.

14.2 Entry & exit door to UTV’s cabin shall open on the loading platform area so that the same operator can work easily in the cabin and on crane of UTV both and he exits UTV with good view of adjacent tracks.

14.3 The gauges, instruments and control panels shall be suitably located in the operator's cabin so that they can be observed without undue fatigue to the operator. Screen wiper preferably operated by compressed air or electrically, shall be provided on the windscreens.

14.4 Seating arrangement for 4 persons in addition to the driver shall be provided in the cabin.

14.5 Suitable number of fire extinguisher (dry chemical type) shall be provided in the cabins. The chemicals used for extinguishing fire by such fire extinguishers shall not chemically react with electronic equipment/components, PCBs, cables etc.

14.6 The machine shall be equipped with speed indicator and recording equipment of range between 0–120 kmph for recording the speed of the machine in real time basis. The equipment shall conform to RDSO specification no. MP-0-0.3700-07, Rev-07, Aug'17 or latest. The recorded data shall be retrievable on computer through memory card/pen drive. It shall be provided in the driving cabin at suitable place and recording system should have sufficient memory to keep the speed record of minimum 15 days which should always be stored for retrieving as per requirement.

14.7 The electric supply in the cabin for operation of electrical instruments, gauges etc. shall not be more than of 110 V.

15.0 TOOLS AND INSTRUCTIONS MANUALS:

15.1 Each UTV shall be supplied with a complete kit of tools required by the operator in emergency and for normal working of the UTV. The list of tools to be provided shall also include all tools necessary for maintenance and repair of the entire UTV including specialized equipment. All special tools shall be listed and catalogued illustrating the method of application. The tenderer shall along with his offer, submit the list of tools, manuals, circuit diagrams and other technical literature/drawings in English language to be supplied along with each machine as above, for operation, servicing, maintenance, assembly overhauling, periodic overhauling and troubleshooting guides/manuals. The list can be modified to suit the purchaser's requirement, while examining the offer.

15.2 Detailed operating manual, maintenance & service manuals and user manual indicating capabilities of machine shall be specifically prepared in English language and four hard as well as soft copies of these shall be supplied with each UTV.

15.3 As a part of service manual, the manufacturer shall also supply circuit diagram in hard and soft copies of electrical, hydraulic, pneumatic electronic circuits used on the UTV. Trouble shooting diagram/table shall also be supplied. In additions, the manufacturer shall provide dimensional drawings with material description of items like rubber seals, washers, springs, bushes, metallic pins etc. and main features such as type, discharge etc of items like hydraulic pumps, motors and such other bought out components/assemblies shall be furnished by the tenderer. These shall be specially prepared in English language and four copies of these shall be supplied with each UTV.
15.4 The supplier/manufacturer shall provide detailed technical drawings and specifications of wheels and axles used in the machine (UTV). The above details shall be provided in four sets with each machine (UTV).

15.5 While offering the UTV for first inspection, the supplier shall submit one copy of complete technical literature in English including operation, service and field maintenance manuals/instructions, complete electrical, hydraulic and pneumatic circuit diagrams, troubleshooting charts, component drawings/description and other relevant technical details for keeping as a reference document for the inspecting officer. These shall be in English language.

15.6 One set of all the manuals and diagrams in hard as well as in soft copy (one set for a group of similar machines) shall be sent to the principal/IRTMT, Allahabad, one set to be sent to ED/TMM Directorate, RDSO, Lucknow, one set to DTK (MC)/Railway Board and one set to Director/IRICEN/Pune and one set to be sent to ED/TMM Directorate, RDSO, Lucknow along with supply of first machine of similar group. In case, there is any subsequent amendment in above documents based on field performance, the amendment/amended documents should also be sent to above mentioned authorities.

15.7 A draft copy of all documents to be supplied with the machine shall be sent 3 months in advance of inspection of the first machine to RDSO for their review regarding adequacy and manner of detailing. Necessary modifications and further detailing as per RDSO’s comments shall be carried out and compliance shall be reported to RDSO as well as the Inspecting officer of the first machine.

15.8 One portable diesel operated D.C. welding generator (with the provision of auxiliary output of minimum 2.5 KW, 230 V AC for lighting) of reputed make (preferably made in India) with a minimum 5 KVA capacity capable of welding up to 5 mm (dia) electrode at 60% duty cycle shall be supplied. Sufficient length of cable or lead shall be provided with the machine of welding plant for day to day repairing work of the machine and its wearing parts. The diesel tank capacity shall be not less than 15 liters.

16.0 SPARE PARTS

16.1 The expected life of the components/spare parts shall be advised along with their condemning limits. The UTV shall be supplied with necessary spare parts for the operation and maintenance of the UTV for a period of two years, i.e., working for about 2000 hours. The spare parts required shall be detailed in a separate list indicating description, part number, quantity and whether imported or indigenous.

16.2 The manufacturer shall be responsible for the subsequent availability of spare parts to ensure trouble free service the life of the UTV (15-25 years). It is preferred that the spares shall be stored in India and will be available at short notice say maximum within a month.

16.3 For indigenous parts and bought out components and assemblies, the source (original equipment manufacturer’s reference and part no.) and other relevant technical details shall be supplied while offering the first UTV for inspection.

17.0 OPTIONAL EQUIPMENT

17.1 Tenderer is expected to quote for optional equipment if any separately for each item giving the advantages/ functions of such optional equipment. Tenderer shall also indicate whether such equipment are is already in use on machine elsewhere indicating the user railway system.
18.0 **MAKER’S TEST CERTIFICATE:**

18.1 Copies of the Maker’s certificate guaranteeing the performance of the UTV shall be supplied in duplicate along with the delivery of each UTV.

19.0 **OPERATORS:**

19.1 The number of operators and allied staff for working of the UTV under normal condition shall be indicated, specifying their duties and minimum qualifications.

20.0 **INSPECTION OF THE MACHINE**

20.1 While inspecting the machine before dispatch from the supplier’s premises, the inspecting officer shall verify the conformity of the machine with respect to individual specification as above. The conformity/non-conformity with respect to each item shall be jointly recorded before issue of the Inspection certificate and approval for dispatch of the machine as per Annexure –VI enclosed.

20.2 Following arrangements shall be made by the supplier/Manufacturer at the inspection premises for carrying out inspection of the machine by inspecting officials:

- Machine to be stabled on straight & level BG track. The length of the track shall be at least 10 m more than buffer to buffer length of machine.

- In order to check Maximum Moving dimensions in cross section, a Sturdy frame of Indian Railways max moving dimensions shall be provided by the manufacturer and passed over the machine holding it perpendicular to track, centre aligned with track centre. Adequate arrangements shall be made to the satisfaction of inspecting official

20.3 The following documents shall be provided to the Inspecting Officer at least 30 days in advance of the date of inspection.

i) One copy of complete technical literature mentioned in clause 15, in English language, including operation, service and field maintenance manuals/instructions and complete electrical, hydraulic and pneumatic circuit diagrams, trouble shooting charts, component drawings/description and other relevant technical details as a reference documents for the inspecting officer.

ii) Cross section of the machine super imposed on Indian Railways maximum moving dimensions envelope shall be provided to inspecting officer (IO) in advance.

iii) Clause by clause comments of the manufacturer to be sent to Inspecting Officer (IO) in advance for his review. Comments should state manufacturer’s conformity of compliance of each of the requirement stated in each clause, elaborating where necessary the details/manner in which the requirement has been complied. The proforma for the clause-wise comments is given below:

<table>
<thead>
<tr>
<th>Clause no.</th>
<th>Clause</th>
<th>Comments of Supplier/manufacturer</th>
<th>Comments of Inspecting Officer</th>
</tr>
</thead>
</table>

iv) Manufacturer’s Internal Quality Inspection Report of the machine.
v) Manufacturer’s quality certificate and/or test reports for bought out assemblies/sub-assemblies shall be provided to IO, containing serial number wherever applicable.

vi) Draft Inspection Report shall be prepared by the manufacturer, containing all annexure mentioned at para 20.4

vii) Details of arrangements made for checking maximum moving dimensions for his approval.

Supplier will incorporate amendments/further clarification in the above documents to the satisfaction of the Inspecting Officer (IO) keeping in view the Inspecting Officer’s comments, if any.

20.4 List of documents to be annexed in the draft Inspection report shall include:

  i. Maker’s Test Certificate.
  ii. Manufacturer’s Internal Quality Inspection Report.
  iii. Quality Certificates of Bought out assemblies/sub-assemblies.
  iv. Cross section of the machine super imposed on the Indian Railways maximum moving dimensions (IR MMD).
  v. Vogel’s diagram.
  vi. List of spare parts to be dispatched along with the machine.
  vii. List of tools to be dispatched along with the machine.
  viii. List of manuals, drawings, spare parts catalogues, etc. to be dispatched along with the machine, duly indicating the number of sets of each.
  ix. Manufacturer’s certificate on standard followed for design of wheels and axles against clause 2.9 to 2.11 2.10 to 2.12.

These above documents in soft & hard copies shall be part of final inspection report

21.0 TRAINING & SERVICE ENGINEERS:

21.1 The contractor shall provide at his own expense the service of competent engineers during the warrantee period for warrantee related issues. The service engineers shall be available for the commissioning of the UTV for regular service. E-Learning Courses shall be arranged for imparting training to Railways operators. In addition the service engineer shall provide hands on training to Railways staff in calibration, operation, repairing and maintenance of the UTV in field to make them fully conversant with the UTV. The engineers shall also advise the Railways on appropriate maintenance, testing, operating, repair and staff training facilities that are necessary for the efficient performance of the vehicle.

22.0 SPEED CERTIFICATE:

22.1 PROVISIONAL SPEED CERTIFICATE:

Whenever a new rolling stock is introduced in Indian Railways, a provisional speed certificate is issued by RDSO of Indian Railways based at Lucknow, based on certain design parameters of the vehicle. Final speed clearance of the vehicle shall be 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 Railways track is taken from commissioner of Railway Safety.
For issue of provisional speed certificate, the following actions are required to be taken by the suppliers:

a) Current suppliers, whose models are approved:

The supplier shall give details of the model, year of introduction in Indian Railway, details of speed certificate issued etc. The supplier shall certify that no change has taken place in the model being offered with respect to design of under frame carriage i.e. suspension system/arrangement, wheel & axle assembly, bogie, braking arrangement, loading pattern of the vehicle etc. and the distribution of axle loads, lateral forces, un-sprung mass and braking force coming on rails is the same. If, there is any change in above respect, the action shall be taken as detailed in clause (b) below:

b) CURRENT SUPPLIERS, WHOSE MODELS ARE NOT APPROVED/ OR NEW:

As soon as the supplier completes the design of the machine as per specifications, the technical details as per Annexure-(VII & VIII) which in no case should be more than six months from signing of contract, shall be supplied to Track Machine and Monitoring Directorate of RDSO for processing of provisional speed certificate for the machine so that it can be permitted to move on track. On case-to-case basis, more technical details (other than mentioned in Annexure-VII & VIII) can also be asked for issue of provisional speed certificate for the machine. The firm will also submit the technical details as per pro-forma placed at Annexure-II for NUCARS or similar track vehicle dynamic simulation. The supplier shall submit the NUCARS or similar track vehicle simulation report. The simulation charge shall be borne by supplier, if the simulation will be done by Indian Railways.

c) New suppliers, whose models are new:

The technical details shall be supplied as detailed in para (b) above.

23.0 FINAL SPEED CERTIFICATE:

Final speed certificate clearance of the machine shall be is given after conducting detailed oscillation trials of the machine vehicle. For this purpose Railways shall conduct running speed tests on the Indian Railways main line track on one of the machines supplied to them preferably with in warranty, in accordance with procedure outlined in Annexure- IX with the machine running up to speed 10% higher than the maximum speed mentioned in clause 2.15 above. The final speed test on the vehicle shall be done preferably within warranty period of the vehicle. The final speed of machine tested should be not less than that specified in clause 2.15.

24.0 ACCEPTANCE TEST:

24.1. In addition to verification of the various items of specifications covered earlier, the following tests shall be carried out in India at the purchaser’s premises by the purchaser’s nominee at the time of commissioning of the UTV. The pre-commissioning tests shall be completed and the machine shall be commissioned within 90 days of its arrival at the premises of the final consignee.

24.1.1 Dimensional check of loading gauge, i.e. maximum moving dimensions, buffer heights, clearances, length of machine, bogie distance, clearance on curves etc.

24.1.2 Performance of crane as per para 4.1, 4.4 & 4.7.
24.1.3 Testing for negotiability on 1 in 8 ½ turnouts.

24.1.4 Construction and engineering of the UTV and its ability to perform all the functions as laid down in the specifications above.

25.0 Should any modification be found necessary as a result of the tests, these shall be carried out by the supplier at his own expenses.

26.0 WARRANTY:

The UTV shall be warranted for 1200 effective working hours or 18 months from the date of commissioning and proving test of machine or 24 months from date of delivery at ultimate destination in India whichever shall be is earlier. Effective working hours for this purpose will be traffic block time during which UTV is deployed for work.

Should any design modification be made in any part of the machine offered, the warranty period of 18 months would commence from the date of commissioning and proving test of the UTV for the purpose of that part and those parts which may get damaged due to defects in the new replaced part. The cost of such modification shall be borne by the supplier.

27.0 MARKING & COLOUR OF MACHINE:

27.1 The machine body shall be painted in golden yellow colour of Indian Standard Colour code of 356 as per IS:5 The exterior painting shall be polyurethane binder based conforming to RDSO Specification No. M&C/PCN/100/2013 (Specification for Epoxy cum Polyurethane Painting System –Two packs for the Exterior Painting of Railway Coaches, Diesel and Electric Locomotives and other Industrial Applications) or ISO 12944.

27.2 Following should be written on the machine at appropriate location

i) India Railways logo of height between 300 mm to 600 mm as suitable on all four faces of the machine.

ii) On both side faces and below the Indian Railways logo, the text “INDIAN RAILWAYS” to be written in bold and in black colour of size equal to or slightly smaller than the size of logo but of size not less than 250 mm.

iii) Below the text “INDIAN RAILWAYS” mentioned above, machine model and manufacturing year should be written in black colour and in letter of size less than the size in which Indian Railways is written but not less than 200 mm in any case.

iv) If required, the manufacturers name may be written in size not more than 150 mm and should not be at more than four locations. Also the manufacturer’s logo may be provided at not more than two locations and should be of size less than 200 mm.

********************
Annexure-II

Machine details required for simulation of machine on NUCARS or similar Track-vehicle simulation software

<table>
<thead>
<tr>
<th>S. No</th>
<th>Component’s Name</th>
<th>Parameters required</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>Mass</th>
<th>Ixx</th>
<th>Iyy</th>
<th>Izz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Super structure with vehicle frame (Machine structure kept on secondary suspension of front and rear bogie)</td>
<td>C.G. of component in x, y, z direction from rail level in mm (reference point 1st axle)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Front Bogie frame including brake rigging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Rear Bogie frame including brake rigging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Transmission system device (hydraulic, Mechanical or electrical traction motors)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Wheel axle set including axle boxes which constitute the unsprung mass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Mass of Items included in unsprung mass partially or fully along with their name per axle</td>
<td>1 2 3 4 Total unsprung mass in tonnes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Total weight of components in tonnes</td>
<td>Front bogie full assembly</td>
<td>Rear bogie full assembly</td>
<td>Machine frame full structure</td>
<td>Full weight of vehicle (All bogies + vehicle car body or super structure)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Suspension stiffness details in kg/mm</td>
<td>Primary suspension element stiffness per axle box between bogie and axle box</td>
<td>Secondary suspension element stiffness per side between bogie and machine frame</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vertical stiff</td>
<td>Lateral stiff</td>
<td>Longitudinal stiff</td>
<td>Vertical stiff</td>
<td>Lateral stiff</td>
<td>Longitudinal stiff</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Damping force details (If hydraulic damper used give there rating force per meter/second)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Clearance in mm or radian provided for motion between bogie frame and machine frame for relative motion (motion stopper)</td>
<td>Vertical direction</td>
<td>Lateral direction</td>
<td>Longitudinal direction</td>
<td>Rotation about vertical axis</td>
<td>Rotation about Lateral axis</td>
<td>Rotation about Longitudinal axis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Detail of location of suspension elements</td>
<td>Detail of location of suspension springs and dampers and shock absorbers with support drawing</td>
<td>Detail of location of suspension springs and dampers and shock absorbers with support drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Details of centre pivot arrangement working and location</td>
<td>Provide detail arrangement drawing and description</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Set of drawings and design description</td>
<td>Concerning with general arrangement of vehicle, bogie general arrangement, suspension arrangement details, suspension clearances drawing, detail written description of configuration and loading pattern accompanies design particular of vehicle bogie.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Annexure-IVA

Sizes and Weight of Some of the P-way Materials and Small Track Machines to be Normally Loaded on UTV platform

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Height (mm)</th>
<th>Weight (kg.) (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Normal Concrete Sleeper</td>
<td>2750</td>
<td>150</td>
<td>220</td>
<td>300</td>
</tr>
<tr>
<td>2.</td>
<td>Wider Concrete Sleeper</td>
<td>2750</td>
<td>285</td>
<td>235</td>
<td>350</td>
</tr>
<tr>
<td>3.</td>
<td>Wooden Sleeper</td>
<td>2750</td>
<td>250</td>
<td>130</td>
<td>100</td>
</tr>
<tr>
<td>4.</td>
<td>Steel Trough Sleeper</td>
<td>2680</td>
<td>257</td>
<td>106</td>
<td>79</td>
</tr>
<tr>
<td>5.</td>
<td>60 kg Rail (2 nos.)</td>
<td>6500</td>
<td>150</td>
<td>172</td>
<td>785</td>
</tr>
<tr>
<td>6.</td>
<td>52 kg Rail</td>
<td>6500</td>
<td>136</td>
<td>156</td>
<td>676</td>
</tr>
<tr>
<td>7.</td>
<td>60 kg 1in 12 CMS crossing</td>
<td>4350</td>
<td>521</td>
<td>172</td>
<td>980</td>
</tr>
<tr>
<td>8.</td>
<td>Abrasive rail Cutter</td>
<td>1070</td>
<td>420</td>
<td>950</td>
<td>30</td>
</tr>
<tr>
<td>9.</td>
<td>Rail Drilling Machine</td>
<td>1030</td>
<td>450</td>
<td>570</td>
<td>60</td>
</tr>
<tr>
<td>10.</td>
<td>Rail Tensor</td>
<td>1700</td>
<td>400</td>
<td>300</td>
<td>700</td>
</tr>
</tbody>
</table>
Annexure-IVB

Sizes and Weight of Some of the P-way Materials to be loaded on Attached Flat Wagon

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Approx. Length (mm)</th>
<th>Weight of half set (switches) including all fittings (kg) (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Over Riding Switch (curved) 52 Kg</td>
<td>Tounge-12356</td>
<td>2410</td>
</tr>
<tr>
<td></td>
<td>(1 in 12)</td>
<td>Stock-13000</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Over Riding Switch (curved) 60 Kg</td>
<td>Tounge -12356</td>
<td>2700</td>
</tr>
<tr>
<td></td>
<td>(1 in 12)</td>
<td>Stock- 13000</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Over Riding Switch (curved) 60 Kg</td>
<td>Tounge -12935</td>
<td>2800</td>
</tr>
<tr>
<td></td>
<td>(1 in 16)</td>
<td>Stock- 13000</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Rail Length 60 kg</td>
<td>13000</td>
<td>780</td>
</tr>
<tr>
<td>5.</td>
<td>Rail Length 52 kg</td>
<td>13000</td>
<td>676</td>
</tr>
</tbody>
</table>
Annexure-V

BRAKE DESIGN DETAILS OF THE MACHINE FOR
CALCULATION OF EMERGENCY BRAKING DISTANCE

<table>
<thead>
<tr>
<th>Tare &amp; gross weight of the machine in Kilograms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake power in Kilograms</td>
</tr>
<tr>
<td>Type of Brake blocks</td>
</tr>
<tr>
<td>Brake block area in Square Centimetres</td>
</tr>
<tr>
<td>Brake Rigging Diagram</td>
</tr>
<tr>
<td>Type of Brake system</td>
</tr>
</tbody>
</table>
CERTIFICATE OF INSPECTION OF UTV (MODEL No:..........................)
BY INSPECTING OFFICIAL AND APPROVAL FOR DESPATCH OF UTV. (STRIKE OUT WHICHEVER NOT APPLICABLE)

This is to certify that I have inspected the
BRM_____________________________bearing Sr.No._____________________________ from
(date)_________________to_________________at (Place)_________________ for its conformity/non-conformity with respect to the laid down Technical Specifications in contract Agreement No._________________dated_______ between President of India through Executive Director/Railway Board and M/s. (Name of Supplier) _____________________________.

The detailed inspection note regarding its conformity/non-conformity to the laid specifications is enclosed along with this certificate. It is observed that (strike out whichever is not applicable):

- The UTV conforms to all the laid down specifications.
- The UTV 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 machine:

1. __________________________
2. __________________________
3. __________________________

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

The UTV is approved/not approved for dispatch to ___________ ___________ (Consignee) Indian Railways.

________________________________________________________________________

SIGNATURE AND DATE
INSPECTING OFFICIAL
(NAME AND DESIGNATION)
for and on Behalf of President of India
Annexure – VII

Particulars Required in Respect of the Rolling Stock Under Consideration

1. A diagram showing elevation salient dimensions:
   a) Wheel spacing, Wheel diameter, bogie centres, and axle load.
      I. Overall length of the vehicle:
      II. Length over head stock:
      III. Length over buffers:
      IV. Distance apart for center of buffers:
      V. Max./Min. height of centers 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 Railways 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. Unsprung weight per axle in tonnes:
   I. Driving axle:
   II. Running axle:

7. Expected lateral force in tonnes per axle At maximum design speed:

8. Increase in the impact load during motion (Dynamic Augment):

9. Method of operation - Whether single only or coupling together is possible. If coupling is possible, the number which can be coupled and what is trailing load:

10. 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:

11. Maximum braking force coming on to the rails per wheel:
12. Drawing indicating suspension arrangement details of bogie and axle.

13. Height of centre of gravity from rail level.

14. Height of floor from rail level.

15. Type of coupler provided - Indian Railways Standard
   I. Coupling
   II. Buffer

16. Any infringement to the moving dimensions
   (Sketch provided in the Indian Railways Standard Schedule of Dimensions – Chapter IV (A)).
Annexure – VIII

Following information as detailed below is also required along with the information required for processing the case for issue of provisional speed certificate for new vehicles

Name of the machine __________________ Model________________

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Item</th>
</tr>
</thead>
</table>
| 1.    | a) Brake System details  
        | b) 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 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/worn wheel flange/rail and other locations for the negotiability of the vehicle on curve and turn out (enclose Vogel’s 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. |
| 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-IX

ACCEPTANCE CRITERIA DURING OSCILLATION TRIALS

1. The speed potential of the machine offered by the firm should be established based upon oscillation trials conducted in India. The tests will be conducted at speed usually 10% higher than the maximum speed potential indicated by the firm for the machine under consideration and the following criteria satisfy for the same. For conducting the tests, a section of mainline track will be selected over which there is no temporary speed restrictions and which is considered by the Railway as being in a generally run down condition for mainline standards, but without speed restrictions. The vehicle will be tested generally for new and worn wheel clearance conditions and where relevant for operation in the forward and backward directions. The vehicle selected for tests will be one in average condition for normal maintenance.

2. The criteria applicable for establishing speed potential will be as follows:

   I. A lateral force lasting over a length more than 2 metres should not exceed the Prud-Homme’s limit of $K(1 + P/3)$ tonnes. Where $P$ is the axle load in tonnes, $K=0.85$ for wooden sleepers and $K= 1$ for concrete sleepers.

   II. Isolated peak values exceeding the above limit are permissible provided the record shows establishing characteristics of the vehicle subsequent to the disturbances.

   III. A derailment coefficient should be worked out in the form of ratio between the lateral force ($Hy$) and the wheel load ($Q$) continuously over a period of $1/20$th second, the value $Hy/Q$ shall not exceed 1.

   IV. The values of acceleration recorded in the cab at location as near as possible to the bogie pivot (as near as possible to axle in case of four wheelers) shall be limited to 0.55 g both in vertical and lateral directions. The peak values up to 0.60 g may be permitted if the records do not indicate a resonant tendency in the region of peak value.

   V. In the case of such vehicles where measurement of forces is not possible, the evaluation shall be in terms of ride index based on the accelerations measured as detailed in Para 2 (IV) above which shall not be greater than 4.5 but a limit of 4.25 is preferred.

   VI. A general indication of stable running characteristics of the vehicle as evidenced by the movements of the bogie in straight and curved track and lateral force and derailment coefficient of accelerations as the case may be.