SECTION - II

IMPORTANT INSTRUCTIONS TO TENDERERS FOR FILLING TECHNICAL BID

1.0 Bidders are required to give clause wise comments on the technical specifications, confirming compliance/non-compliance with details of deviations if any along with their effect on the performance. Back references to be avoided, offers are likely to be ignored in case of non-compliance of these instructions for furnishing the information.

1.1 Unless otherwise stated, latest alterations/ revisions of specifications/ standards/ drawings shall be applicable. In respect of safety standards and environmental standards relevant to the machine, the machine manufacturers shall ensure compliance with international (CE/ISO/DIN/JIS)/National standards (IS) (wherever applicable).

1.2 Tenderers should offer and quote for all the specified concomitant accessories, as these are considered essential for commissioning and utilization of the machine. Even if bidder does not recommend the purchase any of these accessories, the price must be quoted for comparison purposes and their recommendation/suggestion indicated in the offer.

1.3 Tenderers should also quote for optional accessories, spares and consumable spares as asked in the specifications.

1.4 In case, any item is required in sets, please specify nos./pieces per set. This is essential for proper technical evaluation of the offer. Offers received without this may be considered as incomplete and liable to be rejected.

1.5 The bidder should quote only for the specified make of sub-assemblies and equipment wherever specified. Makes of sub-systems other than the specified ones will normally not be acceptable. In case, some other make is quoted, specific reasons for the same including its features/advantages over specified makes must be brought out in the offer.

1.6 In case there is a contradiction in any information provided (some parametric values given in the specification and those given in the brochure or some other document enclosed by the tenderer), unless specifically mentioned in the deviation cum confirmation statement the values as given in the specification shall be taken as confirmed by the tenderer and offer evaluated accordingly.

1.7 The Purchaser may accept internationally accepted alternative specifications which ensure equal or higher quality than the specifications mentioned in the Technical Specification. However, the decision of the Purchaser in this regard shall be final.

1.8 Purchaser reserves the right to verify the details submitted by the bidder by actual site visits.

1.9 Other terms & condition of the contract will be as per Indian Railway Standard conditions of contract.

1.10 Tenderer not submitting the requisite information may note that his offer is liable to be ignored.

1.11 **Tenderer shall design the arrangement as per RCF requirement.**

1.12 The CAMC (Comprehensive Annual Maintenance Contract) shall be kept for a period of 05 years after the completion of the warranty period, irrespective of the type of machine/equipment. **The tendered item shall be treated as Critical from CAMC point of view.**

1.13 Bidder shall quote year-wise CAMC cost for a period of 5 years in the following format:

Year	AMC Charges (in Rupees) Without Taxes	Remarks
Ist Year		
IInd Year		
IIIrd year		
IVth year		
Vth year		

In case, any bidder has not quoted year-wise cost of CAMC and only single value has been offered for 05 years CAMC, linear cost division method shall be followed for calculating yearly CAMC cost. It will imply that CAMC cost of each of the 05 years will be *total quoted CAMC cost divided by tenure in years of CAMC*.

1.14 For CAMC, a Bank Guarantee (BG) equivalent to 10% of the PO value of the machine/ equipment shall be deposited by the contractor to the concerned division/section of Executive department as authorized by PHOD/ CHOD of the department, 90 days before the expiry of warranty. BG shall have validity of 5 years and 6 months. The period of CAMC can also be decided to be less than 5 years, if need be at this stage, with the approval of PHOD/CHOD, in which case the validity of BG will be decided accordingly. In addition to the above, Railway reserves the right to cancel the CAMC at any stage of Contract.

1.15 As indicated above, CAMC cost shall be made part of Evaluation Criteria of the Tender. However, this cost will not be part of the Contract Value (PO value).

1.16 The CAMC payment will be made quarterly after certification by the consignee/user regarding satisfactory performance.

1. PURPOSE FOR WHICH REQUIRED AND CAPABILITY.

1.1 PURPOSE

The Machine is required for manufacture of High Speed Bogies to M/s FIAT/Italy design to be fitted on Railway Passenger coaches/Cars) operating up to the speed of 180 KMPH. (later upgradeable to 200 KMPH or higher).

1.2 CAPABILITY

1.2.1 The machine must be capable of undertaking different rough and finish machining operations such as Pre milling , Milling, Chamfering, Predrilling, Drilling, Boring, Counter boring, Reaming, Threading, Turning, Tapping, and Spot face milling using automated tooling selection transfer/exchange.

1.2.2 The machine shall be capable of undertaking different machining operations to the required tolerance, precision and finish on fabricated frames for Bogies as per the followings:

a) Drawing No. 1267401/LW03007 (subject to change without notice).
b) Type of Bogie Frame – Welding Fabrication
c) Thickness of material Removal to be considered– 5 to 15 mm.
d) Material Specification –
Steel Casting to BSEN 10025-93 (St. 52.3)
Steel Forgings to DIN 1693 Part I & 2 (GS. 20Mn 6v)

The representative machining locations on the FIAT Bogie are as under:

i. Milling operations of control Arm Brackets at four locations having two controls arm brackets per location i.e. total of 08 control arm brackets per bogie frame. Also finish machining of holes of each of control arm bracket.

ii. Milling operation on mounting Brackets for fitment of disk brakes at four locations which involves horizontal and vertical milling operations. Also machining of holes in vertical and horizontal direction.

iii. Finish machining of 02 holes of each bracket and surface machining of Anchor link brackets

at two locations in bogie frame located diagonally opposite.

iv. Finish machining of holes and surface machining of each of cross section brackets on cross tube assembly.

v. Finish machining of four holes of each of Anti Roll Bar Brackets at two locations (LH & RH).

vi. Machining of two holes of each of side frame assemblies for fitment of cross tube assemblies.

vii. Machining of Spring Guide tube at bottom at four locations of primary suspensions.

NOTE:

(i) The machining of holes and faces is at 6 degree to vertical and horizontal axis, therefore the z axis should be freely index able to approach the job at required angles for machining operations.

(ii) The above machining locations are for reference only, final requirement to be complied with relevant drawings.

1.2.3 It should be possible to ensure proper and correct set-up of jobs/work piece through proper and precise fixturing etc. and obviate the use of independent and separate surface table for marking of the job/work piece (bogie frames) prior to loading of the jobs on the machine fixture. Reference points /lines should be located precisely and accurately before the start of machining operations on the jobs so that overall geometrical accuracy of the bogie- frame remain intact and true not only during machining operations but also during subsequent fabrication/ assembly stages.

1.2.4 **LEADING POARAMETERS**:- As per **Schedule-I**

To substantiate its claim for major parameter bidder has to attach technical brochure giving the details of major parameter of the make and model selected for this tender to prove out the capability and productivity

1.3 **PRODUCTIVITY**

1.3.1 The machine is to be provided completely tooled up with all tools and accessories and shall be utilized in double shift working on a regular basis and in three shifts in case of exigencies. The cycle time (floor to floor timing) for complete machining of the High speed FIAT bogies shall be furnished in the offer by the tenderers. **It should be able to machine one bogie in six hours including loading and unloading time.** Bidder should furnish complete cycle time for the entire machining operation that shall include the various elements involved such as given below:

a) Loading of Bogie on machine along with fixtures.
b) Setting of the job in reference to the machine.
c) Machining of the different jobs to sizes and tolerances given in the drawings.
d) Intermediate gauging and final gauging on machine.
e) Unclamping/unloading the job.
f) Time involved in tool tip changing and attachment and cutter holder changing separately for the tool magazine (tool pre-setting unit when required).

1.3.2 The tenderer shall explain the working of the machine in the offer and shall furnish operation sequences charts (for components as per Drawing No. '1267401'/LW03007) showing clearly the

break-up of timings of each elements involved in complete machining of the FIAT BOGIE. The cutting speed, feed rates, metal cutting/removal rates for every machining operation should also be given in the offer**. The offers not containing machine productivity details are liable to be treated as unresponsive.**

1.3.3 The cycle time shall be proved out at manufacturer's works and at consignee's end during commissioning of the machine for at, least 02 (two) bogies & 24 (Twenty four) bogies respectively.

1.4 Criteria of acceptance:

It should be possible to carry out machining of 01 (one number) FIAT Bogie in 6 hrs. This will be inclusive of all the timings defined in clause 1.3.1.

NOTE: The machining of the complete bogie frame is be carried in one set up only, primarily to ensure holding of accuracies warranted by high speed operation of passenger trains.

1.5 The machine shall conform to ISO 10791-2 or DIN or equivalent International Standards for Geometric and performance test.

2. DESCRIPTION AND SCOPE OF SUPPLY

2.1 The scope of supply covers the following:

2.1.1 Design, Manufacture and supply of complete machine along with its concomitant accessories including safety and hazard prevention fittings/interlocks etc. The machine shall be supplied as per leading parameters given in Schedule-I. For Basic Design Features of the machine, please refer to the clauses and sub-clauses of this. Schedule-II is for General Electrical Equipment Design and Schedule-III for General Characteristics (e.g. safety, operations, maintenance, pneumatic/ lubrication/ hydraulic systems etc.).

2.1.2 Installation and commissioning of machine & related equipments.

2.1.3 Proving out trials as per specification.

2.1.4 Supply of spares for normal maintenance and trouble free operation.

2.1.5 Training of personnel in operation and maintenance of adequate no. of staff to run the machine continuously in three shift.

2.1.6 Supply of machine Documentations.

2.2 **CONCOMITANT ACCESSORITES**

The machine shall be accompanied by the concomitant accessories whose cost shall be included in the price of the machine. However, their cost shall be given separately also item wise. This should also include the following accessories.

2.2.1 Automatic Lubrication control system.

2.2.2 Tool Magazine with tool carrier (SK-50) configured for minimum 70 tools.

2.2.3 Coolant system for Precision Machining operation, The system offered should be detailed in the offer.

2.2.4 The CNC control system (as per schedule iv) complete with (Hardware and Software) should be

detailed in the offer.

2.2.5 Battery backup facility for memory retention during power failure for 1hour (min).

2.1.6 Air Conditioning Unit of CNC control as well electrical cabinet etc. should have environment friendly refrigerant.

2.2.7 Voltage stabilizer and Ultra Isolation transformer for the complete machine. .(Details to be provided in the offer.)

2.2.8 Universal Milling and Boring Head (Fully Automatic) having high precision and stability.(Details to be provided in the offer.)

2.2.9 Chip/Swarf conveyor system.

2.2.10 The complete set of tools required for different operations on the FIAT Bogies. The technical data for tools offered should be given in the offer. Tool Holders and inserts for 300 bogies should be supplied.

2.2.11 The fixtures, Holding clamps, Clamps Locating Bolts etc. (Required for proper set up of the job on the machine.)

2.2.12 Foundation, anchor bolts etc. (Required for proper machine foundation.)

2.2.13 First fill of Lubricating oil, Hydraulic Oil, Grease and other consumables required for machine.

2.2.14 Electrical cabinets control desk along with cables/wires up to the main switch of shop electrical power supply.

2.2.15 Set of operating and maintenance service tools (list should be submitted along with description, quantity and make) - 1 set.

2.2.16 Suitable touch probe system for quick job set up and measurement as per clause 3.20 – (1 no.)

2.2.17 Tool presetting unit as per clause 3.23. (1 no.)

2.2.18 Universal milling and boring head (fully automatic) having high precision and stability (to be detailed in the offer), actual position of all axes should be measured physically and controlled by the CNC control separately. – 1 no.

2.2.19 Any other concomitant accessories like angular heads, long heads, etc. Which the bidder feels is necessary for easy and quick machining of FIAT bogie to achieve the productivity of machining of one FIAT bogie frame as stipulated. Bidders to submit details of make and nomenclature. – 1 no. of each type offered.

In case additional heads are offered, Automatic Head Changer shall also be offered. Bidder to furnish cost and technical details.

2.2.20 Dedicated Air Compressor with drier, air receiver, filters, refrigerated drier and 10 mts. Of pipeline – 1 set.

Note: - Bidder to provide details of items and their nos. in 1 set.

2.3 SUPPLY OF HYDRAULIC, LUBRICATION AND CUTTING OILS

The successful bidder shall provide the initial fill along with machine and additional quantity required for one year or two subsequent fills (Whichever is more) required for :-

a) Hydraulic oil
b) Lubrication Oil

Also, the bidder should indicate the quantity and brand name of oils used and their Indian equivalent Brand names, grade, specification and price.

2.4 OPTIONAL ACCESSORIES

2.4.1 Offline Portable Programming Unit as per clause 3.21 – 1 no.

2.4.2 Any other Accessory which can improve the accuracy, reliability and maintainability of the machine shall be quoted separately in the bid, bringing out its advantages and limitations. Its price shall not be added to basic machine price.

2.5 EVALUATION CRITERIA:-

Total value of the offer will be calculated based on

(i) The cost of the basic machine.
(ii) Cost of the concomitant accessories according to tender specifications.
(iii) Cost of any other accessory which in the opinion of supplier is essentially required for making the machine fully functional.
(iv) Cost of Turnkey Charges viz. foundation, installation & commissioning etc.
(v) Cost of Preventive Maintenance during 1st & 2nd year of Warranty Period.
(vi) Cost of comprehensive AMC for five years after the warranty as per term and condition attached with the indent.
(vii) Duties and taxes as quoted by the bidder, insurance and freight,

2.6 OTHER ITEMS TO BE QUOTED:

2.6.1 The following items will need to be quoted additionally though will not be part of commercial evaluation:

(i) Optional Accessories with breakup of individual items.

3. DESIGN FEATURES

The general configuration of the machine is given below in sub para:

3.1 The general configuration of the machine shall be **Moving Double Column with travelling Portal type with CNC control**. The axis control shall have x,y,z, s1 & s2 axis.

3.2 The machine shall be robust, rigid and sturdy construction. It shall be designed to meet heavy duty demands of various operations on the machine under normal workshop environment for such machines. The climatic conditions at RCF/ Kapurthala may be taken as 0^{o} C (minimum temperature) to 50^{0}C (Maximum temperature) and humidity 98% (maximum)Therefore, the CNC controls has to tropicalised and provision of air conditioning system of adequate capacity for trouble-free operation is required.

3.3 The machine offered should be free from vibrations and abnormal operational noise (say not beyond 80dbA) when working at full capacity on sustained three shift working. The successful tenderer shall be required to furnish foundation drawings for the machines to suit the ground conditions with a load bearing capacity of 7 tonnes /M^2 (approx.).

3.4 The machine structural elements should posses high static stiffness as well as dynamic stiffness and preferably be designed and manufactured using latest technological advancements of in the field of CAD/FEM analysis, fabrication techniques & so on. The special features of the machine which enhance both the static and dynamic stiffness & rigidity of the offered machine should be highlighted in the offer.

3.5 The machine should incorporate Adoptive control for power monitoring to maintain desired cutting power by varying the feed between the programmed minimum and maximum values to compensate for changing cutting condition so that it effectively protects the machine, toolings and work pieces by reacting in controlled manner to unexpected increase/decrease in cutting power due to excessive material in roughing cuts, degradation of tool tips, broken tool or no tool, material hardness changes etc.

3.6 WORK TABLE

3.6.1 Work table shall be of adequate size for the jobs and shall have enough space for operation like gauging, tool changing, clamping and unclamping of jobs. The size of the work table should be such so as to accommodate at least 01 nos. FIAT bogies over its length, whereby while machining is being done on one bogie, the other bogie can be loaded/unloaded i.e. the machine must have two work tables or areas to permit simultaneous machining as well as bogie setup in the interest of higher productivity. The work table should be of fixed configuration to carry out machining operations without moving the heavy jobs and thereby reducing the probabilities of inaccuracies during its working life. The work table height should be kept as low as possible to facilitate easy clamping of job and for various operations.

3.6.2 The work table shall be rigid casting of high grade CI like Meehanite with sufficient ribbing for strength and rigidity. It should be suitably stress relieved to avoid any warping or distortion during working. The surface accuracy in micron/meter length of the table shall be indicated in the offer.

3.6.3 The top surface of the table shall constitute the work area and shall be provided with adequate number of T-slots for clamping of job holding fixtures. The weight carrying capacity of the table shall be indicated in the offer.

3.6.4 The straightness of table shall be preferably 10 microns/meter for X-axis and 6 microns/meter for Y-

axis and Z-axes. Actual table straightness in micron/meter for total length of the table and per meter length of individual axes drive shall be indicated in the offer.

3.7 MACHINE BED

3.7.1 The bed shell have guide ways / hardened and ground precision roller ways for traverse of travelling portal. The design details of the system provided shall be explained in the offer with sketches and schematic views.

Details of guide-ways are as follows

X- axis- Hardened flat / LM guide-ways.

Y- axis- Hardened flat / LM guide-ways.

Z- axis-Hardened flat / LM guide-ways.

3.7.2 Heavy duty corrosion resistance metallic telescopic covers shall be provided on each bed ways to protect it from ingress of swarf, dirt and dust.

3.8 TRAVELLING PORTAL

The bidder shall give detailed design features of the quoted system in the bid for travelling Portal type of machine having following features in its general design and manufacturing aspects.

3.8.1 The travelling portal type machine shall have individual traverse beds supporting two sets of hardened precision ground roller ways to which the travelling portal is coupled. The hardness of the roller ways shall be 55 $\pm$ 3 HRC and lined with anti friction synthetic material like turcite for stick slip free motion to which spindle head shall be coupled. The upper surface of the traverse beds shall have heavy duty drive racks for independent x-axis feed drive movement and shall also be suitably synchronized. Each side of the portal shall have dual drive system consisting of a rack and a double pinion with automatic backlash recovery. Two independent x-axis linear measuring system of reputed make shall be provided on the guide ways of each set of traverse beds.

3.8.2 The travelling portal shall support widely spaced hardened precision ground roller ways to which spindle head shall be coupled and shall have pretensioned non rotating y-axis ball lead screw. Mounted between the roller ways of the travelling portal, independent, y-axis linear measuring system shall be provided. The detail of the design and its constructional features shall be explained in the offer.

3.9 RAM ASSEMBLY

3.9.1 The ram assembly housing the spindle and the spindle drive may either be cast or fabricated Ram and spindle quill should offer minimum passive resistance in movement.

3.9.2 Arrangement of prevention of rotation of spindle RAM inside the spindle head shall be ensured. The z-axis drive shall be through preloaded recalculating ball screws/nuts. Arrangement for elimination of backlash produced working shall be explained in the offer.

3.10 MAIN SPINDLE

3.10.1 The machine spindle shall be made of alloy steel and shall be suitably heat treated to give

hardened surface up to 58 HRC with tough core to take the torque. The spindle shall be short and rigid and shall be supported by preloaded high precision taper/roller bearings. The size, type, class, make and the arrangement of the bearings provided shall be explained in the offer.

3.10.2 The mounting of spindle in the bearings shall be play free for accuracy and precision. Arrangement of cooling of spindle and the bearing shall be incorporated in the spindle housing through special water cooled jackets for maintaining the ambient temperature of bearing/spindle against any rise of temperature during course of continuous machining.

3.10.3 Spindle nose taper shall preferably be self locking. The spindle shall be capable of instantaneous braking and stopping. Arrangement of automatic draw bar clamping with ISO-50 taper shall be preferred to transmit higher torque. The spindle should be capable of clamping various tool holders offered.

3.10.4 The spindle speeds shall be infinitely variable through a suitable variable speed AC servo motor thyristor control and shall be programmable over the specified range so as to ensure the use of various cutting speeds for all operations.

3.10.5 Minimum no of gears shall be used for speed changing and for transmission. All high speed gears in the drive unit shall be of alloy steel hardened and ground. The surface hardness value shall be in the range of 55 HRC to 63 HRC (Conformity certificate provided by bidder). The specification of gear material, surface hardness and method of heat treatment of gears shall be indicated in the offer.

3.10.6 Clamping of heads shall be automatic. Indexing of universal milling head shall be through the CNC system. Indexing accuracy shall be $0.001^{0.}$ The method by which automatic indexing and clamping of head is achieved shall be explained in the offer.

3.11 FEED DRIVES

3.11.1 The drive in all the axis shall be provided through an independent drive arrangement comprising of variable speed electric motors and appropriate transmission. The movement in x,y,z and s axes shall be through hardened and ground recalculating ball screws through independent AC servo motors (Brushless) only. The AC drive with AC servo controller of Siemens, Allen Bradley and FANUC make will be preferred. The detail of system to be provided shall be explained in the offer.

3.12 MEASURING SYSTEM

3.12.1 The machine can be provided with optical scales or suitably designed transducers to register slide positions in all the axis within fine limit commensurate with the requirement of control system specified. The type of transducers used should be indicated in the offer.

3.12.2 Details of measuring system for slide displacement shall be explained in the offer giving advantages of the system adopted in preference to others.

3.13 SWARF CONVEYOR/CHIP CONVEYOR

3.13.1 The machine shall be provided with suitable electric motor driven swarf conveying system for collection and removal of swarf (chip) without stopping the machine. Details of the system including layout drawings for the same should accompany the offer.

3.14 TOOLINGS

3.14.1 The machine is required to be supplied fully tooled up at the time of commissioning to establish production capacity on twenty four nos. high speed FIAT bogies to drawings No.1267401(tentative).

3.14.2 The tooling system shall incorporate tool holders/throw away carbide tips and shall be such that tool holders and throw-away carbide tips are available in India. Catalogue/ drawing numbers-reference to Indian manufacturer's of inserts and tool holders shall be furnished along with the offer.

3.14.3 Tool and tool holders with adequate number of inserts and insert must be supplied with the machine for machining of at least 300 FIAT bogies. The item wise details of tool/tool holders along with part list number/ catalogue should be provided with the offer.

3.15 FIXTURES & JOB HANDLING SYSTEM

3.15.1 Work holding fixtures shall be suitable for optimum utilization of machining capacity. For simultaneous machining and loading of jobs, two (2) sets of fixtures shall be required.

3.15.2 The fixtures clamping, holding and locating system shall be precise, simple accurate and fast. The fixture must be rigid, rugged and withstand the cutting forces and the load without any deflection to maintain accuracy of machining operations.

The locating/ mating parts of the fixture should be made from case hardened or nitrided material such as 20MnCr4/16MnCr5/90MnCrV8 or similar (conforming to DIN standard or equivalent ISO standard) depending upon the requirement. The fixture body shall be of suitable material such as C45 or equivalent. The value of hardness of locating/mating parts shall be in the range of 60 $\pm$ 2 HRC to suit the flexibility and strength requirement of each element of the job holding arrangement.

3.15.3 The machine is required to be supplied with job fixturing/pallet and the handling devices required for transportation of loaded pallet/fixtures with the job on to the work table & unloading after machining operation is complete. The job handling system should be rugged, reliable, efficient and free from vibration. It shall be properly designed so that the machine is free from encumbrance on account of any defects/malfunctioning of the system to provide loading of the jobs through alternative means such as EOT cranes etc. The complete detail of the job handling arrangement proposed should be explained in the offer.

3.16 TOOL CLAMPING

3.16.1 Arrangement for power tool clamping should be explained in the offer highlighting the features which ensure precise and rigid tool clamping and release with minimum change over time possible. The tool change over time should be highlighted and given in the offer.

3.17 SAFETY/OPERATIONAL CONTROL / LIGHTING

The machine shall incorporate suitable safety device to provide protection to the operator and the machine against all possible operational and machinery failures.

3.17.1 Suitable interlock (protection) shall be provided to prevent machine operations in the event of:

a) Faulty sequence of operation
b) Fluctuation in supply voltage i.e. voltage beyond limits.
c) Resumption of power supply after power failure
d) Non-positioning of safety guards.
e) Failure of Hydraulic system.
f) Failure of lubricating system (in case of automatic lubrication)
g) Provision phase sequence relay at the input.

3.17.2 A fault or damage in the control circuit or interruption, re-establishment after an interruption of fluctuation in whatever manner in the power supply to the machinery must not lead to dangerous situations in particular.

a) The machinery must not start unexpectedly.
b) The machinery must not be prevented from stopping if command has already been given.
c) No moving part of the machinery or piece held by the machinery shall fall or be ejected.
d) The protection devices must remain effective.

3.17.3 The machine shall be –fitted with an emergency stop device to enable actual or impending danger to be averted. This device must be:

- Conveniently located
- Clearly identifiable
- Stop the machine as quickly as possible without causing additional hazards.

The emergency stop must remain engaged. It should be possible to disengage it only by appropriate operation. Disengaging the control must not restart the machinery but only permit restarting.

3.18 OPERATION CONTROLS

3.18.1 The operation of the machine shall be by push buttons or levers. The basic rules for the direction of controls and the corresponding direction of movements of the machine tools shall be as per IS: 298-1985 (latest version).

3.18.2 The control devices shall be

- Clearly visible and identifiable
- Ergonomically positioned for safe operation without hesitating or loss of time, and without ambiguity.

3.19 LIGHTING

3.19.1 Integral lighting suitable for the operations concerned where its lack is likely to cause a risk despite ambient of normal intensity shall be provided.

3.19.2 The manufacturer must ensure that there is no area of shadow likely to cause nuisance, that there is no irritating dazzle and there are no dangerous stroboscopic effects due to lighting Provided by the manufacturer.

3.19.3 Integral parts requiring frequent inspection and adjustment and maintenance areas must be provided with appropriate lighting.

3.19.4 The machine lighting should be of low voltage so as to prevent any hazard to the operator.

3.20 ON-LINE WORK PIECE PROBING SYSTEM:

3.20.1 Renishaw/ M&H make probe or equivalent shall be provided for work piece gauging along with compatible software. Make of probe, software and its model no. along with its catalogue shall be enclosed with the offer.

3.20.2 The probe shall be capable of measurement of fabricated/ cast surface and referencing of machine axes based on the results of the probing cycle. The probe shall be able to give message to the machine controller in case adequate machining allowance is not available in the workpiece.

3.20.3 It shall also be possible to carry out the final inspection of job with the help of the probe, if desired. The successful bidder shall also provide the probing cycle program for the purpose of gauging and inspection.

3.20.4 The scope of supply shall include the following:-

a) Omni-directional probe with $\pm$ 2 micron repeatability;
b) Standard shank stylus of 100 mm length;
c) Radio receiver and relevant electric interface
d) The system shall have interface with offered CNC system for the use of probe and measurement sub routines.

3.21 Offline part programing software:

Supplier shall include package for offline preparation of CNC Part Program suitable for the quoted machine. The package will include:-

3.21.1 Supply of portable programmable unit like Field PG 710 of Siemens or other equivalent make, with clock speed of 2.0 GHz (minimum) with 512 KB 2nd level cache, 512 MB RAM (minimum), 40 GB HDD,CD-ROM/DVD, 3.5" FDD, 10.4" (minimum) colour screen display, Rs232 Serial port with standard key board and mouse. The system should be preloaded with Window 2000/ Windows XP or latest user-friendly menu driven software package. The details such as make, model no., specifications offered should be indicated in the offer.

3.21.2 The machine and programmable unit shall be configured to exchange data (load, down load of part programs and system parameters.

It should be possible to make part programs on the laptop in plain ASCII and down load this to the machine. A detailed manual explaining the procedure for carrying out communication tasks shall also be supplied with the machine.

3.21.3 High level interactive user friendly program suitable to prepare part programs of various machining operations based on user specifications shall be provided.

3.21.4 Programs shall have features like graphic display of cutter path, calculation of machining time and provide graphical display of the machining process.

3.22 Automatic Head Clamping System

3.22.1 An automatic head clamping system shall be provided which shall automatically clamp the universal head (other heads, if provided) hydraulically/ mechanically to the spindle head. Centering and referencing pin as well as clamping check system shall also be provided. This shall be

controlled through the CNC system.

Actual system of working/functioning should be explained with the help of schematic diagrams/ photographs in the offer.

3.22.2 Ram assembly shall be provided with hydraulic and electrical automatic connectors and relevant cables for facilitating quick and easy changeover of heads, if more than one head is provided on the machine.

3.22.3 Provision for manual positioning and pick up of powered head through electronic hand wheel shall also be available to the operator; if machine is provided with more than one head.

3.22.4 Arrangement provided for keeping and positioning the heads, for picking up as and when required, may be explained.

3.23 TOOL PRE-SETTER:

3.23.1 Tool pre-setter shall be capable of accommodating all boring bars and other qualified tools required for machining operations. It should be supplied from reputed make.

3.23.2 Resolution of glass scale shall be 0.0005 mm and repeatability should be of the order of 0.002 mm.

a) It should be capable of holding tools with taper ISO/SK/BT/HSK 50.
b) It should have connectivity with PC through RS232 port.

3.23.3 Built in optical angle measurement system shall also be provided on the projector having minimum 10-times magnification.

3.24 Automatic Tool Changer (ATC):

3.24.1 The machine shall also be provided with an automatic tool changer and tool magazine having provision of at least 70 tools. Random selection of tools shall be possible. The tool magazine shall have bi-directional rotation and tool shall be presented to the ATC arm through the shortest route. The ATC pocket shall be made of polymeric materials such as ACETAL or equivalent material or SG Cast Iron. The ATC shall be driven through brush-less AC electric motor and should be servo controlled**.**

3.24.2 Endurance Test:

The firm shall carry out 24 hours continuous running of the ATC at their premises and in case of any defect developing during 24 hours continuous running, the test shall be repeated for another 24 hours till trouble free operation is achieved. Firm should indicate details of continuous running that shall be carried out at its premises during testing of the machine ATC.

4. **TECHNICAL DOCUMENTATION**

4.1 One copy of the printed illustrative catalogue showing features of the machine and its elements must be enclosed with the bid.

4.2 The successful tenderer will have to furnish for the machine 4 copies of spare parts catalogue giving the part list number of each component and assembly drawings, maintenance manual, troubleshooting guide & operational manual of the machine within one month of placement of Purchase Order. Bidders should provide the list of literature, which they will supply alongwith the machine. The technical literature shall be provided for complete machine including imported and

indigenously purchased components/sub-assemblies.

5. **SPARES**

5.1 List of recommended perishable and non-perishable spares required for normal maintenance to cover complete range of Mechanical, Hydraulic and Electrical equipment (including controls) on double shift working basis shall be furnished and quoted separately. The quantities shall be for two years normal maintenance. Shelf life shall be indicated with the quotation for spares.

5.2 Spares shall be delivered along with the machine.

6.0 **SPECIAL FEATURES:**

Special features incorporated in the machine, if any, shall be indicated separately in the bid, clearly indicating the advantages of these features.

7.0 DEVIATIONS

7.1 Format for Deviation Statement is enclosed as Annexure II-A of Section–II of these tender documents. Bidders are required to mention all deviations either commercial or technical in their offer in this deviation statement and nowhere else. Deviations / Non Compliances mentioned anywhere else by the bidder in his offer shall not be accepted or taken cognizance of. Deviations, if any, having financial implication should be quantified by the bidder in terms of rupees and the same shall be considered for deciding inter-se merit of the bidders. In case any deviation/condition having financial implications is not quantified as mentioned above, the original tender condition will hold good.

7.2 Any other information, which in the opinion of the supplier is important for consideration by the purchaser, may be given.

7.3 Tenderer is required to submit para wise/point wise comments / remarks in their offer, failing which the offer is liable to be rejected.

8.1 **INSPECTION OF EQUIPMENT AND TESTING AT MANUFACTURER'S WORKS**

9 9.1 The machine shall be inspected and tested during different stages of its manufacture starting from raw material till the completion of machine, by the purchaser or his authorized representative at the supplier's or his sub-supplier's works. The Quality Assurance Programme as per ANNEXURE-G shall be submitted along with the bid. The bidder must submit the exhaustive QAP incorporating the tests as given in ANNEXURE-G along with other tests /stage inspection as followed by them.

10 9.2 A load and functional test like no load test and maximum Horse Power test must be carried out at the manufacturer's works. Rigidity of the machine shall be demonstrated to the satisfaction of appointed inspector or inspecting agency.

11 9.3 Manufacturers must have suitable facilities at their works for carrying out various performance tests on the sub-assembly/assembly/machine. The tenderer shall clearly confirm that all facilities exist and shall be made available to the inspecting authority.

12 9.4 A Sample Inspection Chart for inspecting the equipment shall be supplied along with the bid. The inspection chart should indicate all the tests that are carried out during the machine manufacture and also the tests to be offered to inspecting agency. The standard to which this inspection chart conforms should be clearly indicated. Against each test, acceptable limit/ range of values shall be indicated.

12.1

12.2 A load test must be carried out at the manufacturer's works. Rigidity of the machine shall be demonstrated to the satisfaction of inspecting officer/ appointed inspector or inspecting agency.

While carrying out the various specified tests for inspecting agency should jointly sign each and every page of the test result in token of having witnessed these tests.

12.3 Manufacturer must have suitable facilities at their works for carrying out various performance tests on the machine . The tenderer should clearly confirm that all the facilities exist and shall be made available to the inspecting authority.

12.4 A sample inspection chart for inspecting the equipment should be supplied along with the bid. The inspection charts should indicate all the tests that are carried out during the machine manufacture including geometric, performance and functional tests. The tests that shall be conducted by the inspection agency shall be clearly indicated. For each test, acceptable values/ range of values shall also be specified. The standards to which this inspection chart conforms should be clearly indicated.

12.5 The tenderer will submit quality assurance plan being followed at the manufactures works for ensuring quality of products offered.

12.6 The machine is required for high speed bogies frame machining to desired level of accuracy and repeatability.

9.1 **TRAINING**

9.2 Free training by the firm shall be imparted in operation and maintenance of the machine. The training to be imparted shall cover operation, troubleshooting and repair of all mechanical, hydraulic, electrical & electronics equipments (CNC Control & AC Drives) and CNC/PLC part programming. This training shall be provided to 6 persons nominated by the consignee, for a period of one week free of cost at the manufacturer's premises. One week training will also be provided to one person free of cost from M&P/RCF in design and construction of the machine. All charges pertaining to travel, boarding and lodging shall be borne by Indian Railways.

9.3 The supplier will be responsible for coordinating the travel plans of trainees to ensure that the training of the machine is imparted at its assembly and testing stage. The supplier shall provide all facilities for the training.

9.4 In addition to above, technical experts from the manufacturer will fully and adequately train operators and maintenance staff nominated by the ultimate consignee i.e. RCF/KXH (Rail Coach Factory, KAPURTHALA) for a period of two weeks during commissioning of the machine.

9.5 After completion of successful two weeks training by commissioning team of manufacturer to the operators nominated by RCF/KXH. 12 nos. of bogie frame will be machined by these operators themselves independently to attain the confidence exclusive of 24 nos. of bogie frame to be machined during commissioning by commissioning team.

10. Comprehensive Annual Maintenance Contract (AMC) including Spare Parts

10.1 General

A. Tenderers are required to quote for a comprehensive Annual Maintenance Contract for the machine supplied against this specification, which will be inclusive of all spares, material

and labour costs. The duties and taxes as applicable should be indicated separately.

B. The tenderer must offer AMC services at RCF KAPURTHALA, without any preconditions.

C. The cost of AMC, as quoted by the tenderer in their price bid, will be included in the total cost of M&P for the purpose of evaluation of the offers, as indicated in Para 6 of Section-I of Bid documents.

D. Terms & Conditions of AMC contract and procedure to be adopted regarding maintenance of M&P shall be as below:

10.2. SCOPE OF WORK:

A. This is a comprehensive AMC including supply of all spare/wear parts and consumable spares such as filters, V-belts, O-rings, gaskets, fuses etc. and material and labor as required, except Diesel/ fuel, lubricating oils or coolant, Tyres/tubes, batteries, bulbs and consumables directly dependent on production like electricity, gas, toolings, nozzles etc.

B. The AMC contract covers Scheduled Periodic maintenance, Preventive Maintenance, Break down & other repair and maintenance of M&P at RCF, KAPURTHALA,

C. The details of preventive maintenance services to be provided under AMC shall be provided by the tenderer in the following format:

S. No.	**Type of Preventive Schedule**	**Periodicity**	**Items To be Checked**	**Items of Replacement**	**Expected Plant down time**

The Preventive maintenance schedules shall be conducted on weekends as far as possible or any other day through mutual agreement with consignee. The offered Preventive maintenance must be aimed at achieving minimum 95% uptime of the machine excluding the Machine down time for preventive maintenance schedules.

D. Frequency and duration of visit of Service engineer of the manufacturer/supplier may be decided by the manufacturer/supplier based upon the design requirements of the equipment and recommendations of the manufacturer. **Frequency & duration of such visits must be clearly mentioned by the manufacturer/ supplier in the offer.**

E. Tenderer must provide Rate analysis of AMC component in their offer.

10.3 COMMENCEMENT & DURATION OF AMC

A. The Comprehensive AMC contract will be for a period of 5 years commencing after date of expiry of warranty period.

B. The AMC contract will begin after satisfactory completion of Warranty period.

C. Rates for AMC shall be quoted by the tenderer on yearly basis which will remain firm, during the next 5 years duration of AMC and not subject to any variation except any statutory changes in taxes and duties as compared to quoted rates.

10.4 TERMS & CONDITIONS OF AMC

(1) Tenderers are required to quote for a comprehensive Annual Maintenance Contract for a period of five years on yearly basis giving the rates for each year i.e. first year, second year. So on, which will be inclusive of all spares, material and labour costs.

(2) AMC shall be operated, managed and paid by the RCF/RBL. RCF/RBL will be the bill payment authority & custodian of the AMC BG.

(3) The detailed terms and conditions of AMC shall be as given in following clauses:

(A) The tenderer must provide AMC services at the consignee location without any precondition. The AMC should include complete responsibility for the bought out sub assemblies and components like CNC system, diesel engine, AC unit etc.

(B) The tenderer shall ensure that in case a failure is reported by a consignee, qualified service engineers visit the site within 3 days from the date of complaint on calendar days' basis. This period of 3 days after the failure report shall be treated as grace period, which will not count towards plant down time for upto one failure per quarter and a maximum of 4 failures per annum. In case, the number of failures exceed one during any quarter or four during any year of AMC, grace period of only 2 days will be permissible for such additional failures. Complaints shall be lodged by consignee by fax, e-mail or per bearer at address given by the tenderer. The responsibility to keep the failure reporting address details current will rest with the tenderer.

(C) In case preventive maintenance is carried out along with breakdown maintenance schedule; preventive maintenance time will be deducted from breakdown time of the plant.

(D) Penalty Clause: Penalty shall be levied on the tenderer for maintaining plant up time below the limit of 90% calculated on working days basis, after discounting for grace period and preventive maintenance period. Penalty shall be calculated as %age of quarterly payment and will be deducted from the respective quarterly payments. Penalty calculation will be done over quarterly payment period. S.No. Availability Slab Applicable Penalty 1. 90% to 80% 0.5% for every 1% (or part there of) reduction in availability of plant below 90%. 2. Below 80% 1% for every 1% (or part there of) reduction in availability of plant below 80%.

(E) A Bank Guarantee equal to annual value (highest of the annual values if the rates offered for various years are different) of AMC subject to a minimum value of 5% of the quoted cost of machine including concomitant accessory, will be submitted by the tenderer to the consignee 90 days before the expiry of warranty. If bidder fails to submit the AMC BG in this period his performance guarantee can be enchased. The AMC BG will have the validity of 5 years 6 months. The bidder can submit multiple AMC BG for lesser duration to cover the period of 5 year 6 months ensuring the uninterrupted validity of the AMC BG for 5 year 6 months. This AMC BG will be submitted to IRCON for the release of PBG. The AMC BG will be returned on completion of AMC period. In case, the tenderer fails to provide AMC services successfully; the AMC BG will be forfeited. This will be in addition to penalty as per clause above.

(F) In case firm fails to attend the breakdown within in 48 hours of intimation, a liquidated damage at the rate of Rs. 30,000/- (Rupees Thirty thousand only) shall be imposed per day. The maximum liquidated damage that can be levied will be 2% of the Annual value of the AMC contract on each occasion of lapse.

(G) Spares as per list recommended by the tenderer in bid document will be kept by the consignee, which may be used by the tenderer for performing repair & maintenance under warranty/AMC. However, all spares/items borrowed by the tenderer for warranty/AMC, shall be returned conveniently but not later than the last date of warranty period / end of next quarterly period of AMC respectively. Cost of out standing spares will be deducted from pending bills/Bank Guarantee by the consignee.

(i) In all cases of plant failure except as mentioned in clause below, any other spare part or material necessary to restore the plant to proper working order will be arranged by the tenderer as a part of AMC.

(ii) case of damage to the machine on account of any external factor, viz., floods, earthquake, fire, arson or sabotage, entire cost of spare parts and material necessary for repair of the plant shall be borne by the railways.

(iii) In case of damage to the plant as mentioned above, any spare parts and material necessary to restore the plant to proper working order shall be arranged by the tenderer and charged on actual basis duly certified by authorized railway official in the next quarterly bills. The rates charged for such spare parts shall be based upon the spare part rate list provided by tenderer. The tenderer shall furnish documents to support the rates charged for spares used for repair.

(H) Normally quarterly payment (@ 1/4th of the annual quoted rates) under AMC will be made to the tenderer within 30 days from the end of that quarter subject to submission of the following documents by the tenderer to the paying authority assigned by the consignee: a. Consignee's certificate for work done with calculation of down time and penalty applicable. b. A certificate by consignee that no spare part is due with the tenderer as per clause. c. Bills submitted by the tenderer & accepted by consignee. d. Attested photocopy of the AMC BG.

(I) The contract shall cover all the items pertaining to M&P at the time of commissioning of the equipment or later additions during maintenance period.

(J) The M&P will be attended by trained and experienced service engineers of the manufacturer/supplier.

(K) During AMC contract period, all spare parts & consumables as specified in scope of work shall be supplied by the manufacturer/supplier.

(L) Manufacturer/supplier shall make their own arrangement for Conveyance, Boarding and Lodging as well as arrangement of transportation for spares/wear parts.

10.5. AVAILABILITY & Liquidated Damage (LD)

A. Assuming 26 working days in a month, the manufacturer/supplier will ensure an average monthly availability of 90% of the Equipment (balance 4 days per month are for Schedule & Preventive maintenance) based upon 2-shift working. If the average availability is less than 90%, part AMC payment will be made corresponding to pro-rata availability. This will be calculated on quarterly basis as under:

Availability (%) = (T-D) x 100/T where

i. T = No. of shifts the machine is required to work in a quarter
ii. D = No. of shifts the machine is not able to work during the specified work period

B. The breakdown shall be counted from the date and time the equipment is reported to be under breakdown to the date & time on which the equipment is put back into operation.

C. The M&P shall at all times give contractual output and accuracy. Any deficiency or break down for a total of more than 04 hrs. in a shift would be treated as failure for the shift and break down for a total of 02-04 hrs in a shift would be treated as failure for half shift. Minor stoppages will not be counted under break-down.

D. If the availability of M&P is less than 70% for two consecutive quarters, it will constitute complete failure of tenderer to provide the AMC services successfully and the AMC BG will be forfeited accordingly. This will be in addition to liquidated damages for the period of actual performance.

E. In case of damage to the M&P on account of any external factor viz. floods, earthquake, fire, arson or sabotage, entire cost of spare parts and material necessary for repair of the Machine shall be borne by the RCF/RBL. However, the tenderer shall provide services of their engineers free of cost as a part of AMC to restore the machine to working order.

F. In all cases of M&P failure except as mentioned above in clause (E) above, any other spare part or material necessary to restore the Machine to proper working order will be arranged by the tenderer as a part of AMC.

G. In case of damage to the M&P as mentioned above in Para (E) above, any spare parts and material necessary to restore the Machine to proper working order shall also be arranged by the tenderer and charged on actual basis duly certified by authorized RCF/RBL official in the next quarterly bills. The rates charged for such spare parts shall be based on the current OEM's/tenderer's quotation submitted at the time of AMC agreement for list of spares required to maintain the machine. The period of restoration of machine shall be mutually decided and such period shall not be counted in breakdown.

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10.6 FACILITIES TO BE GIVEN BY RCF/RBL FREE OF COST

A. Electricity, Water and Compressed air free of cost.

B. Crane/other lifting equipment, Workshop facilities and Safe storage facility, if applicable for spare parts, tools etc. However, any special tools required shall be brought /arranged by the manufacturer/supplier at his own cost.

C. If required, facilities for working in the night will also be provided.

10.7 PAYMENT TERMS FOR AMC

A. Payment will be made at the end of each quarter. Quarterly bills for AMC are to be submitted directly to RCF/RBL for release of payment by them.

B. For release of payment, the manufacturer/supplier will mention the contact phone no., Fax No., E-mail address, PAN No., Bank A/C No & RTGS/NEFT details.

C. TDS will be deducted at source as per rules.

10.8 DETERMINATION OF AMC CONTRACT:

A. RCF/RBL may terminate the contract by giving notice in writing, giving 3 months clear notice period. Dues, if any, will be settled in accordance with the conditions of this agreement.

B. RCF/RBL may terminate the contract in the event of failure of tenderer to provide AMC services in foregoing paras.

C. Other general conditions shall be governed by Section-I of Tender documents applicable to respective contract.

11. FOUNDATION & RELATED DRAWINGS

For each machine, the supplier shall furnish 6 copies of foundation drawings and related diagrams (Mechanical and Electrical), giving machine weight, overall dimensions, foundations details, electrical load and circuitry, within 4 weeks of the receipt of Letter of Acceptance.

12. TURNKEY CONTRACT FOR INSTALLATION AND COMMISSIONING:

12.1 JOINT CHECK: - The tenderer shall arrange commissioning and proving out of the equipment at site i.e. Rail Coach Factory, Rai Bareli (Uttar Pradesh) India. The tenderer or his agent will be required to inspect the consignment at the consignee's premises before unpacking is done and carry out a joint check of the receipt of components to avoid subsequent complaints regarding short shipment or transit.

12.2 The bidder shall offer complete installation and commissioning of the machines on a turnkey basis. The turnkey offer shall include the following activities:

12.2.1 Design and construction of foundation suiting local soil conditions, to match the receipt/arrival date of the machine at the consignee's premises. Alternatively, bidder shall install and commission the machine on anti vibration mounts of suitable size and capacity.

12.2.2 Electricals including cabling from mains to machine control panel (up to 10 meters) as well as within the machine, with supply of all required materials. He will separately quote the rate per meter for extra cabling, if required, at site which will not be included in the evaluation but will be paid after commissioning.

12.2.3 Provision of all tools and equipment, technical and unskilled manpower, material handling equipment and material for installation and commissioning.

12.2.4 Installation and commissioning of the machine shall be completed within time line given in Schedule -V. **This will include the dry run of the machine before trials are started. Dry run means that machine is switched on with all the utilities, pre-commissioning tests carried out and is ready to start cutting operation**.

12.2.5 Loading/unloading of the equipment on receipt and its movement to the site of installation.

12.2.6 The machine performance shall be demonstrated by the contractor or his agent after successful commissioning at the consignee's works for 12 Coach/Car sets Thereafter, the machine performance shall be watched by the consignee for a period of one month (each working day having two shifts 8 hrs.) before the final proving test certificate is issued. The reliability /availability of the machine during proving test running should be at least 85%.

12.2.7 Proving out for tooled up machine (where applicable). Machine required to be supplied tooled up for components (as mentioned in the Annexure- I to Schedule –I of specifications) shall be proved out to demonstrate the claimed productivity vide clauses 1.3. This proving out shall be done at the inspection stage itself at supplier's premises for all components listed in Annexure I to Schedule I. The consignee will provide the components which the supplier or his agent will collect from consignee's premises on Indemnity Bond.

12.2.8 If any assembly/sub-assembly is required to be taken back to the manufacturer's premises for repair/replacement either before commissioning or during warranty, the manufacturer or his agent shall be required to submit an Indemnity Bond. In case the entire machine has to be taken back, a Bank Guarantee shall have to be submitted. The Indemnity Bond/Bank Guarantee shall be of adequate value so as to cover the cost of the assembly/sub- assembly/paid-up cost of the machine.

12.3 Responsibilities of Consignee & Supplier:-

12.3.1 Responsibilities of Consignee –

i. IRCON shall provide suitable site for construction of foundation.

ii. IRCON will provide electric connection at the column nearest to the machine area (within a range of 10 to 15 meters from the M&P) and all further arrangements / connections shall be done by bidder at his own cost. However, electricity shall be provided by IRCON on chargeable basis (as per Railways rules) based upon number of units consumed for which supplier will have to deposit requisite security deposit for taking connection and supplier will also install consumption meter at his own cost. Water will, however, be provided by IRCON free of cost to bidder.

iii. In case a road mobile crane has to be arranged by the supplier for material handling, a clear approach for it up to the site shall be provided by IRCON.

iv. IRCON will provide open space for storage of material/equipment required for working/ construction of foundation and installation of the machine etc. However, safety and security arrangements for keeping watch on the material will have to be done by bidder at his own cost. Alternatively, bidder can keep his material by making temporary storage on the space provided by IRCON.

v. Work Load (including input material, consumables, compressed air, diesel, electricity etc.) for commissioning period and proving out the M&P shall be provided by RCF/RBL.

12.3.2 Responsibilities of Supplier:

i. Unloading of the M&P and its accessories etc. at RCF/RBL shall be done by supplier at his own cost. Supplier will ensure presence of his representative for safe unloading of the M&P. IRCON shall not be liable for any damages, demurrages on account of the same. Supplier will intimate, atleast 3 days before, the expected time of arrival of M&P at RCF/RBL site for information only. Further, internal movement of M&P to the site of installation shall also be done by Supplier.

ii. Supplier shall be responsible for design of the foundation keeping in view the soil conditions at site. Bidder will make his own arrangements for the survey & investigation of soil.

iii. Detailed foundation drawings along with other civil works (if any) including structural, reinforcement details and Bill of Materials required should be submitted within 4 weeks of receipt of LOA (Letter of Acceptance). However, all civil and electrical works including arrangement of all technical and unskilled manpower and material for the same shall also be done by the Supplier. Details of such civil works shall be mentioned by the supplier in the Technical cum Commercial offer (Packet-1) and cost for doing the same shall be mentioned in Price Schedule (Packet-2 as Annexure IA).Construction of foundation is to be completed before arrival of machine at site.

iv. All facilities required for the Installation & Commissioning such as manpower, material handling equipment like cranes, lifting arrangement etc., tools & tackles, welding or cutting machine, first fill of all lubricants/oils etc. shall also be the responsibility of the Supplier.

v. Any other resources/facilities required as deemed necessary by Supplier.

vi. The supplier shall depute his authorized experienced erection /commissioning team immediately on receipt of material at site at his own cost. The supplier shall arrange to keep all civil works including foundation & other electrical works ready prior to arrival of equipment at site so that precious time

is not wasted after arrival of the M&P at site and the work of installation can start immediately.

12.4 UTILITIES AVAILABLE WITH CONSIGNEE:

12.4.1 SPACE AND LAYOUT OF PROPOSED MACHINE/ EQIPMENTS

The layout of complete machinery/ plant equipments including material handling equipments shall be as per space provided in the drawing No. PRH15A.090000 Rev 01 attached as Annexure-II. for guidance.

The layout for the proposed machine/ equipments shall not infringe with the column foundations and other permanent structures. Minimum space clearance for movement and maintenance of the machine shall be provided.

12.4.2 ELECTRICAL/ ELECTRONICS

a) The whole machine setup electrical/electronic system shall be designed to low tension power supply of three phase 415±10% V and 50+/- 3% Hz.

b) The necessary incoming supply shall be made available by RCF/ RBL at a single point to the power panel which is under tenderer's scope of supply by using suitable cables.

c) Total power requirement shall be indicated by the tenderer.

d) All the internal requisite power control wiring copper shall be included by the tenderer under his scope of work. All other details of electrical /electronic shall be as per Schedule- II.

e) The total cabling work from distribution board to the machine will be carried out by the tenderer.

13.0 COLOUR

The machine and its accessories shall be painted in RAL 6018.

14. TIME SCHEDULE CHART: The bidder shall furnish the information as required vide Schedule - V along with the offer.

Schedule -I

SPECIFICATION FOR BOGIE FRAME MACHINING CENTRE

The leading parameters of machine are as under:

1.	**Leading Parameters**	
(A)	Longitudinal Travel-X-Axis	5,000mm (to accommodate 1 bogie Frames) (min)
(B)	Transverse Travel-Y-Axis	3500 mm (min)
(C)	Vertical Travel of the RAM_ Z-Axis	1200mm (min)
(D)	Work Table Size	To suit the Job Parameters (for 2 bogie frames)
2	**Other Parameters**	
2.1	Job Passage Height Clear	1200mm (min)
2.2	Machine Feeds	
(A)	Rapid power Traverse- X-Axis	18000 mm/Min (min)
(B)	Rapid power Traverse- y-Axis	18000 mm/Min (min)
(C)	Rapid power Traverse- Z-Axis	10000 mm/Min (min)
2.3	Main Spindle size	To suit the job requirements.
2.4	Taper Spindle	ISO -50
2.5	Speed Range (infinitely variable)	10-4000 RPM
2.6	Spindle Power (Minimum)	AC36 KW (S6-60%)
2.7	X-Axis feed rate	5-6,000 mm/Min.
2.8	Y-Axis feed rate	5-6,000 mm/Min.
2.9	Z-Axis feed rate	5-6,000 mm/Min.
2.10	Rotary Axis feed rate	5-10,000 mm/Min.
2.11	Positioning Accuracy as per VDI/DGQ 3441	
(a)	X Axis	.040 mm for entire length
(b)	Y Axis	.025 mm for entire length
(c)	Z Axis	.020 mm for entire length
(d)	Angular accuracy for rotary axes	+/- 2 seconds
2.12	Automatic Tool changer with tool Magazine equipped with NC/ CNC Tool guidance axis and double gripping device for tool pre-selection and fast exchange both in the main spindle and in the tool holder	
2.13	Nos. of Magazine Spaces	70
2.14	Tool carrier(DIN 69871/72 Form A)	SK-50
2.15	Electrical Power Supply (Ac 3 Phase)	415 $\pm$ 10% Volts. 50 $\pm$ 3% Hz

Note: No deviation in leading parameters will be acceptable.

ANNEXURE-I To Schedule -I

1.1 Job Drawings:

S.NO.	Drg. No.	Description
1.	1267401	Bogie Frame

2.0 CONFIDENTIALITY & SECRECY REQUIREMENTS:

2.1 These drawings being confidential documents shall not be disclosed or published to third party in India or abroad without the prior written permission of Rail Coach Factory (I.R) and shall not be used for any other purpose except for study of the job requirements viz.-a-viz. machine specification/proposal being considered by the machine manufacturer/supplier.

2.2 Regarding secrecy provisions please refer to General Conditions of Contract clauses pertaining to official Secrets Act (Govt. of India)

Annexure-A

Note: The Tenderer Should indicate actual technical data of the machine offered by them The following information should also be furnished in the offer.

1.1 Tool Data meter
1.2 Tool Length Maximum (A-dimension)
1.3 Tool weight Maximum
1.4 Tool Weight Min.
1.5 Tool Starting Tractive effort
1.6 Tool Exchange Time
1.7 Bore-to-Bore according to VDI 2852
1.8 Machining Capacity (In Kw and Nm)
1.9 No. of T- Slots and finish tolerance and DIN specification/norms.
1.10 Admissible Weight on work table.
1.11 Type of CNC Control Provided.
1.12 Type of Microprocessor with data like Memory, Speed etc.
2 Connected load of machine in Kilo Watts.
2.1 Different supply voltage required (with range).
2.2 Permissible voltages fluctuations in supply voltages-Long term and short term.
2.3 Duration for which the machine can be operated in case of persistent extreme under or over voltage.
2.4 Admissible voltage interruption period .
2.5 Admissible interference voltage for which electric circuit is valid.
2.6 Maximum Limit of sum of harmonic components permissible as percentage of Supply voltage
2.7 Type and make of CNC system should be clearly specified.
2.8 The make of all AC drives .
2.9 The air conditioning arrangement for cooling of CNE panel, electrical panel, high Voltage portion & Laser portion .
3 Information/remarks for each of the following items for CNC shall be furnished .
3.1 Memory capacity in terms of tape equivalency/M.B.
3.2 Programme input formats and software's features.
3.2.1 ISO/EIA/ASCII.
3.2.2 Menu Driven.
3.2.3 Interactive/conversational.
3.2.4 High level languages.
3.2.5 Special macros provided with the machine.
3.3 Facilities for simultaneous programming.
3.4 Facility for mono/color solid graphics.
3.5 Communication interfaces available.
3.5.1 RS 232 C
3.5.2 DNC
3.5.3 FMS
3.6 Hardware features:
3.6.1 Programming interface.
3.6.2 RAM capacity available.
3.6.3 Media facility.
3.6.4 Interfacing possibilities.
3.7 Self diagnostics facility:
3.7.1 Programming station recommended for machine
3.7.2 Microprocessor/processor used in CNC control system of recommended Programming station

3.7.3 In case of customer built Micro Processor ,Data sheet of Microprocessor should be furnished along with the offer.

3.7.4 Various input/outputs status should be available on screen.

3.7.5 Remote inputs/outputs(status of various push buttons, key board, key and lamps) should be available on screen.

3.8 Whether the CNC system is compatible for signature analyzer trouble shooting?

If yes, will the HP make signature millimeter/Signature analyzer be compatible? For signature analysis trouble shooting.

SCHEDULE-II

GENERAL SPECIFICATION
(ELECTRICAL)

1 The provision of this general specification shall apply.

2 All equipments and material shall comply with appropriate Indian Standards (latest) of National Standards of the country of origin provided the latter are equivalent to or better than the former. For items for which Indian standards are not published, National Standards shall be acceptable. The tenderer shall indicate the Standards applicable. The following standard are applicable in particular.
(Corresponding International Standards like ASA, NEMA, BSS, DIN etc. may also be quoted.

IS	325-1979 (Latest)	Three phase induction motors (corresponding to IEC Pub-51) (Latest)
IS	1248 (Latest)	Direct acting indicating analogue electrical measuring instruments and their accessories (corresponding IEC Pub-51) (Latest)
IS	1231-1974(Latest)	Dimensions of three phase induction motors (corresponding to IEC Pub-71-1)(Latest)
IS	1271-1985(Latest)	Classification is insulation material for electric machinery and apparatus in relation to IEC-Pub 85)(Latest)
IS	6875 (Latest)	Push Buttons and related control switches corresponding to IEC Pub/73)(Latest)
IS	375-1963(Latest)	Marking and arrangement of switch gear, bus bars, main connection & auxiliary wiring.
IS	996-1979(Latest)	Single phase small A.C. and Universal electrical motors.
IS	1356(Latest)	Electrical equipment of machine tools
IS	2516 (Latest)	Circuit breakers (corresponding to IEC Pub-56) (Latest)
IS	7752-1975 Pt.I	Guide for the improvement of power factor consumer's installation

3 Unless specified in the main specs the AC motors and starters shall be of the following type. Tenderer is however, free to give alternative proposal along with justification, if in his view alternative proposal is warranted by site conditions.

Clause	Type of motor	Type of starter
3.1	Any type of AC motor starting current of which does not exceed 75 amps.	Direct on line.
3.2	AC squirrel cage, induction motors, starting current of which is above 75 amps if started direct on line	Star delta or auto transformer type
3.3	AC slipring type motor	Resistance type air/oil cooled
3.4	AC synchronous or synchronous induction motor	Suitable makers standard
3.5	DC motor	Resistance type/Thyristor type

4 The control gear for AC/DC motors shall incorporate the following protection devices as concomitant accessories.

4.1 **No Voltage Protection** – No voltage protection shall be provided so that machine will not start up again by itself when, following an interruption the supply is restored.

4.2 **Short Circuit Protection** – To protect against short circuits due to insulation failure of

faulty connections HRC fuses shall be provided for each motor. The rating of the fuse shall be such as to take care of the over current due to motor starting.

4.3 **Overload Protecton** – To prevent motors from overloading, overload protection shall be provided separately for each motor. Three phase motors shall be protected by overload tripping devices on each phase.

4.4 **Single Phasing protection** – A separate current sensitive delayed action single phasing preventor shall be provided for each motor separately. Overload protection shall not be treated as single phasing preventor.

5 Control equipment shall be mounted in separate drip proof enclosures. Control enclosures and compartments are to be so designed as to give adequate protection against ingress of dust, oil coolant or chips. All control devices like contactors etc. shall be front mounted on a rigidly fabricated metal panel for ease of operation. All other electrics shall be so installed that they are readily accessible when the doors and covers are opened. Hinged covers shall be interlocked with the machine tool control to prevent operation of the machine when cover is open.

6 The motor shall be totally enclosed with or without fan cooled frame. Screen protected drip proof type motor may be provided if it is mounted inside protective enclosures.

7 The electrical equipments shall comply with the requirement of Indian Electricity Act and Rules.

8 All instruments shall be of the Industrial Grade “A”(IS-1248) switch board type the range of the instrument shall be such that the maximum load expected in the circuit shall produce a deflection of 60% to 80% of the full scale.

9 The supplier shall furnish 3 sets of complete electrical and electronic wiring diagrams in full details to enable the maintenance staff to locate faults in the circuits, 3 sets of part catalogue, maintenance manuals operating instructions with details of coils and windings, used in the equipment to facilitate repairs and maintenance should also be supplied.

10 For main motor class “B” insulation shall be provided. If any other class of insulation is proposed, detailed justification for providing different class of insulation shall be given.

11 Motors shall be designed to withstand frequent starts, stops and reversals as demanded in the operation of the machine.

12 Two earthing terminals shall be provided on all electric motors including the control gear.

13 **POWER SUPPLY**

13.1 The machine shall be suitable for operation on 415/230 volts 3 phase cycles, AC 3 wire or 4 wire system with neutral solidly earthed. The supply voltage may vary upto +/10%. The frequency may vary upto +/- 3%. However, full rated power of the motor shall be available at the lower voltage.

13.2 In case of machines equipped with NC, CNC, Thyristor controlled devices and other sophisticated electronic gadgets including microprocessor etc. which are susceptible to power line spikes and surges, a suitable voltage stabilizer and ultra isolation transformer of adequate capacity to cover for the entire electrical load of the machine shall be offered as a concomitant accessory conforming to specification for voltage stabilizer as mentioned in clause 13.2 above and isolation transformer to the parameters mentioned below. Indigenous make voltage stabilizer and isolation transformer from the reputed manufacturers are acceptable.

i)	Transformer ratio	1:1
ii)	Winding	Copper wire wound with “B” class insulation or better

iii)	Protection	To arrest spikes and surges to the order of 3 KV for 200-400 micro seconds duration
iv)	Common mode noise reduction	120 dB
v)	Isolation	Capacitance .005 Pf: resistance greater than 1000 Mega Ohms

13.3 Voltage stabilizer shall be equipped with a protective relay to trip to trip the AC power supply to the machine instantaneously with audio and visual indication to the operator. Settings of the protective relay for low and high voltage shall be 320 volts andn460 volts respectively. Protective relay shall be provided as concomitant accessory on the machines having electrical load below 30 KW.

14 **ATMOSPHERIC CONDITIONS**

The ambient temperature at the site at which the machine will be installed may vary from + 0^0 C to + 50^0 C over the year. The relative humidity may be as high as 100%. The atmosphere is expected to be dusty. The machines offered shall be suitably tropicalised to work under these atmospheric conditions without any adverse effect on their performances.

15 The temperature rise shall not reach such a value that there is a risk of injury to any insulating material or adjacent parts.

16 The drive shall be capable of operating at any one of the speed required independent of the load in accordance with the requirement of the machine.

17 The enclosed Annexure ‘A’, ‘B’ & ‘C’ to Schedule- II shall be completed and submitted with the tender, separately for each motor/control gear.

18 All electric motors shall be of Siemens, NGEF, ABB, Bharat Bijlee, Crompton Greaves makes only. Control gear shall be of L&T, BCH, Siemens, Havells, Telemechanique makes only.

19 The provision of this general specification shall apply.

20 All equipments and material shall comply with appropriate Indian Standards (latest) of National Standards of the country of origin provided the latter are equivalent to or better than the former. For items for which Indian standards are not published, National Standards shall be acceptable. The tenderer shall indicate the Standards applicable.

ANNEXURE "A" TO SCHEDULE-II

TECHNICAL PARTICULARS OF A.C. MOTORS AND CONTROL GEARS

1. **MOTOR**

1.1 Manufacturer's Name
1.2 Type of enclosure
1.3 Type of duty (Ref. IS: 325) (Latest)
1.4 Rating-Continuous/intermittent
1.5 Output (KW/BHP)
1.6 AC voltage across phases, number of phases & frequency.
1.7 Speed in RPM
1.8 Class of insulation
1.9 Normal full load current
1.10 Starting current
1.11 Maximum current at the time of change over from lower speed to higher speed
1.12 Type of motor-Squirrel cage/slipring (wound rotor)
1.13 Temperature rise of windings and other parts allowed above an ambient temperature of 50 degree C.
1.14 Frame size of motor
1.15 End use of motor

2. **CONTROL GEARS**

2.1 Manufacturer's Name
2.2 Type of control gear (Direct on line/Star Delta/Auto-transformer etc.)
2.3 Rating of starting gear in KW & amps.
2.4 Are the following provided :
2.4.1 Short circuit protection
2.4.2 No volt trip
2.4.3 Overload trip
2.4.4 Delayed action current sensitive single phasing preventor

3. Standard specifications to which the motor control gear and its ancilliary offered conform to

4. Any other special features.

ANNEXURE "B" TO SCHEDULE-II

TECHNICAL PARTICULARS OF D.C. MOTORS AND CONTROL GEARS

1. **MOTOR**

1.1 Manufacturer's Name
1.2 Type of enclosure
1.3 Type of duty (Ref. IS: 4722) (Latest)
1.4 Rating-Continuous/intermittent
1.5 Output (KW/BHP)
1.6 DC voltage across phases, number of phases & frequency
1.7 Method of excitation whether shunt, series, compound or separately excited, if separately excited state excitation voltage.
1.8 Speed in RPM
1.9 Class of insulation
1.10 Normal full load current in amps.
1.11 Starting current
1.12 Temperature rise of windings and other parts allowed above an ambient temperature of 50 degree C.
1.13 Frame size of motor
1.14 End use of motor

2. CONTROL GEARS

2.1 Manufacturer's Name
2.2 Type of control gear (Direct on line/Resistance type/Thyristor type)
2.3 Rating of starting gear in KW & amps.
2.4 Are the following provided :
2.4.1 Short circuit protection
2.4.2 No volt trip
2.4.3 Overload trip

3. Standard specifications to which the motor control gear and its ancillary offered conform to

4. Standard specification to which control gear conforms to

5. Any other special features.

ANNEXURE "C" TO SCHEDULE-II

TECHNICAL PARTICULARS OF VOLTAGE STABILISER, ULTRA ISOLATION TRANSFORMER

1. VOLTAGE STABILISER

1.1 Manufacturer's Name

1.2 Type of voltage stabiliser :

a) DC servo motor type

b) AC servo motor type

c) Solid state

1.3 Rated capacity in KVA

1.4 Nos. of phases & frequency

1.5 Type of input supply unbalanced

1.6 Input voltage

1.7 Output voltage

1.8 Rate of correction

1.9 Class of insulation & winding (only copper wound is acceptable)

1.10 Type of control circuitry

1.11 Class of duty

1.12 Type of cooling

1.13 Indicating instruments and their ranges

1.14 Safety features

2 **ULTRA ISOLATION TRANSFORMER**

2.1 Manufacturer's Name

2.2 Rated capacity

2.3 Ratio of input/output voltage

2.4 Class of insulation

2.5 Arrangement for suppression of power line surges, spikes, transients and noises

2.6 Type for cooling.

SCHEDULE-III

GENERAL CHARACTERISTICS

1. **RIGIDITY AND STABILITY**:

1.1 The machine shall be robust, rigid and of sturdy construction. It shall be designed to meet heavy duty demands of various operations on the machine under normal workshop environment for such machine. It shall be free for vibrations even when working at full capacity.

1.2 All machine castings shall be made of close grained high grade cast iron like Meehanite or equivalent materials meeting IS:210 Standards to ensure durability and rigidity, unless otherwise mentioned in Section II. The casting shall be thermal stress relieved to ensure stability and continued accuracy.

1.3 All machine fabrications of critical load bearing assemblies like beds, columns etc. shall be adequately strengthened and stress relieved.

1.4 Change in ambient temperature shall not effect the performance of the machine.

1.5 There shall be no change in the performance of the machine either on switching on the machine or after continuous running.

1.6 There shall be no resonant vibrations throughout the working range of the machine at all loads levels.

2. **SAFETY CONTROLS**

2.1 The machine shall incorporate safety devices to provide protection to the operator and machine against al possible operational and machinery failures.

2.2.1 Suitable interlock shall be provided to prevent machine operations in the event of:

- Faulty sequence of operation
- Fluctuation in supply voltage
- Resumption of power supply after power failure
- Non-positioning of safety guards
- Failure of hydraulic system (where applicable)
- Failure of lubricating system (In case of automatic including drop in pressure lubrication)

2.2 A fault or damage in the control circuit or interruption re-establishment after an interruption of fluctuation in whatever manner in the power supply to the machinery must not lead to dangerous situations in particular.

- The machinery must not start unexpectedly
- The machinery must not be prevented from stopping if command has already been given.
- No moving part of the machinery or piece held by the machinery shall fall or be ejected.
- The protection devices must remain effective.

2.2.2 The machine shall be fitted with an emergency stop device to enable actual or impending danger to be averted. This devices must be

- Conveniently located
- Clearly identifiable
- Stop the machine as quickly as possible without causing additional hazards. The emergency stop must remain engaged. It should be possible to disengage it only by appropriate operation. Disengaging the control must not restart the machinery but only permit restarting.

2.2.3 Safety features shall also include.

- Safety device against overload for all mechanical and electric items to the extent possible.
- Safety stops against over-running of slides.

2.2.4 Guard and protection device shall protect exposed persons against risks related to moving transmission parts (such as pulleys, belts, gears, rack and pinion, shafts etc.) and moving parts

directly involved in the process to the extent possible. This shall meet the following requirements:

- Be of robust construction
- Not give rise to any additional risk
- Not be easy to buy pass or render non-operational
- Be located at an adequate distance from danger zone.
- Cause minimum obstruction to the view of the production process.
- Rigidly connected and not prone to rattling.
- Enable essential work to be carried out without the guard or protection device having to be dismantled.

2.6 A load meter shall be provided to indicate the load on the machine. The meter shall have a suitable mark to indicate the maximum load the machine can take. Full details of the above and other safety features indicating how each one function must be explained in the offer or patented fail safe relief valve which prevents overloading and ensure 100% safety should be provided.

3. **OPERATIONAL CONTROLS**

3.1 The operation of the machine shall be by push buttons or levers/joysticks. The basic rules for the direction of operation of controls and the corresponding direction of movements of the machine tools shall be as per IS:2987-1985.

3.2 The control device shall be

- Clearly visible and identifiable
- Ergonomically positioned for safe operation without hesitating or loss of time, and without ambiguity.

4. **LIGHTING**

4.1 Integral lighting suitable for the operations concerned where its lack is likely to cause a risk despite ambient lighting of normal intensity shall be provided.

4.2 The manufacturer must ensue that there is no area of shadow likely to cause nuisance, that there is no irritating dazzle and that there are no dangerous stroboscopic effects due to lighting provided by the manufacturer.

4.3 Integral parts requiring frequent inspection and adjustment and maintenance areas must be provided with appropriate lighting.

4.4 The machine lighting should be of low voltage so as to prevent any hazard to the operator.

5. **MACHINE MAINTAINABILITY**

5.1 The machine shall be so designed as to require minimum possible maintenance and to give trouble free service.

5.2 All assemblies/parts of the machine shall be easily accessible for maintenance.

5.3 The machine shall not require major dis-assembly for checking and replacement of a particular part, especially for parts requiring periodical check up and replacement.

5.4 The manufacturer must provide means of access e.g. stairs, ladders, cat walks etc. to allow access safely to all areas used for production, adjustments and maintenance operations.

6. **WEAR COMPENSATION ADJUSTMENT**

The original built in accuracy of the machine shall be capable of being maintained conveniently and economically by suitable adjustments for taking up wear on slides, bearings and load screws.

7. **COOLANT SYSTEM (WHERE APPLICABLE)**

7.1 Suitable coolant system with pump, motor, tank, filter, etc. shall be provided. The filter shall be of reusable type and indigenously available. If reusable filter cannot be offered the filter cartridge shall be readily available in India. Source of supply shall be indicated.

7.2 The supply of coolant shall be in ample volume. Provision to re-circulate the coolant shall be available. A chip and coolant tray shall be provided. It shall be adjustable.

7.3 An enclosure shall be provided to prevent the coolant from splashing outside the machining zone.

8. **LUBRICATION SYSTEM (WHERE APPLICABLE)**

8.1 The machine shall be provided with an automatic lubricating system for ensuring delivery of adequate quantity of lubricant to areas requiring continuous lubrication. Suitable arrangements must be provided for indication of failure of the lubricating system.

8.2 The system shall be provided with interlock to prevent machine operating/starting in the event of the failure of lubrication system.

8.3 Reusable filters capable of filtering chips, dust particles etc. shall be provided. Indicators for showing clogged condition of filters shall be available. The filters shall be indigenously available. If reusable filter cannot be offered the filter cartridge shall be readily available in India. Source of supply shall be indicated.

8.4 Lubrication and filter cleaning chart shall be displayed on a metal plate at a conspicuous location on the machine indicating:

a) Specific location of points on the machine to be oiled lubricated/ greased.
b) Periodicity of lubrication of these points.
c) Filter to be cleaned.
d) Periodicity of cleaning filters
e) Periodicity of replenishing lubricating oil for the centralized system
f) Any other similar relevant information.

8.5 Points where manual lubrication is needed shall be separately indicated. Frequency of lubrication shall be also clearly mentioned.

8.6 Lubricating oils used in the machine shall be available in India. Successful tenderer will be required to indicate brand names of approved oils manufactured by various Indian Oil Companies.

8.7 First fill of lubricating oils used in the machine shall be provided with the machine. Details of lubricating system provided shall be indicated.

9. **PNEUMATIC SYSTEM (Where applicable)**

9.1 The compressed air supply will be provided by the customer at the machine with a pressure of Min. 5 Kg./cm^2 and a moisture content of 1000 ppm. The pneumatic system of the machine should be designed accordingly. An alarm shall be provided for low air pressure.

9.2 Suitable filter/moisture trap shall be provided by the contractor in the system of pneumatic air intake. The filter shall be reuseable type and indigenously available. If reuseable filter cannot be offered, the filter cartridge shall be easily available in India. Source of supply shall be indicated. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare.

9.3 Air pressure regulator, if necessary, shall be provided by the tenderer.

9.4 The make of pneumatic control equipment shall be reputed make. The makes shall be indicated.

10. **HYDRAULIC SYSTEM (Where applicable)**

10.1 Hydraulic circuit must be equipped with the following safety and inspection equipments:

a Pressure gauges at all place, where pressure has to be set up or inspected.

b Safety valves for hydraulic circuit if relief valve does not fulfil this function.

c Equipment for checking of temperature in the circuit or in the pump wherever necessary.

d Arrangement to show if the filters (including those in the pump set) are choked and need cleaning. The filters shall be of reuseable type and indigenously available. If reuseable filter cannot be offered, the filter cartridge shall be readily available in India. Source of supply shall be indicated.

10.2 The sump aggregate shall have the following:

a Oil level sight gauges or any other equipment showing the minimum and maximum oil levels in sump.

b A drain plug at the lowest portion of the tank.

c It shall be possible to drain the oil from the tank without disconnecting any pipes or other fittings.

10.3 The temperature of oil in hydraulic circuits shall not exceed 60^{0} C in any case. Suitable arrangement shall be incorporated to ensure that the oil is not overheated under local weather conditions at continuous normal working of the machine.

10.4 Facilities for bleeding of air in case of air lock shall be provided.

10.5 The hydraulic reservoir, pump and allied equipment shall be suitably segregated from the machine in order to remove major source of heat.

10.6 Hydraulic oils used on the machine shall be available in India. Successful tenderer will be required to indicate brand names of approved oils supplied by various Indian Oil Companies.

10.7 First fill of hydraulic oils used on the machine shall be provided with the machine.

10.8 The hydraulic pump, cylinder and system elements shall be from reputed Indian/foreign manufacturers like M/s. REXROTH, Wipro, Vickers-Sperry, Yuken, L&T, Bosch, SLM.

10.9 All piping shall be of suitable seamless steel tubes to withstand the high pressures and be clamped firmly with anti-vibration features. The bends shall not be very sharp. The layout of hydraulic pipes shall be done in a neat manner for ease of maintenance and diagnostic.

SCHEDULE-IV

CNC SYSTEM

1. The machine shall be provided with a microprocessor based CNC control of preferably Fanuc 16 i / Siemens 840 D /Hiedenhain make and shall have five axes control with hard disk. Programming language shall be according to DIN 66025.
2. Controls for all machine functions should be from the operator control station. Some exceptions depending upon design of the machine can be accepted but these must be clearly indicated in the offer.
3. The program entry & display shall be either in plain language dialogue or by ISO standard part programming language to enable a full machining cycle to be built up prior to its execution.
4. A full set of alphanumeric keys for functional values and operating command shall be provided.
5. A 10.4" colour graphics flat screen shall be provided.
6. Controls shall be through push button for manual positioning of machine, manual control of spindle rotation and machine ancillaries.
7. The CNC system shall be capable of programmed control machine functions like axis movement and velocity control at pre-selected speeds, clamping of slides on reaching the programmed position, start and stop rotation and reversal of spindle, selection of spindle speeds, feed rates, start and stop of cutting fluid, tool positioning selection.
8. Programming software shall be facilitated with an overall sensor for the reduced speed and feed rates against previous higher selected speeds and feed rates during machining operations.
9. The standards features of the CNC system shall be described in detail in the offer. These should include but not be limited to the following features:

   i) 3-axes linear as well as circular interpolation.
   ii) Helical and full circle programming in all principal planes.
   iii) Standard programming with 0.0001" or 0.001 mm resolution with automatic recognition and acceptance of inch/mm.
   iv) Absolute and incremental programming.
   v) Decimal point programming.
   vi) Dwell cycle programmes.
   vii) Facility of automatic tool off setting.
   viii) Facility of tool nose radius compensation.
   ix) Data protection key shall be provided. It shall prevent the program offset, parameters data etc. from being registered, set, modified or deleted erroneously.
   x) Mirror image programming on x-y, y-z and z-x planes.
   xi) Canned cycle programming for repetitive machining, particular to the type of machine offered in boring and drilling cycles.
   xii) Facility to have a part program storage length of atleast 512KB/equivalent storage space on floppy disc drive. The memory shall be adequate for loading

the complete program of the job. Facility of accepting input either through machine keyboard, punch tape reader/floppy disc drive/CD/DVD/USB Drive or from a remote device through RS 232 port should exist. The latter should be usable to down load the machine program into any storage or copying device. Facility of program search using program name or program number shall be available. It shall be possible to select the sequence number required to be searched.

xiii) The programming codes would be ISO standard and shall be automatically recognized.

xiv) It shall be possible to control the movement of the tool with respect to machine zero through the machine coordinate system.

xv) It shall be possible to set up work coordinate system using commands. It shall also be possible to set up adequate number of work coordinate systems through the MDI and select any of these in the programme.

xvi) It shall be possible to set up local coordinate systems with respect to work coordinate systems, which has been set up through MDI.

xvii) The colour monitor for distance display of programs, status parameters position and velocity offset, sub-routine and macros.

xviii) It shall be possible to check program by colour graphic display of the work piece shape and tool path for machining.

xix) It should be possible to rotate the program by coordinate system according to the direction of milling head.

xx) Facility for edit, store, search, delete etc. for part programs subroutine macros.

xxi) It shall be possible to enter sub-programs into memory and calling them in memory command mode, 4-loop setting shall be available.

xxii) It shall be possible to store program number and program name for identifying the program. The number of characters in program name shall be indicated.

xxiii) Facility for maintaining constant cutting speed.

xxiv) Buffer memory storage capacity for writing programs while the older programs are under execution.

xxv) Provision for instant stop of operations in case of power disturbances and interruptions, keeping the programs safe and possibility to resume the work from the same point onward.

xxvi) Provision for overriding the axis feed rate and spindle speed override shall be provided.

xxvii) Jog operation of axis and spindle on Hi/Lo RPM/Feed.

xxviii) Program test through dry run.

xxix) Tool indexing in both the directions without any interruption through random position selection with MDI/auto programming.

xxx) Tabulated display of tool data, tool off sets, operational parameters, safety parameters and control parameters on main screen or windows display.

xxxi) Single direction positioning: The spindle shall make its final approach to each set of coordinate position from the same direction irrespective of the general direction of movement.

xxxii) Direct spindle RPM programming.

xxxiii) Automatic corner override: Feed rate shall be reduced automatically to allow for increased cutter loading when approaching an internal corner.

xxxiv) Provision of different stored stroke checks for safety. Stored stroke limit shall be provided thus enabling creation of forbidden zones where the cutting tool may not travel.

xxxv) Function to store distance available on each axis to stop the machining if programmed out of range.

xxxvi) Function to define a zone in the machine working area into which machine shall not be allowed to enter e.g. to prevent a collision with a clamp.

xxxvii) Provision of run hour display: To monitor the time in hours/minutes/seconds of automatic operation. Provision of displaying one line message impart program shall be made available.

xxxviii) Provision for optional stop, optional block skip and tool retract and recover (to restart a program when a tool has been replaced in the machine spindle)

xxxix) Provision to return the machine tool to the reference point through program commands as well as manually.

xl) Provision of pitch error compensation and backlash compensation shall be available.

xli) Operation of air conditioner, oil chiller and swarf conveyor etc. shall be possible independent of CNC and shall be provided with positive safety interlock/feed back.

xlii) The CNC control panel shall be air conditioned and shall be capable to function satisfactorily at any incoming supply voltage within the range of 415V ± 10%.

xliii) The microprocessor unit shall be suitable for satisfactory operation at any incoming supply voltage within the range of 415 V ± 10%.

xliv) The manufacturer's/ Indian agents' infrastructure for repair and maintenance of the offered controls in India, in particular for repair of PCBs shall be commented upon in detail in the tender.

xlv) 2nd additional machining channel and maximum memory expansion as a package should be operative.

xlvi) Fast interpretation links should also be available.

xlvii) CNC should have capacity to interrupt routine with high sped retraction from the contour.

xlviii) Multi axis interpolation should be available.

xlix) Polynomial interpolation should be available in the system:

l) Synchronized axes pair should be available.

li) Tangential control of cutter should also be available.

lii) For (3 linear + 2 rotary) 5 axes machining, all supplementary functions and spline interpolation should be provided with the system.

10. Software

10.1 The machine software shall cater to all the features included in the machine specifications but need not be limited to the following:

i) Shall be capable to display the position, velocity off sets, graphic tool movements

etc. on separate screens.

ii) Shall be programmable through normal data entry methods so that important instructions and safety aspects may be displayed to the operator prior to undertaking next operation through a distinct window.

iii) Shall be able to display dynamic simulation of tool movement for proving out a new program, to write a sequential program through the entry of geometrical entry data, the two features being provable vice versa.

11. The bidder shall provide ladder diagram/ statement list for CNC control of the machine.Programmable Machine Controller for Maintenance Purpose.

11.1 This shall be able to indicate the following:

i) Shall be able to display on CNC monitor screen, detailed diagnostic messages, all dynamic ladder, STL format and real time status data etc. beside safety limit NC, PMC and PC parameters. The trouble shooting software shall be adequate, powerful and shall have menu driven approach down to exact location of the problem spot.

ii) Able to indicate timely alarms for preventive maintenance schedule as recommended by the manufacturer and easy adaptable by the machine users through normal data entry method.

11.2 The machine software shall have remote diagnostic facility in the CNC system.

12. For online condition monitoring of machine, issue of automated warning & messages, software's like SAP etc. are likely to be used. Necessary compatibility must be there in the control system for interaction and connectivity with such software's.

SCHEDULE-V

SPECIFICATION FOR BOGIE FRAME MACHINING CENTRE
SPECIFICATION NO. IRCON/ BOGIE FRAME MACHINING CENTRE/2011

Time Schedule Chart

S.N.	Activity	Activity Code	Time Schedule expected by IRCON	Time Schedule Offered by bidder	Remarks, if any
1	Issue of LOA	D1	D	D	
2	Submission of PBG By Successful Bidder	D2	D1+15	D1+15	
3	Issue of Purchase Order after verification of PBG	D3	D2+30	---	
4	Opening of LC	D4	D3+30	---	(If Applicable)
5	Submission of GA drawings to consignee by Successful Bidder/Supplier	D5	D1 + 30	D1 +	
6	Approval of GA drawings by consignee (Max 6 weeks from date of receipt from supplier)	D6	D5+30	---	
7	Handing over of clear site by consignee	D7	Latest D9-60	---	
8	Completion of foundation	D8	D7+60	D7+_	
9	Supply of machine	D9	D4 + 180 for Foreign suppliers, D1+180 days for indigenous suppliers	D4 + or D1 + (As the case may be)	
10	Installation & Commissioning of machine	D10	60 days after receipt at site	D9 +	
11	Prove Out of machine	D11	D10 + 30	D10 +	
12	Issue of PTC	D12	D11 + 30	---	
13	Warranty	D13	D11+2 years	D11+2 years	

Signature of the Bidder

Annexure II-A

Declaration to be submitted by the bidder

We hereby agree to comply with all the clauses of the technical specifications as per Section-II and conditions of contract as per Section –I fully.

Signature of Bidder

Company Stamp

Date

OR

We offer the equipment complete with technical specifications as per section-II and conditions of contract as per section-I, except for the following deviations:

S. No.	Section / Cl. No.	Details of Deviation	Reason/justification for giving deviations	Amount in Rs if offer is made without deviation

Additional Sheets may be used, if required.

Signature of Bidder

Company Stamp

Date

** Strike out whatever is not applicable.

ANNEXURE-G

QUALITY ASSURANCE PLAN

MACHINE DESCRIPTION

Category	S. No.	Component/ Process	Sample Size	Type Of Check	Quality record	TYPE OF CHECK	REMARKS
Bought Out Raw Material		Steels/castings	1 Sample / Size	Chemical & Mech.	TC & INV.	CHP	
Bought Out Components		Bearings	100%	Visual	Inv	CHP	
		Electric Motors	100%	Review of TC	TC & INV	V	
		Hydraulic Pumps & Elements	100%	Review of TC	TC & INV	V	
		Rubber Seals, O Rings & Seals	100%	Visual	TC & INV	V	
		Controllers	100%	Review of TC	TC & INV	V	
		Ball Screw	100%	Visual	IIR	V	
Bought out sub assemblies		Weld joints Load Bearings Others	 100 % 5 %	 RT DPT	 IR IIR	 CHP V	
		Hardness	100%	Hardness	IIR	V	
In process Inspection stage							
		Heat Treatment	100%	Review of Inv.	IIR	V	
		Castings	100%	Visual	IIR	V	
		Spindles	100%		IIR	V	
		surface finish of components	Random	Surface	IIR	V	
		Noise level	100 %	Sound	IIR	CHP	
		Temperature rise	100 %	Measurement	IIR	V	
		Structures Geometry alignment, Guideways	100%	Relevant ISO/DIN/IS/JIS standard	IR	CHP	

INV - Invoice
TC – Test Certificate
V – Verification
CHP – Customer Hold Point
IIR – Internal Inspection Report
IR – Inspection Report