Draft specification of “Rail Milling Machine (RMM)”
Based on Reasoned Document (26-12-17)

1. General:

1.1 This draft specification of rail milling machine informs the technical requirements of IR to the manufacturers and supplier. It is a self-propelled rail-milling machine. The Rail milling machine is meant to improve the worn profile of rail head to remove fatigued material having micro cracks and other surface defects on the rail head, re-profile rail head being friendly for rail wheel interaction and remove corrugations. The machine should be capable for mechanical surface processing by milling of rail head to minimize/removal of formation of defects on the running surface of the rails head. Mainly milling function to achieve the target profile and surface finishing tool as polishing tool for smoothing the rail surface upto desired value. Machine loaded with optical rail profile measuring system to obtain real time track rail profile and able to feed milling processor as input to get smooth target rail profile in real time automation. The Rail milling machine shall be able to effectively work on open tangent track, curves, switches, SEJ, rail on bridge, in tunnels rail having without removal of checkrail/guard rail and S&T equipment. The Rail milling machine shall be able to effectively work without removal of The Technical requirements have been drafted to cover the performance and quality requirement of the equipment. Manufacturers are requested to carefully study the specifications and assure that their equipment fully comply with these requirements.

1.2 The manufacturers and supplier provide supply, testing, commissioning, maintenance and operation of a self-propelled rail-milling machine analysis system (here after referred as machines) for use on the tracks of Indian Railways.

1.3 One crew rest van having resting capacity of about 12 persons without compromising the space for crew (a general layout has been given at Annexure VIII of the technical Specification which may further be modified after approval of Indian Railway) will be integral part of the machine and shall be supplied with the same. The supplier shall include all items and accessories required for proper operation of the machine along with the offer and not mentioned in these specifications and supply the same along with the machine. Rest van may be attached at rear end of rail milling machine.

1.4 The Technical Specifications have been drafted to cover the performance and quality requirement of the equipment in a neutral manner without bias to any specific manufacturer. Bidders are requested to carefully study the specifications and assure that their equipment fully comply with these specifications. Thereafter, if a bidder feels that his equipment can substantially meet the performance and quality requirement of the specification in general but does not fully satisfy a particular specification, he should immediately seek clarification from the purchaser prior to submission of bids as to whether such deviation is substantive or not and he should clarify how will his equipment meet the functional requirement of that deviation.
1.5 The tenderer shall specify the model offered and furnish a detailed Technical Description of the machine. System/sub-systems of the working mechanisms of the Rail milling Machine as per clause ‘3 of this specification & Annexure 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 requirement of the specifications are accomplished by the machines (models) offered.

1.6 Photographs and video (in compact disc//Pen drive) of the type of machine offered in working mode (showing the working of machine in real time under field conditions) be enclosed with the offer. This shall also show close-ups of various working assemblies/systems and the full machine.

2. Dimensional and Operating requirements:

2.1 The diesel-powered / diesel-electric powered with intelligent energy management system, self-propelled Rail Milling Machine shall be of latest design, robust, reliable and suitable for working on Indian Railways. The design and dimensions of the machine components shall be to SI (International) system of unit standards and should comply with provision of Indian Railways Schedule of Dimensions – 1676 mm gauge (BG), revised, 2004 with the latest corrigendum and up to date correction slips issued.

2.2 Quality assurance during manufacturing of the machine shall be according to ISO-9001. The welding standard followed for manufacturing of machine should be to ISO:3834, EN:15085 or any other equivalent standard for welding railway vehicle and components. The manufacturer should specify the standard followed and certify that it meets the welding standard mentioned above. The machine shall also be suitable for working on rail of straight, transition and curved tracks (up to 10 degree) and upto 3% gradient, switches and crossing, SEJ, rail on bridge with guard rail, in tunnels, level crossing having checkrail/ without check rail on broad gauge (1676 mm) of Indian Railways.

2.3 The Machine shall be Diesel/ diesel-electric powered (preferably indigenous) self-propelled bogie type vehicle. It should be reliable and suitable for working on Indian Railways straight, transitions and curved track up to 10° curves on broad gauge (1676 mm). Shared 2 axle bogies between two carriages and/or between two vehicles are not acceptable. The machines shall be capable of negotiating curves up to 10° curvature (175 m radius), super elevation up to 185 mm and gradients up to 3% in travel mode as well in working mode. The manufacturer shall specify the minimum attainable speed under the above limiting conditions which in any case shall not be less than 40kmph.

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, safety and operation requirements of Indian Railways (Annexure-I). 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 this 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 infringes the minimum clearance of 102 mm from rail level while travelling.

2.6 The machines 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° to 55°C
- Altitude : Sea level to 1800 m above mean sea level
- Humidity : 20% to 100%
- Maximum rail temperature : 70°C

All the system components on the machine shall be covered by roof or other suitable sturdy covering so that the system & components vulnerable to moisture ingress are not adversely affected during rains and the machine is able to work continuously even during rains.

2.7 The profile of the machines longitudinally and in cross section during transfer as self-propelled vehicle or towed in train formation as last vehicle shall be within the Indian Railways Schedule of Dimensions –1676 mm gauge (BG), revised, 2004 with the latest corrigendum and up to date correction slips issued. The minimum and maximum moving dimensions of the machines in plan and cross-section and shall give calculations to show the extent of lateral shift at the ends, centre and any other relevant cross section and to prove that the machines do not cause infringement while moving on a 10° curve at any cross section while opening and closing of work. The machine shall be equipped with pneumatically operated brake/Disc brakes of IRS blocks acting on all wheels.

2.8 Axle load shall be less than 20.32 T with minimum axle spacing of 1.83m. Load per meter shall not exceed 7.67 tones. Axle loads up to 22.82t and lower axle spacing may be permitted, provided the load combinations do not cause excessive stresses in the track and bridges of IR. Stresses in the tracks & bridges shall be calculated by Indian Railways/RDSO based on design data submitted by the firm as per (Annexure III A to C), and decision of Indian Railways/RDSO shall be final in this regard.

2.9 The Machines shall have a desirable wheel diameter of 914mm or more (new wheel profile). However, lesser diameter up to 730 mm (new wheel profile) can also be considered, provided it meets the condition laid down in clause 2.5 at its condemnation limit and also rail wheel contact stresses for 72 UTS are within permissible limit. Forged wheels to Indian Railway Profile shall be provided on the machine. It is desirable that 50mm margin between new and permitted worn wheel diameter should be available. 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>
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<tbody>
<tr>
<td>22.82</td>
<td>908</td>
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<tr>
<td>22.00</td>
<td>878</td>
</tr>
<tr>
<td>21.50</td>
<td>860</td>
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<tr>
<td>21.00</td>
<td>841</td>
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<tr>
<td>20.32</td>
<td>816</td>
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<tr>
<td>20.0</td>
<td>805</td>
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<tr>
<td>19.5</td>
<td>787</td>
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<td>768</td>
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<tr>
<td>18.5</td>
<td>750</td>
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<tr>
<td>18.0</td>
<td>732</td>
</tr>
<tr>
<td>17.5</td>
<td>713</td>
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</tbody>
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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 (Annexure II).

2.10 Wheels shall be conforming to Indian Railway 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 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 Railway 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 Railway 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 submit detailed design calculation along with material parameters at the time of supply of the machine.

2.13 The Milling Machine formation (in composition with all its integral part) shall be capable of travelling at a speed of 80km/h in either direction when travelling on its own power. In train formation, it should be capable of being hauled at a speed of 100km/h. It shall be possible to haul the machines in both directions at the same speed. Since the machines are likely to cover long distances on their own power, the travel drive system should be robust to sustain these requirements during the life of the machine without much breakdown/failure.

2.14 The machines shall be capable of working without requiring power block in electrified sections. 2*25KV or 25 KV power 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. Accuracy of measurement shall not be affected in any manner due to overhead and track circuit voltage
(12 V & 1 AMP). In the work mode, no part of the machines should rise beyond 4.265 m. above rail level for safe working in the electrified sections.

2.15 While working on double line sections, the machines or its any part shall not infringe the adjoining track as per the Indian Railways schedule of Dimension 1676 gauge (BG) revised 2004 with latest correction slip issued, while opening and closing of work. During working, also 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.

2.16 It shall be possible to drive the machine in both directions at the same speed from both ends.

2.17 To enhance the safety of Machine operation in continuous Ghat section and to restrict the speed of the machine going down the gradient to pre-determined maximum speed, the supplier has to provide ‘Automatic Penalty Brake Application System’ in the machine as per Instruction Bulletin no. MP. IB.EC. 01.02.2008 issued by RDSO.

3. WORKING MECHANISM OF RAIL MILLING MACHINE:

3.1 The working mechanism of the rail milling machine shall be equipped with:

3.1.1 Desired milling processing units and sufficient cutting heads with different required cutting tools to provide required target profiles of rail in one pass.

3.1.2 Control system for rail milling mechanism shall be CNC based so that required different target profiles should be processed with different cutting tool heads/ cassettes setting to achieve target profile loaded before starting of machine and system shall be able to change required tool head in operation according to target profile required.

3.1.3 During work, machine shall be able to adopt automatically the milling parameter according to the target profile and rail condition. All parameters shall have visualization from control cabin.

3.1.4 Machine shall be capable of dry cutting process without cooling agents in milling.

3.1.5 Milling operation and cutting controls shall be CNC and PLC based with or without additional surface finishing tool/grinder with all functional control, visualization screen and commands from cabin. Preference may be given to manufacturer, offering, surface finish mechanism without grinding stones. Machine shall be able to produce finish surface superior than 8 micron.

3.1.6 CNC control processing units should be capable to process both rails independently with a cutting tool heads equipped with multiple functional tools.

3.1.7 Machine shall be equipped with optical rail profile measurement system (ORPMS) to examine pre and post –profile of rail head and monitor milling performance. System should be capable to transfer it to onboard computer for access and calculate difference with target profile.

3.2 The rail milling machine should be capable of producing good longitudinal and transverse profile of the railhead continuously.

3.3 The rail milling machine shall be capable of smooth milling over plain track, curves, level crossing, track on sharp curves having check rails without removing the check rails, track in tunnels, track on bridges having guard rails without removing the guard rails, switch and crossing and track on platform lines.
3.4 The change in cutting tool heads during operation of machine on plain track to switches and level crossing shall be possible to implement seamlessly from the operator control station while milling over open track.

3.5 The rail milling machine shall also be capable of milling only one of the rails of the track as in the case of curves etc., if required.

3.6 The rail milling machine shall be capable of milling profile of UIC 60 Kg rail section, 52 Kg rail heads in 72/90/110 UTS strength and head hardened rails inclusive of fish plated joint, insulated joints and welded joints in long welded rails and short welded rails laid on pre stressed concrete sleepers, steel sleepers, composite sleepers and wooden sleepers. It shall also function effectively on rails having surface defects such as wheel burns, shelling and corrugation etc. The configuration of tools in cutting tool heads of the machine shall be such, that to carry out cleaning of all rail corrugation defects and also defects of long wave length to produce a smooth cross sectional profile without creating any sharp edge between the rail table and gauge face. Supplier should mention that upto what wave length corrugation abrasion is millable by his machine, measuring mechanism of corrugation also to be provided so that after milling assessment of final track take place.

3.7 The supplier shall ensure that the offered rail milling machines shall be capable of modular up gradation at a later stage and shall have such computer hardware and software which shall facilitate easy up gradation.

3.8 The rail milling and finishing mechanism shall be electric driven or hydraulic driven, drawing power from an onboard diesel generating set.

3.9 The rail milling machine, cutting heads/tools and any other equipment should be capable to perform continuous operation up to 8 hrs in one spell under the field working conditions of Indian Railway. They must be shielded against heat accumulation in the work area and good effective suction type disposal system for metallic chip/dust generated at the work site.

3.10 Machine shall be capable to give post milling profile so as to compare it with target rail profile to judge machine performance and system shall also able to calculate total material cut from rail top surface.

3.11 Each milling processing unit shall be controlled by electric / hydraulic/ pneumatic means for its up/down movement.

3.12 The rail milling machine shall be equipped with an inbuilt mechanism to stop the milling when the operating tools head malfunction/any tool damaged in certain angle or so. Each milling head operation and control should be visible from control cabin to observe and audio alarm in malfunctioning to stop in case of emergency.

3.13 The rail milling machine shall capable to cut excessive material from each rail in one pass to achieves target profile, from the rail top of a 60 kg. UIC (90 UTS) rail section, with top surface work hardened, 315 to 380 BHN will be provided by the supplier. Capability of machine to cut depth of material on various speed may be as below:-

- Work Speed: 2000 m / h up to 1.0 mm
- Work Speed: 1200 m / h up to 1.5 mm
- Work Speed: 700 m / h up to 3.0 mm
3.14 The metal removal shall be fairly uniform over the entire rail surface to be cut. Machine shall be capable to absorb the milling forces in horizontal and vertical direction by suitable mechanism so that milling operation not affected.

3.15 Supplier shall ensure that system is fairly capable of minimum 0.3mm 0.2mm to maximum of 2.0mm 3mm depth of cutting in terms of depth milling capacity achieved by the machine over centre, field side and gauge corner of rail head while operation.

3.16 The supplier shall mention that rail milling machine capability of removing minimum and maximum material from each rail in each pass in term of area and volume of material cut, from the rail top of a 60 kg. UIC (90 UTS) rail section, with top surface work hardened to BHN 315 to 380, while operating at various speed of 1500 meter/hour and 900meter/hour.

3.17 Machine shall be capable to ensure Gauge Face correction without flattening the root curve. Machine will work in safe diagnostic mode in all condition, so that in no condition machine functioning/ malfunctioning damage rail head or over cut precious rail material above desired quantity and by audio/visual alarm signal alert to the operator.

3.18 The unit must be capable of travelling and milling under the following track conditions:
   (i) Maximum continuous gradient (more than 1 Km) 3%
   (ii) Minimum radius curve 175m

3.19 There shall be computer controlled monitoring of input and output of different electrical/ electronic devices with the facility of display of input/output so as to monitor the functioning of electrical/electronic devices.

3.20 The machine cutting processing unit’s control for raising/lowering, and other all movement controls shall be from control consol only.

3.21 The computer controlled system shall have the facility of System diagnostics in operator’s cabin (at least in one cab) which should be able to do following:
   (a) Detection of short circuit and open circuit conditions and measurement of amperage in connection to control devices.
   (b) Diagnostics modules shall be provided for troubleshooting of various electronic printed circuit boards used up to card/board level fault finding.
   (c) Communication between various sub systems used in the system shall be provided as a diagnostics feature.

3.22 The rail milling machine must be equipped with an obstacle sensing/detection system with manual lifting of the cutting head carriages through controls from operators’ cabin before approaching the obstacle and restore it after the clearance of the obstacles.

3.23 The cutting head tools must be sufficient in numbers cantered over the spot at all intended cutting angles to achieve target profile in one pass. To ensure proper positioning and angle of the cutting module, the support structure must be equipped with electronic sensing to permit the angular adjustment in relation to the rail for proper and balance pressure on entire width of tool head. Accordingly, Vertical and horizontal adjustment of processing units and required processing forces should be controlled by CNC itself.

3.24 The machine must be capable of achieving target profile on any worn rail profile to shapes within justified tolerances with selected target profile.
3.25 The surface finishes after the milling shall be that corresponding to RMS value of 8 microns roughness or less. To achieve the required finish Finishing may be achieved by with or without any suitable finishing tool/ system may be used to fulfil the standard.

3.26 The rail milling machine must be capable of setting down or picking up Cutting tools head in curves.

3.27 Milling carriages should be capable of being raised and lowered and locked into position on 10° curved tracks up to 175m radius.

3.28 The rail milling machine must be supplied with adequate lighting to perform functioning at night safely and efficiently.

3.29 Milling area shall be covered by protection hood, effective suction removal of metal chips and metal dust for big chip volume with a transverse conveyor system into a container which accommodate chip/dust and easy to release after a 3 days work.

3.30 There should be an installed, integrated backup of the following critical sub-systems to ensure maximum availability and minimal chances of disruption of rail milling machine operations:
   - Hydraulic pumps/motors
   - Air compressors
   A suitable by-pass mechanism should be installed and integrated to main system to operate the machine with backup assembly.

3.31 Rail milling machine is capable to achieve required rail head profile by covering entire rail head width with by milling wheel single/double cutting tools unit both rail in one pass with achievable configuration of tools in units. The system and cutting units at all angles the milling efforts must potentially be 100%.

3.32 The Supplier/ Manufacturer is responsible to deliver required skill to the IR staff to manage different configuration of tools in cutting tool unit for achieving different target profiles and also educate with required skill for preparation of different angle/shaped tools and strategy of their uses (When, Where and How)

3.33 The on board computer will, monitor the main system of rail milling machine and maintain a log of following items:
   (a) Milling tool head performance
   (b) Cutting tool head configure of tools uses
   (c) Milling time.
   (d) Tools life.
   (e) Performance monitoring
   - Quantitative assessment of metal removal from each km of track to achieve target profile.
   - Percentage deviation of ground profile from target profile
   - Quantum of work done in each milling km
   - History of existing rail profile, target profile
   (f) Engine performance monitoring
   (g) Machine fault monitoring and alarm logs
   (h) Profile opted for specific location
(i) Daily production reporting
(j) Tools angles and used configuration in tool heads for used profile

3.34 It shall also be possible to record the milling length vis-à-vis time on a print out to obtain information on the rail milling machine output. The system shall be able to produce performance parameters and progress of work such as milling length, speed of milling, number of passes done, pre/post milling - Quality Index (QI) etc in a way that should facilitate its transfer to pen drive at the end of day’s work.

3.35 The rail milling machine shall be provided with a set of optical rail profile measuring system integrated with the onboard computer both in front of the rail milling mechanism as well as rear of the rail milling mechanism.

a) The profile measurement system should be able to capture rail profile both ahead of and behind the milling machine and should have capacity to store data of rail profile at least 200 km of track length for real time comparison of rail profile before milling and after. Optical rail profile measurement system should have facility to transfer data to onboard computer without human interface.

b) The on board profile measurement system, in a real time basis, should show the actual rail profile ahead of work and after the work, difference between the measured profile and selected target profile. The system should save the captured rail profile data along with input location data such as milepost, curve-data, speed etc.

c) Electronic/computerized rail profile data processing system and software plug-ins to milling the existing rail profile to a selected target rail profile shall be provided on board to Rail Milling Machine. Rail Milling Machine should be equipped with following hardware and software accordingly -

i. To capture, store and process rail profile data from other satellite measuring devices of rail profile,
ii. Machine having required software for quantitative assessment of metal removal per meter of rail to achieve target rail profile,
iii. Recommended cutting tool head configuration for achieving different target rail Profile,
iv. Comparative picture of target profile and profile achieved after processing on real time basis,

d) Quantitative assessment of deviation of milled profile from target profile, The rail milling machine should be provided with the necessary software and hardware system to store a library of desired railhead profiles (templates). The supplier shall be responsible to provide technical support and services for software maintenance and upgradation during warranty and subsequent working life of the rail milling machine (minimum 15 years).

e) To develop library of target profiles for various rail sections on different route, supplier of rail milling machine will design the target rail profiles friendly to sectional rolling stocks for all the locations where it will be deployed to work. The system should be equipped to store data of rail profile before milling, its target profile and rail profile after milling in an integrated way so that it could be retrieved for any given location of track.

4. DIESEL ENGINE/ELECTRIC GENERATOR:

4.1 The machines shall be powered by diesel engine(s)/diesel electrical engines preferably indigenous, with proven record of service in tropical countries with wide service network in India. Robust construction and low maintenance cost are of particular importance. Adequate
allowance shall be made to provide adequate reserve power to take care of the working of machines under most adverse climatic conditions, heavy milling requirements on steep gradients, and to provide backup power in case of failure of one of the engines.

4.2 The supplier should 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.

4.3 Diesel tank fuel capacity of the rail milling machine should not be less than 40 hrs of working. Supplier should mention the fuel storage capacity and average fuel consumption of machines.

4.4 The engine shall be mounted on suitable Anti-Vibration Mountings.

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

4.6 Sight glass type fuel measuring gauge or any other indicator shall be provided on the fuel tank.

4.7 For starting the engines, storage batteries of well-known make shall be provided. The engine shall be push button start type or key type.

4.8 Since the engines are to work outdoor under extreme dusty condition, the air intake system shall be designed suitably so as not to allow dust through air intake system.

4.9 There is likelihood of dust deposition over the engine body and surrounding area over the lubricants spill-over. These should be easy to access 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.

4.10 The engine parameter monitoring gauges like temperature, rpm, 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 coloured. There shall be audiovisual warning (safety mechanism) to the operators in case of any of these parameters exceeding the safe limit, and engine shut down circuit in case of operator’s failure to respond.

4.11 The diesel engines of Rail Milling Machine shall be coupled to the electric generator(s) of a continuous rating to suit machine-operating requirements. Suitable cooling arrangement for the generator shall be provided. The electric generation parameter monitoring gauges shall be provided like wattmeter, voltmeter, ammeter, frequency meter etc. Generator shall have over voltage protection.

4.12 The diesel engines of machines should meet emission norms regulated by Government of India. In order to adhere to pollution control norms, the diesel engine should be electronically controlled emissionized engine with minimum compliance to tier 2 stage or other superior device to control emission.

4.13 The electric power should be on a common bus to ensure milling with specific cutting tool head may continue in case of failure of one of the engines / generators. The supplier shall furnish the details of power requirement for working under normal conditions as specified in clause 3.13 and power required on the machine other system and sub system.
4.14 The engine should have Electronic Control Module (ECM) or similar arrangement for taking out operating parameters on real time basis such as RPM, load, temperature, pressure and diagnostic data as well as trip and historical data. These data should be displayed and stored on a centralized computer and monitoring system. It should also be possible to transfer these data on USB device through the centralised computer based control.

5. REST VANS:

5.1 One crew rest van having total capacity of about 12 persons will be integral part of the Rail Milling Machine and shall be supplied with the same.

5.2 Typical layout of coach is given at Annexure VIII of the Technical Specification. These layouts are for guidance of tenderer in respect of the facilities required and general arrangement thereof.

5.3 Tenderer can propose modifications in layout as a part of technical proposal while providing the required facilities as per typical layout. Overall dimensions of the rest van will be within (+/-) 10% of the typical layout subjected to conformity to the Indian Railways Schedule of Dimensions 1676mm Gauge (BG) – Revised 2004 incorporating all correction slips up to date. The modifications proposed by tenderer will be discussed with tenderer during technical evaluation and necessary modifications required by IR will be incorporated by the tenderer as per mutual consent. If any further modifications are required by the successful contractor at the stage of detailed design, the same will be subjects to approval of RDSO.

5.4 Rest van should be air conditioned and fully furnished for comfortable stay of operation & maintenance crew and IR personnel.

5.5 Minimum amenities to be provided in rest vans, its colour scheme and other details shall be as per Correction Slip no.12 of IRTMM-2000. A Washing machine, Microwave oven and communication gadgets are also to be provided.

6. COOLING SYSTEM:

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

7. BRAKES:

7.1 The machines shall be fitted with the compressed airbrakes system or equipped with disk brakes of IR standard applying brakes equally on all wheels/axle.

7.2 The rail milling machine shall have provision for suitable air brake or equipped with disk brakes of IR standard system in the driving cabins to brake the entire consist including camping coach/crew rest van and water wagon attached as a part of its consist/formation. Fail safe braking mechanism system shall be provided so that in case of any failure of brake circuit will result in automatic application of brake. The pneumatic parking brake should also be spring loaded so that in case of drop in pneumatic pressure below certain value the brake will be automatically be applied.
7.3 The brakes shall be protected from ingress of water, grease, oil or other substances, which may have an adverse effect on them. The brake lining shall be suitable for high ambient temperature of 55°C. The force required for operating the air brake shall not exceed 10 kg at the handle while applying by hand and 15kg on the pedal, when applied by foot. In addition, mechanical brakes shall also be provided for use in an eventuality of failure as well as for parking.

7.4 The machines shall be equipped with suitable air brake valves so that while working in train formation, machines can be braked by the traction vehicle.

7.5 The pneumatic circuit should be provided with air dryer for the smooth working of pneumatic components.

7.6 There should be provision of emergency brake application in the machine either travelling alone or coupled with the coach/wagons, in addition to the normal braking system of the machine, using the compressed air. The emergency braking distance (EBD) of the machine on the Indian Railway Track, at the maximum design speed on level track shall not be more than 600 m. 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 III-D.

7.7 Provision of hand operated “Manual operated hand brake” system shall be provided.

8. SAFETY MECHANISM:

8.1 The Machines shall be provided with electric horns/ hooters facing outwards at each end of the machine at suitable locations to warn the workmen of any impending danger at the work spot or from oncoming train. These electric horns/hooters shall be operated by means of push buttons provided in the cabs.

8.2 The Machines shall have arrangement for flasher lights at both ends.

8.3 Safety equipments like jacks, pullers, tirfor and other such equipments specific to the machines for restoring failed units of the machines during working, shall be provided on the machines.

8.4 Machines shall be provided with emergency backup system to wind up the machines in the event of failure of prime mover or power transmission system of the machine. The emergency backup system should able to be operated manually and may also use a manual hydraulic power pack in addition to the emergency generator / battery based electric hydraulic system.

8.5 The Milling carriages of machine should have non-flammable shields and guards so as to avoid damage due to milling scrape/sparks, dust and flying debris.

8.6 The rail milling machine shall have a UV and Temperature based fire detection system that will alert the operator. There shall be an arrangement that when the fire extinguisher is activated, the all engine automatically shuts down with activated intelligent hazard safety system to protect the CNC and PLC control consol.
9. **HOOKS AND BUFFERS:**
The machines shall be fitted with transition CBC coupling, screw coupling and buffers of IR design on both the ends for coupling it with other vehicles for running it in train formation. Attachment with IR standard locomotives, wagons & coaches should be possible.

10. **ELECTRIC EQUIPMENT AND LIGHTING:**
The electrical equipment to be provided on machines shall conform to relevant standard specifications and shall be suitable for Indian climatic conditions. The machine shall be equipped with Twin beam headlight assembly conforming to RDSO’s specification No. ELRS/SPEC/PR/0024 Rev-1, Sept 2004 with latest amendments ensuring a light intensity of 3.2 lux at ground level at track centre at a distance of 305 mts. 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 pressurize floodlights shall also be provided to illuminate the working area sufficiently bright for efficient working during night. The umber colour LED based flasher lights producing not less than 500 lux at 1 meter and 55 lux at 3 meter at both ends shall be provided on the machine to give indication to the train arriving on other line. In addition minimum eight power point locations 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.

11. **CHASSIS AND UNDERFRAME:**
The chassis of machines shall be of standard welded steel section and of steel sheets, so as to permit transportation of the machine in train formation without endangering safety of the train. The under frame shall be constructed with rolled steel section and/or plates and shall be designed to withstand a maximum static squeeze test load of 102t at buffers i.e. 51t 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 last vehicle.

12. **CABINS:**

12.1 The machines shall be equipped with fully enclosed air conditioned and pressurized cabins with safety glass window at both the ends. The noise level in the cabins should be less than 70 dB for operator’s comfort. It shall be possible to have a clear view of the track ahead while driving the machine in both the directions from the cabins at either end. The cabin layout shall be such that, before leaving the machine, the operating staffs has full view on both the sides, to avoid any danger to them from trains on the adjacent tracks.

12.2 The gauges, instruments, CNC and PLC monitors and controls shall be suitably located in the operator’s cab so that they can be observed without undue fatigue to the operator.

12.3 The operator’s cabin shall be ergonomically designed to have easy access to all controls.

12.4 Screen wipers preferably operated by compressed air or electricity shall be provided on the wind screens.

12.5 Suitable number of fire extinguisher (dry chemical type) shall be provided in all the vehicles.

12.6 The machines shall be provided with well-defined space for keeping the tools and spares required for at least one week of operation and onsite repair of the machine to attend the breakdowns and other working requirements.
12.7 Large window shall be provided in both cabs of the rail milling machine at low level to ensure good visibility for the operator controlling working and driving of machines to observe the track features and to operate the controls based on the features/obstructions being approached and cleared. Facility of driving the machine for travelling purpose shall be from both the cabins. All travelling and milling control shall be housed in the air conditioned cabins.

13. TOOLS AND INSTRUCTION MANUALS:

13.1 Rail milling machine shall be supplied with a complete at least four complete set kit of cutting tools for milling purpose.

13.2 The supplier should supply required tools kit by the operator in emergency and for normal working of the machines. The list of tools to be provided shall also include all tools necessary for maintenance and repair of the entire machine including specialized equipment, like milling tool sharpener, grinder, hydraulic jacks, welding equipment, wheel truing shoes, refractometer, power tools, air hoses etc. All special tools shall be listed and catalogued illustrating the method of application. The list can be modified to suit the purchaser's requirement, while examining the offer. The supplier shall include all items and accessories required for proper operation of the machine along with the offer and not mentioned in these specifications and supply the same along with the machine.

13.3 Detailed operating manual, maintenance and service manual shall be specifically prepared in English Language and four copies of these shall be supplied with each machine.

13.4 The manufacturer shall also supply circuit diagrams of electrical hydraulic, pneumatic and electronic circuits used on the machine. Trouble shooting diagram/table shall also be supplied. In addition, the supplier shall provide dimension drawings with material description of items like rubber seals, washers, springs, bushes, metallic pins etc., main features such as type, RPM & discharge etc. of items like hydraulic pump-motors, and the tenderer shall furnish the details of such other bought out components/assemblies. These shall be specially prepared in English language and four copies of these shall be supplied with each machine.

13.5 Documents to be supplied with the machines should 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 should be carried out and compliance should be reported to RDSO as well as the Inspecting officer of the first machine.

13.6 The firm shall provide detailed technical drawings and specifications of wheels and axles used on the machines. The above details shall be provided in four sets with each machine.

13.7 One set each of all the manuals and diagrams should be sent to the Principal/IRTMTC, Allahabad, ED/TM/RDSO, Lucknow, DTK(MC)/Railway Board and Director/IRICEN/ Pune along with supply of first machine. 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.

13.8 Each machine should be supplied with following Equipments-
- Two contact based rail profile measuring equipment shall be supplied by Manufacturer along with machine as per RDSO Specification no. TM/SM – 323
- Bar gauge with appropriate templates
• Digital inclinometer
• Rail Hardness measuring equipment
• Rail Roughness measuring equipment

14. SPARE PARTS:

14.1 The expected life of the components shall be advised along with their condemning limits.

14.2 The manufacturer shall be responsible for the subsequent availability of spare parts and special tools etc. to ensure trouble free service for the life of the machine. (Minimum 15 years)

14.3 For indigenous parts and bought 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 machine for inspection.

15. MAKER’S TEST CERTIFICATE:

15.1 Copies of maker’s certificate guaranteeing the performance of the machine shall be supplied in duplicate along with the delivery of each machine.

16. OPERATORS:

16.1 The supplier of machine shall confirm after commissioning of machine at least two year operation and maintenance of machine by their fully skilled staff on Indian Railway track and also trained IR staff in all about operation and maintenance of machine and the required number of operators and allied staff for smooth working of the machines under normal condition shall be indicated, specifying their duties and minimum qualifications.

17. OPTIONAL EQUIPMENT:

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

18. INSPECTION:

18.1 While inspecting the machine before dispatch from the supplier’s premises, the inspecting officer to be nominated by the purchaser shall verify the conformity of the machine with respect to individual clause of technical requirements laid down in this specification. The machine’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 machine” as per Annexure-IV enclosed.

18.2 Following arrangements shall be made by the supplier/Manufacturer at the inspection premises for carrying out inspection of the machine by inspecting officials:
   i. Machine to be stabled on straight & level BG track. The length of the track should be at least 10 m more than buffer to buffer length of machine.
   ii. In order to check Maximum Moving dimensions in cross section, a sturdy frame of IR Max Moving Dimensions shall be provided by the manufacturer and passed over the
iii. Adequate arrangements shall be made to the satisfaction of inspecting official.

18.3 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 13, 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 IR maximum moving dimensions envelope shall be provided to 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 of draft inspection report 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>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(To be filled by inspecting officer)</td>
</tr>
</tbody>
</table>


v. Manufacturer’s quality certificate and/or test reports for bought out assemblies/subassemblies to be provided to IO, containing serial number wherever applicable.

vi. Draft Inspection Report to be prepared by the manufacturer, containing all annexure mentioned at clause 18.4.

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 keeping in view the Inspecting Officer’s comments, if any.

18.4 List of documents to be annexed in the draft Inspection Report should 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 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.

Above documents shall be part of final inspection report.
19. 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. For issue of provisional speed certificate, the following actions are required to be taken by the suppliers.

20. MARKING & COLOUR:

20.1 The machine body shall be painted in golden yellow colour, conforming to RDSO specification No M & C/PCN/109/88 (with latest amendment) to minimum DFT of 80 mm. Colour code to be ISC: 356.

20.2 Following should be written on the machine at appropriate location (as per Annexure V):

i. Indian Railway’s logo of height between 300 mm to 600 mm as suitable on all four faces of the machine.

ii. On both side faces, 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 color 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 desired by the Manufacturers, his Name may be written in size not more than 150 mm and should not be at more than four locations. Also the Manufacturers Logo may be provided at not more than two Locations and should be of size less than 200mm.

21. Acceptance test-
The acceptance test as below shall be carried out at the time of commissioning of machines in India at the consignee Railway.

21.1 Rail Milling Machine: The acceptance test of Rail milling Machine shall consist of:

A. Dimensional test of the loading gauge, maximum moving dimensions, buffer heights, clearances etc.

B. Testing for negotiability of 10-degree curve and 1 in 8.5 turnouts.

C. Train running speed tests (light running) on the Indian Railway main line track in accordance with the procedure outlined at Annexure –VI.

D. Construction and engineering of the machine.

E. Output performance quality tests with High carbon 90 UTS/110 UTS H.H. rails with 60-kg/52 kg UIC section.

F. Profile of the rail section shall not be deformed.

G. For the purpose of metal removal capability of the machine (clause 3.13), 2 sites of minimum 500m each shall be selected. At each site measurement of both left and right rail shall be taken Also one location each on 1 in 8.5 and 1 in 12 turnout marked to evaluate total cutting area on turnout and performance on turnout.

i. At each site, the machine shall milled and grind a length of at least 500 meters to ensure that no any metallurgical changes take place on rail section.

ii. The profile of the rail shall be close to the desired profile.

iii. The rail hardness shall be measured and recorded.

iv. A each site, on the test rails, 5 X-sections shall be selected on both rails. These X sections shall be at least 2 meters away from any weld/fish plated joint and not in heavily corrugated rail.
v. The X-sectional area shall be recorded, at each X-section, before the milling, and after one milling pass. The working speed, while milling/grinding shall be maintained as specified.

vi. The average material removal per pass for the site shall be the average of material removal per pass at 5 X-sections.

vii. The average material removal per pass at the specified speed at each of the 2 sites both left and right rail separately shall be more than that specified by IR officials.

H. For the purpose of depth of metal removal capability of the machine (clause 3.13), 2 sites of minimum 500m each shall be selected for carrying out tests at the speeds mentioned in clause 3.13. At each site, measurement of both left and right rail shall be taken:

i. At each site, the machine shall milled and grind a length of at least 500 meters to ensure that the no any metallurgical changes take place on rail section.

ii. The profile of the rail shall be close to the desired profile.

iii. The rail hardness shall be measured and recorded.

iv. 5 points shall be chosen at 5 locations across the X-section, one towards gauge face side, three in the middle of rail top and one towards non-gauge face side such as to cover full width of rail head, at 5 X-sections on both rails at each of the 2 sites.

v. The working speed, while milling shall be maintained as specified. The depth of metal removed shall be measured by measuring the depth of cut rail profile before and after one milling pass (as per clause no. 21.1/G/v). Measurement to be done with Contact based Rail profile measurement Device with or better precision/accuracy.

vi. The average of the 10 observations at each site for each rail shall be worked out. The average depth of metal removal per pass for the site shall be the average depth of material removed for all 10 test points.

vii. None of the average depth of metal removal per pass for a site, out of 5 selected sites for both rails should be less than as specified at clause 3.13 for the respective milling speed.

I. Stoppages of work not attributable to machine shall be discounted.

J. The difference in the target profile and ground profile ie profile achieved after milling, shall not more than + 1% in terms of cross sectional area of rail head.

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

22. TRAINING:

22.1 The supplier shall impart professional training to IR Personnel in various aspects of operation, maintenance and management of the machine, planning and designing rail milling program, inspection, monitoring, quality control and review as per the brief scope defined in Annexure-VII.

The tenderer will submit detailed program covering scope and coverage in detail, place and manner in which the training will be imparted so that a satisfactory level of knowledge and skill is developed by IR Personnel for satisfactory implementation of milling program

22.2 E-Learning courses module should be arranged for imparting training to railway operators. In addition, the service engineer shall provide hands on training to railway staff in calibration operation, repairing and maintenance of the machine in field to make them fully conversant with the machine. 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 machines.

23. WARRANTY AND POST WARRANTY MAINTENANCE CONTRACT:

The machine shall be warranted for 24 months from date of commissioning at ultimate destination in India Design modification made in any part of the machine offered, the
warranty period of 24 months would commence from the date of modification and proving test of machine 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 should be borne by the supplier.
NOTE:
ALL DIMENSIONS ARE IN METRES EXCEPT WHERE OTHERWISE SHOWN.
PROCEDURE OF DRAWING:

1. Draw a vertical line at X-Y.
2. Draw a semi-circle of 145 mm radius.
3. Draw two tangent lines to the semi-circle at X-Y.
4. Draw a horizontal line at 24.5 mm from the toe of the profile and two tangent lines to the semi-circle at X-Y.
5. Draw a tangent line to the semi-circle at X-Y.
6. Draw an arc corresponding to points A, B, C, and D.
7. Draw a horizontal line at 65 mm from the toe of the profile.
8. Draw a tangent line to the semi-circle at X-Y.
9. Draw an arc of 100 mm with center Y.
10. Draw a vertical line at 10 and 20 tangentally to B.
11. Draw a vertical line at X-Y from the toe of the profile.

NOTE:
- All dimensions are approximate.
- This drawing is based on nominal dimensions.
- Coordinates of points A, B, C, and D are given as follows:
  - A: X=130, Y=63.5
  - B: X=130, Y=44.0
  - C: X=28.5, Y=44.0
  - D: X=28.5, Y=63.5

SCALE: 1:1
SHEET: 2/5
NOTE: OF 28.5 mm.

REFERENCE:
- Co-ordinates of points A, B, C, and D are given.
- The vertical and horizontal lines are drawn accordingly.
- The semi-circle and arcs are drawn to scale.

Annexure-II
Annexure III-A

Particulars Required in Respect of the Rolling Stock Under Consideration

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
   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 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. 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. 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.

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 from rail level:

13. Height of floor from rail level:

14. Type of coupler provided -Indian Railways Standard

   Coupling: 
   Buffer:

15. Any infringement to the moving dimensions: 
    Sketch provided in the Indian Railways Standard Schedule of Dimensions – Chapter IV (A).
Following information as detailed below is also required along with the information required as per Annexure ‘A’ for processing the case for issue of provisional speed certificate for new vehicle.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>a) Brake System details</td>
</tr>
<tr>
<td></td>
<td>b) Gross Braking Ratio</td>
</tr>
<tr>
<td>2.</td>
<td>Brake rigging arrangement drawing and calculation of braking force</td>
</tr>
<tr>
<td>3.</td>
<td>Maximum Braking Effort. at start and at the speed of operation -&lt;br&gt;a) at working drive at start:&lt;br&gt;at operation speed:&lt;br&gt;b) at transfer drive at start:&lt;br&gt;at maximum speed:</td>
</tr>
<tr>
<td>4.</td>
<td>Characteristics of springs used in suspension indicating free height, working height, dynamic range, stiffness and locations etc.</td>
</tr>
<tr>
<td>5.</td>
<td>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 :-&lt;br&gt;i) Bouncing ii) Pitching iii) Rolling&lt;br&gt;Wave length of free axle and bogie</td>
</tr>
<tr>
<td>6.</td>
<td>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.</td>
</tr>
<tr>
<td>7.</td>
<td>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.</td>
</tr>
<tr>
<td>8.</td>
<td>Wheel and axle assembly drawings</td>
</tr>
<tr>
<td>9.</td>
<td>Calculation for flange force</td>
</tr>
<tr>
<td>11.</td>
<td>Calculation of natural frequency</td>
</tr>
<tr>
<td>12.</td>
<td>Calculation of spring characteristics and critical speed of the vehicle.</td>
</tr>
<tr>
<td>13.</td>
<td>Simulation result showing ride index, lateral force and acceleration results.</td>
</tr>
<tr>
<td>14.</td>
<td>A certificate regarding the speed of the vehicle for which it has been designed.</td>
</tr>
</tbody>
</table>
Annexure IIIb

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

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>Component’s Name</th>
<th>Parameters required</th>
<th>C.G. of component in x, y, z direction from rail level in mm (Referenced point 1st axle)</th>
<th>Mass in Kg and Mass moment of inertias in Kg-m^2 of component in three dimension space about their C.G</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>X Y Z Mass Ixx Iyy Izz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Front Bogie frame including brake rigging</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>
</tr>
<tr>
<td>4.</td>
<td>Transmission system device (hydraulic, Mechanical or electrical traction motors)</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>
</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 5 6</td>
<td>Total unsprung mass in tonnes</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Total weight of components in tonnes</td>
<td>Front bogie full assembly                                    Rear bogie full assembly                                Machine frame full structure                                Full weight of vehicle (front bogie + rear bogie +vehicle car body or super structure)</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>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vertical stiff Lateral stiff Lateral stiff Lateral stiff Lateral stiff Longitudinal stiff</td>
<td>Vertical stiff Lateral stiff Lateral stiff Lateral stiff Lateral stiff Longitudinal stiff</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Damping force details</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(If hydraulic damper used give there rating force per meter/second)</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 Lateral direction Lateral direction Lateral direction Rotational about vertical axis</td>
<td>Rotational about horizontal axis Rotational about horizontal axis Rotational about horizontal axis</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Dimension 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>
</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>
</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>
</tr>
</tbody>
</table>
BRAKE DESIGN DETAILS OF THE MACHINE FOR CALCULATION OF EMERGENCY BRAKING DISTANCE

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tare &amp; gross weight of the machine in Kilograms</td>
</tr>
<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>
INSPECTION CERTIFICATE
CERTIFICATE OF INSPECTION OF TRACK MACHINE(

) 
BY INSPECTING OFFICIAL AND APPROVAL FOR DESPATCH OF MACHINES
(STRIKE OUT WHICHEVER NOT APPLICABLE)

This is to certify that I have inspected the machine----------------------------------(type)
bearing SL 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 Director Track(Machines)
and M/s (Name of Supplier)---------------------------------------------------------------
-----------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------.
The detailed inspection Note regarding its conformity/non-conformity to the laid 
specifications is enclosed along with an Annexure. It is observed that (strike out whichever 
is not applicable):-

- The machine conforms to all laid down specifications.
- The machine 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 machine is certified/not certified to be conforming to the 
specifications.
The machine is approved/not approved for despatch to _________________ (consignee) 
Indian Railway.

SIGNATURE AND DATE

For M/s _______________ 
__________________________ 
INSPECTION OFFICIAL
__________________________ 
(NAME AND DESIGNATION)

for and on behalf of President of India
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 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.

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

i) A lateral force lasting more than 2 metres should not exceed the Prud Homme’s limit of $0.85 \left(1+\frac{P}{3}\right)$ where $P$ is the axle load.

ii) Isolated peak values exceeding the above limit are permissible provided the record shows establishing characteristics of the vehicle subsequent to the disturbance.

iii) A derailment coefficient should be worked out in the form of ratio between the lateral force ($h$) and the wheel load ($Q$) continuously over a period of $1/20$ second; the value $h/Q$ 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 $0.55g$ both in vertical and lateral directions. The peak values upto $0.6g$ 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 movement of the bogie in straight and curved track and lateral force and derailment coefficient of accelerations as the case may be.
Scope of Training to be imparted by Manufacturer/Supplier to IR Personnel

The training program shall consist of the following modules-

1. For Senior Engineering officers of IR-
   Four senior IR personnel shall be given training for a period of two weeks in manufacturing plant of manufacturer/supplier and/or affiliated institute/training centers and field operation where the machines are already in operation. Broad scope of this training shall be to provide quality training in the areas of management of milling, machine familiarization, machine utilization, managerial aspects of operation and maintenance of the machine, milling strategy, tools and tools head management, best practices for optimal performance, reporting, quality control, producing quality rail profiles, progressive review of milling strategy program, important safety aspects, vendor support.

2. For Track Machine organization Personnel –
   This training will cover operation and maintenance of the machine. The broad scope of this training will be as under:
   - Machine’s general arrangement including air systems, mechanical systems, hydraulic systems, electrical systems, rail measurement systems, controls etc.
   - Operation of the machine in working mode (milling) and travel mode.
   - Maintenance and overhauling of rail milling machine.
   - Recording of rail profiles, use of Rail Inspection data and preparing the milling program.
   - Trouble shooting skills.
   - Responses of emergency situations
   - Basics of producing quality rail profiles.
   - Milling tools cutting matrix
   - Cutting tools different shapes, angels there uses
   - Cutting tool head management

   The training will be conducted as per following sub-modules-

2.1. 12 IR personnel shall be given training for a period of Three weeks at contractors manufacturing premises about machine assembly line in different shops, operation, repair and maintenance. Also they will be given on-site training in field operation abroad where same type of machine is already in operation for the contract.

2.2. In India, training of 12 IR personnel per machine for four weeks will be given in operation and maintenance of the machine. Out of four weeks, at least two weeks training will be imparted at the site of commissioning of the machines and has to be completed before commissioning of machines. The remaining period of training will be imparted in one or two modules spread over warranty period in the form of refresher/updating training at the time of delivery of each machine. Details of the proposed program should be given in the offer.
3. **For P-Way Personnels** –

This training will cover design, planning, quality control, monitoring and review of milling program. The broad scope of this training will be as under:

- Technical aspects of Rail milling and the benefits
- Rail milling functions and best practices for optimal performance.
- Basics of producing quality rail profiles.
- Rail and wheel interaction.
- Technical aspects of rail lubrication, and planning the lubrication strategies.
- Understanding and development of rail milling program based on severity of RCF, surface defects and profile deterioration.
- Monitoring of rail milling result, its benefits and review of the milling program.
- Rail milling Implementation and quality control.
- Track inspection and data collection for rail milling
- Designing of optimal rail- wheel profiles
- Establishment of test sites and monitoring
- Designing rail milling strategies and program

The training will be conducted as per following sub-modules-

3.1. 12 IR personnel shall be given three weeks training at manufacturer’s premises and/or affiliated institute/training centre, this training shall include taking rail profile, wheel profile, work on simulation software for different contact location of rail-wheel interface, designing theory for developing required rail profiles, different pattern for achieving the required rail profile and calculate rail life and such other aspects in the contract.

3.2. In India training for 12 IR personnel per machine for six weeks will be given at site of milling / railway premises. This training includes taking rail profile pre-post milling and use of other handheld gadgets for inspection of finished rail and contact bend before and after, how to maintain data base for milling quality, for establishing efficient Rail milling Management system on Indian Railways for each machine. This module of training may be staggered in suitable phases prior to supply of machines, post supply and mid warranty review/refresher.

4. Tenderers are required to submit detailed proposal of the training program along with their offer. The topics, detailed content of training, demonstrations, site visits and hands-on experience should be elaborated in detail in the offer. The names of manufacturing premises, affiliated institute/training centre where abroad training is proposed to be conducted should be detailed in the training proposal in the offer. Further details of places where field visits, demonstrations, hands on experience etc are proposed to be conducted may be submitted within 90 days of signing the contract agreement.

5. All the cost for arranging and facilitating the training are to be borne by the supplier. Tenderers are required to quote the prices for training as per tender conditions. However training as per 2.2 and 3.2 will be at suppliers cost and nothing extra shall be paid for the same. The cost of boarding, lodging and air fare of IR personnel shall be borne by the purchaser and should not be included in tenderer’s quote.
1. OPERATION AND MAINTENANCE CONTRACT (DURING WARRANTY PERIOD)

The following clauses outline the key requirements of the O&M conditions for Indian Railways to be met by the supplier for a period of 24 months post commissioning:

1.1 The supplier or their designated Indian agent/Indian counterpart has to execute works of Operation & maintenance of Rail Milling Machine which will be deployed over many Zonal Railways as per the instructions of Consignee Zonal Railways office. During the execution of the contract fuel, oil, water and lubricants are to be provided by Zonal Railways free of cost to the supplier.

1.2 To operate & maintain complete the Rail milling machine fully utilizing it's potential. The tenderer is responsible for ensuring the availability of machine for 08 hour every day for milling operation (which might be increased upto 2 to 3 hours depending on traffic condition over IR during operation). During maintenance shift, the stipulated maintenance of RMM, stipulated preventive checks and schedule maintenance of RMM machine including all assemblies (like engines, generators, CNC, PLC hydrologic, Pneumatic, Cutting tools head, electrical control system etc.) or sub-assemblies (various Hydraulic & HSD oil pumps ,sensors etc) as specified by OEM/supplier updated time to time to ensure it's upkeep shall be carried out.

1.3 The supplier or their designated Indian agent/Indian counterpart, has to provide sufficient number of skilled/semi-skilled staff required for operation and maintenance of RMM. Milling operator different cutting tools miller shall be certified by the OEM and with valid competency certificate in train operation issued by ZRTI/IR and medically fit in A-1 Category. In case initial/refresher course to be done for G & SR from ZRTI/IR during the currency of this contract, the same shall be got done for the operators by the contractor and it shall payable as applicable. Zonal Railways shall facilitate in expediting the process. All the operators shall have valid PME certificate issued by IR and all the cost for medical examination connected with PME, shall be payable by the contractor.

1.4 One 4 wheeler vehicle in good condition with proper road permit and insurance(Safari/Scorpio or similar) for transporting men and material required for day to day working will be provided by tenderer during O&M period for use by O & M crew and IR crew (on RMM) without any extra payment.

1.5 The contractor must ensure the care /safety/health hazards of the labours engaged by him/her during the course of the execution of work. Necessary safety equipment shall be provided by the contractor for the staff engaged by the tenderer and also for 2-4 IR official nominated on this machine. No extra amount is payable toward this.

1.6 Railway shall provide adequate and appropriate security at their disposal to protect and preserve the RMM Machine from anti-social elements especially in insurgency defined areas, where the machine maybe required to operate from time to time.

1.7 The contractor's staff & labour shall not have any claims of appointment in Railways in future.

1.8 Authorized Railway's representative having route learning of the particular section where the RMM is working will be present for supervising the milling work and to monitor the movement of the RMM from one section to another. RMM shall not be moved without authorized Railway's representative. The same would be provided free of charge.
1.9 All tools and plants, drawings, manuals which are supplied by the manufacturer to the Railways will be handed over to the contractor free of cost for use along with the machine. All these to be handed over back in good condition after expiry of the contract period to authorized Railways.

1.10 RMM shall be made available for milling operation for minimum period of 25 days in a month and 75 days in consecutive 3 months. The balance 15 days are meant for maintenance functions during which time all maintenance activities are to be completed by the tenderer. While the RMM is on transit from one station to another or waiting for loco for hauling, it will be considered as availability unless the RMM is under breakdown preceding to this.

1.11 The supplier will be responsible for ensuring the availability of machine for eight hours every day for at least 25 days a month and the availability certificate will be rendered (as per enclosed Annexure - A). During these 8 hours (which may be in two shifts with one break of maximum upto 2 to 3 hours) of daily availability of machine.

The machine availability for penalties purposes will be worked out by taking average availability of machine after 6 months (150 days over 6 months). Availability of machine for work less than 150 days in half year on account of supplier during the warranty period will invite a penalty of Rs 30,000/- per day and the penalty certificate will be rendered (as per enclosed Annexure - B).

1.12 When the RMM is on transit with its own power from one station to another, since there will be no routine maintenance, and RMM shall be made available for movement in two shifts of 10 hours each (2x10 hours) in 24 hours time frame till it reaches destination. The staff of operation and maintenance shall be so redistributed to perform transit work with sufficient staff.

1.13 All the fixtures in Camping coach shall be maintained in good condition. Special cleaning of camping coach (once a month) to be carried out so as to maintain in excellent condition. All electrical, plumbing, furniture, electronics, computers/laptop, TV&DVD, Genset, Washing machine, freezer, geyser, microwave/oven, communication and all other fixtures available in camping coach to be maintained at all times in good fettle and at the end of the contract period. The fixtures would be handed over the Zonal Railways in good condition, as received at the beginning of the contract.

1.14 Special cleaning of RMM to be carried out once a month (as far as possible) with detergents and other cleaning agents to remove all soot, dust and to keep the entire machine in good appearance. RMM will be stabled at a place so that adequate water (to be provided by Zonal Railways) & non-OHE siding are available so as to ensure proper cleaning. Patch panting at rusted locations should be done after cleaning with matching colour. No amount is separately payable towards this.

1.15 Complete and up to date records for daily, weekly and monthly maintenance will be maintained by the contractor and countersigned by IR officials. The daily/weekly/monthly and all progress report in the special format shall be mailed to division/zone/RDSO/Rly board daily.

1.16 The daily progress, grind history shall be mailed to the nominated IR official along with weekly and monthly progress reports in the existing format.

1.17 Contractor shall furnish adequate VHF sets for crew communication for safe operation of RGM. This should include atleast 6 hand held devices.
1.18 Spares for repair/maintenance and consumables would be supplied by Railways.

1.19 Each party agrees to indemnify, defend, and hold harmless the other party from all liability, cost or expense (including any court costs) caused by the joint and/or concurring negligence of the parties, arising on account of injury to or death of any employee, agent or representative of the indemnifying party during the performance of the Services or who shall, if not performing Services, be present as a bystander or otherwise on the property of either party, provided always, however, that if the injury or death to an employee of an indemnifying party is caused solely by the negligence of the other party then this indemnity and hold harmless provision shall be null and void, and the party who solely caused the injury or death shall bear the cost or expense. Notwithstanding any provision herein to the contrary, Tenderer total cumulative liability for any or all claims arising out of this agreement shall not exceed the three month value of this contract.

1.20 If there is deficiency of staff on RMM w.r.t. minimum stipulated staff in operation and maintenance (minimum staff in O & M shift put together), penalty of Rs 3000.00 per head per shift or part thereof shall be imposed. For maintaining attendance of the staff for this purpose, the contractor has to provide one finger print attendance system in the camping coach & shall ensure it is working condition always. No extra payment shall be admissible on this account.

1.21 The maintenance role encompasses undertaking all schedule/periodic/ routine of RMM machine RMM machine including all assemblies (like engines, generators, CNC, PLC hydrologic, Pneumatic, Cutting tools head, electrical control system etc.) or sub-assemblies (various Hydraulic & HSD oil pumps ,sensors etc) as specified by OEM /supplier updated time to time, either by day or night. OEM recommended spares will be provided by Zonal Railway on the machine and the released spares/material shall be returned to Zonal Railway on the machine. The transport of spares would be done by Zonal Railways.

1.22 Scheduled Maintenance:
   i. Daily maintenance will be strictly followed after grinding operations. Other schedule maintenance (weekly, monthly, two monthly, quarterly, half yearly, yearly and two yearly checks) are to be performed at appropriate time intervals in the balance time available after offering the RMM for operational activities.
   ii. Routine maintenance of undercarriage systems shall be undertaken by the tenderer.
   iii. Tenderer shall be responsible towards mounting and dismounting of unserviceable components/ parts / materials on the RMM. Zonal Railway shall be responsible for providing serviceable components/ parts/materials on the RMM.
   iv. Wheel and Bogie turnings (if needed) will be coordinated and executed by Zonal Railway and wheel turning charges of as applicable by w/shop per wheel would be paid by the tenderer.

1.23 Maintenance of Records
   i. Maintenance records during Schedule and breakdown maintenance shall be maintained in hard copy as well as soft copy as per format provided and updated time to time.
   ii. These records shall be provided to Zonal Railway crew on the machine in a timely manner.
   iii. Tenderer shall complete a standard daily report accurately depicting operational times, delays, and machine availability. Zonal Railway crew/ representative has to sign daily report based on satisfactory completion of daily operational services. The signed daily report shall be the basis for invoicing and shall
constitute Zonal Railway’s acceptance of day to day work apart from the completion of scheduled maintenance in timely manner.

1.24 Test Site Management:

(i) As part of the O&M Services provided by the tenderer or their designated Indian agent, 20 test sites would be actively managed by them. This would include atleast 4 mild curves, 4 sharp curves and 4 tangents and 8 on different type of turnouts. Breakup would be as follows:
- 2 mild curves at same location on UP Line and DOWN Line = 4 Total
- 2 sharp curves at same location on UP Line and DOWN Line = 4 Total
- 2 tangents at same location on UP Line and DOWN Line = 4 Total
- 2 on 1-8.5 turnout of Up and Dn line = 4 Total
- 2 on 1-12 turnout of UP and Dn line = 4 Total
Final = 20 test sites and would be jointly selected by IR/Zonal Railways in tenderer.

These locations should be maintained as permanent test sites and should be re-marked periodically by proper paint by Zonal Railways. Format for Test site location marking by paint as ben shown as Annexure C.

(ii) As part of requirement of the Test site management, tenderer or their designated Indian agent shall note the following for each test site:
- Pre Grinding MiniProf, surface photograph and dye penetrant test, within 10 days before grinding
- Post Grinding MiniProf, surface photograph and dye penetrant test, within 10 days after grinding
- Maintaining proper record of the same.
- Sharing run on run analysis for all 12 test site locations.
- Review of grinding pattern changes needed, if any post analysis
- Review for further changes in profile and grinding cycle.

(iii) As part of this exercise, any existing templates would also be reviewed and modified as needed.

1.25 During the currency of the O&M period, the supplier or its Indian agent may seek documents for importing spare parts/material/testers/manuals/equipment’s on required basis for Customs clearance. These will be provided by Consignee Zonal Railways in required format for speedy clearance on arrival at port

1.26 Spare Parts:

Complete OEM spare parts list broken down to the last level for Rail Grinding Machine classified into:

i. Recommended – these are those parts covered under warranty period and will be either replaced/repaired. During repaired/replacement period, Recommended parts held on Railway Inventory can be fitted on the machine on returnable basis and is provided by IR only to ensure machine uptime.

ii. Essential - resulting from fair, wear and tear and do not necessarily constitute a warranty claim.

iii. Consumables – are those which will be as per actual consumption/supply during the warranty period is to be provided.

It maybe noted that the Spare Parts List indicates for O&M Period must indicate the anticipated quantity of use. This would be used to establish a budget and the total budget per machine would remain fixed, while actual used quantities may vary based on usage. During the 24 month O&M period, in case spares beyond the budget need to be used, the additional
spares would be supplied free of cost by the supplier. Cost of Spares needed for the 24 month O&M period would be considered as part of price calculation for the determination of successful bidder.

It is important to note that spares not included in the list would be provided by the supplier free of charge during the O&M period. The supplier must ensure that spares are properly budgeted keeping in mind the IR working and environmental conditions.

Tenderer should insure availability of spares for machine stipulated service life of 15 years by providing ware house or store in India for uninterrupted working of machine. Furthermore, spares per year per machine should generally not exceed 5% of machine price.

2. POST-WARRANTY OPERATION & MAINTENANCE CONTRACT:

The supplier shall quote for a two year extension of O&M services after the expiry of the warranty period. The additional extension for 2 years is on the sole discretion of Railway Board / Zonal Railways.

2.1 Machine availability of minimum 25 (twenty five) days in a month.

The supplier will be responsible for ensuring the availability of machine for eight hours every day for at least 25 days a month and the availability certificate will be rendered (as per enclosed Annexure - A). During these 8 hours (which may be in two shifts with one break of maximum upto 2 to 3 hours) of daily availability of machine,

The machine availability for penalties purposes will be worked out by taking average availability of machine after 6 months (150 days over 6 months). Availability of machine for work less than 150 days in a year on account of supplier during the warranty period will invite a penalty of Rs30,000/- per day and the penalty certificate will be rendered (as per enclosed Annexure - B)

2.2 The supplier or their designated Indian agent has to execute works of Operation & maintenance of Rail Milling Machine which will be deployed over many Zonal Railways as per the instructions of consignee zonal railways office. During the execution of the contract fuel, oil, water and lubricants are to be provided by Zonal Railways free of cost to the supplier.

2.3 Spare Parts:

Complete OEM spare parts list broken down to the last level for Rail Milling Machine classified into:

(i) Recommended - Constitutes a warranty claim either by repair/replacement
(ii) Essential - resulting from fair, wear and tear and do not necessarily constitute a warranty claim.
(iii) Consumables – are those which will be as per actual consumption/supply during the warranty period is to be provided.

2.4 All other terms and conditions of the extended O&M would be as per Clauses given below:
- 1.3 to 1.9
- 1.12 to 1.25
ANNEXURE A

QUARTERLY AVAILABILITY CERTIFICATE FORMAT

“THE OPERATION AND MAINTENANCE OF RAIL MILLING MACHINE HAS SATISFACTORILY PERFORMED FOR _______ DAYS DURING THE THREE CONSECUTIVE MONTHS / 90 DAYS PERIOD FROM _________ TO _________ FOR WHICH PAYMENT INSTALMENT IS CLAIMED”.

The details of Rail Milling Machine availability days for ______ Quarter is furnished below.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Month</th>
<th>M/C Availability Days</th>
<th>M/C Non-Availability Days</th>
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<tr>
<td>Total days</td>
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</tbody>
</table>

Average no of days available/month = Days

By CE/TM/Lines

C/- CE/TM For kind information.
C/- Supplier,
ANNEXURE B

HALF YEARLY PENALTY DEDUCTION CERTIFICATE FORMAT

“AMOUNT OF PENALTY DEDUCTION TO BE MADE AS PER CLAUSE NO 1.11 OF THE TECHNICAL SPECIFICATION TO RAILWAY BOARD CONTRACT AGREEMENT NO____ _________________IS ________________”.

Dy CE/TM/Lines

C/- CE/TM For kind information.
C/- Supplier,
List of Track features

1. Km post,
2. TP/OHE Mast,
3. Pt.& Crossing In
4. Pt.& Crossing out
5. Level Crossing,
6. Switch Expansion Joint,
7. Fish plated joint
8. Axle counter
9. Bridge () In,
10. Bridge () Out,
11. Curve In,
12. Curve Out,
13. Tunnel In,
14. Tunnel Out,
15. 10 spare keys as user options.
16. Platform () In.
17. Platform () Out.