

7. DELIVERY SCHEDULE CHART:

In the event of acceptance of the offer, the machine(s) shall be supplied as per the following Milestone Chart:

Name of machine – CNC Vertical Turning Lathe

Specification No. - JUDW/CNC/VTL/WHL-1200/2024

S.No.	Activity	Activity Code	Outer Limit of Time Schedule expected by COS/NR
1.	Issue of LOA	D1	-
2.	Submission of PBG By Successful Bidder	D2	D1+30 days
3.	Issue of AT / Contract By COS/NR (after verification of PBG)	D3	D2+30 days
4.	Opening of LC by COS/NR (for foreign suppliers)	D4	D3+30 days
5.	Submission of GA drawings and requisition for the trial component (s) (if applicable) to consignee by Successful Bidder/Supplier along with information on power and other utilities required for machine.	D5	D3 + 45 days
6.	Approval of GA drawings by consignee (to be governed by clause 11.2 of section-V) and confirmation of availability of components to be proved out at manufacturer premises and value of BG required for providing prove out components.	D6	D5+ 45 days
7.	Confirmation of availability of clear site by consignee	D7	By D6 (i.e. at the time of approval of GA drg.)
8.	Completion of foundation	D8	D7+150 days or latest by D 10
9.	Submission of BG and collection of components from consignee by the supplier for prove out of machine at manufacturer's works.	D9	<u>D6 + 60 days</u>
10.	Supply/ Delivery of machine (for foreign suppliers on FOB basis)	D10	For First machine: D4 + 180 days Or D6 + 180 Days (whichever is later) Thereafter subsequent machines:

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			@ 1 machine per month <u>Indigenous portion of supply (if any)</u> <u>For first machine</u> D6 + 180 days <u>Or receipt of machine at site whichever is later</u> <u>Thereafter subsequent machines:</u> @ 1 machine per month
	Supply/ Delivery of machine (for indigenous suppliers)	D10	<u>For First machine:</u> D6 + 180 days <u>Thereafter subsequent machines:</u> @ 1 machine per month
11	Power connection for the machine and other on site requirements to be provided by railways	D11	<u>D10 + 7 days</u>
12	Railway to give call to supplier for the commissioning of machine	D12	<u>D10 + 7 days</u>
13	Installation, commissioning and proving out of machine by supplier	D13	D11 + 180 days or D12 + 180 days (whichever is later)
14.	Issue of PTC by consignee	D14	D13 + 30 days
15	Warranty by supplier	D15	D13 + 2 years
16	AMC	D16	D15 + 5 years

Notwithstanding the delivery period indicated elsewhere in the tender document, the delivery indicated in this schedule shall be taken as overriding and final

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Section-V

TECHNICAL SPECIFICATIONABBREVIATIONS

A-1, A-2, A-3, A-4	Standard paper sizes
AC	Alternating Current
AMC	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
COS/NR	Controller of Stores/Northern Railways
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 etc.)
RDSO	Research Design & Standards Organisation
SS	Solid state, stainless steel
WBG	Warranty Bank Guarantee

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CNC VERTICAL TURNING LATHE

1.	BASIC DESIGN FEATURES:
1.1	Safety features:
1.1.1	The machine shall incorporate all safety devices so as to provide complete protection to the operator and machine. Some of the important safety features, which should be available on the machine, are mentioned below:
	a. When feed hold is 'ON', all slide motions are to be inoperative.
	b. Software limit switches are to be provided to restrict the total slide travel, maximum feed velocity and maximum spindle speed. Hardware features should also be available for controlling the above movements.
	c. Improper job clamping in the spindle nose should inhibit spindle rotation and error is to be displayed on the control screen.
	d. The work piece should not get unclamped in the event of power failure or an emergency stop.
	e. Load meter should be provided to indicate the load on spindle drive motor, so that the load on the motor can be maintained within the safe limits. The safe zone should be indicated in green colour, the danger zone in red and intermittent zone in yellow colour.
	f. When any of the machine functions like spindle rotation, slide movement, etc. come to a stop without being programmed to stop, the machine should come to a stop and should be operative only in the manual mode till the fault is rectified.
	g. In case of failure of powered clamping system or sudden power failure, a suitable safety interlock system should be provided to prevent loosening of chuck jaws when table is rotating.
	h. Safety against ingress of Swarf on all sliding surfaces.
	i. All operating controls should be located preferably on a swivel able pendent or positioned within easy reach of the operator and should be of push button type clearly colour coded and marked with user friendly symbols.
1.1.2	Suitable interlocks should be provided to protect the machine in the event of hydraulic oil failure, lubrication failure, coolant failure, pneumatic system failure, fluctuation in voltage and frequency.
1.1.3	The safety feature shall include safety device against over loading of any drive, over travel of any slide and interlock against conflicting motions.
1.1.4	Mushroom type emergency stop shall be provided on the machine, which shall be easily accessible and capable of disabling the machine, drives in case of any emergency. The offer should give specific details of the safety features incorporated in the machine.
1.1.5	Work area enclosure with transparent windows should be provided. The work area should be completely enclosed and interlocked so that no cutting operation in auto mode can take place as long as it is open except for motions in jog mode. An "acrylic" shield swing open or shutter type table guard (with glass and protecting bars) should be provided to protect the operator from flying chips coming out of the revolving table. Adequate clearance should be provided between the column and the table to

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	ensure un-interrupted flow of chips. The clearance provided should be indicated in the offer.
1.2	Specific characteristics:
1.2.1	General
1.2.1.1	All the machine elements should be properly designed by using finite element method analysis (FEM techniques or equivalent software) to get optimum cross section and ribbing. The machine should be rigid and of sturdy construction, design to meet cutting forces at full load encountered in heavy-duty application under severe workshop conditions. The machines shall be free from excessive vibrations and noise at full load. The exact method followed for designing of machine elements may please be specified in the offer.
1.2.1.2	<p>All the major machine elements such as base, column, cross rail, ram head and table should be of thermo symmetric design. The elements should be made from highest quality, heavily ribbed, rigid gray cast iron and produced to BS-1452-1990 Grade 250 or Grade 25/30 conforming to DIN 1691. The casting should be suitably stress relieved and aged to ensure dimensional stability and freedom from distortion over the entire life of the machine. The actual process followed for stress relieving should be detailed in the offer.</p> <p>All mating guideways of X and Z axis should be hardened (preferably induction) and precision ground. The hardness of guideways should be 58 +/- 2 HRC. The guideways should be lined with anti friction strips for stick slip free guide motion. The grinding of guideways should be carried out on precision grinding machine such as Waldrich-Coburg/ Forest line / Hitachi Seiki or equivalent precision grinding machines under controlled temperature conditions. The method followed for maintaining controlled temperature conditions may be specified in the offer. The firm should indicate the value of grinding accuracy in micron/metre.</p> <p>The details of the various elements (base, column, cross-rail, ram head, table etc.) material, heat treatment cycle and maximum permissible inclusion level in cast iron shall be clearly indicated in the offer. Special design and constructional features of the elements (the bed, column, cross-rail, ram head, table etc.) must be fully explained in the offer.</p>
1.2.1.3	All the guideways for X and Z axis shall be suitably protected with wipers and heavy duty telescopic covers made of stainless steel conforming to Grade 3: ISO 683-13 to prevent ingress of coolant swarf and dirt. Telescopic cover should be preferably from reputed make like Sur Henning etc. Appropriate chip chutes should be provided for easy chip disposal.
1.2.1.4	Detailed drawing of the offered machine including isometric view clearly indicating the various machine parts and accessories should be submitted along with the offer.
1.2.2	Base
1.2.2.1	<p>The machine bed should be made from a fabricated steel or casting. It should incorporate suitable design features for high damping, high rigidity and continued dimensional stability over the life of the machine i.e. thick wall, thermo symmetric feature optimum ribbing and full stress relieving The casting should be made of stabilized cast iron as per Gr GG25/GG30 of DIN 1691 or equivalent JIS standards or ISO standard.</p> <p>In case of fabricated structure the steel used for fabrication should be Fe360A conforming to ISO 630-95 or better grade. The fabricated structure should be subjected to stress</p>

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	relieving cycle. The details of the bed material and heat treatment cycle shall be clearly indicated in the offer. Special design and constructional features of the bed must be fully explained in the offer.
1.2.2.2	The design of the bed shall be such as to provide the operator easy access for loading and unloading of jobs, gauging, tool changing and other related functions. The offer shall explain how this is achieved.
1.2.4	Column
1.2.4.1	The column construction should be of thermo symmetric design to minimise thermal distortion of the machine frame. The design should provide adequate rigidity.
1.2.4.2	The column should be of sturdy design to withstand heavy machining operations. It should be integral with the base or rigidly connected to it to ensure vibration free operation. Details of the special features, if any, should be explained in the offer.
1.2.5	Cross Rail
1.2.5.1	The cross rail shall be of fixed type.
1.2.5.2	Widely spaced guideways hardened and ground (to ensure square guidance of the head) and large front guideways (to take and dampen the main cutting forces) shall be provided. The arrangement should ensure the highest accuracy and rigidity. The guideways shall be properly lined with antifriction lining like turcite or hardened and ground steel plates of adequate thickness should be provided. Hardness of the guideways or steel plates should not be less than HRC 58 +/-2 & case depth of 1.5 -2 mm. Any other better arrangement for smooth movement of guideways like LM guideways can also be considered.
1.2.5.3	The cross rail guideways should be properly protected from ingress of dust and swarf. The wipers/telescopic covers of reputed make such as Henning conforming to CE/ISO standards.
1.2.6	Ram Head
1.2.6.1	The ram should be made of forged steel or SG cast iron. A ram head shall have enclosed type hardened and ground guide ways properly lined with antifriction lining like turcite or hardened and ground steel plates of adequate thickness should be provided. Hardness of the guideways or steel plates should not be less than HRC 58 +/-2 & case depth of 1.5-2 mm. The grinding accuracy should be 4-5 micron/metre or better. Any other better arrangement for smooth movement of guideways like LM guideways, as specified in 1.2.5.2 above can also be considered.
1.2.6.2	The tool holders shall be automatically clamped in the tool location of the ram head. The tool clamping system should provide high stiffness and tool change repeatability. Cutting forces should not influence the tool clamping. The ram head shall be hydraulically balanced.
1.2.6.3	A 12-station automatic tool changer with a round disc type magazine (cross rail mounted) shall be provided. Tool magazine movement shall be bi-directional. All the tool selection and transfer motors shall be completely automatic through CNC command.
1.2.7	Table
1.2.7.1	The table should be provided with stiff and rigid machine base with large space for mounting the machine column. The table should be of thick wall construction, optimum ribbing and fully stress relieved.

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1.2.7.2	The table shall be capable of taking the thrust and radial loads under maximum feeds/speeds, depth of cut and thereby ensuring high degree of accuracy during the life of the machine.
1.2.7.3	The table should be supported on a precision preloaded antifriction bearing system consisting of thrust roller bearing for vertical loads and precision taper roller bearing for taking up radial loads. Bearing should be of preferably P5/P6 Class of precision. Recirculating lubrication system shall be provided for the table bearings.
1.2.7.4	<p>A hydraulically operated 3-jaw self-centering chuck which can be controlled through CNC program as well as through a foot operated switch should be provided. It should be possible to load concentric as well as non-concentric jobs on the table either with adjustable individual jaws on a 3 jaw self-centering chuck or with the help of a fixture directly mounted on face of the table.</p> <p>"Clamping and resting arrangement for wheel disc on the base should be such that wheel disc should not lift upwards while clamping through jaws".</p> <p>The foot-operated switch should be ineffective while machine is working in CNC mode. It should be possible to adjust chucking pressure according to the job requirements.</p> <p>The details of arrangement and design features of fixtures, if provided should be explained in the offer.</p>
1.2.7.5	The radial chuck jaws shall be of quick setting type and include an arrangement for independent micro adjustment to maintain concentricity without re-grinding.
1.2.7.6	The clamping operation should be electrically/ hydraulically interlocked so that the table cannot be started when chuck jaws are unclamped.
1.2.7.7	Table should derive its rotation from the variable speed AC spindle motor through a two-stage gearing. The drive shall be further transmitted through flat belt & a two-speed gearbox. The speed range selection shall be through CNC system. Electric safety limit switch should be provided so that table do not rotate unless range selection has been completed.
1.2.7.8	The table drive elements such as pinion and gears should be made of Nickel chromium steel such as 18 Ni Cr Mo7 (as per DIN grade) /20 MnCr2/15 CrNi6 or equivalent ISO grade as per design requirement. The gear should be of helical type and should be hardened (preferably induction) and ground. The hardness value should be HRC 58 +/-2. The accuracy of gearing should be preferably DIN6 class or better.
1.2.7.9	Suitable dynamic or regenerative braking for quick stoppage of the table should be provided. The quantum of braking effort shall also be indicated.
1.2.7.10	Table drive elements such as Pinion & Gear should be properly lubricated. The details of the arrangement provided should be explained in the offer.
1.2.8	Speed and Feed
1.2.8.1	Adequate speed and feed ranges should be provided for machining different components.
1.2.8.2	<p>The feed drive for vertical movement of the ram head and cross movement should be through hardened and ground precision pre-loaded recirculating ball screw of C3 class or better of adequate diameter. The ball screws should be supported on both ends by precision bearings.</p> <p>The size, precision level and class of ball screws and their make should be indicated in the offer. The feed movement should preferably be transmitted from the motor to the ball screws through a direct coupling overload safety interlock or other latest device ensuring protection of machine elements. The actual arrangement provided should</p>

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	be explained in the offer.
1.2.8.3	The complete range of infinitely variable speed shall be operative for table movement and programmable over the entire range to ensure optimal cutting speeds. It shall be possible to change the speed while machining is in progress by over ride. The extent of change of speed by override may be explained in the offer
1.2.9	Drive
1.2.9.1	Feed drives for ram slide vertical and cross movements should be from digital control AC servomotors. The servo motor and associated control systems should be of the same make as that of CNC control system. The motor should be provided with inbuilt rotary encoders.
1.2.10	Work Light
1.2.10.1	A lighting unit for illumination of the working area preferably with halogen lamp should be fixed at a convenient location. The minimum illumination at work/tool interface should be 300 lux or higher. The location and type of lamp used should be indicated in the offer. The firm should also indicate the operating voltage of lamps used on this machine.
1.2.11	Measuring System
1.2.11.1	The machine should be equipped with a suitable error actuated closed loop feed back system to ensure accuracies specified in Schedule-1. Axis should be equipped with the Latest technology linear scale with 10 micron/metre accuracy or better and 1 micron resolution or better. Preferred Make: Newall, Heidenhain, Electronica and Fagor.
1.2.11.2	Encoder should be provided to register slide positions within fine limits, commensurate with the requirement of the control system. The firm should furnish the actual details such as make, resolution and accuracy of measuring system provided to the various axis. Firm should also furnish the details of means provided for protection of linear scales. For measurement of table rotation speed, suitable encoder shall be provided. To monitor axis and table movements, suitable individual display units shall be provided in the operator panel. Preferred Make: Newall, Heidenhain, Electronica and Fagor.
1.2.12	Hydraulic system
1.2.12.1	The hydraulic oil tank, pump, electric drive motor etc. shall be free standing to eliminate effects of hydraulic oil temperature on the machine.
1.2.12.2	The piping and fitting of hydraulic system should conform to DIN 2391/C.
1.2.12.3	Pump shall be used to supply oil for the various functions like clamping and unclamping of tool etc. Refrigerant type cooling system should be used to control the temperature of hydraulic oil.
1.2.13	Coolant System
1.2.13.1	The coolant system will be required if wet cutting is offered. The machine should have its built-in filtration system for the coolant.
1.2.13.2	It should be ensured that the coolant should not affect table bearings. Details of the arrangement provided should be explained in the offer.
1.2.14	Lubrication "
1.2.14.1	An automatic lubrication system covering all the bearings, driving gears, feed screws, guideways of the cross rails, saddle and slide ways and all other moving parts and components should be provided. Details of the lubrication system like make of system, no of lubrication points offered should be indicated in the offer.

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1.2.14.2	Protection against over pressure and low lubrication oil pressure should be provided. Complete details in this regard should be fully explained in the offer
1.2.15	<p>CNC Control</p> <p>The CNC control system should be of latest version of Fanuc FS 0i F with alpha i/beta i series AC Servo motors or latest version of Sinumerik 840 Dsl of Siemens make. AC Servomotors, PLC's and AC drive control systems etc. should be of the same make as that of CNC control system.</p> <p>The offered CNC Control System shall have the following features:</p>
1.2.15.1	The control system should have provision of 32 bit or higher micro processor based integrated type of controller. Standard CNC system hard disk with 2 GB minimum should be provided.
1.2.15.2	<p>It should have provision of 32 bit or higher version of microprocessor based integrated type of controller. The other features are as under:</p> <ul style="list-style-type: none"> • Disc 32 MB RAM (Minimum) or better • Parallel interface with 6 GB hard disc capacity (Minimum) • 19" Flat operator Panel with 15" TFT/LCD colored screen and Alpha-numeric keyboard with soft keys • Block processing time should be less than 2.5 ms (milli-second). • Part program memory should be 1GB or higher.
1.2.15.3	A memory of 1 MB or more should be available for storage of part program, tool offset and other off sets.
1.2.15.4	Facility for program and tool data transfer through RS 232/Ethernet port should be available. Program running from external source through RS 232/Ethernet port should also be available.
1.2.15.5	Loading and unloading of program through Ethernet port/PCMCIA Card/ flash disk/Pen drive should be possible.
1.2.15.6	Data protection key (password protection) shall be provided. It shall prevent the program offset parameters, data etc. from being registered, modified or deleted erroneously. All the passwords shall be given to consignee during commissioning of the machine. Bidders will certify that there is no such password in the machine, which has not been given to the consignee and the consignee has to approach the manufacturer for rectification later on/ at regular interval.
1.2.15.7	The offered CNC control system should have the provision of displaying the menu & other contents preferably in HINDI in addition to the English language.
1.2.15.8	Facility should be available for tool retraction in case of emergency or power failure. Supplier should ensure necessary back up power availability for this purpose. The firm should provide UPS of adequate for this purpose. Details of UPS like make, Ampere- hour rating of battery, backup rating in minutes etc.
1.2.15.9	In case of interruption and subsequent restoration of power supply to the machine, it should be possible to resume operation from the point at which it was interrupted.
1.2.15.10	It should be possible to add, delete or modify program blocks. An axis key block should be provided to prevent tempering with program edit.
1.2.15.11	Back ground editing facility should be available such that when machine is executing a CNC program in Auto mode, the operator should be able to enter new program or

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	carry out editing of the existing program.
1.2.15.12	Teach in mode should be available.
1.2.15.13	It should be possible to directly program CNC system from machine console.
1.2.15.14	Fixed cycle programming should be available for milling, boring, drilling, reaming and tapping. Graphical support for cycles should be provided.
1.2.15.15	Mirror imaging feature should be available for machining operation.
1.2.15.16	Inch/Metric program should be available for dimension input.
1.2.15.17	Linear and circular interpolation programming should be possible.
1.2.15.18	The control panel should have provision for manual over ride for speed and feeds from 0-120% of the program value.
1.2.15.19	Auxiliary hand pendant to be provided for jog/inching movement with push button/electronic pulse generator for movement of all axis with axis and increment selector switches and spindle rotation with following functionalities: <ul style="list-style-type: none"> • Electronic hand wheel. • Incremental movements. • Axes selector • Tool locking • Toolunlocking • Spindle rotation • Emergency button head.
1.2.15.20	Absolute/Incremental Input – Program data may be in either absolute or incremental from selectable by G code.
1.2.15.21	Feed rate programming – Feed rate should be programmable in direct millimeters per minute (MMPM) or inches per minute (IPM) . Feed rate should also be programmable in mm per revolution (MMPR) or inches per revolution (IPR) selectable by G codes.
1.2.15.22	Dwell – Programmable up to 99.9 seconds using G-code.
1.2.15.23	The control should be able to give error messages with diagnostic level up to PLC in case of malfunctioning of the system. The controller should also maintain a record of the error messages with date and time that are registered by the machine.
1.2.15.24	Pitch error compensation through software should be accepted by the control.
1.2.15.25	The controller should be able to interface with tool Monitoring system installed for the purpose of monitoring the condition of the Tool.
1.2.15.26	Any other feature present in the CNC control should be explained in detail.
1.2.15.27	Tool Management details (Magazine configuration Screen).
1.2.15.28	PLC integrated with CNC control should be provided. Scan rate of PLC should be of the order of 3 microseconds per instructions.
1.2.15.29	Spindle control – CSS orientation.
1.2.15.30	All necessary back up data and program like NC, PLC,HMI and DP data/parameters, Fixed cycles and part programs, PLC program should be made available on PEN DRIVE of 16 GB capacity and ghost program should be made available on spare hard disk drive as fitted on the CNC Control.

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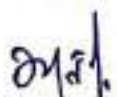
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1.2.15.31	Execution and PLC programs should be in F-EPROM so that power failure should not affect system execution and PLC program.
1.2.15.32	<p>Ladder diagram/STL diagram with cross-reference listing of the PLC program should be displayed provided for ease in maintenance purpose. In case, this cannot be provided, the alternate documents/ means should be given to assist maintenance staff for troubleshooting.</p> <p>Online diagnostic system using PLC ladder has to be enabled in the system installed in the machine to enable easy maintenance in case of faults by studying real time status of various I/O/F to the machine.</p> <p>A portable programmer is to be supplied along with the machine with the licenced software of Windows and also the system software which is used in the machine along with inter-connecting cables. This programmer is to be used for up/down loading of software, programs, parameters and offline/online troubleshooting.</p> <p>CNC system should have tele-diagnostic facility for remote diagnosis in case of faults.</p>
1.2.15.33	<p>Fanuc/ Siemens unit of the country which supplies CNC system should enter in to repair & Service contract with Fanuc/ Siemens India for attending the defects.</p> <p>Documents must be enclosed in the offer.</p>
1.2.15.34	<p>There should be provision of password protection for operator name, component number and data log registration in CNC system, using PMC (programmable machining controller).</p> <p>This provision should be developed by machine tool builders.</p>
1.2.16	Chip Conveyor
1.2.16.1	<p>The machine should be provided with a suitable motor driven swarf conveyor system for collection and removal of swarf from the machine without stopping it. The chip conveyor capacity should be adequate to cater for maximum metal removal rate. There should be provision to start and stop the conveyor either by manual mode or CNC Part programme through 'M-Code' functions. The chip conveyor should conform to relevant DIN/ISO specifications, which may be indicated in the offer. The firm should furnish the following details of chip conveyor.</p> <ol style="list-style-type: none"> Type and make of chip conveyor Width of chip conveyor Type of motor and its KW Drive speed in mm/min Height of discharge of chip conveyor from the floor level Schematic layout of the system and sub-assemblies. Material composition and hardness values of the conveyor Components
1.2.16.2	The system should be designed in such a way that the coolant is completely drained off from the swarf without carrying any residual contents along with it to the coolant tank.
1.2.17	TOOLINGS & FIXTURES
1.2.17.1	Complete pre-set toolings/qualified toolings to cover requirement specified Annexure "F" of Section VI should be supplied with the machine. Details of toolings including tool post, boring bars, tool holders, and throw away carbide tipped inserts their grades should be indicated in the offer. Complete tooling should be listed out and described in detail with individual prices



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1.2.17.2	The basic tool holder used should be with ISO 50/ BT 50 taper and pull stud design. In case any other tool holder taper is offered, complete justification shall be given. Spindle should also be such as to accept the basic holder of the offered type. The no. of machines in the past supplied with the offered spindle taper may also be indicated. Tooling should be modular type.
1.2.17.3	Tool holders and cutting tools offered should conform to ISO standards. The life of inserts should be indicated in the offer.
1.2.17.4	The design of the fixture should be such that it should be possible to do the machining of each types of wheels in one fixture. Holding device for fixture should be self-centering and there should not be any need of its manual adjustment. The tenderer is to offer the best design of the fixtures, which should utilize advance hydraulic clamps for quick clamping & de-clamping.
1.2.17.5	Clamping arrangement provided should be flexible for the full range of table so that different items can be loaded as needed.
1.2.18	All motors used in the machine should be energy-efficient star rated.
1.2.19	Motors for axis movements and spindle rotation should be ac servomotors run by ac servo drives. Motors make shall be Fanuc, Siemens, Indramatt.
1.2.20	Limit switches shall be located in the easy access areas so that they can be easily replaced.

2. GENERAL ELECTRIC SPECIFICATION

2.1	The provision of this General Specification shall apply, where ever relevant.	
2.2	All equipments and material shall comply with appropriate Indian Standards (latest), International Standards or National Standards of the country of origin provided the latter are equivalent to or better than the former. The tenderer 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).	
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

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		(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 (Latest)	- Single phase small AC and universal electrical motors.
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. Tenderer is, however, free to give alternative proposal along with justification, if in his view alternative proposal is warranted by site conditions. Type of motor type of starter.	
	TYPE OF MOTOR	TYPE OF STARTER
2.3.1	Any type of AC motor starting current of Which does not exceed 75 amps.	Direct on line.
2.3.2	AC squirrel cage, introduction motors, Starting current of which is above 75 amps. if started direct on line	Star delta or Auto transformer type.
2.3.3	AC slipring type motor	Resistance type air/fan Cooled.
2.3.4	AC synchronous or synchronous induction motor.	Suitable makers standard.
2.3.5	DC motor	Resistance type/Thyristor type.
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.	

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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 (latest).		
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 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 catalogues, maintenance manuals operating instructions with details of coils and windings, used in the equipment to facilitate repairs and maintenance should also be supplied.		
2.10	For main motor class minimum "B" Class 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 415V+10%-20% and 50HZ+3% frequency or should provide voltage stabilizer as specified against clause 2.13.2 below of required capacity.		
2.13.2	The voltage stabilizer, if required, shall conform to :		
i)	Input Voltage	-	320 to 460 volts 3 phase 4 wire supply.
ii)	Out put Voltage	-	415 volts
iii)	Regulation	-	+ 1% from No load to Full load.
iv)	Rate of correction	-	20 volts per second per phase.
v)	Wave distortion	from	NIL

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vi)	Efficiency	-	Not less than 97%.
vii)	Winding and class of insulation	-	Copper wire wound with "B" class of insulation or better.
2.13.3	In case of machines equipped with NC, SS, CNC, Thyristor controlled devices and other sophisticated electronic gadgets including microprocessors 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 2.13.2 above and isolation transformer to the parameters mentioned below.		
i)	Transformer ratio	-	1:1
ii)	Winding	-	Copper wire wound with "F" 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 rejection ratio	-	120 dB
v)	Isolation	-	Capacitance 005 Pf; resistance greater than 1000 Mega Ohms.
2.13.4	Voltage stabilizer shall be equipped with a protective relay 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 and 460 volts respectively.		
2.14	ATMOSPHERIC CONDITIONS		
2.14.1	The ambient temperature at the site at which the machine will be installed may vary from -4°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.		
2.16	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.		

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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	Resumption of power supply after power failure.
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 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:-

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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 by pass 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.
3.3.3	CNC Controls (where applicable) - The general requirements of CNC controls are given at Schedule-IV.
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

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	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.
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 safely to all areas used for production, adjustments and maintenance operations.
3.6	WEAR COMPENSATION ADJUSTMENT
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 lead screws. The system of adjustments incorporated shall be explained in the offer.
3.7	COOLANT SYSTEM (WHERE 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 (WHERE 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 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

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	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. 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 (WHERE 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 or 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.
3.10	HYDRAULIC SYSTEM (WHERE APPLICABLE)
3.10.1	Hydraulic circuit must be equipped with the following safety and inspection equipments:
(a)	Pressure gauges at all places, where pressure has to be set up or inspected.
(b)	Safety valves for hydraulic circuit if relief valve does not fulfill 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 reusable type and indigenously available. If reusable filter cannot be offered, the filter cartridge shall be readily

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उ० रे०, जगाधरी वर्कशापAsstt. Production Engineer
सहायक उत्पादन अभियन्ता
N. Rly. Jagadhri Workshop
उ० रे०, जगाधरी वर्कशापउप मुख्य धार्मिक अभियन्ता
उत्तर रेलवे, जगाधरी वर्कशाप

	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.
(e)	Alarm for low oil level.
3.10.2	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.
3.10.3	The temperature of oil in hydraulic circuits shall not exceed 60 degrees 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.
3.10.4	Facilities for bleeding of air in case of air lock shall be provided.
3.10.5	The hydraulic reservoir, pump and allied equipment shall be suitably segregated from the machine in order to remove major source of heat.
3.10.6	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.
3.10.7	First fill of hydraulic oils used on the machine shall be provided with the machine.

4.0 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:
- Operational & Maintenance manual of the machine.
 - Operational & Maintenance manual of the servo controlled voltage stabilizer.
 - Operational & Maintenance manual of the ultra isolation transformer.
 - Instruction & Maintenance manual for Hydraulic Oil Cooling Unit.
 - User manual for Tool changer system (if provided).
 - Technical & Maintenance manual for Hydraulic System
 - Technical & Maintenance manual for Lubrication System.
 - Operator Guide for CNC Control System (if provided).
 - Programming Guide for CNC Control System (if provided).
 - Diagnostic & Trouble shooting Guide for CNC Control System (if provided).
 - Start-up Guide for CNC Control System (if provided).
 - Machine Software listing (if provided).
 - Soft and hard copies of PLC Program in ladder form with cross reference listing and PLC

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Asstt. Production Engineer

सहायक उत्पादन अभियन्ता

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- project file.
- xiv. Drawings of tooling & fixtures, hard copies in A-2 size as well as soft copy in PDF format.
 - xv. Wiring diagram, in which length of wires must be mentioned, hard copies in A-3 size as well as soft copy in PDF format.
 - xvi. Mechanical drawings (spindle assembly, table assembly, column assembly), hard copies in A-1 size as well as soft copy in PDF format.
 - xvii. Spare part manual with exhaustive bill of material with complete specification including part lists no., hard copies in A-4 size as well as in PDF format.
 - xviii. Lay out drawings in A-1 size, which clearly shows the position of all type of electrical components in machine.
 - xix. Original manuals issued by the manufacturers for stabilizer, isolation transformer, oil coolers, panel coolers and other equipment which are procured and fitted.
 - xx. PLC ladder hard and soft copy in readable format along with cross reference to I/O/F.
 - xxi. Servo drive, servo motor manuals with troubleshooting guide
 - xxii. CNC System manuals supplied by system manufacturer
- Note: All manual and literature should be in English/Hindi.**

5.0 SPARES

- 5.1 Since the machine will be under comprehensive preventive maintenance during warranty period of two (02) years and under AMC for five (05) years after the warranty period, it is the sole responsibility of bidders to stock such spares as required for smoother execution of PMC during warranty and AMC in order to achieve response time in compliance to 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 eventuality 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

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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 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 (CNC Control & AC Drives) and CNC/PLC part programming. This training shall be provided to **Two persons from each department viz. Production, Millwright and Electrical, totaling six persons to be trained at manufacturer premises during final phase of machine manufacturing process so as to implement any modification suggested by user/service department to suit JUDW/NR** for a period of 2 weeks free of cost at the manufacturer's premises. One weeks training will also be provided to one person free of cost from COS/NR 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/Hindi 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-IV 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

- IS: 2974 (Pt.I Para 4.1) for reciprocating type machine.
- IS: 2974 (Pt.III Para 3.1) for rotary type machine (medium & high frequency).
- IS: 2974 (Pt.IV para 4.1) for rotary type machines of low frequency.
- IS: 2974 (Pt.V para 3.1) for impact type machines other than hammers

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11.2 APPROVAL OF GA DRAWING

To be governed by Time Schedule in clause 7 of section-IV 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. The copy of AT will be provided by Contractor to Consignee and take necessary action for approval of GA drawings.

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 COS/NR, 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 supply 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 clarifications 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 COS/NR, 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 COS/NR 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 COS/NR 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.

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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 COS/NR and consignee. In case of delay in readiness of site on part of consignee, COS/NR shall take up the matter with concerned Railway, and advise supplier accordingly.

11.3.3 In case proving of component at manufacturer works, the supplier should request 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.

12.0 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-VI 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 15 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 as per time schedule chart. 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.

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v Unloading of the machine on receipt (both imported and indigenous machine) 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 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.

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.

12.4 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-IV. 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 15 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 as per time schedule chart. Any delay in providing the "raw material or any other input" for proving out shall not be logged on supplier's account.

A Joint Commissioning Note (JCN) to this effect shall be made as per the format at Annexure-D of Section-VI. 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 can not 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 COS/NR. If no intimation is given to COS/NR and the PTC is not issued till the 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.

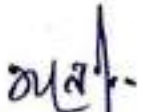
12.5 If an assembly/sub-assembly requires to be taken back to the manufacturer's premises for repair/replacement either before commissioning or during warranty, the manufacturer or his agent would be required to submit BG of suitable amount. In case the entire machine has to be taken back, a Bank Guarantee 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.

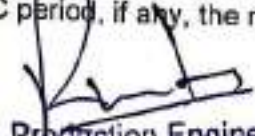
13.0 SERVICE FACILITY IN INDIA AND TECHNICAL SUPPORT

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 Part-II. The complete 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 AMC period, if any, the manufacturer or his agent shall

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