

Section-II

TECHNICAL SPECIFICATION

ABBREVIATIONS

A-1,A-2, A-3, A-4	Standard paper sizes
AC	Alternating Current
CAMC	Comprehensive Annual Maintenance Contract
AT	Acceptance of Tender
BG	Bank Guarantee
CME	Chief Mechanical Engineer
CME/PCM	Chief Mechanical Engineer/Post Contract Management
CNC	Computer Numeric Control
ICF	Central Organization for Modernization of Workshops
COS	Controller of Stores
Db	Decibel
DC	Direct Current
FA&CAO	Financial Advisor & Chief Accounts Officer
GA (Drawing)	General Arrangement (Drawing)
HRC	Hardness Rockwell 'C' Scale (value)
Hz	Hertz
IEC-Pub	International Electro technical Commission - Publication
JCN	Joint Commissioning Note
JRI	Joint Receipt Inspection
KW	Kilo Watt
LC	Letter of Credit
LD	Liquidated Damages
LOA	Letter of Acceptance
NC	Numeric Control
NIT	Notice Inviting Tenders
PBG	Performance Bank Guarantee
PDF	Portable Document Format
PLC	Programmable Logic Controller
PTC	Proving Test Certificate
PU	Production Unit (Any of the six Railway Production Units e.g. RCF, ICF, CLW etc.)
RDSO	Research Design & Standards Organization
SS	Stainless Steel
WBG	Warranty Bank Guarantee

1.	BASIC DESIGN FEATURES:
1.1	The general characteristic of the machine shall be as per Clause 3 and electrical characteristics as per Clause 2
1.2	SPECIFIC CHARACTERISTIC
1.2.1	Rigidity-Control-Safety
1.2.1.1	It shall be possible to modify the operation mode to run the machine through hand wheel or foot pedal manually if the bending and radius need minor alteration. Also while setting the machine it shall be possible to do inching operation manually.
1.2.1.2	Emergency switches shall be provided at convenient locations clearly visible on either side of the machine.
1.2.1.3	Overload protection shall be provided in the machine.
1.2.1.4	In case of any hydraulic, mechanical or lubrication failure, machine shall give suitable indication to the operator.
1.2.1.5	Protective shrouding shall be provided for all hydraulic hoses and control cables.
1.2.1.6	Attention of the bidder is invited to sub Clause 2.13 of General specification (electrical) of Clause 2 in which power supply conditions are mentioned.
1.2.1.7	The machine shall be designed for operation from centralized panel. A foot pedal switch shall also be provided to enable the operator to initiate bending cycle. The foot pedal switch shall be shrouded to prevent accidental operation of the Press Brake. Light guards/Optical sensors shall be provided suitably to stop the machine operation if hands are kept near or in-between the die and the punch.
1.2.1.8	The machine offered shall be free from vibrations and abnormal operational noise which shall not exceed 85 dB even when working at full rated capacity. There shall be no resonant vibrations throughout the working range of the machine at all load levels and working speeds. The actual noise level that can be obtained shall be furnished in the offer.
1.2.1.9	A temperature sensor shall be provided in press brake to detect rise in hydraulic oil temperature beyond safe limits and an audio alarm and visual indication shall be actuated after crossing the safe limit.
1.2.1.10	In case of power failure, the ram shall not move automatically when the power supply is resumed but shall operate only on pressing of cycle start switches.
1.2.1.11	The doors provided on the electrical panel shall have interlocking so that the doors cannot be opened till the electric supply is disconnected by the main isolation switch. The press brake shall not start till such time the panel doors are closed and main isolation switch placed in 'ON' position.
1.2.1.12	The press brake shall be provided with auto stroke setting facility at a pre-set stroke range.
1.2.1.13	All limit switches provided in the machine(s) shall be of reputed make such as Siemens / L&T/ Telemecanique.
1.2.1.14	The Hydraulic Press Brake machine should be provided with LED light to illuminate work area with minimum illumination level of 300lux. No. of lamps, their wattage and operating voltage shall be furnished by the bidder.

1.2.2	Fabrication of Machine Frame and Associated Steel Structures
1.2.2.1	The Press Brake Machine frame and other associated structure such as table etc. shall be fabricated out of quality steel plates conforming to IS:2062 or equivalent international standards. The supplier shall have sound infrastructure facilities, good working system and practices for fabrication and machining of various structural components of press brake.
1.2.2.2	All welding shall be carried out under the overall supervision of a welding engineer

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	qualified from a recognized institute. The welding engineer shall prepare the welding procedure in accordance with IS: 9595-1980 "Recommendation for Metal Arc welding of carbon and carbon Manganese steels". In addition, the exact welding sequence to be followed for typical locations shall have welding engineer's prior approval for the same. The welding engineer shall also be responsible for actual implementation of the above mentioned approved welding procedure. Proof of the same must be presented to the Inspecting official.
1.2.2.3	Welding supervisors shall have received formal training from institutions with recognized courses for supervisors.
1.2.2.4	Details of the edge preparation for welding shall be in accordance with IS:9595-1980 "Recommendations for Metal-Arc welding of Carbon steel and Carbon Manganese Steels".
1.2.2.5	Automatic/Semi-automatic submerged arc/gas shielded welding shall be carried out according to corresponding IS or other International Specifications.
1.2.2.6	Welders engaged in fabrication shall be subjected to approval tests in accordance with IS Specification No. 7318 (Part-I) "Approval tests for welders when welding Procedure Approval is not required- Part I Fusion Welding of Steel."
1.2.2.7	All welding equipment and accessories should meet the requirements of the corresponding Indian Standard specifications (or International Specifications where IS specifications does not exist). The contractor shall be responsible for satisfying the Inspecting Officer that all welding equipment and accessories being used meet these requirements.
1.2.2.8	Electrodes and wire flux combination used for fabrication should be from reputed make such as Magna, L&T, ESAB, Advani Orlikon, Philips etc.
1.2.2.9	Welding, gas or electric, where called for, shall be performed in an approved and workman like manner. All welds shall be homogenous and show physical properties similar to those of parent metal. Finished welds shall be perfectly free from all defects such as porosity, burnt metal, inclusions etc. and shall present a smooth appearance. All critical welded joints should be tested for crack detection by dye penetrate test/ ultrasonic test/ Radiographic test as per requirement of the various welded joints. A list of such welded joints shall be enclosed with the offer. However, ultrasonic testing would be preferred for checking the welding of critical joints e.g. ram, cylinder slides and butt welds in case of built up frames etc. Records for the same must also be presented to the Inspecting official.
1.2.2.10	When the welded joints are inspected, no defect especially due to the use of equipment and/or filler material shall be accepted. After welding the welded parts or assemblies should correspond to the dimensions required as per mentioned in the drawings.
1.2.2.11	The stress relieving of welded structure should be carried out in thermoelectric or gas fired furnace having proper facilities for temperature controlling and recording. Alternatively, structure can also be stress relieved by vibration techniques. It should absorb all working forces and only minimum stress should be transmitted to the foundation.
1.2.2.12	All the surfaces to be painted shall be cleaned by grit/shot blasting. The shot blasted surface shall provide a degree of roughness where total range of unevenness is less than 40 microns so that anti-corrosion protection coat covers the profile of clean surface continuously. After shot blasting, the surface must be brushed and dusted, then a coat of anti corrosive primer shall be applied, the thickness of which must be at least 40 microns. The structural surfaces to be painted shall be prepared as per method given in IS:

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	1477 Pt.I and then final painting shall be carried out. The thickness of painted surface shall be at least 80 microns when measured in dry condition.
1.2.2.13	The machining of fabricated components should be carried out in single set up on horizontal boring and milling machine to get proper accuracy. The firm should have in house facility of this operation, the details of which should be furnished in the offer.
1.2.2.14	An appropriate working platform with safety cum fencing arrangement should be provided for safety of maintenance staff on the top of the machine(s). A suitable ladder should also be provided.

1.2.3	Specific Characteristic – Electrical / Electronics The Electricals/Electronics of the machine shall meet the requirements specified in Clause 2,General Specifications (Electrical), as modified/ added to the details given below: -
1.2.3.1	The machine tool shall be suitable to work in three phase, three wire,415V \pm 10% .50 Hz \pm 3% enclosed distribution system, with neutral solidly earthed at the source.
1.2.3.2	The motors shall be AC squirrel cage induction motor, confirming to IS:12615-1989 pertaining to “Energy efficient three phase squirrel cage induction motor” or equivalent ISO/DIN specifications.
1.2.3.3	The electrical items like induction motor, operated through conventional (star Delta) starter shall be so selected that they are suitable for operation directly in the electrical system referred to in Clause 1.10.1 i.e. without the use of voltage stabilizer, ultra-isolation transformer etc. irrespective of the rating.
1.2.3.4	Power factor improvement device- The power factor improvement device should be provided with adequate rating of capacitor bank to affect savings in energy bills. The capacitor bank shall conform to IS:7752(Part of 1975) The power factor of the machine tool at the input supply shall be 0.95 \pm 0.2 lag for input voltage of 415V and while performing under maximum load. The capacitor(s) therefore, shall take care of the variation in voltage/frequency specified in Clause above, the control gears/scheme employed for switching ON/OFF of the capacitor(s) shall take care of the poor power factor in the input supply etc. the following details for power factor improvement device should be furnished: - a. Manufacturer’s name b. Rated capacity in KVAR c. AC voltage across phase, no. of phase and frequency d. Frame size
1.2.3.5	The maximum distance of power point to the machine control cabinet would be 10 meters. Bidder is required to supply suitable cable of 10 meters’ length. The foundation of the machine tool shall include provision of trenches for laying interconnecting cables as well as laying of incoming cable from the power point. The location of trenches shall be approved from the consignee along with GA drawing.
1.2.3.6	The earth continuity of the machine tool shall be ensured by connecting two bare copper conductors /flat of required cross section to the existing earth distribution net work of the consignee from common earth pits. In case the machine calls for separate earth pit, provision of two earth pits shall be in the scope of the supplier. This may please be clearly specified in the offer.

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1.2.3.7	The earth continuity shall be connected to copper flats of size 30x30mm brazed to the machine control panel. The contact surface on these copper flats shall be tinned (coated with tin or tin alloy). Connecting the earth continuity conductors to MS hardware, on painted surface, to foundation bolts etc. shall not be acceptable.
1.2.3.8	All the connections shall be either through armored cables with cable glands or through flexible cables laid in rigid conduits/reinforced flexible pipes of reputed makes with end fittings. This may be specified in the offer.
1.2.3.9	The tenderer shall furnish the total connected load of the machine tool with break up for each motor/sub-system in KW/KVA indicating maximum starting as well as running current.

1.3	Beam and Beam Guides
1.3.1	The beam shall be of single piece construction. The firm shall indicate the value of deflection of the beam in mm/meter. The beam movement shall be through hydraulic cylinders. The design of hydraulic cylinders shall be explained in the bid , with regard to beam stroke adjustment and its repeatability, maintenance of cylinders, prevention of shock to hydraulic system in case of blanking operation and beam return.
1.3.2	The beam stroke should be infinitely variable over the entire stroke. Tonnage required according to the job size and thickness should be variable and to be clearly explained in the bid. The types, makes and location of measuring device for the feedback system for the desired accuracy should be indicated in the bid.
1.3.3	The upper beam should be precisely guided in both sides by wide guide ways throughout the length of stroke. The guide ways shall be precision machined and fitted with renewable and non ferrous material such as turcite. The guide design shall be such that perfect guidance can be ensured without any loss of guidance during travel. Manufacture shall specify the perpendicularity of the stroke.
1.3.4	Parallelism of the top beam during fast approach and return shall be ensured by suitable design of the system. The maximum deviation permissible on the parallelism shall be furnished in the offer. The permissible deviation on parallelism shall be such that the same shall not affect the parts of machine.
1.3.5	The movement of the ram at bottom dead point shall be within the accuracy $\pm 0.01\text{mm}$ on the set values.
1.3.6	Measuring system for the ram shall ensure measurement of travel of the beams with reference to the table so that the same is not affected by the side frame deflection. The firm is to explain the hydraulic balancing system adopted.
1.3.7	Heavy components of the machine like ram, table etc. shall have provision for lifting during major maintenance.
1.3.8	Provision shall be made to lift the die to enable selection of the die opening for rotating the same. The arrangement shall be furnished in the GA drawing and shall be got approved from consignee.
1.3.9	The top beam shall be provided with hydraulic clamping arrangement for fixing top tools.

1.4	Table
1.4.1	A rigid table to accommodate die shall be provided. The table of press brake(s) should be provided with suitable hydraulic tool clamping system for the upper tool and manual clamping system for lower tool. The method of fixing die on table shall be explained with sketches in the bid. It shall be possible to adjust and center the lower tools in relation to top tooling. The means and method by which this is achieved shall be explained in the offer.

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1.4.2	The beam and table structure shall be designed in such a way so that perfect parallelism between the table and beam is ensured at any point of stroke/load. The arrangement provided shall be explained in the bid. The value of parallelism in microns for the complete beam length should also be furnished.
1.4.3	The flexure compensation system to be provided in the machine should ensure a uniform bending angle irrespective of material rolling. Thickness tolerances or otherwise tolerances applicable should be commented upon. The advantages of compensation system offered over other systems (static, electromagnetic, mechanical, hydraulic etc.) should be explained in the offer.

1.5	Back Gauge
1.5.1	The machine shall have Numerically controlled, two finger type back.
1.5.2	The accuracy and repeatability of the back gauge system shall be +/-0.05 mm. The back gauge shall be provided with suitable digital readout for positioning.
1.5.3	The drive to the back gauge movements shall be provided through V F D drive with normal induction motor of Siemens / ABB / Delta and ball screw of reputed make such as THK/INA/Rexroth Star. The back gauge shall be provided with suitable mechanism to prevent backlash, which shall be explained in the offer.
1.5.4	To prevent the damage of the fingers/probes of the back gauge by the components during bending cycle, the movement of the back gauge shall be suitably designed so that it will retract immediately after dwelling cycle.

1.6	Toolings: The bidder shall offer the tooling as per Clause 4.2.9 of Section-I. The toolings shall have the following features:
1.6.1	The material used for tooling shall be 42 CrMO ₄ steel – hardened and ground to 45 – 50 HRC and UTS of 90 – 110 Kg/mm ² . The alternative material for tooling can be Grade XT 160 CR 12 of IS: 3748: 90 for Tool and Die Steels. The accuracy should be 0.015mm/1000mm. The angular accuracies of tools should be within ± 15'. The firm shall give the value of surface hardness, UTS, accuracy and surface finish value of each type of tool being offered individually. The name of the tool manufacturer from whom each tooling shall be sourced should also be clearly indicated. This shall also be supported by invoices for verification of the inspecting authority.
1.6.2	The arrangement provided on the beam to clamp the upper tools shall be indicated in the offer. Upper tools shall be hydraulically clamped.
1.6.3	The top tools shall be segmented type for easy loading and unloading on the machine without using a crane.

1.7	Front Support Unit:
1.7.1	The front support unit shall consist of four rigid adjustable bed mounted detachable arms for easy handling of the plates. The minimum length of each arm shall be 1 meter. A minimum of three balls shall be provided on each front arm, which shall help to feed the plate to be bent. The complete unit shall be able to feed a plate of approximately 1000 kg weight into the machine for bending. Information about number of balls on each arm, weight carrying capacity & hardness of balls and length of each arm shall be given in the offer.

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1.7.2	The four detachable supports shall be able to move in a T slot along the width of the bed independently. It shall also be possible to adjust them in height so as to bring them to the same height as that of the die in use. The mechanism provided for the adjustment of height of roller stand shall be explained in the offer.
1.7.3	Stay fixing T-slots shall be provided on both front and rear side of the table for supporting the job.

1.8	Hydraulic System
1.8.1	The operation of beam carrying bending tool shall be done with the help of two hydraulic cylinders. The machine shall have downward operating stroke.
1.8.2	Overload protection of hydraulic pressure system shall be available. The hydraulic system shall be fitted with a suitable indicator to show the pressure being developed in the hydraulic cylinders and corresponding bending force exerted by the beam. The least count of the indicator both for pressure and force shall be given in the offer.
1.8.3	An internal gear type pump of Rexroth/ Vickers/ Yuken/ Atos/ Parker/ Mico Bosch/ Voith/ Velax make shall be provided. The maximum pressure that can be developed by the pump under safe operating conditions shall be indicated in the bid. Star coupling for the pump shall preferably be of polyurethane material. The offer shall indicate make of pump and material of star coupling.
1.8.4	The hydraulic system shall be such that parallelism of top beam with respect to bottom beam is maintained even in case of off center loading. The method by which parallelism of top beam is being ensured shall be explained in the offer. Also, maximum permissible limit of beam tilt in the offered design shall be indicated.
1.8.5	The hydraulic cylinders shall be machined out of close grained forging made out of high grade alloy steel such as C – 50 or equivalent EN grade of steel. The hydraulic cylinder should be finished by honing and the Ra value of honed surface shall be in the range of 0.1 – 0.2 microns. The ovality and cylindricity of hydraulic cylinder shall be within 50 microns. The maximum pressure that is developed inside the cylinder during normal working and area of cylinder shall be indicated. . A dimensional assembly drawing of cylinder assembly showing its important dimensions and tolerances shall be furnished.
1.8.6	The piston shall be made of hardened and ground alloy steel such as C – 50 or equivalent EN grade of steel and be suitably heat treated to provide surface hardness of 58 ± 4 HRC. The piston surface shall be super finished and coated with brass/PTFE to avoid direct contact of piston with the cylinder. The surface finish value of piston shall be in the range of 0.1 – 0.2 Ra micron. The ovality and cylindricity of piston shall be within 50 microns.
1.8.7	The Hydraulic system shall be provided with strainers / filters at suction, delivery (high pressure) and return lines respectively with capability of filtration down to 6.3 and 10 microns or less to ensure purity of oil at required level. In addition, sophisticated valves shall be provided with filters as recommended by the manufacturers of these valves. The pressure drop across these valves / strainers shall be continuously monitored and suitable indication shall be provided to operators / maintenance staff to ensure timely attention. The offered arrangement shall be explained in the offer. The technical details of filters such as make, capacity, type (reusable or

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	throw away type), and life of filter in working hours shall be given in the offer. Adequate no. of filters for 2 years working shall be offered as spares.
1.8.8	The maximum hydraulic oil temperature should be maintained up to 60°C even under the highest ambient temperature condition of 48°C. The refrigerant type oil cooler shall be provided to keep the hydraulic oil temperature within this limit for continuous working of machine in double shift at maximum ambient temperature. The refrigerant type oil cooler shall be of reputed makes such as Emmegi/ Werkin / Warner Finley / Kelvin/Zapp Cool/Advance cooling system/Sunbeam confirming to DIN/ISO standards. The refrigerant used shall be R407C. The bidder shall furnish the technical details of offered oil cooler such as make, type, capacity, refrigerant details, heat load calculation and technical leaflet of offered model.
1.8.9	Oil level sight gauge or suitable equipment showing the minimum and maximum oil level in the tank shall be provided. The indicator shall have marking to show the lowest and highest permissible oil levels for the convenience of the operator. In addition, an oil dipstick with graduated markings clearly indicating minimum & maximum permissible oil levels to be provided. A drain plug at the lowest point of the hydraulic tank shall be provided so that oil can be drained out without disconnecting any pipe or connection.
1.8.10	All pipes used in hydraulic system shall conform to DIN 2391/C and pipe fittings shall be of Ermeto type (vibration proof) confirming to SAE grade. The pipes shall be given anti corrosion treatment. Size and thickness of pipe along with the UTS of the material shall be indicated in the offer. Pipes shall be clamped at suitable locations so that they do not leak/break under vibrations. Location of flexible pipes, if any, in the hydraulic circuit should also be clearly indicated. Stackable valves and manifold shall preferably be used for ease of assembly, reduced piping and leakage through fittings. The hydraulic oil tank inner surface shall be provided with anti-corrosion treatment such as phosphating or hydraulic oil resistant anti corrosive paint. The details of anti corrosive treatment used shall be clearly indicated in the offer. Minimess connections shall be provided as a facility for pressure checking wherever required. The pressure gauge provided for hydraulic system shall preferably be glycerin filled.
1.8.11	Fully labeled line diagram of hydraulic circuit indicating different elements shall be furnished in the offer. Various elements of hydraulic system shall be clearly numbered and shown on circuit diagram. The operation of press brake must be explained sequentially through the circuit diagram.
1.8.12	The construction of piston seals should be explained. Sectional drawings indicating material used in seal should be provided. The seals should be from reputed makes such as SIMRIT/ MERKEL/ HUNGER/ WALKERSOLO/ SOLOSEAL.
1.8.13	All elements in the hydraulic system such as pump, valves, filters etc. provided in the machine shall be from same manufacturer such as Rexroth Bosch/ Vickers/ Voith/ ATOS/ Parker only.

1.9	Deflection Compensation System (if applicable)
1.9.1	Mechanical Crowning system shall be incorporated in the bed to compensate for deflection of bed and beam.
1.9.2	The system shall be able to ensure 0.5 deg/meter and max. upto 1 deg. variation

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	in bending angle along the entire bending length. The bidder shall indicate the designed deflection in mm per metre, which can be taken up by the system.
1.10	Controls:
1.10.1	The machine controls shall be ergonomically designed. Provision shall also be provided to indicate the position of cylinders.
1.10.2	The electrical control cabinet should be of IP55 or better degree of protection and of reputed make such as RITTAL, Siemens etc. The control cabinets& panels should be dust and vermin proof. The electrical components in the cabinets should be mounted on DIN Rail.
1.10.3	All electrical/electronic panels to be provided with adequate door locks. All electrical & electronics panels including operators panel should have sufficient illumination and power receptacles/plug points of 220 Volt, 5/15 Amp AC with on/off switch for maintenance purpose. All electrical adopters/receptacles, fittings, consumables etc. should be compatible with Indian equivalents.
1.10.4	The bidder/supplier shall lay out the electrical cabling with suitable 3 phase 50Hz AC electrical power cable from mains to machine on-off switch in the machine electrical/control panel as well as within the machine, along with supply of all materials.
1.10.5	Total power requirement shall be indicated by Bidder.
1.10.6	The control gear for electrical system should be of reputed make i.e. C&S/L&T/Siemens/BCH/ABB/Telemecanique/Schneider Group etc.

2.	GENERAL ELECTRIC SPECIFICATION		
2.1	The provision of this General Specification shall apply, wherever relevant.		
2.2	All equipments and material shall comply with appropriate Indian Standards (latest) or National Standards of the country of origin provided the latter are equivalent to or better than the former. Items for which Indian Standards are not published, National Standards shall be acceptable. The Bidder shall indicate the Standards applicable. The following standards are applicable in particular. (Corresponding International Standards like ASA, NEMA, BSS, DIN etc. may also be quoted). All electrical equipments like panel boards, motors etc should be placed above 2 feet from the ground level to avoid storm water entering them.		
IS :	325-1979 (latest)	-	Three phase induction motors (corresponding to IEC pub-34-1) (Latest).
IS :	1248 (Latest)	-	Direct acting indicating analogue electrical measuring instruments and their accessories (corresponding to IEC Pub-51) (Latest).
IS :	1231-1974 (Latest)	-	Dimensions of three phase induction motors (corresponding to IEC Pub-72-1) (Latest).
IS :	1271-1985 (Latest)	-	Classification of insulation material for electrical machinery & apparatus in relation to their thermal stability in service (corresponding 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	-	Single phase small AC and universal electrical motors.

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	(Latest)		
IS :	1356 (Latest)	-	Electrical equipment of machine tools.
IS :	2516 (Latest)	-	Circuit breakers (corresponding to IEC Pub-56) (Latest)
2.3	Unless specified in the main specification, the AC motors and starters shall be of the following type. Bidder is, however, free to give alternative proposal along with justification, if in his view alternative proposal in warranted by site conditions. Type of motor type of starter.		
	TYPE OF MOTOR		TYPE OF STARTER
2.3.1	Any type of AC induction motor starting current of which does not exceed 75 amps.		Star / Delta starter.
2.4	The control gear for AC/DC motors shall incorporate the following protection devices as concomitant accessories.		
2.4.1	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.		
2.4.2	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.		
2.4.3	Over Load Protection - 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.		
2.4.4	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.		
2.5	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 contractors etc. shall be front mounted on a rigidly fabricated metal panel for ease of operation. All other electrics shall be 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.		
2.6	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.		
2.7	The electrical equipments shall comply with the requirement of Indian Electricity Act and Rules.		
2.8	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.		
2.9	The supplier shall furnish 04 sets of complete electrical and electronic wiring diagrams in full details to enable the maintenance staff to locate faults in the circuits, 04 sets of part catalogues, maintenance manuals operating instructions		

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	with details of coils and windings, used in the equipment as per Clause 4 in this section to facilitate repairs and maintenance should also be supplied.
2.10	For main motor class minimum “B/F” insulation shall be provided. If any other class of insulation is proposed, detailed justification for providing different class of insulation shall be given.
2.11	Motors shall be designed to withstand frequent starts, stops and reversals as demanded in the operation of the machine.
2.12	Two earthing terminals shall be provided on all electric motors including the control gear.
2.13	POWER SUPPLY
2.13.1	The machine shall be suitable for operation on 415 volts 3 phase 50 cycles AC 3 wire or 4 wire system with neutral solidly earthed. The supply voltage may vary up to +10 -20%. The frequency may vary up to + 3%. However, full rated power of the motor shall be available at the lower voltage. Firm should confirm satisfactory performance of the machine at incoming power supply in the range 415 V+10-20% and 50HZ+3% frequency.

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2.14	OPERATING ENVIRONMENT/ATMOSPHERIC CONDITIONS
2.14.1	The ambient temperature at the site at which the machine will be installed may vary from 0°C to +50°C over the year. The relative humidity may be as high as 98%. 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 performance.
2.15	The temperature rise shall not reach such a value that there is a risk of injury to any insulating material or adjacent parts.
2.116	The drive shall be capable of operating at any one of the speed required independent of the load in accordance with the requirements of the machine.
2.17	Information/data shall be furnished as per the format of submission of technical bid Annexure-A.

3.	GENERAL CHARACTERISTIC
3.1	RIGIDITY AND STABILITY
3.1.1	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 machines. It shall be free for vibrations even when working at full capacity.
3.1.2	All machine castings shall be made of close grained high grade cast iron like Mechanite or equivalent materials meeting IS-210 Standards to ensure durability and rigidity. The casting shall be thermal stress relieved to ensure stability and continued accuracy.
3.1.3	All machine fabrications of critical load bearing assemblies like beds, columns etc. shall be adequately strengthened and stress relieved.
3.1.4	Change in ambient temperature shall not affect the performance of the machine.
3.1.5	There shall be no change in the performance of the machine either on switching on the machine or after continuous running.
3.1.6	There shall be no resonant vibrations throughout the working range of the machine at all load levels.
3.2	SAFETY CONTROLS
3.2.1	The machine shall incorporate safety devices to provide protection to the operator and machine against all possible operational and machinery failures.
3.2.2	Suitable interlock shall be provided to prevent machine operations in the event of:
3.2.2.1	Faulty sequence of operation.
3.2.2.2	Fluctuation in supply voltage.
3.2.2.3	During power failure, the RAM must stop without going up or down. On resumption of power supply the RAM must go to Top Dead Center (TDC) on operating the foot switch.
3.2.2.4	Non-positioning of safety guards.
3.2.2.5	Failure of hydraulic system (where applicable)
3.2.2.6	Failure of lubricating system (In case of automatic including drop in pressure lubrication)
3.2.3	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.
3.2.3.1	The machinery must not start unexpectedly.
3.2.3.2	The machinery must not be prevented from stopping if command has already been given.
3.2.3.3	No moving part of the machinery or piece held by the machinery shall fall or be

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	ejected.
3.2.3.4	The protection devices must remain effective.
3.2.4	The machine shall be fitted with an emergency stop device to enable actual or impending danger to be averted. This device must be:-
3.2.4.1	Conveniently located.
3.2.4.2	Clearly identifiable.
3.2.4.3	Stop the machine as quickly as possible without causing additional hazards.
3.2.4.4	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.
3.2.5	Safety features shall also include.
3.2.5.1	Safety device against overload for all mechanical and electric items to the extent possible.
3.2.5.2	Safety stops against over-running of slides.
3.2.6	Guard and protection devices 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:-
3.2.6.1	Be of robust construction
3.2.6.2	Not give rise to any additional risk
3.2.6.3	Not be easy to bypass or render non-operational
3.2.6.4	Be located at an adequate distance from danger zone
3.2.6.5	Cause minimum obstruction to the view of the production process.
3.2.6.6	Rigidly connected and not prone to rattling
3.2.6.7	Enable essential work to be carried out without the guard or protection device having to be dismantled
3.2.7	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 functions must be explained in the offer
3.3	OPERATIONAL CONTROLS
3.3.1	The operation of the machine shall be by push buttons or levers. 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.
3.3.2	The control devices shall be
3.3.2.1	Clearly visible and identifiable.
3.3.2.2	Ergonomically positioned for safe operation without hesitating or loss of time, and without ambiguity.
3.4	LIGHTING
3.4.1	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.
3.4.2	The manufacturer must ensure 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.
3.4.3	Integral parts requiring frequent inspection and adjustment and maintenance areas must be provided with appropriate lighting.
3.4.4	The machine lighting should be of low voltage so as to prevent any hazard to the operator.

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3.5	MACHINE MAINTAINABILITY
3.5.1	The machine shall be so designed as to require minimum possible maintenance and to give trouble free service.
3.5.2	All assemblies/parts of the machine shall be easily accessible for maintenance.
3.5.3	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.
3.5.4	The manufacturer must provide means of access e.g. stairs, ladders, cat walks etc. to allow access safety to all areas used for production, adjustments and maintenance operations.
3.6	WEAR COMPENSATION ADJUSTMENT(IF APPLICABLE)
3.6.1	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. The system of adjustments incorporated shall be explained in the offer
3.7	COOLANT SYSTEM (IF APPLICABLE)
3.7.1	Suitable coolant system with pump, motor, tank, filter etc. shall be provided. The coolant pump shall be as per IS:2161-1962. 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. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare. Details of the coolant system shall be indicated in the offer.
3.7.2	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. The volume of coolant flow shall be indicated. It shall be adjustable.
3.7.3	An enclosure shall be provided to prevent the coolant from splashing outside the machining zone. Details of enclosure shall be provided. Specific requirements of coolant system for grinding machines etc. shall be clearly indicated.
3.8	LUBRICATION SYSTEM (IF APPLICABLE)
3.8.1	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.
3.8.2	The system shall be provided with interlock to prevent machine operating/starting in the event of the failure in lubrication system.
3.8.3	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. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare.
3.8.4	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.
3.8.5	Points where manual lubrication is needed shall be separately indicated.

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	Frequency of lubrication shall be also clearly mentioned.
3.8.6	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.
3.8.7	First fill of lubricating oils used in the machine shall be provided with the machine. Details of lubricating system provided shall be indicated.
3.9	PNEUMATIC SYSTEM (IF APPLICABLE)
3.9.1	The compressed air supply will be provided by the customer at the machine within pressure range of 4.5-7.5 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.
3.9.2	Suitable filter/moisture trap shall be provided by the contractor in the system of pneumatic air intake. The filter shall be reusable type and indigenously available. If reusable 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.
3.9.3	Air pressure regulator, if necessary, shall be provided by the tenderer.
3.9.4	The make of pneumatic control equipment shall be of reputed make. The makes shall be indicated.

4.	TECHNICAL LITERATURE
4.1	One copy of the printed illustrative catalogue showing features of the machine and its elements must be enclosed with each copy of the bid.
4.2	The technical literature shall be provided for the complete machine, including imported and indigenously purchased components / sub- assemblies. The successful tenderer will have to furnish 4 (four) copies each of the following manuals directly to the consignee along with the machine. Out of these 04 sets, the bidder shall be required to submit one set of all documents in best available condition one month prior to the training for the machine. One set of technical literature should cover the following details:
i.	Operational & Maintenance manual of the machine.
ii.	Instruction & Maintenance manual for Hydraulic Oil Cooling Unit.
iii.	Technical & Maintenance manual for Hydraulic System
iv.	Technical & Maintenance manual for Lubrication System.
v.	Soft and hard copies of PLC Program in ladder form with cross reference listing and PLC project file.
vi.	Drawings of tooling & fixtures, hard copies in A-2 size as well as soft copy in PDF format.
vii.	Wiring diagram, in which length of wires must be mentioned, hard copies in A-3 size as well as soft copy in PDF format.
viii.	Mechanical drawings (spindle assembly, table assembly, column assembly), hard copies in A-1 size as well as soft copy in PDF format.

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xii.	Spare part manual including part lists no., hard copies in A-4 size as well as in PDF format.
xiii.	Lay out drawings in A-1 size, which clearly shows the position of all type of electrical components in machine.
	Note: All manual and literature should be in English.
5.0	SPARES:
5.1	Since the machine will be under comprehensive preventive maintenance during warranty period of two (02) years and under CAMC for five (05) years after the warranty period, it is the sole responsibility of bidder to stock such spares as required for smoother execution of PMC during warranty and CAMC in order to achieve response time in compliance with machine availability as per stipulated requirements.
6.0	CONSUMABLES:
6.1	The list of consumable spares shall be furnished and quoted along with their unit rate.
6.2	Consumables shall be supplied along with the machine or as per agreed time table, if ordered.
7.0	SPECIAL FEATURES:
7.1	Special features incorporated in the machine, if any, shall be indicated separately in the bid clearly indicating the advantages.
8.0	DEVIATIONS:
8.1	The tenderer shall certify that the offered machine fully meets the specification. Various design features incorporated in the machine to fulfill different technical performance requirements shall be fully explained in the offer. However, minor deviations from these specifications which do not affect or in any way interfere with the stipulated performance standards or would result in improved safety/ reliability or would reduce recurring maintenance/operating cost of the machine, can be considered for acceptance. The tenderer in such event shall clearly indicate the details of these deviations and their implications as per the following format.
8.2	All Deviations shall be clearly indicated in the deviation statement as per the format of submission of technical bid Annexure-A
9.0	INSPECTION AND TESTING AT MANUFACTURER'S WORKS:
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-I shall be submitted along with the bid. The bidder must submit the exhaustive QAP incorporating the tests as given in Annexure-I along with other tests /stage inspection as followed by them
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.
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.
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

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	agency. The standard to which this inspection chart conforms should be clearly indicated. Against each test, acceptable limit/ range of values shall be indicated.
10.	TRAINING:
10.1	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 (NC Control & AC Drives) and NC/PLC part programming. This training shall be provided to 03 persons nominated by the consignee, for a period of 02 weeks free of cost at the manufacturer's premises. Two weeks training will also be provided to one person free of cost from ICF in design and construction of the machine. All charges pertaining to travel, boarding and lodging shall be borne by Indian Railways.
10.2	Subsequently, technical experts from the manufacturer will fully and adequately provide training to operators and maintenance staff nominated by the consignee at the time of commissioning of the machine.
10.3	The supplier will be responsible for co-coordinating with the consignee the travel plans of trainees to ensure that the training is imparted on the machine at its assembly and testing stage. The bidder shall also submit training schedule along with the offer.
Note:	All training should be imparted in English only.
11.	FOUNDATION & RELATED DRAWINGS
11.1	SUBMISSION OF GA, FOUNDATION & RELATED DRAWINGS FOR APPROVAL:
11.1.1	For each machine, the supplier shall first submit 01 copy of foundation drawings with details of construction of foundations, complete layout of machine elements like bed, hydraulic tank, coolant tank, electrical panel, Servo Controlled Voltage Stabilizer etc. and other related diagrams (Mechanical, Hydraulic, Electrical & Electronics) along with machine weight, overall dimensions, electrical load with length of 3 phase, 415 V AC electric power cable for approval as per time schedule specified in Section-IV to each consignee for approval and to enable the consignee for making necessary arrangements for Installation & Commissioning of Machine on receipt. After getting approval from consignee, the supplier shall supply directly to each consignee 6 copies of approved GA foundation drawings and related diagrams for each machine as per time schedule specified in Section-I from the date of approval of GA drawing for information only. This information should be furnished on the pattern indicated in detail in the following IS Specifications (Latest) or relevant international standards <ul style="list-style-type: none"> i) IS: 2974 (Pt.I Para 4.1) for reciprocating type machine. ii) IS: 2974 (Pt.III Para 3.1) for rotary type machine (medium & high frequency). iii) IS:2974 (Pt.IV para 4.1) for rotary type machines of low frequency. iv) IS: 2974 (Pt.V para 3.1) for impact type machines other than hammers
11.2	APPROVAL OF GA DRAWING (Applicable for machines wherever delivery period is linked with approval of GA drawing) To be governed by Time Schedule in Clause 7 of section-I and following stipulations.
11.2.1	General Arrangement Drawings will be sent by the 'Contractor' to the Consignee as per Time Schedule annexed in LOA/AT. Consignee will download the copy of AT from ICF website and take necessary action for approval of GA drawings.

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	The 'Contractor' should ensure that drawings sent to consignee are complete in all respects as specified in technical specification. The GA drawings shall be approved by the consignee and given back to the contractor, under advice to ICF, as per the Time Schedule in the LOA/AT.
11.2.2	Delays in submission of drawings by Contractor will be added to the delay in supply of machine in case submission of GA drawing is delayed beyond stipulated time as per time schedule and LD will be levied as per bid document Part-I . Thus the number of days' delay in submission of GA drawing plus the number of days delay in supply of machine together will be taken as the delay in supply of machine for the purpose of calculations of LD as per Clause 1002 of section II of bid document part-I. However, if the contractor supplies the machine before original delivery period as per AT the number of days by which machine has been supplied earlier than original delivery period that many days will be subtracted from the delay in submission of GA drawings and LD will be levied accordingly . Delays in approval of the drawings by consignee will not be on account of Contractor, except as detailed below.
11.2.3	In case Consignee finds some deficiencies in the Drawings and returns the same for rectification to the 'Contractor', the contractor must return the rectified drawings within 30 days from the date of issue of letter by Consignee. This period will not be counted towards LD calculation. The consignee shall ensure that all deficiencies in the Drawings shall be pointed for clarification to the firm together at one time only instead of piecemeal multiple reference
11.2.4	A repeat back reference(s) by Consignee to Contractor pointing out further defects/deficiencies in the Drawings, will be considered a delay on account of the contractor, except for special circumstances like change in location, review of arrangement etc. Thus, Contractors must take utmost care in ensuring completeness as per requirements of the Consignee.
11.2.5	Where GA Drawing cannot be approved by consignee due to clear site not being available etc., the Consignee must inform Contractor and ICF, explaining the exact delay. However, initiative must be taken by Contractor to obtain such a certificate from Consignee. Contractor must bring any difficulty/dispute to the notice of ICF immediately.
11.2.6	In their own interest, contractor must maintain a log of events in this respect with clear dates and regularly inform consignee and ICF to avoid wrong levy of LD. Consignees must cooperate with Contractors by providing all assistance, including clear information about any expected delays in site availability, promptly and in writing.
11.2.7	If an order has been placed on the firm, the firm will have to advise the consignee well in advance regarding requirement of road permit and assistance required from the consignee, if any, so that delay on this account is avoided. Firm should also visit the site before dispatch of machine to assess the condition of path to be used for movement of trailer
11.3	DISPATCH OF THE MACHINE FROM MANUFACTURER WORKS:
11.3.1	The supplier should normally dispatch the machine only after the foundation is ready for installation and commissioning of the machine on arrival.
11.3.2	In case of delay on part of consignee in providing the clear site for construction of foundation or any other facility as specified in the contract to the supplier, the supplier will report the matter to ICF and consignee. In case of delay in readiness of site on part of consignee, ICF shall take up the matter with concerned Railway/ PU, and advise supplier accordingly
11.3.3	In case proving of component at manufacturer works, the supplier should request

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	for the same as soon as possible after receiving contract keeping allowance of transit time etc. and approximately 60 days for consignee to handover the parts after receipt of the request accompanied by appropriate and valid bid guarantee. In the event of consignee certifying the non-availability of prove out components, such components will be deemed to be proved out at manufacturer works. However the firm will prove out these components at consignee subject to the availability.
12.	INSTALLATION, COMMISSIONING AND PROVING TESTS: (ON TURNKEY BASIS)
12.1	Joint Check – The contractor or his agent would be required to carry out a joint check at consignee’s end, along with the consignee, before unpacking is done, to avoid subsequent complaints regarding short shipment/transit damages. It is necessary that this joint receipt inspection be done immediately on receipt of the machine by consignee & bidder’s representative to avoid commissioning delays due to shortages/transit damages. After receipt of the machine as above a Joint Receipt Inspection note (JRI) as per Annexure-C of Section-III shall be prepared by the consignee and the firms representative indicating the tentative time schedule for various activities of installation and commissioning. For Indian manufacturers, JRI note shall accompany the bill for 80% payment.
12.2	RESPONSIBILITIES OF CONSIGNEE AND BIDDER
12.2.1	The consignee shall be responsible for-
i.	Provision of a clear covered (except where shed is in the scope of contract) site for construction of foundation as per the schedule to ensure its readiness before arrival of machine at site
ii.	In case where construction of shed is also in the scope of contractor the consignee shall ensure site is encroachment and encumbrance free
iii.	Electricity, water and compressed air for installation and commissioning of machine shall be provided free of cost within one week of arrival of machine at site
iv.	Wherever a road mobile crane has to be arranged by the supplier for material handling, a clear approach for it up to the site has to be provided
v.	Clear covered space for storage of material/equipment required for working/ construction of foundation and installation of the machine etc
vi.	The consignee shall arrange the raw material for prove out at their end within 7 days of the dry run of the machine (installation, power connection, auxiliary connection like air, water connection) failing which such components will be deemed to have been proved out. The components supplied by the consignee in time will be required to be proved out within specified time schedule thereafter.
12.2.2	The bidder shall be responsible for-
i.	Design of foundation as well as flooring (if required) of sufficient thickness, suiting local soil conditions at the site.
ii.	Advise consignee in time regarding schedule for requirement of clear site for construction of foundation and other infrastructure, resources & facilities required.
iii.	Construction of foundation as well as flooring (if required) of sufficient thickness suiting local soil conditions, for machine shall be completed by the bidder at the site provided by the consignee before receipt of the machine at their premises.
iv.	Provision of all tools and equipment, technical and unskilled manpower, material handling accessories/ equipment and material for installation and commissioning.
v.	Unloading of the machine on receipt (both imported and indigenous machine)

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	and its movement to the site of installation including provision of road mobile crane.
vi.	The bidder should ensure the proper earthing for the machine and its peripherals/accessories.
12.3	<p>Consignee will provide only 415 V+10%-20%, 3 phase 50 Hz±3% AC supply at a single point (mains). All types of cables, connections, circuit breakers etc. required for connecting power supply point to different parts of the machine/control cabinets, shall be the responsibility of the bidder. Requirement of grounding/earthing with required material shall also be incorporated by the bidder during construction of foundation.</p> <p>Electrical work like laying of power/electrical cables & earthing wires from mains to machine control panel (upto 20 meters) as well as within the machine, with supply of all materials shall also be carried out by the supplier.</p>
12.4	<p>The supplier shall demonstrate machine performance and prove out the claimed capability for successful commissioning at the consignee's works as per Clause 2.4 of Section-I. The M&P shall be deemed to be "commissioned" at consignee premises on the date when it is tested and meets with the specified capabilities/functions according to the technical specifications. In addition to above, in case of tooled-up M&P , the M&P shall be deemed to be "Commissioned" at consignee premises on the date when "prove out" components specified as per the relevant Clause of technical specification have been successfully proved out meeting the productivity requirements of Technical specification. The consignee shall arrange the raw material for prove out at their end within 7 days of dry run of the machine (installation, power connection, auxiliary connections like air, water etc.) failing which such components will be deemed proved out. The components supplied by consignee in time will be required to be proved out within as per specified time schedule thereafter. Any delay in providing the "raw material or any other input" for proving out shall not be logged on supplier's account.</p> <p>A Joint Commissioning Note (JCN) to this effect shall be made as per the format at Annexure-D of Section-III. After issue of JCN the performance shall be watched for a period of one month, after which the PTC shall be issued. The issue of PTC cannot be delayed by more than 60 days from the issue of JCN. If some minor breakdowns are noticed after the issue of JCN, these shall be attended as per warranty obligations and suitable extension of the warranty period, under intimation to ICF. If no intimation is given to ICF and the PTC is not issued tillthe expiry of 60 days from the issue of JCN, then the issue will be discussed in a meeting between CME/PCM and the consignee. Based on this, decision to issue PTC will be taken by CME/PCM, the concerned technical officer and CME.</p>
12.5	If an assembly/sub-assembly requires to be taken back to the manufacturer's premises for repair/replacement either before commissioning or during warranty, the manufacturer or his agent would be required to submit BG of suitable amount. In case the entire machine has to be taken back, a Bank Guarantee for the cost of the machine would have to be submitted. The bank guarantee should be of adequate value so as to cover the cost of the assembly/sub-assembly/paid up cost of the machine.
13.0	SERVICE FACILITY IN INDIA AND TECHNICAL SUPPORT
13.1	The tenderer will clearly spell out in the offer the facilities available with him or his agent for providing adequate after-sales service in India during warranty period in the appropriate section of Annexure 'A' of Bid Document . The complete

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	details such as organization for after sales service, availability of technically competent engineers and warehousing facilities for spares should be clearly indicated. Bidders not offering complete servicing/repair facilities in India to ensure quick response to maintenance/ servicing calls are not likely to be considered.
13.2	After the warranty period and CAMC period if any, the manufacturer or his agent shall agree to provide service supports for trouble shooting and obtaining spare parts. The manufacturer shall be obliged to provide spare parts required by the Purchasers for a period of 15 years from the date of delivery of the machine at the ultimate destination to safeguard against obsolescence.
13.3	Tenderer who are OEM, shall undertake to supply spare parts for a period of expected life of machine. Other tenderers shall submit undertaking from OEM for supply of spare parts for a period of expected life of the machine.
13.4	During warranty period, the supplier or his authorized agent shall attend for break down as soon as possible, but in no case later than 72 hours of receipt of intimation of the breakdown.
14.	BOUGHT OUT ITEMS
14.1	The bidder shall furnish along with the offer a list of all critical items/ sub-assemblies which are bought out by the bidder and proposed to be used, along with the manufacturer's name, brand model etc. The successful bidder may be required to produce invoices to ensure genuineness of such products / verification by the Inspecting agency.
14.2	The bidder should clearly indicate that in case of components/sub assemblies taken from reputed companies such as Vickers, Rexroth, RITTAL, THK, and Shenburger etc., the parent company has already entered into contract with their Indian units/affiliates for undertakings repairs/after sales service during warranty and post warranty

S.No.	Sub-assembly	Make
1	Hydraulic system	Rexroth/ Vickers/ Yuken/ Atos/ Parker/Mico Bosch/Voith/Valex
2	Ball screws	THK/INA/Rexroth Star
3	Refrigerated type Air cooler for hydraulic system	RITTAL/Warner Finley/Kelvin
4	Hydraulic Oil	IOCL/BOCL/HPCL/Castrol/ESSO
5	Lubrication System	Cenlub/ Dropco/ Vogel/ Rexroth
6	Electrical Control Cabinet	RITTAL/ Siemens or of other reputed make with IP55 Protection level
7	Toolings	Rolleri/Italy, Ferrari/Italy, Gimec/Italy, Euro stamp/France or Willa/Swiss
8	Limit Switches	Siemens / L&T/ Telemecanique
9	Bearings	FAG/SKF/Timken/NTN/KOYO
10	Contactors	Siemens/BCH/ABB/Schneider/L&T
11	'O' Rings & rubber seals	Merlin/Parker/Busak/Hunger/Merkel/Soloseal/Walkersolo/Halite

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14	Filters	Hydac/Hydroline/Parker/Rexroth/EPE, Germany/ Vickers/Mahle/Purolator
15	Control gears	C&S/L&T/Siemens/BCH/ABB/Shneider/Tele mechanic/ Schneider Group
16	VFD based induction motor	Fanuc/Siemens/ABB/Baldor/Allen-Bradley/ Schneider.
17	Air conditioner	RITTAL/Warner Finley/Kelvin

15.0	COLOUR: The machine and its accessories shall be painted in Apple Green Colour No.281 to IS:5-1978,(if any specific colour code standardized by BIS is available, the same be given). The machine can also be painted in equivalent RAL/DIN/other International Standards. If there is a standard color scheme of the manufacturer, the same can also be considered and may be specified
16.	WARRANTY OBLIGATION –The following conditions regarding Maintenance and reliability shall also apply:-
16.1	The machine shall be designed for a life of 15 years with regular maintenance and all the structural members of the machine and the foundation shall be guaranteed for 15 years against cracks breakages and etc. during the course of normal operations. Tenderer would submit suitable undertaking
16.2	Foreign suppliers who do not have registered office / maintenance facilities in India may authorize an Indian agent, who shall be responsible for maintenance and break down support. In such case, Indian agent should have experience of maintaining at least 5 machines during past 5 years preceding the tender opening date. The tenderer should submit documentary evidence towards the experience of the Indian agent, along with the offer.
16.3	In addition to warranty obligations prescribed under Clause 3400 and 3500 of the Bid Document Pt.-I, the warranty period would also cover comprehensive preventive maintenance, which will be inclusive of all spares, material and labour cost. All maintenance consumables like lubricants and grease except hydraulic oil / machine coolants shall form part of the scope of the preventive maintenance during the warranty. The cost of preventive maintenance to be carried out during warranty period should be quoted separately.
16.4	The payment of preventive maintenance schedule carried out during warranty period shall be made by ICF annually at the end of each year after completion of the work and issue of certificate by the consignee as per annexure-E of section-VI.
16.5	The machine shall at all times give contractual out-put and accuracy. Any deficiency or break down for a total of 02 hr. or more for a day would be treated as failure for the day, for the purpose of extending warranty period in terms of Clause 3405 of Bid Documents .
16.6	The tenderer shall ensure that in case a failure is reported by a consignee qualified service engineers shall visit the site within two days from the date of complaint on calendar day's basis. The period of three days (excluding date of complaint) after the failure reported shall be treated as grace period, which will not count towards breakdown time for up to one failure per month and a maximum of 3 failures per quarter. In case the number of failure exceeds one failure per month or three during any quarter of warranty, grace period of only 1 day will be permissible for

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	such additional failure. Complaints shall be lodged by consignee by fax phone, e-mail or per bearer at address given by the tenderer.
16.7	The details of preventive maintenance to be provided during warranty period shall be indicated by the tenderer giving details of type of preventive schedule, periodicity on items to be checked, items to be replaced and expected plant down time. Preventive maintenance schedules shall be conducted on weekends as far as possible or any other day through mutual agreement with consignees. Total breakdown hours shall be calculated after discounting grace period and preventive maintenance period.
16.8	Maximum permissible down time till it is restored back to the contractual output and accuracy levels, in any quarter of the year during the warranty period, shall be 150 hrs. In case the total breakdown period in any one of year during warranty period, exceeds 500 hrs., the consignee shall inform the same to ICF to ensure this as a record of breakdown (duly signed by shop in-charge) in hours on quarterly basis should be maintained by the consignee and joint report with the contractor shall be made for each breakdown attention. At the end of first and second year of warranty, these details of breakdown hours during warranty period should be advised to ICF as per performance appraisal report given in Annexure – E of Section -III. The firm will then request ICF for release of WBG annexing the performance appraisal report as per Annexure-E of Section-III and the breakdown details mentioned above. Penalty will be levied on the bidder for breakdown period on working days basis (excluding holidays) after discounting for the grace period. Penalty will be calculated as percentage of annual preventive maintenance charges and will be deducted from the respective annual payments as under

Breakdown period	Applicable penalty
Up to 150 hours in each quarter and not exceeding 500 hours annually	Nil
Exceeding 150 hours - up to 200 hours in any quarter and not exceeding 500 hours annually	5 % of annual preventive maintenance charges
Exceeding 500 hours - up to 750 hours annually	10% of annual preventive maintenance charges
Exceeding 750 hours - up to 1000 hours annually	25% of annual preventive maintenance charges
Exceeding 1000 hours annually	50% of annual preventive maintenance charges and Encashment of Warranty Bank Guarantee besides other action like noting adverse performance of the bidder and/or agent for future tenders and their offer in the subsequent tenders will not be considered for placement of any order.

17.	COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT
17.1	Tenderers are required to quote for a comprehensive Comprehensive Annual Maintenance Contract for the machine supplied against this specification for a period of five years on

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	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. The duties and taxes as applicable should be indicated separately. All consumables spare and materials shall form a part of the scope of comprehensive CAMC except as follows a. Diesel/Fuel, lubricating oils or coolant b. Major machines elements/structural members which are under guarantee for a period specified in Clause 16.1 as stipulated in 'warranty obligations' requirement.				
17.2	CAMC shall be operated, managed and paid by the consignees indicated under Clause 3 of SECTION I. The consignee shall indicate the bill payment authority & custodian of the CAMC BG. No further agreement is required for operating CAMC at consignee end.				
17.3	CAMC is a part of scope of supply as concomitant requirement and included in commercial evaluation criteria vide Clause 5 of Section-I. The detailed terms and conditions of CAMC shall be as given in following Clauses.				
17.3.1	The duration of CAMC shall be 5 years from the date of expiry of warranty. Rates for CAMC shall be quoted by the tenderer on yearly basis, which will remain applicable during the duration of CAMC and not subject to any variation except any statutory changes in taxes and duties as compared to quoted rates.				
17.3.2	The tenderer must provide CAMC services at the consignee location without any precondition. The CAMC should include complete responsibility for the bought outsub assemblies and components like diesel engine, AC unit etc.				
17.3.3	The details of preventive maintenance services including cleaning of machine to be provided under CAMC 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
17.3.4	Preventive maintenance shall preferably be conducted on weekends through mutual agreement with the consignee. Each preventive maintenance schedule normally shall not exceed one day. The total shutdown time for preventive maintenance should be kept as low as possible but not more than 60 hours/month (averaged over the quarter) including time for cleaning, weekly, fortnightly, monthly, quarterly schedules etc. The preventive maintenance regime offered must be aimed at achieving minimum 90% uptime of the plant excluding the plant down time for preventive maintenance schedules.				
17.3.5	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 (excluding date of complaint) 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. Incase, the number of failures exceeds one during any quarter or four during any year of CAMC, 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.				
17.3.6	Inc case preventive maintenance is carried out along with breakdown maintenance schedule; preventive maintenance time will be deducted from breakdown time of				

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	the plant .
17.3.7	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 thereof) reduction in availability of plant below 90%.
2.	Below 80%	1% for every 1% (or part thereof) reduction in availability of plant below 80%.

17.3.8	A Bank Guarantee equal to $\frac{1}{4}$ of annual value (highest of the annual values if the rates offered for various years are different) of CAMC subject to a minimum value of 1.25% of the quoted cost of machine including concomitant accessory (in case the annual CAMC rate quoted is less than 5% of the cost of machine), will be submitted by the tenderer to the consignee 90 days before the expiry of warranty. CAMC will have the validity of 5 years 6 months. The bidder can submit multiple BG for lesser duration to cover the period of 5 year 6 months ensuring the uninterrupted validity of the CAMC BG for 5 year 6 months. The confirmation for the submission of this BG will be returned on completion of CAMC period. In case, the tenderer fails to provide CAMC services successfully, the CAMC BG will be forfeited. This will be in addition to penalty as per Clause 17.3.7 above. This provision would not be applicable where the advance payment is made.
17.3.9	Plant up time of less than 60% for two consecutive quarters will constitute complete failure of tenderer to provide the CAMC services successfully and will result in forfeiture of CAMC BG, besides other action like noting adverse performance of the bidder and/or agent for future tenders and their offer in the subsequent tenders will not be considered for placement of any order. This will be in addition to penalty Clause 17.3.7 above for the period of actual performance.
17.3.10	As per Clause 5.1.1 of bid document SECTION II, where CAMC is part of evaluation of offer, it is the sole responsibility of bidders to stock all spares and materials as required for smoother execution of CAMC in order to achieve response time in compliance to machine availability as per stipulated requirements.
17.3.10.1	In all cases of plant failure except as mentioned in Clause 17.3.10.2, 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 CAMC.
17.3.10.2	In 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. However, the tenderer shall provide services of their engineers free of cost as a part of CAMC to restore the plant to working order.
17.3.10.3	In case of damage to the plant as mentioned in para 17.3.10.2, any spare parts

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	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 in compliance of Clause 5.2 or any other valid document. The tenderer shall furnish documents to support the rates charged for spares used for repair under para 17.3.11(a).
17.3.11	Normally quarterly payment (@ 1/4 th of the annual quoted rates) under CAMC 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 as per Annexure-G of Section-III 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 17.3.10 above. c. Bills submitted by the tenderer & accepted by consignee. d. Attested photocopy of the CAMC BG.
17.3.12	The CAMC contract can be terminated in following ways: Consignee may terminate the CAMC in the event of failure of tenderer to provide CAMC services of the CAMC agreement in addition to encashing of CAMC BG asper Clause 17.3.8
17.3.13	Other general conditions shall be governed by Bid Document Part-I (Section-I, II and III) as applicable to respective ICF A/T.

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