

	<b>BHARAT HEAVY ELECTRICAL LIMITED</b>	
	<b>UNIT'S ADDRESS:</b>	
	<b>CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL</b>	
	<b>(FROM PURCHASE DEPTT.)</b>	
	<b>Enquiry No. :</b>	
	<b>Due Date :</b>	
	<b>Supplier Qtn. No.:</b>	
	<b>Date :</b>	

## SPECIFICATION CUM COMPLIANCE CERTIFICATE OF CNC VERTICAL BORER.

### NOTE:-

1. Vendor (OEM) must submit complete information against clause no. 25 (Qualifying condition). The offer meeting this clause would only be processed (OEM : Original Equipment Manufacturer).
2. The vendor(OEM) should fill the "Offered" Column in compliance to specified requirements and also "Deviations" Column, where there is deviation from the requirement. Duly filled specification cum compliance certificate should be submitted along with the offer. Inadequate, incomplete, ambiguous or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.
3. The offer and all documents enclosed with offer should be in English language only.

<b>NAME &amp; ADDRESS OF THE SUPPLIER :</b>
<b>TELEPHONE NOS.:</b>
<b>FAX NOS.:</b>
<b>E-MAIL ADDRESS :</b>

SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC VERTICAL BORER COMPLYING WITH SPECIFICATIONS AS BELOW:				
SNO	DESCRIPTION FOR BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATIONS
1	PURPOSE & WORKPIECE MATERIAL			
1.1	Purpose: This machine is required to rough & finish machine components of Steam Turbines including Bearings demanding high accuracies & surface finish.	Vendor to note & accept		
1.2	Work Piece Material: Carbon Steel, Nimonic Steel, Alloy Steel, Stainless Steel, Inconel, Cast Iron, Stellite and Non-Ferrous materials like Aluminium Alloys, Bronze, Copper, Babbitt material etc. having Hardness up to 500 BHN.	Vendor to note & accept		
2	SPECIFICATION: (Minimum requirements)			
2.1	MACHINE CONFIGURATION			

2.1.1	Double Column CNC Vertical Borer with Single Ram and Grinding Facility for Spherical Grinding.	Vendor to note		
<b>2.2</b>	<b>CAPACITY &amp; SIZE</b>			
2.2.1	Maximum Height for Turning & Facing	2500mm or more		
2.2.2	Maximum Turning Diameter	3000mm or more		
2.2.3	Max weight admitted on table	40000Kg or more		
2.2.4	Maximum Swing Diameter	Vendor to inform		
2.2.5	Minimum Boring Diameter (using standard turning tool holder & tool clamped on the ram)	400mm or less		
<b>2.3</b>	<b>TABLE</b>			
2.3.1	Table Diameter	2500mm		
2.3.2	Load Capacity	40000Kg or more		
2.3.3	Table Speed ( Infinitely Variable )	Min. 0.5rpm or less, Max. 150rpm or more		
2.3.3.1	No. of Speed Ranges	Vendor to inform		
2.3.4	Power of Main Drive ( S1 - Continuous Rating ) AC, Minimum	60 KW or more		
2.3.5	Motor & Drive Make: FANUC ai or SIEMENS 1PH series motor with matching drive	Vendor to inform		
2.3.6	Encoder: FANUC/SIEMENS/HEIDENHAIN rotary encoders for direct reading of actual rpm	Vendor to confirm		
2.3.7	No. of Jaws/Vices	4		
2.3.8	Maximum External Clamping Diameter	Vendor to inform		
2.3.9	Minimum External Clamping Diameter (It should be equal or lesser than central bore of table, if possible)	Vendor to inform		
2.3.10	Maximum Internal Clamping Diameter	Vendor to inform		
2.3.11	Minimum Internal Clamping Diameter	Vendor to inform		
2.3.12	Clamping Force of each Jaw.	Vendor to inform		
2.3.13	Positions and Dimensions of the Jaws on Table. Chucking Capacity Diagram should be submitted.	Vendor to inform & submit		
2.3.14	Type of Force Multiplier Mechanism used in Jaws should be explained and Drawings should be submitted.	Vendor to inform & submit		
2.3.15	Maximum permissible Cutting Force	Vendor to inform		
2.3.16	Maximum permissible Torque	Vendor to inform		
2.3.17	RPM at which Max. Torque is available.	Vendor to inform		
2.3.18	Table Torque - Speed diagram should be submitted.	Vendor to submit		
2.3.19	Type of Bearing for the Table : Make & Model no. to be informed by vendor	Vendor to inform		
2.3.20	Bearing of the table should be well-protected from grinding slurry etc.Details to be submitted.	Vendor to confirm & submit		

2.3.21	Size of T - slots, their position and accuracy. Drawing of Table showing details of the T - slots etc. should be submitted.	Vendor to submit			
2.3.22	Two perpendicular accurate Slots should be provided at the Center of the table to use for alignment purposes. Sizes ( Width & Depth ), accuracy etc. of these slots should be furnished along with a Drawing.	Vendor to inform & submit			
2.3.23	Table Loading Diagram should be submitted (Load v / s Distance from Table Center) for uniform as well as for eccentric loading.	Vendor to submit			
2.3.24	Diameter, Depth and Accuracy of Center Bore on Table Top Surface.	Vendor to inform			
2.3.25	Single piece construction of machine table	Vendor to confirm			
2.3.26	Position of machine table - with ref. to shop floor in vertical direction : Machine shall be fixed on foundation so that face of machine's table is at shop floor level or above shop floor level by maximum 200mm. Rest of the parts which are below that level shall be fixed at foundation pit.	Vendor to inform			
<b>2.4</b>	<b>CROSS RAIL</b>				
2.4.1	Vertical Travel.	Vendor to inform			
2.4.2	Vertical Traverse Rate.	Vendor to inform			
2.4.3	No. of Positions.	Vendor to inform			
2.4.4	Distance between each Position/Step	Vendor to inform			
2.4.5	Distance of lowest Step from Table Top	Vendor to inform			
2.4.6	Distance of highest Step from Table Top	Vendor to inform			
2.4.7	Maximum Height of Cross Rail bottom from Table Top	3200 mm or more			
2.4.8	Minimum Height of Cross Rail bottom from Table Top	Vendor to inform			
2.4.9	Movement of Cross Rail : Through NC Program as well as manually by Push Buttons	Vendor to offer			
2.4.10	Machine Reference Point should be at Ram Reference Point and it should be updated automatically with movement of Cross Rail	Vendor to offer			
2.4.11	Details of crossrail movement/positioning/locking mechanism	Vendor to submit			
<b>2.5</b>	<b>TOOL HEAD and RAM</b>				
2.5.1	No. of Columns	2			
2.5.2	No. of Rams	1			
2.5.3	Cross - Section of Ram (It should be rigid enough for troublefree machining with maximum projection of ram and also suitable for specified minimum bore dia)	250mmX 250 mm			
2.5.4	Thread Cutting Capacity - maximum Pitch	Vendor to inform			
2.5.5	Clamping details for mounting Turning Tool Holders/Attachments on ram, should be submitted.	Vendor to submit			
2.5.6	Clamping Force Available for clamping of Turning Tool Holders/Attachments.	Vendor to inform			
2.5.7	Mounting of Turning Tool Holders and Attachments should be automatic through Program as well as manually through push buttons.	Vendor to confirm			

<b>2.6</b>	<b>MAIN TRAVERSES</b>				
2.6.1	Vertical Travel of Ram (Z-Axis) For maximum turning/facing height of 2500mm. (If offered turning height S.No. 2.2.1 is more than 2500 mm, Ram travel should also be increased by half value of increase in turning height above 2500 mm)	Minimum 1500mm			
2.6.2	Horizontal Travel of Ram ( positive X-Axis )	Vendor to inform			
2.6.3	Horizontal Travel of Ram beyond Center of the Table ( negative X-Axis )	1550 mm or More			
2.6.4	Maximum Distance between Table Top and Standard Turning Tool Holder with Tool.	Vendor to inform			
2.6.5	Minimum Distance between Table Top and Standard Turning Tool Holder with Tool.	Vendor to inform			
<b>2.7</b>	<b>MACHINE GUIDEWAYS</b>				
2.7.1	Width of Cross Rail guideways	Vendor to inform			
2.7.2	Width of column guideways	Vendor to inform			
2.7.3	X & Z guide ways should be hydrostatic with pump per pocket design (Details should be submitted)	Vendor to confirm			
2.7.4	Hardness of guideways	Vendor to inform			
2.7.5	Metallic Telescopic Covers: Waterproof Telescopic Covers of rust resistant steel should be provided with pads/wipers on both left and right sides of tool head on the crossrail and also above & below the crossrail on both columns covering the guide ways. Joints of telescopic covers should be sealed to avoid mixing of coolant & hydrostatic oil . The movement of telescopic covers should be troublefree and requiring minimum maintenance.	Vendor to offer			
<b>2.8</b>	<b>FEEDS AND DRIVE SYSTEM</b>				
2.8.1	Cutting feed in X & Z Axes ( Infinitely Variable )	0.5 - 10000mm/min or more			
2.8.2	Rapid feed in X & Z Axes	Min. 10000mm/min			
2.8.3	Feed motors & drives: <a href="#">FANUC ai</a> or <a href="#">SIEMENS 1FT/1FK series AC servo motors</a> with matching <a href="#">AC servo drives</a>	Vendor to offer			
2.8.4	Maximum cutting force permissible on Ram & at what extension	Vendor to inform			
2.8.5	Maximum permissible Cutting Force at Maximum Ram extension	Vendor to inform			
2.8.6	Permissible Cutting Force v / s Ram Projection - Diagram should be submitted.	Vendor to submit			
2.8.7	<a href="#">Feed back system for X, Z axes: Heidenhain linear scales (Details to be submitted)</a>	Vendor to offer			
2.8.8	Details of backlash free movement mechanism in X & Z axes should be submitted.	Vendor to submit			
2.8.9	Mechanism for locking X & Z axis	Vendor to submit			
<b>2.9</b>	<b>CONSTRUCTION</b>	Vendor to inform			

2.9.1	Vendor to furnish details of material, hardness & constructional details, including explanatory drawings, of various components/ assemblies like Column, Cross Rail, Ram head, Table, Guideways/slides, Feed Transmission system, Ram, Hydraulic and Lubrication system, Feedback system etc. of the machine.	Vendor to submit			
2.9.2	Video images on CD including hard copy explaining the technical features / Literature with photographs, drawings explaining the technical features should be enclosed with the offer.	Vendor to submit			
2.10	<b>OPERATION AND CONTROL SYSTEM</b>				
2.10.1	<b>OPERATOR'S PANEL :</b> Floor mounted operator's panel having complete CNC and machine control system with all displays of required configuration shall be provided and suitably located for convenient, efficient and safe operation of the machine. All switches with suitable interlocks should be within reach of operator of height around 5.5 feet. All displays/indications should also be conveniently placed accordingly. The operator panel should be swivelable for ease of operation. A protection cover made of steel sheet or equivalent ( hut type or similar) should be provided above the operator's panel covering its completely with some extension. Layout showing complete details should be submitted.	<b>Vendor to offer</b>			
2.10.2	<b>CNC SYSTEM &amp; FEATURES</b>				
2.10.2.1	Make : Fanuc / Siemens.				
2.10.2.2	Type : PC based latest version	Vendor to confirm			
2.10.2.3	The system should have full alphanumeric keyboard, TFT colour display (10.4" or larger), Machine Control Panel (MCP), RS232C serial interface, USB port for data input/output, network ready, graphic simulation and on-screen PLC Ladder display. All PLC input/output modules should be of FANUC/SIEMENS make. (Latest hardware & software versions, as available at the time of delivery, should be supplied).	Vendor to offer and submit details			
2.10.2.4	Details of optional features, recommended by vendor. (Including features required for Prove-Out Components)	Vendor to offer and submit details			
2.10.2.5	Details of other optional features:	Vendor to offer and confirm			
2.10.2.5.1	Axes Interpolation: Linear, Circular, Cylindrical, Helical, Spline	Vendor to confirm			
2.10.2.5.2	Max Number of simultaneous interpolation: 3	Vendor to confirm			
2.10.2.5.3	Part Program Storage: 2 MB or more	Vendor to confirm			

2.10.2.5.4	Technology Cycles: Geometry Calculation, standard Drilling, Tapping, Milling cycles.	Vendor to confirm			
2.10.2.5.5	Graphics simulation (Static and dynamic) of Part Programs and Machining process.	Vendor to confirm			
2.10.2.5.6	Co-ordinate Transformation: Datum shift, rotation, mirror image, scaling factor.	Vendor to confirm			
2.10.2.5.7	Pitch Error compensation (As applicable)	Vendor to confirm			
2.10.2.5.8	Backlash error compensation (As applicable)	Vendor to confirm			
2.10.2.5.9	Zero Offset for all axes	Vendor to confirm			
2.10.2.5.10	Feed override switch 0-120% for all axis	Vendor to confirm			
2.10.2.5.11	Spindle speed override switch 70-120%	Vendor to confirm			
2.10.2.6	Provision for safe shut down of CNC Control in case of Power Failure	Vendor to confirm			
2.10.3	<b>MANUAL CONTROL:</b>				
2.10.3.1	Complete manual operation of machine should be possible through Machine Control Panel (MCP). The MCP should have Spindle & Feed override switches, +/- Jog keys for individual axis, Start/Stop keys for Cycle, Spindle & Feed and additional keys/switches for auxiliary functions. Diagram of complete operator pendant with full details of all the switches/keys should be submitted.	Vendor to confirm. Layout of panel showing requisite switches to be submitted.			
2.10.4	<b>HAND HELD UNIT:</b>				
2.10.4.1	Hand Held unit, alongwith sufficient length of interfacing cable is to be offered for handwheel (MPG) operation of individual axis in jog & increment mode and provision for spindle inch in c.w & c.c.w directions	Vendor to offer & details to be submitted.			
2.10.5	<b>UPS FOR CNC SYSTEM: (Only in case of PC based CNC systems)</b>				
2.10.5.1	UPS of 15 minutes for CNC system with inbuilt cooling and charge status display is to be supplied only in case of PC based CNC systems.	Vendor to offer & details to be submitted.			
2.11	<b>NOTE BOOK PC (I/O DEVICE):</b>				
2.11.1	Note Book PC (Internationally reputed make and latest model) with Windows operating system is to be supplied for bi-directional transfer of program and data between the offered unit and supplied CNC system. The notebook must contain all application softwares for the supplied CNC, PLC and Drives systems along with required interfaces and cables.	Vendor to offer with details.			
2.12	<b>MACHINE LIGHTS</b>				
2.12.1	Machine Lights for sufficient illumination of complete working area on the table, on the ram to view tool inside long casing type jobs and operator's panel also, should be provided for clear visibility.	Vendor to offer			
2.12.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to offer			

2.12.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to offer			
2.12.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to offer			
2.12.5	Flashing/Rotary type light indicating end of cutting, program stop, alarm etc. at a easily visible & suitable place.	Vendor to offer			
<b>2.13</b>	<b>REFRIGERATION UNITS / AIR CONDITIONERS</b>				
2.13.1	Door mounted Air Conditioners with Dehumidifiers of reputed international make who have after-sales spares support in India or of Indian make like Advance/ Werner Finley/ Rittal for all Electrical/ Electronic Panels/ Cabinets including Operator's Panel (One no.of sufficient capacity for each cabinet/ panel considering continuous operation at ambient temperature of 50°C). The blow of cool air from the air conditioners shall not fall directly on the electronic circuits/ modules. ACs must be incorporated with electrical/ refrigeration interlocks.	Vendor to offer and confirm			
2.13.2	ACs unit must be mounted on the movable pendent with well-supported universal-head bolt. Two sets of cut-out labels are mandatory to be supplied with the units. The electrical connection of the AC unit must be with male-female connector, easily disconnected from the AC unit side. There has to be a MCCB to isolate the AC unit from the electrical panel.				
2.13.3	Oil Chiller units of reputed international make who have after-sales spares support in India or of Indian make like Advance/ Werner Finley/ Rittal/ Gem in package should have minimum 50% standby with multiple refrigeration circuits having energy-efficient HFC-based Hermetically-sealed Rotary/ Scroll/ Reciprocating Compressors with independent refrigeration circuits having SS-brazed Plate-type Heat Exchanger, Air-cooled Condenser, Thermostatic Expansion Valve, HP/ LP Switch, Oil Flow/ Anti Freeze Cut-out, etc. The units must have In-line Multistage Gear Pumps (with 100% standby), SS Storage Tank, Valves, NRVs, Filters, Automatic Microprocessor-based Controller with LCD Display, Safety Interlocks, etc. in one complete package. The unit must operate continuously with equal-run-time of Compressor at ambient temperature of 50°C.	Vendor to offer and confirm			
2.13.4	For precise air/ oil temperature with energy-efficient operation, latest state-of-the-art technology features like constab pressure control, variable speed control of fan-motor, hot-gas bypass control, etc. needs to be incorporated in the above Unit (s).	Vendor to offer and confirm			



2.13.5	Unit (s) must be designed to work in extremely harsh industrial environment and needs protection from heat, dust, fumes, corrosive or oily vapours, moisture, etc. The condenser coil must resist dust accumulation & must transfer heat efficiently.				
2.13.6	Vendor to supply the following information about Air Conditioners and Chiller Unit (s) used in the machine: Type of Air Conditioning/ Chiller Unit. - Capacity of the Unit. - Type of Compressor with complete specifications. - Type of Thermostatic Expansion Valve with complete specifications. - Fan size and flow in CFM (cubic feet meter) of the Condenser unit. - Specifications of the Evaporator Unit. - Functional requirement of temperature of cool air/ oil to be maintained between range +15°C to +40°C. - Type of Microprocessor-based Controller with LCD Display with complete functional details. Detailed specifications of all the components fitted in the Unit (s) are to be submitted with BOM, make, etc. in Technical bid. Vendor have to provide leaflet/ catalogue of all the brought-out items, refrigeration accessories and provide schematic layout of the system.	Vendor to specify			
2.13.7	Compressor, Refrigeration Spares Items, PHE (Plate-type Heat Exchanger), Gear Pump, etc. must be available in India and if possible can be repaired, locally. Vendor have to give training to operate, maintain & repair all the individual items and the Chiller/ AC Unit (s) as a whole. Exhaustive training is to be given for electrically integration of the Unit (s) with the CNC machines.	Vendor to confirm			
2.14	<b>HYDRAULIC SYSTEM</b> <b>(Details should be Submitted by the Vendor)</b>	<b>Vendor to submit.</b>			
2.14.1	The Hydraulic System shall be of Re-circulating Type. Hydraulic Tank should be preferably placed at shop floor. Complete Hydraulic system should be designed to avoid any leakage or spillage.	Vendor to offer and confirm			
2.14.2	Pumps, Valves, Switches (Pressure & Flow) should be of Make : Rexroth / Vickers / Parker / Hawe.	Vendor to offer and confirm			
2.14.3	Filtration System: Sufficient no. of filters ( with electric clogging indicator and alarm on PLC ) should be used to avoid frequent clogging of the filters and other maintenance related problems. Filter elements should, preferably, be of Make : EPE / Hydac.	Vendor to offer and confirm			
2.14.4	Failure indication	Vendor to offer			
2.14.5	Automatic shut off provision, Details should be submitted.	Vendor to offer			



2.14.6	Refrigerated type cooling system of sufficient capacity to maintain complete Hydraulic System, including lubrication oil, hydrostatic oil and gearbox oil, etc. keeping in view the specified ambient conditions to be offered with complete details. The temperature of Hydraulic Oil should not go beyond 40 deg. C.	Vendor to offer & submit			
2.14.7	Hydraulic pump capacity (flow / pressure)	Vendor to inform			
2.14.8	No Tandem pumps should be used. Maximum desired permissible pressure is 100 Kg/sqcm. If anywhere, more than 100 Kg/sqcm pressure is used, then one set of such hose pipes and seal kit of such Hydraulic cylinder should be supplied in spare in addition to other spares.	Vendor to confirm & offer			
<b>2.15</b>	<b>FIRST FILLING OF OILS</b>				
2.15.1	First filling of all required Oils & Grease etc. for the machine, voltage stabilizer, isolation transformer & air-compressor etc. to be supplied by vendor. Indigenous (Indian) source or Indian equivalent and specifications of oils/ greases are also to be provided by the vendor.	Vendor to offer & submit			
<b>2.16</b>	<b>COOLANT SYSTEM</b>				
2.16.1	Coolant System with all accessories for following variants shall be provided. Selection of all the variants shall be through program and push buttons as well.	Vendor to offer			
	a) Recirculating Type Flood Coolant System	Vendor to offer			
	b) Air coolant system	Vendor to offer			
2.16.2	All attachments, tool holders, boring bars, cassettes, adapters etc. shall have the provision so that coolant is available directly at the tool-cutting tip.	Vendor to offer			
2.16.3	Coolant collection and recirculation system should be leak proof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc. In case, any leakage is found, it shall be corrected by vendor. Additionally, suitable equipment should be provided at deepest point of foundation pit to pump out collected oil/coolant up to shop floor.	Vendor to offer & confirm			
2.16.4	Coolant Filtration System: Recirculating type coolant system with Vacuum Rotary drum type Coolant Filtration System and magnetic separator. The filtration system should be mounted at shop floor level, if possible with provision to avoid leakage/spillage of coolant.	Vendor to confirm and submit details.			
2.16.5	Coolant Flow Diagram showing filters, pumps, valves, tanks etc.	Vendor to submit			
2.16.6	Coolant pumps & motor details etc. for all types of coolant variants	Vendor to inform			
2.16.7	Coolant Tank Capacity	Vendor to inform			

2.16.8	Pressure & rate of flow of coolant for different coolant variants for turning operations should be furnished in the offer. The coolant should be able to reach tool tip at full pressure.	Vendor to inform			
2.16.9	All types of coolant variants should be switchable through program as well as manually by push buttons provided on the Operator's control panel.	Vendor to offer			
2.16.10	For finer control of Pressure and Coolant Flow Rate, after its activation through program or switches, Rotary/ potentiometer switches shall be provided on the Operator's Panel.	Vendor to offer			
2.16.11	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to offer			
<b>2.17</b>	<b>REQUIREMENT FOR ELECTRICAL EQUIPMENT</b>				
2.17.1	415V with fluctuation +/-10%, 50HZ with fluctuation +/- 3 %, 3 Phase AC (3 wire system without neutral) Power Supply Source will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine/ control cabinets, etc., shall be the responsibility of vendor. Requirement of grounding/ earthing with required material (Indian make) details is to be informed by vendor well in advance so that same could be incorporated during construction of foundation. The vendor can take earthing connection from the nearest column of the production shop.	Vendor to accept & offer			
2.17.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized.	Vendor to offer			
2.17.3	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to offer			
2.17.4	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to offer			
2.17.5	All electrical / electronic panels to be provided with adequate door locks. All electrical & electronic panels including operator's panel should have sufficient illumination and power receptacles/plug points of 220Volts, 5/15 Amp AC with on/off switch. All electrical adapters/receptacles, fittings, consumables etc. should be Indian or should have compatibility with Indian equivalents.	Vendor to offer			
2.17.6	All motors shall conform to IEC or Indian Standards	Vendor to offer			
2.17.7	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all the cable trays required for laying of cables should be included in the offer.	Vendor to offer			

2.17.8	Vendor should ensure the proper earthing for the machine and its peripherals/accessories. Any material requirement for the same should be informed with foundation design/drawings. The vendor can take earthing connection from the nearest column of the production shop.	Vendor to offer			
<b>2.18</b>	<b>SAFETY ARRANGEMENTS</b> <b>Following safety features in addition to other standard safety features should be provided on the machine:</b>	<b>Vendor to offer</b>			
2.18.1	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on CNC display and panels) should be available.	Vendor to offer			
2.18.2	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to submit			
2.18.3	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	As offered & agreed			
2.18.4	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations & noise.	As offered & agreed			
2.18.5	Emergency Switches at suitable locations as per International Norms should be provided.	As offered & agreed			
2.18.6	Oil & water pipe lines should not run with electrical cable in the same trench.	As offered & agreed			
<b>2.19</b>	<b>ENVIRONMENTAL PERFORMANCE OF THE MACHINE :</b> <b>The Machine should conform to following factors related to environment :</b>	<b>Vendor to offer</b>			
2.19.1	Maximum noise level shall be 85 dB(A) at normal load condition, 1 meter away from the machine with correction factor for back ground noise, if necessary. This will be measured as per international standards like DIN 45635-16, if required. Supplier to demonstrate compliance to noise level, if so required.	Vendor to confirm			
2.19.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm			
2.19.3	There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to confirm			
2.19.4	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm			

2.19.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm			
2.19.6	Paint of the machine should be oil / coolant resistant and should not get peeled off and mixed up with coolant.	Vendor to confirm			
2.20	In-cycle hour counter with reset facility for counting table running time, in-feed motion of ram, machine idle time, machine under maintenance time etc. and display the counted data on CNC display on video pages created by vendor.	Vendor to offer			
2.21	Portable Data Input Output Device : Portable unit or its equivalent for bi-directional program & data transfer between the offered unit & supplied system and as well as standard PC available at BHEL works, using floppy drive or its equivalent, should be offered with all required hardware, software, interfaces, cables, protection cover etc.	Vendor to offer			
3	<b>CHIP CONVEYOR</b>				
3.1	An elevating type chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin on shop floor (on either side of the machine) should be provided at appropriate location. Metallic chutes should be provided all around the table for smooth collection of chips upto opening of chip conveyor.	Vendor to offer			
3.2	Type of chip conveyor	Hinged type or superior			
3.3	Width of conveyor	Vendor to inform			
3.4	Elevation of chip conveyor for chip bin	Vendor to inform			
3.5	Material of chip conveyor (should be rust resistant)	Vendor to inform			
3.6	Provision for smooth collection of chips from all-around table to the conveyor and for avoiding clogging of chips should be provided. Removable Grill/Mesh type rigid covers should be provided above some portion of the chip conveyor, to enable machine operator's access to chip conveyor from shop floor for disposal of scattered chips on shop floor, if any, through chip conveyor. Details for the same should be submitted by vendor.	Vendor to offer			
3.7	Operation of chip conveyor (forward & reverse) should be possible through push buttons on operator's panel and also near chips disposal point/chip bin.	Vendor to offer			
3.8	Layout showing location of chip conveyor should be submitted.	Vendor to submit			
3.9	CHIP BIN of appropriate size of Indian make, with wheels, lifting hooks & handle for movement.	Vendor to offer			
4	<b>ULTRA ISOLATION TRANSFORMER :</b>				

4.1	Ultra Isolation Transformer (of reputed Indian make) suitable for complete machine , its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer			
4.2	Make	NEEL or Apla or Auto Electric or Servomax or of international repute.			
4.3	Model, Rating & Input/Output Voltage etc.	Vendor to inform			
4.4	Catalogue of the Ultra Isolation Transformer (copy of relevant pages) shall be submitted with the offer.	Vendor to submit			
<b>5</b>	<b>PNEUMATIC SYSTEM :</b>				
5.1	<b>AIR COMPRESSOR :</b>				
5.1.1	Independent Air/Oil cooled, Screw Type Air Compressor (of reputed Indian make Elgi or Ingersol Rand) with refrigerated type Dryer & Filter of suitable/sufficient capacity with all required accessories for the total compressed air requirements of the machine & accessories and to suit required air quality should be supplied. The system should be so designed to have additional provision and required accessories so that BHEL compressed air supply ( having pressure 5-6 bar with little moisture/dirt content) could be used as and when required. The compressor unit should be suitable for continuous duty considering specified power supply & ambient conditions..	Vendor to offer			
5.1.2	Make & Model of Air Compressor and Refrigerator type Dryer.	Vendor to inform			
5.1.3	Capacity (Flow, Pressure & KW)	Vendor to inform			
5.1.4	Refrigerant used	Vendor to inform			
5.1.5	Output Air Quality (Pressure Dew Point in degree Celsius, Residual mist/oil content in ppm etc.). It should be odor-free.	Vendor to inform			
5.1.6	Noise level ( Maximum 80 db )	Vendor to inform			
5.1.7	Spares Package for the Air Compressor and Refrigerator type Dryer etc. for 2 years trouble free working should also be offered. List to be submitted.	Vendor to offer & submit			
<b>5.2</b>	<b>COMPRESSED AIR POINTS :</b>				
5.2.1	Compressed Air Point with connections for Air Coolant System mentioned at <b>Sl. No. 2.16.1</b>	Vendor to offer			
5.2.2	Suitably located Compressed Air Point near machine table with manually operated ON/ OFF Valve and flexible pipe of suitable length for cleaning of workpiece, tools and work area etc.	Vendor to offer			

6	TOOLINGS : * Individual package prices against each <b>Sl.No.</b> shall be quoted by Vendor. * Ordering quantity for all tooling items shall be decided by BHEL at the time of ordering. * For inserts, price for ten inserts should be quoted. * Vendor may recommend and offer any other type of tool holders/adapters/cassettes in addition to tooling items mentioned below considering specified requirements/applications and submit their details	Vendor to confirm		
6.1	TOOL HOLDERS All tool holders & boring bars should have holes for lifting by suitable eye-bolts. Final drawings for offered items shall be submitted by vendor to BHEL after PO, in case of order, for BHEL's approval prior to their manufacturing & supply. ( LH - Left Hand / RH - Right Hand )			
6.1.1	Tool holder for external turning having provision for rigid cassette type clamping or equivalent.	Vendor to offer		
6.1.2	Tool holder for internal turning having provision for rigid cassette type clamping or equivalent.	Vendor to offer		
6.1.3	Tool holder, having provision for both LH and RH facing using rigid cassette type clamping or equivalent.	Vendor to offer		
6.1.4	Standard ( Conventional ) tool holder for 40*40mm tool shank with direct clamping of tools for internal / external turning and LH/RH facing operations with provision for clamping 32*32mm shank tools with packing pieces.	Vendor to offer		
6.1.5	Tool holder with provision to clamp standard dia 50mm boring bar with clamping length of approx. 300mm	Vendor to offer		
6.1.5.1	Reduction Sleeve, dia 50 - dia 40, for Boring Bar Holder	Vendor to offer		
6.1.5.2	Reduction Sleeve, dia 50 - dia 32, for Boring Bar Holder	Vendor to offer		
6.1.6	Boring Bar, dia. 120mm, length 600mm , suitable for clamping of 32*32mm shank tools radially & axially as well with provision for clamping 25*25mm shank tools using packing pieces.	Vendor to offer		
6.1.7	Boring Bar, dia. 80mm, length 400mm , suitable for clamping of 25*25mm shank tools radially & axially.	Vendor to offer		
6.1.8	Eccentric Boring Bar, dia. 100mm, length 500mm , suitable for clamping of 25*25mm shank tools radially & axially. Tool point should clear ram for boring operations.	Vendor to offer		

6.1.9	General adapter for turning with flange type clamping or equivalent so that special tool holders manufactured by BHEL could be clamped for use in future.	Vendor to offer			
<b>6.2</b>	<b>PRESETTABLE CASSETTES (to suite above cassette type holders). Drg. No. R6300-0965 of RH Cassette is enclosed for vendor's reference.</b>				
6.2.1	LH cassette for 40*40mm tool shank. Length approx. 230 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer			
6.2.2	RH cassette for 40*40mm tool shank, Length approx. 230 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer			
6.2.3	LH long cassette for 40*40mm tool shank, Length approx. 430 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer			
6.2.4	RH long cassette for 40*40mm tool shank, Length approx. 430 mm, with provision for clamping 32*32mm shank tools also with packing pieces.	Vendor to offer			
<b>6.3</b>	<b>TOOLING FOR MACHINING OF PROVE-OUT COMPONENTS</b>	Vendor to offer			
6.3.1	All types of required tools, inserts, holders, adapters, grinding wheels (if applicable), fixtures & clamping elements, special measuring instruments (if required) etc. in sufficient quantity for all types of operations like turning, grooving, grinding (if applicable), boring operations etc., as recommended by the vendor, should be offered for complete proveout machining to meet the required drawing accuracy & surface finish . These tooling items shall be in addition to the tools mentioned above at Sl. No. 7.1 & 7.2. List with item's nomenclature, quantity & copies of relevant pages of catalogue to be submitted by vendor	Vendor to offer			
6.3.1.1	Consumables (e.g. inserts, screws, shims etc.) for the tools offered for the proveout components should be quoted for machining of two more same components by BHEL after proveout and commissioning of the machine.	Vendor to offer			
<b>6.4</b>	<b>ADDITIONAL TOOLING REQUIREMENTS</b>				
6.4.1	Mounting details of each type of toolings to be explained & submitted with the help of drawings / sketches.	Vendor to submit			
6.4.2	Offered tooling system to be rigid to carryout machining without undue vibration, which can effect job accuracy and surface finish in extreme machining conditions like max. overhang of ram etc.	Vendor to confirm			
6.4.3	In case of order, manufacturing drgs., catalogues & source of all tooling items should be submitted by vendor.	Vendor to confirm			
6.4.4	Supplier should offer all tools & inserts with latest cutting geometries & grades to achieve high productivity and cutting parameters.	Vendor to confirm			



6.4.5	All supplied tool holders, boring bars, cassettes, adapters etc. shall have built in system for the coolant so that coolant is available directly on the cutting tip during all possible operations like grooving, turning etc. Provision for external coolant should also be provided.	Vendor to offer			
6.4.6	Offered tooling system to be rigid to carryout machining in extreme conditions like max. overhang of tool carriers etc. without undue vibration, which can effect job accuracy and surface finish.	Vendor to confirm			
6.4.7	Additional 2 nos. of offered Vices ( Complete with jaw, force multiplier,screw, fasteners etc.)	Vendor to offer			
7	<b>MEASURING SYSTEM :</b>				
7.1	<b>AUTOMATIC JOB MEASURING SYSTEM :</b> Automatic Wireless Job Measuring System using electronic probes with measuring cycles, automatic programmable calibration system. The probe adapters should be clamped in tool holders mounted on ram. Calibration block should be suitably located for automatic programmable calibration. Details to be submitted. measuring cycles, automatic programmable calibration system. The probe adapters should be clamped in tool holders mounted on ram. Calibration block should be suitably located for automatic programmable calibration. Details to be submitted.	Vendor to offer & submit			
7.2	All types of standard & special probes/styli & their adapters required to measure all machined surfaces & dimensions ( external & internal ) of the prove-out components.	Vendor to offer			
7.3	Vendor to quote separately for the package of probes/styli & their adapters required for measurements, as above, of each of the proveout component specified above. Component wise list of offered items with quantity is to be submitted.	Vendor to offer & submit			
7.4	The measurement system shall be customised so that the measured result file shall be generated in the CNC System only and shall contain all relevant information such as nominal values, measured values, tolerances along with project details of measured component as per sample format at Annexure-I. Further , all the measurements done on the component shall appear in a single file in the above sample format. The selected probing results output file shall be printable from the CNC screen of the machine on a printer through a single key command/soft Key. All necessary hardware & software including Printer, all types of cables, communication software, CNC features required for above mentioned setup shall be provided by the vendor.	Vendor to offer with details			

7.5	Spares Package for the Measuring system for 2 years trouble free working should also be offered. The spares should include Tool Probes, Interface Unit & Special Probes if any. List to be submitted.	Vendor to offer & submit			
7.6	Details of Automatic calibration of the probes.	Vendor to submit			
7.7	Repeatability and accuracy of the probe	Vendor to inform			
7.8	Operating Manuals, Maintenance Manuals & Catalogues for offered Automatic Job Measuring System.	Vendor to offer			
7.9	During proveout machining, final inspection of the components shall be done by supplied Job Measuring System using required program supplied by vendor.	Vendor to accept & offer			
<b>8</b>	<b>DIAGNOSTIC SYSTEMS</b>				
8.1	<b>TELE-DIAGNOSTIC SERVICE :</b> Tele-diagnostic service should be provided through International telephone lines along with required Hardware / Software package for the supplied CNC system for remote diagnosis and correction of the problems in both CNC System and PLC of the machine. This should be provided free of charge for the guarantee period. Terms and conditions for the service after guarantee period should be informed by vendor. Subsequently, it should be possible to use other platforms, such as Internet or ISDN, subject to their availability in future.				
8.2	<b>FAULT DIAGNOSTIC SYSTEM :</b>				
8.2.1	Supplier's own diagnostic system with required Software and Hardware installed on the CNC system, which shows detailed cause and remedy for the fault on the CNC system display with full diagnostics indicating the element /device causing the fault.	Vendor to offer			
8.2.1a	Vendor to offer a PC note book along with Simatic S7 software ( licensed copy), necessary cables, PCMCIA card / Adaptor ( for Communication with MPI port ) for diagnostic purpose. The Note Book PC should be loaded with complete Electrical Schemes, Mechanical Assembly drawings, Hydraulic Circuit Diagrams, Operation and Maintenance Manuals, Machine Alarm list along with Help text wiring diagram, On-Line display of PLC user should be available on the note book PC.	Vendor to offer			

8.2.2	Provision of OEM Screen with soft keys enabling the service personnel to bring back the ATC to its initial/nearest position in case of interruption of positioning cycle of ATC due to alarm on the machine or power failure. With this OEM screen, service personnel should be able to perform individual steps of positioning cycle of ATC, manually. Separate Pendant should also be provided to retrieve the ATC to it's initial position. Similarly, provision shall also be there to bring back the crossrail to its initial/nearest position in case of interruption of positioning cycle of crossrail due to alarm on the machine or power failure.	Vendor to offer			
8.2.3	Machine should have provision to switchover from position feedback system - 2 ( direct) to Position feed back system-1 ( Motor encoder ) through PLC program ( for service personnel only).	Vendor to offer			
8.3	Help guide should be provided to use diagnostic systems.	Vendor to offer			
9	<b>LEVELING &amp; ANCHORING SYSTEM:</b>	Vendor to offer			
9.1	Complete set of anchoring materials including foundation bolts, nuts, washers, fixators, leveling shoes etc for alignment of table/ram and to fix the machine to the foundation should be supplied. Details to be submitted.				
10	<b>TOOLS FOR ERECTION, OPERATION &amp; MAINTENANCE</b>				
10.1	Tools and Equipment required for erection of the machine shall be brought by the vendor. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the machine should be supplied by the vendor. List of such tools should be submitted with offer.	Vendor to offer			
10.2	Set of Test Mandrels/Cylindrical Bars for checking table run-out & alignment of ram etc. should be supplied with protection boxes.	Vendor to offer			
11	<b>CHIP &amp; SPLASH GUARD</b>				
11.1	Movable Chip / Splash Guards of sufficient height and made of rust resistant material (painted), shall be provided all around the Table (on front side of columns) to avoid spilling of Coolant and scattering of Chips on Operator's Panel and Shop Floor. Front part of splash guards shall be movable provided with safety glass for clear visibility of job to the operator.	Vendor to offer			
11.2	Additionally a fixed type of splash/ chip guard of atleast full turning height should be provided on rear side of machine i.e. around rear portion of table between columns .	Vendor to offer			

11.3	Movable splash guard should have interlock for table rotation. Opening of guards on front side of table should suit maximum possible size of the job which can be loaded on the table. The guards should not provide any hindrance with complete vertical movement of crossrail/ATC on both sides of the table.	Vendor to confirm			
11.4	Drawing of Chip/Splash Guards (pre-liminary) showing total height, layout and other details of the same should be submitted.	Vendor to submit			
<b>12</b>	<b>ACCESSORIES</b>				
12.1	<b>GRINDING UNIT :</b>				
12.1.1	Suitable Grinding Attachment should be offered for Cylindrical (Internal & External both) as well as Surface Grinding. Grinding wheel should clear ram in all conditions for cylindrical grinding. It should generate surface finish of 0.8 microns Ra value or better without any chatter or line marks.	Vendor to offer			
	Additional provision to enable troublefree grinding on external & internal spherical surfaces as per drawing accuracy & surface finish using CNC program controlled interpolation of grinding wheel along the profile. Shapes of spherical surfaces shall be similar to as given in enclosed Drg.Nos. 2-11604-21003 (Spherical Socket) and 2-11604-21002 (Spherical Piece). Max. depth of internal spherical surface (as in spherical socket) i.e. from bore diameter to deepest point of sphere shall be 30 mm. Ram shall not obstruct while performing internal & external cylindrical/spherical grinding using offered grinding unit with wheel mounted on it, for total Z-axis traveers. It should generate surface finish of 0.8 microns Ra value or better without any chatter or linemarks on spherical surface also.				
12.1.2	The grinding Unit should be supplied with its all required accessories for it's mounting/clamping on the ram, safe and integral power connections, coolant supply/connections using same offered flood coolant through offered filtration system ( <b>ref. sl.no. 2.16.4</b> ) and tools for mounting of grinding wheel on the unit etc.	Vendor to offer & submit			
	Additional Paper Filter ( Indian make consumable paper ) should be used only for grinding. For turning and grinding operations, the coolant should be collected through the chip conveyor and re-circulated through a vacuum filter & magnetic separator. In case of grinding operation, after the vacuum filter & magnetic separator, the coolant should also pass through a paper filter. The selection should be automatic or through program. Details with relevant drawings/sketches/catalogue including list of offered items to be submitted.				

12.1.3	Balancing device for balancing of Grinding Wheel before mounting the wheel on grinding unit. Technical details to be submitted.	Vendor to offer		
12.1.4	Programmable grinding cycles, ready for use for CNC controlled grinding & wheel dressing.	Vendor to offer		
12.1.5	Additional provision for manual grinding i.e. without any CNC program.	Vendor to offer		
12.1.6	Additional grinding wheels (2 nos. of each type) should also be offered by vendor.	Vendor to offer		
12.1.7	Power	Vendor to inform		
12.1.8	Speed (Infinitely Variable)	Vendor to inform		
12.1.9	Details of the Drive viz. Make, Model etc.	Vendor to inform		
12.1.10	Power - Torque - Speed Diagram	Vendor to submit		
12.1.11	Maximum Diameter of the Wheel	Vendor to inform		
12.1.12	Minimum Diameter of the Wheel	Vendor to inform		
12.1.13	Width of the Wheel	Vendor to inform		
12.1.14	Provision of the programmable wheel dressing device, fixed at suitable point on the machine.	Vendor to inform		
12.1.15	Position of the Wheel Dresser. Drawing should be submitted.	Vendor to inform		
12.1.16	Vendor to confirm that sufficient protection for bearings, Guide Ways etc. from ground dust / slurry has been provided.	Vendor to confirm		
12.1.17	Dimensional Details and Weight of Grinding Attachment	Vendor to inform		
12.1.18	Provision for availability of flood coolant on grinding wheel.	Vendor to confirm.		
12.1.19	Minimum bore dia for Internal Cylindrical and Spherical Grinding.	450mm or less		
12.1.20	Maximum bore dia for Internal Cylindrical and Spherical Grinding.	Vendor to inform		
12.1.21	Minimum dia for External Cylindrical and Spherical Grinding.	Vendor to inform		
12.1.22	Maximum dia for External Cylindrical and Spherical Grinding.	Vendor to inform		
12.1.23	Maximum height (from machine Table) of Grinding Wheel mounted on Grinding Attachment clamped on Ram .	Vendor to inform		
12.1.24	Specifications & source of offered grinding wheels shall be informed by vendor for future procurement of same by BHEL.	Vendor to inform		
12.1.25	Minimum & Maximum depth of spherical surface for both internal/external spherical grinding.	Vendor to inform		
12.1.26	Spares Package for Grinding Unit, with item-wise breakup, are to be recommended and offered by the vendor in sufficient quantity for 2 years of trouble free operation. List is to be submitted.	Vendor to offer		
12.1.27	Pressure & rate of flow of coolant for grinding.	Vendor to inform		
12.1.28	While grinding, provision for flushing out grinding dust to avoid clogging of holes of chip conveyor offered at <b>Sl.No. 3</b> should be provided.	Vendor to offer		
<b>13</b>	<b>SPARES :</b>			

<b>13.1</b>	Itemised breakup of mechanical, hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: (Unit Price of each item of spare should be offered)	Vendor to offer		
<b>13.1.1</b>	<b>Mechanical &amp; Hydraulic Spares :</b> Following Spares are to be offered.	Vendor to offer		
13.1.1.1	Pressure control valves, Pressure reducing valves, Flow control valves & Direction control valves used in Hydraulic / Lubrication / Pneumatic / Coolant Circuit. (1 no. of each type)	Vendor to offer		
13.1.1.2	Pressure switches, flow switches used in Hydraulic / Lubrication / Pneumatic / Coolant Circuit. (1 No. of each type)	Vendor to offer		
13.1.1.3	All types of regenerative type filter inserts (6 No. of each type in hydraulic, pneumatic & coolant circuit)	Vendor to offer		
13.1.1.4	All types of Disposable type filter inserts (30 nos. of each type)	Vendor to offer		
13.1.1.5	All types of Accumulator bladders (1 no. of each type) with charging kit	Vendor to offer		
13.1.1.6	One set of timing belts used in the machine.	Vendor to offer		
13.1.1.7	One set of seal kits used in different hydraulic & pneumatic cylinders in the machine.	Vendor to offer		
13.1.1.8	One set of hose pipe with end connection used in the machine.	Vendor to offer		
13.1.1.9	All types of couplings used with different pumps (1 no. of each type) & pressure sleeves used in machine.	Vendor to offer		
13.1.1.10	All types of shaft seals (2 no. of each type), O-rings & Piston Rings (5 nos. of each type) used in the machine.	Vendor to offer		
13.1.1.11	One set of pneumatic filtration / condensate drain system.	Vendor to offer		
<b>13.1.2</b>	<b>Electrical /Electronic / CNC Spares :</b> Following Spares are to be offered.	Vendor to offer		
13.1.2.1	Limit Switches/ Micro Switches (2 Nos each type )	Vendor to offer		
13.1.2.2	Relays ( 2 Nos each type )	Vendor to offer		
13.1.2.3	Contactors ( 2 Nos each type )	Vendor to offer		
13.1.2.4	RTD temperature transmitter ( 1 No each type )	Vendor to offer		
13.1.2.5	Proximity Switches ( 5 Nos each type )	Vendor to offer		
13.1.2.6	Push Buttons ( 5 Nos each type )	Vendor to offer		
13.1.2.7	Indicating Lamps ( 10 Nos each type )	Vendor to offer		
13.1.2.8	Semiconductor Fuses ( 5 Nos each type )	Vendor to offer		
13.1.2.9	Special Fuses ( 5 Nos each type )	Vendor to offer		
13.1.2.10	Circuit Breakers ( 1 No each type )	Vendor to offer		
13.1.2.11	Main Power Switch ( 1 No each type )	Vendor to offer		
13.1.2.12	Encoders ( 1 No each type )	Vendor to offer		

13.1.2.13	Scanning Heads for Linear Scales ( 1 No each type )				
13.1.2.14	PCU module ( Hard disk loaded with Ghost of the machine after final commissioning)	Vendor to offer			
13.1.2.15	NCU module	Vendor to offer			
13.1.2.16	I/O Cards for PLC ( 1 No each type )	Vendor to offer			
13.1.2.17	Power Module & Control Cards for Main Drive as well as Feed Drives ( 1 Nos each type )	Vendor to offer			
13.2	All types of spares for total machine and accessories should be available for at least ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required.	Vendor to confirm			
13.3	Vendor to confirm that complete list of spares for machine and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine.	Vendor to confirm			
13.4	Repair service contract with supplier of offered CNC system for service & spares for motor drives & CNC Unit etc.	Vendor to offer			
14	<b>DOCUMENTATION</b> : Three sets of following documents (Hard copies with Soft Copies wherever specified) in English language should be supplied along with the machine	Vendor to offer			
14.1	Operating manuals of Machine & CNC system	Vendor to offer			
14.2	Programming Manuals of Machine & CNC system	Vendor to offer			
14.3	Detailed Maintenance manual of machine and supplied systems.	Vendor to offer			
14.4	Maintenance Interface & commissioning manuals, PLC programming manual for CNC system, Interface & commissioning manuals for table & feed drives and auxiliary drives etc.	Vendor to offer			
14.5	Manufacturing drawings for all supplied clamping jaws, tool holders, boring bars, cassettes, adapters, sleeves, fixtures etc.	Vendor to offer			
14.6	Catalogues, Operation & Maintenance Manuals of all bought out items including drawings, wherever applicable.	Vendor to offer			
14.7	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to offer			
14.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied accessories viz. Voltage Stabilizer, Isolation Transformer, Air-Compressor etc.	Vendor to offer			
14.9	User Program print-outs (hard copy) with comments in English for PLC of main machine and auxiliary systems (if used) alongwith cross reference list and Input/Output list.	Vendor to offer			
14.10	PLC program, NC data & PLC data on CD.	Vendor to offer			



14.11	Complete back-up of PCU-50 or equivalent (in case of Fanuc) hard disk on GHOST CD and clearly written Instructions to take back-up and reloading on a new hard disk.	Vendor to offer			
14.12	Complete list of parts/items( Bill of materials) used in the machine in English language.	Vendor to offer			
14.13	Electrical Schematic Diagrams, Wiring Diagrams, Junction Box Layouts, Connector Diagrams and Cable Layouts of the machine in English.	Vendor to offer			
14.14	Drawings of machine assemblies/sub-assemblies/parts including Pneumatic/Coolant / Hydraulic circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list marked on it in English.	Vendor to offer			
14.15	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to offer			
<b>15</b>	<b>PROVEOUT MACHINING OF BHEL COMPONENTS</b>				
15.1	Drawings of proveout components are enclosed. Job setting plan, Machining process plan & Requirement of Tools etc. for machining of proveout components shall be discussed and mutually agreed with vendor ( Final proveout component drawing no. may change, however, the machining features of the changed components shall be in line with the original component drawing ). Complete machining of prove out components shall be done by Vendor at BHEL works to the specified design accuracy and surface finish, using cutting tools and CNC programs to be provided by the vendor to prove the machine after complete erection, tests & test piece machining etc. Material for the proveout components shall be provided by BHEL. Vendor shall submit final job setting plan, machining process plan, tool layout & list with complete description, time study etc. for the proveout machining within two months of placement of order. Vendor shall submit CNC programs prior to start of erection of Machine at BHEL works.	Vendor to accept & offer			
	Vendor shall be fully responsible for machining of proveout components as per drawing and other requirements specified by BHEL to the full satisfaction of BHEL. Clarifications, if any required by vendor, regarding accuracy requirements of the proveout components, whether specified or not, should be discussed and cleared by vendor during initial technical discussions.				
15.1.1	<b>Separate package price for proveout machining of each component shall be quoted.</b>	Vendor to accept			
<b>15.2</b>	<b>PROVEOUT COMPONENTS</b>				
	No. of components : 3.				

	Proveout components shall be U-Sealing Ring (drg.no. 21050124003), Spherical Socket (drg.no. 21160421003) & Spherical Piece (drg.no. 21160421002).				
15.2.1	Component no. 1 - "U-Sealing Ring" : All types of Turning & Grooving operations as per BHEL Drg. No. 2-105-01-24003 are to be performed. Rough machined forging as per Drg. no. 4-10501-24992 shall be provided to the vendor.				
15.2.1.1	Material of U-Sealing Ring : Creep Resistant alloy - Niomonic 80A - Heat Treated Forging NiCr20TiAl, 0.2% Proof Stress=600N/Sq.mm, Hardness more than 300BHN, Composition : C max. 0.1%, S max. 0.03%, Cr 18-21%, Mn max. 1.0%, Si max. 1.0%, P max. 0.015%, B max. 0.008%, Al 1.0-1.8%, Ti 1.8-2.7%.				
15.2.2	Component no. 2 - "Spherical Socket" : Turning operations i.e. spherical surface and adjoining chamfers as per BHEL Drg. No. 2-11604-21003 are to be performed. After turning, spherical surface is to be ground using supplied Grinding Attachment & wheels to achieve required surface finish and accuracy. Turning and Grinding cuts shall be intermittent as only two pieces of component shall be clamped diametrically opposite to each other on the machine table. Two pieces of component with rough machined straight bore dia and finished length 150mm shall be provided to the vendor.				
15.2.2.1	Material of Spherical Socket : Carbon Steel Forging, Tensile Strength 490 N/sq.mm, Hardness 140-200BHN, Composition : C 0.25-0.35%, S max. 0.04%, Cr max. 0.3%, V max. 0.05%, Mn 0.6-0.9%, Si 0.15-0.35%, P max. 0.04%, Ni max. 0.3%, Mo max. 0.15%, Cu 0.25%, Sn max. 0.05%, B max. 0.0003%.				
15.2.3	Component no. 3 - "Spherical Piece" : Turning of external spherical surface as per BHEL Drg. No. 2-11604-21002 is to be performed. After turning operation, spherical surface is to be ground using supplied Grinding Attachment & wheels to achieve required surface finish and accuracy. Single piece of component with rough machined straight external dia and finished length 600mm, clamped on Bearing Shell Drg. No. 0-11703-27101 (both halves finish machined and clamped together by BHEL) shall be provided to the vendor. Assembly Drg. No. 0-11703-27000 (Radial Thrust Bearing dia 380x290) is also enclosed for clarity and reference. Turning and Grinding cuts shall be intermittent as only one piece of component shall be clamped on Bearing Shell.				
15.2.3.1	Material of Spherical Piece :				

15.3	Same as of Spherical Socket. Vendor shall be responsible, financially or otherwise, for any deviation/rejection in proveout component to the extent of cost of Casting/Forging, due to wrong machining or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper recommended tooling etc..The cost of such deviation / rejection, if any, shall be refunded by the vendor to BHEL.				
16	<b>TRAINING</b>				
16.1	Four BHEL Persons should be trained at vendor's works for each machine for the area & period given below: (a) CNC Part Programming for the machine, application of all CNC Features, Programming for Measuring Systems & supplied accessories etc. (Period 3 Weeks) (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments ( Period 2 weeks ) (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments ( Period 2 weeks ) (d) Operation of the machine & other supplied equipments ( Period 2 weeks ) ) Pre-dispatch inspection (ref. <b>Sl.No. 21.1</b> ) of the machine shall also be carried out by the team during their stay at vendor's works for the training. Vendor may specify days required for pre-dispatch inspection. BHEL reserves the right to choose no. of persons, field & period of training, out of above, while deputing their engineers for training.	Vendor to accept & confirm			
16.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	For vendor's information.			
16.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to accept & confirm			
16.4	Vendor should commit & offer to organize training of Electronics Engineer and Programmer at the CNC System Manufacturer's works/training school for advanced features and specialized training, if so required by BHEL.	Vendor to offer			
16.5	Training charges, if any, for training requirement at <b>Sl.No. 16.1 &amp; 16.4</b> should also be quoted on per Man-day basis so that training charges can be derived for the agreed period & persons, in case of any change.	Vendor to offer			
17	<b>FOUNDATION</b>				

17.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) / P.O. Soil condition data will be furnished by BHEL alongwith the approval. Complete Foundation Design including details viz. static / dynamic load details etc. and final Layout drawings shall be submitted by the supplier within three months after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of vendor and at vendor's responsibility. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine. Vendor should arrange equipments required for the testing of foundation, if required.	Vendor to accept & offer			
<b>18</b>	<b>ERECTION &amp; COMMISSIONING</b>				
18.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment , machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to offer			
18.2	Erection & Commissioning of indigenously supplied items like Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to offer			
18.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at clause no. 23 (Machine Acceptance) shall form part of the commissioning activity.	Vendor to offer			
18.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all erection & commissioning activities to be arranged and brought by the supplier. Out of the complete supply, all tools, tackles, mandrels etc. which may be required by BHEL to maintain the machine, after commissioning, shall not be taken back by vendor. Other equipment including Laser equipment shall be arranged by vendor on returnable basis. Vendor to offer accordingly.	Vendor to accept			

18.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to accept			
18.6	All Cover Plates, sheets/plates for chutes for chips flow etc. required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor.	Vendor to accept			
18.7	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to submit			
18.8	Duration, terms & conditions for Erection & Commissioning should be furnished in detail separately by vendor along with offer.	Vendor to submit			
18.9	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours of paint used. The vendor shall ensure performing touching after commissioning but before final acceptance.	Vendor to offer			
<b>19</b>	<b>ACCURACIES</b>				
<b>19.1</b>	<b>GEOMETRICAL ACCURACIES</b>	Vendor to offer			
19.1.1	Geometrical Accuracy Tests shall be in accordance with DIN 8609 / ISO 3655 standard or equivalent applicable standard. Detailed Test Charts for the same, clearly showing the accuracies to be achieved on the machine, shall also be Submitted with the offer.				
19.1.2	Table Flatness	Vendor to inform			
19.1.3	Table Radial Runout (at 2.5M dia)	Vendor to inform			
19.1.4	Table Axial Runout	Vendor to inform			
19.1.5	Cylindricity of turning	Vendor to inform			
19.1.6	True roundness of turning	Vendor to inform			
19.1.7	Facial run-outs	Vendor to inform			
19.1.8	All other accuracies to conform to specified standard (Latest Revision) or Suppliers Test chart whichever is finer and more accurate.	Vendor to confirm			
19.1.9	All the Geometrical accuracies including test pieces machining for turning & grinding operations etc. should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and again during Erection & Commissioning at BHEL Works. Test pieces are to be supplied by vendor for test pieces machining both at vendor's works & at BHEL's works. Drawings of test pieces to be submitted with the offer.	Vendor to confirm			
19.1.10	Vendor to confirm clearly that it will be possible to machine proveout components to specified drawing accuracies with above mentioned machine accuracies.	Vendor to confirm			

<b>19.2</b>	<b>POSITIONING &amp; REPEATABILITY ACCURACIES</b> (Should be measured as per VDI/DGQ 3441 - Latest Revision) CHECKING BY USING LASER INTERFEROMETER.				
19.2.1	Positioning accuracy in X axis (Pa) per 1000 mm	± 0.005mm or 0.01mm			
19.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm	± 0.005mm or 0.01mm			
19.2.3	Repeatability in X axis (Ps)	0.007mm			
19.2.4	Repeatability in Z axis (Ps)	0.007mm			
19.2.5	Positioning accuracy over entire traverse in X axis (Pa)	Vendor to inform			
19.2.6	Positioning accuracy over entire traverse in Z axis (Pa)	Vendor to inform			
19.2.7	Total positioning error along X & Z axes per 1000 mm (P)	Vendor to inform			
19.2.8	Total positioning error along X & Z axes over entire traverse (P)	Vendor to inform			
19.2.9	Vendor to confirm clearly that it will be possible to machine proveout components to specified drawing accuracies with above mentioned machine accuracies.	Vendor to confirm			
19.2.10	All the Positioning and Repeatability accuracies should be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and again during Erection & Commissioning at BHEL Works.	Vendor to offer			
	Note1: LC of scale should be taken to achieve above	Vendor to note			
	Note 2: Accuracy should remain within specified tolerance over a time period of 24 hours (Maximum temperature variation is 25 degree centigrade during peak summer)	Vendor to note			
<b>20</b>	<b>OPERATING CONDITIONS &amp; THERMAL STABILITY :</b>				
20.1	Total machine including all supplied items should work trouble free and should give specified accuracies under existing power supply and ambient operating conditions, as mentioned below at Sl. Nos. 20.1.1 & 20.1.2	Vendor to accept & confirm			
20.2	Power Supply (AC): Voltage = 415V +/- 10% of fluctuations , Frequency= 50Hz +/- 3% , No. of phases = 3 phase without neutral.	Vendor to accept & confirm			
20.3	Ambient Operating Conditions: Temperature = 5 to 48 degree Celsius , Relative Humidity = 95% max. Weather conditions are tropical. Atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition without any temperature controlled enclosure/shop. Max. temperature variation is 25 deg Celsius in 24 hours. Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor.	Vendor to accept & confirm			

20.4	Thermal Stability: Thermal Stability of the complete machine and all supplied items keeping in view the specified Ambient Conditions at <b>SI.No. 20.3</b> , specified accuracies, machining requirements of BHEL component and trouble free operation of the machine to be ensured by vendor. Since the machine shall be installed in shop with operating conditions as per <b>SI.No. 20.3</b> , the vendor shall ensure to have provisions in the machine for achieving the drawing accuracies on the job under these conditions. Accordingly, Vendor to ensure that machine is suitable for above and provisions on the machine for the suitability should be included by Vendor.	Vendor to accept & confirm			
20.5	The machine, including attachments and accessories, should be suitable for continuous operation to its full capacity for 24 hours a day and 7 days a week throughout year. Vendor to ensure and confirm the same.	Vendor to offer & confirm			
<b>21</b>	<b>MACHINE ACCEPTANCE</b> <b>(Tests/Activities to be performed &amp; demonstrated by Vendor)</b>	Vendor to accept & confirm			
21.1	Tests/Activities to be carried out at vendor's works on the machine before dispatch : All these activities (As per <b>SI.Nos. 21.1.1 to 21.1.5</b> ) shall be part of pre-dispatch inspection of the machine which shall be carried out by BHEL's team during their stay at vendor's works for the training ( Ref. <b>SI.No. 16.1</b> ). Report of the same shall be submitted to BHEL by vendor.	Vendor to accept & confirm			
21.1.1	Demonstration of specified/offered Geometrical accuracies as per test chart/standard and specified values ( <b>SI.No. 19.1</b> )	Vendor to accept & confirm			
21.1.2	Demonstration of specified/offered Positioning accuracies as per test chart/standard and specified values ( <b>SI.no.19.2</b> )	Vendor to accept & confirm			
21.1.3	The machine should be tested for continuous running of 48 hrs. If any breakdown occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to accept & confirm			
21.1.4	Demonstration of all features of the machine, control system & accessories/attachments	Vendor to accept & confirm			
21.1.5	Machining of test piece as per AFNOR/ISO/NAS for turning operations etc. Vendor to supply test pieces.	Vendor to accept & confirm			
21.2	Tests/Activities to be carried out at BHEL works while commissioning the machine : as per <b>SI.Nos. 21.2.1 to 21.2.10</b>	Vendor to accept & confirm			
21.2.1	Demonstration of specified/offered Geometrical accuracies as per test chart/standard and specified values ( <b>SI.No. 19.1</b> )	Vendor to accept & confirm			
21.2.2	Demonstration of specified/offered Positioning accuracies as per test chart/standard and specified values ( <b>SI.no.19.2</b> )	Vendor to accept & confirm			



21.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to accept & confirm			
21.2.4	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to accept & confirm			
21.2.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine.	Vendor to accept & confirm			
21.2.6	Demonstration by actual use of all supplied accessories to their full capacity for required applications.	Vendor to accept & confirm			
21.2.7	Machining of test piece as per AFNOR/ISO/NAS for turning & grinding operations etc. Vendor to supply test pieces and required tools for their machining. Drawing of test pieces & list of offered tools to be submitted.	Vendor to accept & submit			
21.2.8	Successful machining of proveout components to required drawing accuracies as per <b>SI. No. 15.0.</b>	Vendor to accept & confirm			
21.2.9	Two weeks of supervision by Vendor of independent operation of machine by BHEL after job proveout.	Vendor to accept & confirm			
21.2.10	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works. This training is in addition of the training specified at <b>SI.No. 16.0</b>	Vendor to accept & confirm			
<b>22</b>	<b>PACKING</b> PACKING : Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes. Indigenous supply items like Voltage Stabiliser, Isolation Transformer, Air Compressor etc. should be fully packed in proper rigid boxes for safe transportation and avoiding pilferages.	Vendor to accept & confirm			
<b>23</b>	<b>GUARANTEE</b> Guarantee for complete machine and all supplied accessories/equipments for 24 months from the date of acceptance of the machine.	Vendor to offer			
<b>24</b>	<b>GENERAL</b>				
24.1	Machine Model No.	Vendor to inform			
24.2	Total connected load (KVA)	Vendor to inform			
24.3	Total Space required (Length, Width, Height) for complete machine, accessories/attachments and other supplied items like Voltage Stabilizer, Isolation Transformer & Air compressor etc.	Vendor to inform			

24.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green ( Polyurethane Paint )	Vendor to offer		
24.5	Total weight of the machine	Vendor to inform		
24.6	Weight of heaviest part of machine	Vendor to inform		
24.7	Weight of the heaviest assembly of the Machine	Vendor to inform		
24.8	Dimensions of largest part of the machine	Vendor to inform		
24.9	Vendor to submit reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, CNC System, Table Dia, Max. Turning Dia, Max. Turning Height, RPM, Load Carrying Capacity, Main Drive Rating and detail of accessories/attachments, if any, etc.	Vendor to submit		
24.1	Detailed catalogues, sketches / drawings / photographs pertaining to the offered machines and accessories / attachments/items should be submitted with the offer.	Vendor to submit		
24.11	Hydraulic, Pneumatic & Oil piping should be preferably metallic except places where flexible pipings are essential. All the pipes required for the same shall be supplied by the vendor.	Vendor to confirm		
24.12	All Cables and Hoses etc. should be well supported & protected in trays/brackets/drag chains etc.	Vendor to confirm		
<b>25</b>	<b>QUALIFYING CONDITIONS</b>			
25.1	Only those vendors (OEMs), who have supplied and commissioned at least one CNC VERTICAL BORING MACHINE of same ( Table diameter 2.5M, Load Capacity 40 Tons & Max Turning Height 2.5 M) or higher sizes in the past ten years ( on the date of opening of Tender ) should quote. The following information should be submitted by the vendor about the companies where referred machine (s) have been supplied. This is required from all the vendors for qualification of their offer.	Vendor to accept and confirm		
25.2	Name of the customer / company where referred machine is installed.	Vendor to inform		
25.3	Complete postal address of the customer.	Vendor to inform		
25.4	Month & Year of commissioning.	Vendor to inform		
25.5	Parameters of machine(s) supplied (Table diameter, Max. Turning Height, Table Load Carrying Capacity) and application for which the machine is supplied.	Vendor to inform		
25.6	Name and designation of the contact person of the customer.	Vendor to inform		
25.7	Phone, FAX no. and e-mail address of the contact person of the customer.	Vendor to inform		

25.8	Performance certificate from at least one customer regarding satisfactory performance of machine supplied to them. The referred machine should presently be working satisfactorily for more than one year (on the date of opening of Tender ) after its commissioning.	Vendor to submit			
25.9	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect, the offer shall be rejected.	Vendor to accept & confirm			
<b>26</b>	<b>NETWORKING</b>				
26.1	Machine control should have necessary hardware and software for interfacing with gigabit Ethernet Local Area Network with 100 MB/sec through UTP cables for NC program and other related data transfer. This network to be connected to wide area network/Internet. The networking should have following capabilities:	Vendor to offer			
26.2	The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to offer			
26.3	The program transfer shall be by simple copy and paste method provided sharing access is allowed between any PC and the machine across the network.	Vendor to offer			
26.4	The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to offer			
26.5	The program transfer shall be by simple copy and paste method provided sharing access is allowed between any PC and the machine across the network.	Vendor to offer			
26.6	The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to offer			
<b>27</b>	<b>MACHINE MONITORING SYSTEM (MMS) SIGNALS</b>				
27.1	Following MMS signals would be made available on a specifically earmarked terminal strip. These MMS signals should be sourced from a PLC output card separately.	Vendor to offer			
27.2	Control ON	Vendor to offer			
27.3	Cycle ON	Vendor to offer			
27.4	Spindle Running	Vendor to offer			
27.5	Feed Active (Any of the axes moving)	Vendor to offer			
27.6	M30 (Program Stop)	Vendor to offer			
27.7	Alarm Active	Vendor to offer			
<b>28</b>	<b>OPTIONAL ITEMS</b>				
<b>28.1</b>	<b>OPERATOR'S PLATFORM</b>				
	<b>Separate package price is to be quoted.</b>				

28.1.1	The machine should be equipped travelling type operator's platform with ladder. It should be independent of crossrail movement, equipped with all motorised movements, movable / adjustable in vertical and horizontal direction. It should be able to reach almost to center of the Table in horizontal direction for total turning height. Interlocks should be provided for its horizontal / downward movement against rotating Table and against the job ( rotating or stationary ) to avoid collision / accident. Positions of the gates provided in the platform for Operator's convenience should be informed by the Vendor . The platform should provide sufficient space for convenient and safe operation of the machine and its control. Drawing / Details of the Operator's Platform should be submitted.	Vendor to offer			
28.1.2	The platform should clear maximum swing dia at its reference position.	Vendor to confirm			
28.1.3	Operator's platform should have suitably located sufficient illumination (for clear view of operator's panel, drg. display area etc.), 2 nos. power plug point (Indian type) of 220Volts, 15 Amp AC with on/off switch for connecting 2000W electric heater (BHEL's supply), fans (pedestal type or wall-hanging type) and a board for display of component drawing ( A1 size) for ease of operator.	Vendor to offer			
28.1.4	Reach of the platform up to center of machine table to view tool and its location inside long jobs during machining.	Vendor to confirm			
28.1.5	Horizontal movement of complete Platform.	Vendor to inform			
28.1.6	Vertical movement of complete Platform to cover total turning height.	Vendor to inform			
28.1.7	Height of Platform Railing.	Vendor to inform			
28.1.8	Weight Capacity of the Platform.	Vendor to inform			
28.1.9	Minimum Position of Platform from Shop Floor.	Vendor to inform			