



An ISO 9001  
Company

## Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT/ MATERIALS MANAGEMENT

### ENQUIRY

### NOTICE INVITING TENDER

Phone: +91 431 257 70 49

Fax : +91 431 252 07 19

Email : [csguna@bheltry.co.in](mailto:csguna@bheltry.co.in)

Web : [www.bhel.com](http://www.bhel.com)

TWO PART BID	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
Tender to be submitted in two parts.	<b>2620900220</b>	<b>07.10.2009</b>	<b>07.11.2009</b>

You are requested to quote the Enquiry number date and due date in all your correspondence. This is only a request for quotation and not an order.

Please note that under any circumstances both **delayed offer** and **late offers** will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of tender opening.

Item	Description	Quantity
10	<b>CNC Horizontal Boring Machine – 900 mm</b> as per the technical specification, general guidelines instructions & commercial conditions applicable (to be downloaded from web site <a href="http://www.bhel.com">www.bhel.com</a> or <a href="http://tenders.gov.in">http://tenders.gov.in</a> )	<b>1 No</b>

#### Important points to be taken care during submission of offer

1. Delivery required 10 months from the date of purchase order.
2. Grace period of 2 months beyond the above delivery period will be considered.
3. Checklist to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.

BHEL's General guidelines / instructions (refer MM/CE/GT/001) including bank guarantee formats and list of consortium banks, commercial terms check-list can be downloaded from BHEL web site <http://www.bhel.com> or from the Government tender website <http://tenders.gov.in> (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2620900220".

Tenders should reach us before 14:00 hours on the due date  
Tenders will be opened at 14:30 hours on the due date  
Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present

Yours faithfully,  
For BHARAT HEAVY ELECTRICALS LIMITED

Sr.Manager / MM / Capital Equipment

**PART A**  
**HORIZONTAL BORING MACHINE**  
**SECTION – I: QUALIFYING CRITERIA**

The BIDDER has to compulsorily meet the following requirements to get qualified for considering the technical offer:

S. No.	REQUIREMENTS	Vendor's Response
1	<p>Only those vendors (OEMs), who have supplied and commissioned at least one <b>HORIZONTAL BORING MACHINE</b> with</p> <p><b>1. Spindle power of 37 KW or more,</b>  <b>2. Spindle diameter of 130mm or above</b>  <b>3. Horizontal boring machine of Ram type</b></p> <p>in the past ten years and such machine should be working satisfactorily for a minimum period of one year after commissioning, as on the date of opening of this Tender are eligible to quote.</p> <p><i>(However, if such machine is already supplied to BHEL, then that machine should be working satisfactorily for a minimum period of six months after commissioning, as on the date of opening of this Tender.)</i></p>	
	<b>The vendor should submit following information where similar machine has been supplied for qualification of their offer.</b>	
1.1	Name and postal address of the customer or company where similar machine is installed.	
1.2	Name and designation of the contact person of the customer.	
1.3	Phone, FAX no and email address of the contact person of the customer.	
1.4	Month and Year of commissioning of the machine.	
1.5	Parameters of machine supplied, viz. Spindle power, Spindle diameter and the application for which the machine is supplied.	
1.6	Along with the Technical offer, the Vendor should submit one Performance certificate from the customer for the satisfactory performance of the machine supplied to them. For obtaining the Performance certificate, a suggestive format is provided in <b>SECTION – IV</b> .	
1.7	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	
2.0	<b>DELIVERY</b> - The bidder shall quote the best possible delivery. However the delivery shall not exceed 10 months with an additional grace period of 2 months. The additional grace period will attract a penalty which is explained in the commercial terms of the enquiry. The delivery period shall be reckoned from date of purchase order to despatch from the vendor works.	

**SECTION – I I**

The BIDDER / VENDOR is requested to provide the following information:

<b>S. No.</b>	<b>REQUIREMENTS</b>	<b>Vendor's Response</b>
3.0	The BIDDER/VENDOR to furnish Reference List of Customers, with full address, details of contact person, where HORIZONTAL BORING MACHINES have been supplied in the past.	
4.0	Details of HORIZONTAL BORING MACHINES supplied to other BHEL units, if any. (Year of commissioning, Spindle power and Spindle diameter).	
5.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Address of Agents / Service Centers in South India.	
6.0	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

**SECTION – III**

The BIDDER to note:

<b>S. No.</b>	<b>PARTICULARS</b>	<b>Vendor's Response</b>
7.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS. 1. Technical Offer [with PART A & PART B] and Commercial offer. 2. Price Bid.	
8.0	The Technical Offer shall contain a comparative statement of Technical <b>Specifications demanded by BHEL</b> and <b>Offer Details submitted by the Bidder</b> , against each clause. A just 'CONFIRMED' or 'COMPLIED' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement may lead to disqualification of the Technical Offer.	
9.0	The Technical Offer shall be supported by product Catalogues & Data Sheets and also technical details of Bought-Out-Items with copies of Product Catalogue to the extent possible.	
10.0	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation.	

**SECTION – IV**

The performance certificate should be produced **on Customer's Letter Head.**

**PERFORMANCE CERTIFICATE**

1. Supplier of the machine		
2. Make & Model of the M/C		
3. Month & Year of Commissioning		
4. Application for which M/C is used		
5	a) Spindle Power (cont. rating) b) Spindle diameter c) Ram dimension d) Spindle Taper	
6. Performance of the Equipment (Tick whichever is applicable)		<b>Satisfactory</b>
		<b>Good</b>
		<b>Average</b>
		<b>Not Satisfactory</b>
7. Service after sales		<b>Satisfactory</b>
		<b>Good</b>
		<b>Average</b>
		<b>Not Satisfactory</b>
<div style="display: flex; justify-content: space-between; align-items: flex-end;"> <div>Date:</div> <div>Signature &amp; Seal of the Authority Issuing the Performance Certificate</div> </div>		

**PART-B TECHNICAL SPECIFICATION FOR CNC HORIZONTAL BORING MACHINE**

**SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC HORIZONTAL BORING MACHINE COMPLYING WITH SPECIFICATION AS DETAILED BELOW:**

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
<b>1.0</b>	<b>PURPOSE &amp; WORKPIECE MATERIAL</b>		
1.1	Purpose: (Operations/Jobs involved) Through boring of T pieces annexure-2	Vendor to note	
1.2	Work Piece Material: The work pieces are forged and ends gas cut. The Inner diameter is irregular as shown in annexure-3	Vendor to note	
1.3	The machine to be designed to suit the machining operation on work piece as per clause 1.1 and 1.2 and cutting parameters as per clause 6.2	Vendor to confirm	
<b>2.0</b>	<b>SPECIFICATION:</b>		
<b>2.1</b>	<b>MACHINE CONFIGURATION:</b> The machine shall be a 5 axis CNC (X,Y,Z,W & B-axes) controlled Horizontal Boring machine with fixed column.		
<b>2.2</b>	<b>HEAD STOCK</b>		
2.2.1	Boring spindle diameter- Preferred 160mm.	Vendor to specify	
2.2.2	Ram Cross section (LxB)	Vendor to specify	
2.2.3	Spindle drive power (AC Continuous Rating - S1)-min 37KW	Vendor to specify	
2.2.4	Spindle speed (Infinitely variable)-Suitable for the cutting parameters as per clause 6.2	Vendor to specify	
2.2.5	Max torque on the boring spindle (Nm) -min 2800	Vendor to specify	
2.2.6	Spindle taper	ISO 50	
2.2.7	Torque-Power-Speed characteristics of the spindle system	Vendor to specify	

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.2.8	Forward and reverse rotation of spindle motor with suitable braking mechanism. (Complete details with drawings, explanations to be submitted along with the offer.)	Vendor to confirm with details	
<b>2.3</b>	<b>COLUMN:</b>		
2.3.1	Column should be sturdy and fixed to take heavy load	Vendor to confirm with details	
<b>2.4</b>	<b>HEADSTOCK TRAVERSE ON COLUMN:</b>		
2.4.1	Headstock vertical travel (Y-Axis)	1500 mm	
2.4.2	Y-axis feed rate (Infinitely variable)	0.5-2500 mm/min	
2.4.3	Y-axis rapid traverse rate	2500 mm/min	
2.4.4	Axis Resolution	0.01 mm	
<b>2.5</b>	<b>RAM/ SPINDLE TRAVERSE:</b>		
2.5.1	Boring spindle axial travel (W-Axis)	700mm (min)	
2.5.2	Ram axial travel (Z-Axis)	800 mm(min)	
2.5.3	Ram + Spindle Travel	1500mm (min)	
2.5.4	Lowest spindle position from table top	150 mm	
2.5.5	Boring Spindle axis feed rate (Infinitely variable)	0.5-2500 mm/min	
2.5.6	Boring Spindle axis rapid traverse rate	2500 mm/min	
2.5.7	Axis Resolution	0.01 mm	
2.5.8	Ram axis feed rate (Infinitely variable)	0.5-2500 mm/min	
2.5.9	Ram axis rapid traverse rate	2500 mm/min	
2.5.10	Axis Resolution	0.01 mm	
2.5.11	Ram Axes should be independently programmable with Independent Drives and Feed back system.	Vendor to Confirm	
<b>2.6</b>	<b>FEED AND DRIVE SYSTEM:</b>		
2.6.1	Feed drives/ motors for X,Y,Z & W axes [AC servo motors] shall be digital type of either Siemens or Fanuc make (Details of model, make, type etc. to be submitted)	Vendor to Confirm	
2.6.2	Maximum feed force for all axes	Vendor to specify	
2.6.3	Feed back system for X, Y, Z & W axes: Heidenhain linear scales / Rotary Encoder.	Vendor to specify	

**CABS-3-17N CNC Horizontal Boring Machine**

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.6.4	Cleaning of linear scales(if required)	Vendor to specify	
2.6.5	<b>Type of power transmission:</b> Backlash free re-circulating ball screw with Pre-loaded double nut for all axes. (Complete description of the aforesaid including diameter of Ball Screw for each axis, to be submitted with the offer)	Vendor to specify	
2.6.6	Mechanism for locking / clamping X, Y & Z axis	Vendor to specify	
<b>2.7</b>	<b>MACHINE GUIDEWAYS:</b>		
2.7.1	Width of bed guideways, X-axis	Vendor to specify	
2.7.2	Width of column guideways, Y-axis	Vendor to specify	
2.7.3	Details of Guide ways for Ram axis and bearing details of Spindle axis are to be submitted with offer.	Vendor to specify	
2.7.4	Guide ways for X-axis, Y-axis & Z-axis. Details to be submitted. Details of lubrication system provided on Spindle axis are also to be submitted with the offer.	Vendor to specify	
2.7.5	Hardness of guideways	Vendor to specify	
2.7.6	<b><u>Metallic Telescopic Covers</u></b> of stainless steel material to be provided with wipers for X & Y axes guide ways. Joints of telescopic covers should be so sealed to avoid mixing of coolant & lubrication oil is to be provided. The telescopic cover for X-axis should be with a slant towards chip conveyor and should be of Walk on Type.	Vendor to confirm	
<b>2.8</b>	<b>ROTARY TABLE :</b>		
2.8.1	Table size (LxB)	Vendor to specify	
2.8.2	Maximum load carrying capacity (Tons)	5 T	
2.8.3	Eccentric Loading permissible	Vendor to specify	
2.8.4	Table rotation (B-axis)-Motorised	360°	
2.8.5	Table rotation (B-axis)- Resolution	Vendor to specify	
2.8.6	Table indexing positions - with locking at	4x90°	
2.8.7	Size of T-slots	For M24 studs	
2.8.8	T-slots pitch (as per DIN standard)	Vendor to specify	
2.8.9	Minimum distance between ram face and table face.	Vendor to specify	



### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.8.10	Loading chart of the table to be submitted.	Vendor to specify	
2.8.11	Mechanism for locking/ clamping of Table axes	Vendor to provide details	
2.8.12	Spindle should reach extreme end of rotary table	Vendor to Confirm	
2.8.13	Guideways for Table Rotation	Vendor to Specify	
2.8.14	Table rotation motor capacity	Vendor to specify	
2.8.15	4 x 90 deg Precision Positioning (Details to be submitted.)	Vendor to specify	
2.8.16	Table cross travel (X axis)-min 1000mm	Vendor to specify	
2.8.17	X-axis feed rate (Infinitely variable)	0.5-2500 mm/min	
2.8.18	X-axis rapid traverse rate	2500 mm/min	
2.8.19	Axis Resolution	0.01 mm	
<b>2.9</b>	<b>CONSTRUCTION:</b>		
2.9.1	Details of material, hardness & constructional details, including explanatory drawings, of various components/assemblies like Column, bed, head stock, ram, spindle, table, guide ways, etc. of the machine.	Vendor to furnish	
2.9.2	Automatic deflection compensation for ram and column effective at any extension of the ram plus spindle is to be provided taking into consideration weight of all possible cutters/ attachments offered. Details of the offered system should be submitted with offer.	Vendor to furnish	
2.9.3	Head Stock Counterbalancing System. (Details of the offered system to be submitted)	Vendor to furnish	
<b>2.10</b>	<b>OPERATION AND CONTROL SYSTEM:</b>		
<b>2.10.1</b>	<b>OPERATOR'S PANEL:</b>		

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.10.1.1	Swiveling type operator's panel having complete CNC and machine control system with CRT of required configuration shall be provided on the operators platform. All switches on the Operator's panel including that for table rotation should be within reach of operator of height 5' 6" for convenient, efficient & safe operation. All displays/indications should also be conveniently placed accordingly. Layout showing complete details of the panel should be submitted.	Vendor to furnish	
2.10.1.2	An auxiliary pendant, which can be taken to the table for job setting and similar other purposes, should be provided.	Vendor to furnish	
<b>2.10.2</b>	<b>CNC SYSTEM &amp; FEATURES :</b>		
2.10.2.1	Make : Siemens/Fanuc	Vendor to specify	
2.10.2.2	Type : PC based latest version	Vendor to confirm	
2.10.2.3	Latest version, as available at the time of ordering, should be supplied.	Vendor to specify	
2.10.2.4	Details of Standard features.	Vendor to specify	
2.10.2.5	Details of optional features.	Vendor to specify	
2.10.2.6	The system should have full alphanumeric keyboard, TFT colour display(preferably 15" ), additional draw-out type QWERTY Key Board and mouse in suitable enclosure, two numbers RS232C serial interfaces, parallel interface for printer, network ready with LAN, electronic hand wheels for all axes, CD/DVD drive unit for data input/output, hard disk of not less than 80 GB, graphic simulation and preinstalled system software & other required softwares etc.Dry run & Simulation to be included.	Vendor to specify	
2.10.2.7	Provision for automatic safe shut down of CNC Control in case of Power Failure.	Vendor to specify	
<b>2.10.3</b>	<b>MANUAL CONTROL :</b>		
	Complete manual control of machine with required switches / keys should be provided on operator's panel for selection of required axis, axis direction, cutting feed, spindle rpm, Direction of Spindle Rotation, i.e. CW/ CCW, cutting feed and spindle rpm on/off, display of axis position values etc, for manual operation without using CNC program or MDI mode. Diagram/ Sketches for switches/ keys provided on operators pendant to be submitted.	Vendor to furnish	

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
<b>2.10.4</b>	<b>HAND HELD UNIT:</b>		
2.10.4.1	Hand held unit for axis selection, and movement with pulse generator & display is to be offered. This is required for job setting. Make, model no. and literature of the offered hand held unit shall be furnished.	Vendor to Confirm	
<b>2.10.5</b>	<b>UPS FOR CNC SYSTEM:</b>		
2.10.5.1	UPS of 30 minutes backup for CNC system with inbuilt cooling and charge status display (Battery charging /discharging time should be specified by vendor)	Vendor to furnish	
<b>2.11</b>	<b>MACHINE LIGHTS:</b>		
2.11.1	Machine Lights for sufficient illumination of complete working area on both sides of operator's platform should be provided for clear visibility.	Vendor to specify	
2.11.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to specify	
2.11.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to specify	
2.11.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to specify	
2.11.5	Flashing / rotary type End of Cutting and Program Stop Light.	Vendor to Confirm	
<b>2.12</b>	<b>AIR CONDITIONERS:</b>		
2.12.1	Air Conditioners with Dehumidifiers of suitable / sufficient capacity to be provided for all Electrical / Electronic Panels / Cabinets including Operator's Panel considering specified ambient conditions. Detailed specifications of the same are to be submitted. Make: Rittal / Warner & Finley or any other reputed make acceptable to BHEL. Detailed specifications to be submitted.	Vendor to specify	
<b>2.13</b>	<b>HYDRAULIC SYSTEM :</b>		
2.13.1	The System should be centralised. Hydraulic Tank shall preferably be located at floor level. Hydraulic power pack to have minimum number of pipes/pipe joints and usage of manifolds/stacked valves construction preferred.	Vendor to specify	

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.13.2	Latest version of pump,valves,accessories etc. preferably Make Rexroth / Vickers should be used.Seals used shall be Merkel/Freudenberg/Parker/Bushak+Shamban/Hunger/Smrit make. (Details to be submitted)	Vendor to specify	
2.13.3	Power pack should be energy efficient (Hi-low pump system,proper unloading during idling,etc.)Suitable standby pump unit,filter unit etc. shall be provided for critical areas.The pumps should not be kept immersed/inside the tank.	Vendor to Confirm	
2.13.4	All the pipe/hose fittings shall be of standard weld nipple with o-ring seating type (DIN 3865) and no ferrule joints are to be proposed in the hydraulic system.All threaded connections shall be of Metric size.	Vendor to Confirm	
2.13.5	Pressure measuring minimess check points(preferably with 1/4 " BSP end) to be provided,wherever required for quick pressure measuring/setting while troubleshooting.One set of handheld minimess pressure gauge with 1-1.5 m length hose to be supplied.	Vendor to specify	
2.13.6	The power pack should be tropicalised for Indian conditions-for 40 deg C ambient temperature. Refrigerated type cooling system of sufficient capacity to maintain complete Hydraulic System at a temperature not exceeding 50 deg C irrespective of the ambient conditions. BHEL prefers to have direct cooling of oil in the chiller rather than indirect water cooling type. Complete details should be submitted with the offer.	Vendor to specify	
2.13.7	Suitable vibro mounts,compensators,delivery hose between pump and valve block,polypropylene pipe & hose clamps etc are to be provided to minimise the vibration.	Vendor to specify	
2.13.8	Oil used shall be ISO Viscosity grade 32/46/68/150 Centi-stokes at 40 deg C.Maximum pressure shall be 310 bar.	Vendor to Confirm	
2.13.9	Control voltage for all the solenoidss of the valves shall be 24 V DC and all solenoid operated DC valves should have manual over ride position and light indicating.	Vendor to specify	

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.13.10	Sufficient number of Duplex filter units with stand-by for the required level of cleanliness is to be provided with clog indicators and preferably with reusable type of filter elements. The filter unit shall be of Hydac / Parker / Rexroth or equivalent reputed make acceptable to BHEL. (Details to be submitted).	Vendor to specify	
2.13.11	The flexible hoses used in the system shall be of Gates / Aeroquip / Parker or any other reputed make acceptable to BHEL.	Vendor to specify	
2.13.12	Failure indication for oil level, temperature, pressure, filter clogging should be provided	Vendor to Confirm	
2.13.13	All the pipe / hose end fittings shall be of standard weld nipple with O-ring seating type (DIN 3865 or equivalent) - female swivel nut with 240 cone and o-ring and no ferrule joints are to be used in the hydraulic system. All threaded connections shall be of metric sizes	Vendor to Confirm	
2.13.14	It should be possible to replace hydraulic elements like valves, manifolds etc without disturbing the associated pipelines. The positioning of hydraulic elements should allow easy maintenance	Vendor to Confirm	
2.13.15	All hydraulic pipelines, hoses and electrical control cables to be neatly laid out with proper clamps and flexible hose conveyors wherever required.	Vendor to Confirm	
2.13.16	Suitable leakage oil collection metallic tray to be provided wherever required.	Vendor to Confirm	
2.13.17	All the components in the hydraulic power pack shall be provided with identification numbers, as per the hydraulic circuit and should be pasted with metallic identification number plates.	Vendor to Confirm	
2.13.18	The pipelines to be painted with standard colours. The supplier shall provide the hydraulic circuit with bill of materials giving complete purchase specifications for each item.	Vendor to specify	

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.13.19	First filling of all required Oils & Grease etc. Should be supplied by vendor. Grease: Servo gem grade 2 (preferred) Indigenous (Indian) source or Indian equivalent and specifications of oils/greases are also to be provided by the vendor.	Vendor to Confirm	
2.14	<b>Machine lubrication:</b> Automatic centralized lubrication system with timer control and suitable metering cartridges to be supplied.	Vendor to Confirm	
2.15	<b>ELECTRICAL SYSTEM :</b>		
2.15.1	415V + 10% / -10%, 50HZ +/- 1.5 HZ, 3 Phase AC (3 wire system ) 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, shall be the responsibility of vendor. Requirement of grounding/earthing with required material details is to be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to confirm	
2.15.2	<b>Tropicalisation:</b> All electrical / electronic equipment shall be tropicalized. All control cables should be of copper.	Vendor to confirm	
2.15.3	All electrical & electronic control cabinets & panels should be dust and vermin proof and shall have IP 54 protection.	Vendor to confirm	
2.15.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm	
2.15.5	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents.	Vendor to confirm	
2.15.6	Motors shall conform to IEC Standards	Vendor to confirm	
2.15.7	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 confirm	

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.15.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
2.15.9	In-cycle hour counter with reset facility is to be included in the offer.	Vendor to confirm	
<b>2.16</b>	<b>SAFETY ARRANGEMENTS:</b>		
	Following safety features in addition to other standard safety features should be provided on the machine:		
	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 confirm	
	2. A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to confirm	
	3. All the pipes, cables etc. on the machine should be well supported and protected.	Vendor to confirm	
	4. All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.	Vendor to confirm	
	5. Emergency Switches at suitable locations as per International Norms are to be provided.	Vendor to confirm	
	6. Oil & water pipe lines should not run with electrical cable in the same tray / trench.	Vendor to confirm	
	7. Safety Lights at both ends of moving column (preferably Flashing during X-travel).	Vendor to confirm	
	8. All lubricated parts like Bed, guide ways shall have provision for collecting the used Lubrication oil from machine guide ways and preventing them from spilling over on to the ground.	Vendor to confirm	
<b>2.17</b>	<b>ENVIRONMENTAL PERFORMANCE OF THE MACHINE :</b>	Vendor to confirm	
	The Machine shall conform to following factors related to environment :		

**CABS-3-17N CNC Horizontal Boring Machine**

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
	(a) Maximum noise level shall be 85 dB(A) at normal load condition, 1 M 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. Supplier to demonstrate compliance to noise level, if so required.	Vendor to confirm	
	(b) There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm	
	( c) 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	
	(d) No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm	
	(e) If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm	
	(f) Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to confirm	
<b>3.0</b>	<b>CHIP CONVEYOR :</b>		
3.1	A chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin to be provided on one end of the machine . Two Chips bins of appropriate size of Indian make, with wheels & handle for movement,should also be supplied	Vendor to specify	
3.2	Type of chip conveyor	Vendor to specify	
3.3	Width of conveyor	Vendor to specify	
3.4	Elevation of chip conveyor for chip bin	Vendor to specify	
3.5	Material of chip conveyor (to be rust resistant)	Vendor to specify	
3.6	Provision for smooth flow of chips to the conveyor.	Vendor to specify	
3.7	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor	Vendor to confirm	
3.8	Layout showing location of chip conveyor to be submitted.	Vendor to confirm	
<b>4.0</b>	<b>SERVO VOLTAGE STABILIZER:</b>		



### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
4.1	Indian make Oil / <b>Air</b> Cooled servo Controlled Voltage Stabilizer suitable for complete machine, its drives, controls, PLC etc. with no undesirable Harmonics in the stabiliser output.	Vendor to confirm	
4.2	Make. : NEEL / AEI / SERVO MAX	Vendor to specify	
4.3	Model & Rating	Vendor to specify	
4.4	Spares Package for the Voltage Stabiliser for 2 years working should also be offered with item wise list.	Vendor to specify	
4.5	Catalogue of the Voltage Stabiliser shall be submitted with the offer.	Vendor to furnish	
<b>5.0</b>	<b>ULTRA ISOLATION TRANSFORMER</b>		
5.1	Indian make Ultra Isolation Transformer suitable for complete machine , its drives, controls, PLC etc. shall be supplied	Vendor to confirm	
5.2	Make. : NEEL / AEI / SERVO MAX	Vendor to specify	
5.3	Model and Rating	Vendor to specify	
5.4	Spares Package for the Ultra Isolation Transformer for 2 years working should also be offered.	Vendor to specify	
5.5	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to furnish	
<b>6.0</b>	<b>TOOLINGS:</b>		
6.1	Complete Description of offered Tooling System	Vendor to specify	
6.2	Tooling suitable for ID Boring of T'ees with cutting parameters Cutting speed: 120-150mm/min Depth of cut:5 - 17 mm Cutting Feed: 0.2-0.8mm/rev	Vendor to furnish	
6.3	2 sets of Boring tools with sufficient qty of adopters etc as recommended by vendor for complete machining of prove out components (at BHEL works ) should be offered	Vendor to confirm	
<b>7.0</b>	<b>OPTIONAL ACCESSARIES</b>		
<b>7.1</b>	<b>TELE-DIAGNOSTIC SERVICE :</b>		

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
7.1.1	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.COM port for telediagnosics, 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.	Vendor to give as optional with separate quote	
<b>7.2</b>	<b>FAULT DIAGNOSTIC SYSTEM:</b>		
7.2.1	Supplier's own diagnostic system with required hardware and software should be supplied and installed on the CNC system. This should include customised auto-diagnostic system with supporting hardware and software which shows detailed cause and remedy for the fault on the display with full video diagnostic help for faults related to mechanical and electrical maintenance. On line ladder/STL display of PLC programme should be possible directly on screen or through laptop.	Vendor to give as optional with separate quote	
<b>7.3</b>	Help guide should be provided to use both diagnostic systems	Vendor to offer	
<b>8.0</b>	<b>LEVELING &amp; ANCHORING SYSTEM</b>		
8.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc shall be supplied for the Machine, Rotary Table, Floor Plates etc.	Vendor to offer	
<b>9.0</b>	<b>TOOLS FOR ERECTION, OPERATION &amp; MAINTENANCE :</b>		
9.1	Special 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. List of such tools should be submitted with offer	Vendor to offer	
9.2	Test mandrel for checking spindle run-out & alignment should be supplied	Vendor to offer	
<b>10.0</b>	<b>SPARES:</b>		

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
10.1	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: <b>(Unit Price of each item of spare should be offered)</b>	Vendor to offer	
	<b>a) Mechanical &amp; Hydraulic Spares:</b> All types of pumps, All types of Valves, All types of pressure switches / transducers, All types of filters, All types of seals	Vendor to offer	
	<b>b) Electrical /Electronic / CNC Spares:</b> All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, Scanning Heads for Linear Scales, MMC module, NCU module, Operator's panel with Display Unit, I/O Cards for PLC, Servo Motors for Feed Drives, Power Module & Control Cards for Main Drive as well as Feed Drives etc.	Vendor to offer	
10.2	All types of spares for total machine and accessories should be available for atleast 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	Vendor to offer	
10.3	Recommended set of spares for all attachments are to be offered with details.	Vendor to offer	
10.4	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 offer	
10.5	Spares listed in Annexure – 1 shall be offered.	Vendor to offer	
<b>10.0</b>	<b>DOCUMENTATION :</b>		
<b>10.1.0</b>	Set of Documents <b>to be submitted along with the Offer</b> for technical evaluation:		
10.1.1	General Lay-out of the machine with major and critical dimensions in line with the specification	Vendor to furnish	
10.1.2	General Assembly drawing of the machine with bill of materials and critical dimensions	Vendor to furnish	

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
10.1.3	Sub-assembly drawings with bill of materials and critical dimensions for all the major sub-assemblies in the machine.	Vendor to furnish	
10.1.4	List of bought out items with make and specification along with catalogues: Motors, Gear boxes, Controllers, Drives, Cylinders, Seals, CNC system, PLC, etc.	Vendor to furnish	
10.1.5	Hydraulic / Pneumatic Circuit with Bill of Materials giving specification and make of components used.	Vendor to furnish	
10.1.6	Lubrication Circuit with Bill of Materials giving specification and make of components used.	Vendor to furnish	
10.1.7	Electrical Circuit with Bill of Materials giving specification and make of components used.	Vendor to furnish	
10.1.8	Video images on CD /Hard copy of literature with photographs & drawings explaining the technical features.	Vendor to furnish	
<b>10.2.0</b>	Set of Documents <b>to be submitted after placement of order</b> for approval / verification before manufacturing:		
10.2.1	General Lay-out of the machine with major and critical dimensions in line with the specification	Vendor to confirm	
10.2.2	General Assembly drawing of the machine with bill of materials and critical dimensions	Vendor to confirm	
10.2.3	Sub-assembly drawings with bill of materials and critical dimensions for all the major sub-assemblies in the machine.	Vendor to confirm	
10.2.4	Hydraulic / Pneumatic Circuit with Bill of Materials giving specification and make of components used.	Vendor to confirm	
10.2.5	Lubrication Circuit with Bill of Materials giving specification and make of components used.	Vendor to confirm	
10.2.6	Electrical Circuit with Bill of Materials giving specification and make of components used.	Vendor to confirm	
10.2.7	Quality plan	Vendor to confirm	
<b>10.3.0</b>	Set of Documents <b>to be submitted along with machine:</b>		

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
10.3.1	<b>Three sets</b> of following documents as Hard copies and 1 set of all documents including bought out item catalogues – soft copy in CD in English Language should be supplied along with the machine.	Vendor to confirm	
10.3.2	<b>One set</b> of complete documents as Hard copy and complete documents in CD / Pen drive to be submitted during inspection at supplier's works for verification. This forms part of acceptance criteria at supplier's works.	Vendor to confirm	
10.3.3	Operating Manuals of Machine & CNC system	Vendor to confirm	
10.3.4	Programming Manuals for the machine & CNC system.	Vendor to confirm	
10.3.5	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical /PCB circuit diagrams/ Pneumatic/ Hydraulic Circuit Diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list / Bill of Materials giving complete specification and make of components.	Vendor to confirm	
10.3.6	Hydraulic / Pneumatic Circuit with Bill of Materials giving specification and make of components used. Function diagram of the Hydraulic / Pneumatic system to be provided with the circuit.	Vendor to confirm	
10.3.7	Lubrication Circuit with Bill of Materials giving specification and make of components used.	Vendor to confirm	
10.3.8	Electrical Circuit with Bill of Materials giving specification and make of components used.	Vendor to confirm	
10.3.9	Maintenance, Interface & Commissioning Manuals for for CNC system, spindle & feed drives.	Vendor to confirm	
10.3.10	Manufacturing drawings for all wearing components like bushes, pulleys, gears, clutch plates, etc.	Vendor to confirm	
10.3.11	Manufacturing drawings for all supplied tool holders, cutting tools, adapters, sleeves, fixtures etc.	Vendor to confirm	
10.3.12	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable highlighting the specific model used in the supplied	Vendor to confirm	
10.3.13	Detailed specification of all rubber items, hoses, fittings, etc. List of bearings, belts used to be provided.	Vendor to confirm	

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
10.3.14	Operating Manuals, Maintenance Manuals & Catalogues for all supplied Accessories including Voltage stabilizer, Isolation transformer, etc.	Vendor to confirm	
10.3.15	Complete Master List of parts used in the equipment.	Vendor to confirm	
10.3.16	Complete list of spares for equipments and accessories, along with item part no / specification / type / model, and name & address of the spare supplier shall be furnished.	Vendor to confirm	
10.3.17	PLC program printouts with comments in English.	Vendor to confirm	
10.3.18	PLC program on CD, NC data & PLC data on CD	Vendor to confirm	
10.3.19	Complete back up of hard disk on CD and clear written Instructions (3 copies) to take back up and reloading of a new hard disk.	Vendor to confirm	
<b>11.0</b>	<b>TRAINING:</b>		
11.1	The Vendor shall train Three BHEL's Engineers in Operation and Maintenance (Mechanical, Electrical/ Electronics and CNC System) of the Machine at Vendor's works for a period of 5 working days.	Vendor to confirm	
11.2	The Vendor shall impart training to BHEL's Machine Operators and Maintenance crew in Operation and Maintenance during commissioning of the Machine at BHEL works for 10 working days	Vendor to confirm	
11.3	Airfare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor to confirm	
11.4	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel	Vendor to confirm	
11.5	Vendor to quote for training on per man per day basis for training at vendor's work	Vendor to quote	
<b>12.0</b>	<b>FOUNDATION:</b>		

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
12.1	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. , whichever is earlier. Soil condition data will be furnished by BHEL alongwith the approval. Complete Foundation Design including details, like 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 and all accessories, including space requirement for Voltage Stabiliser, Isolation Transformer, , Chip Bin & any other accessory. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipment required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and grouting procedure etc. for foundation bolts of the machine.	Vendor to confirm	
<b>13.0</b>	<b>ERECTION &amp; COMMISSIONING</b>		
13.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control system & 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 confirm	
13.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.	Vendor to confirm	
13.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at <b>clause 17</b> (Machine Acceptance) shall form part of the commissioning activity.	Vendor to confirm	
13.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier.	Vendor to confirm	

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
13.5	Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to confirm	
13.6	Special equipments, like test mandrel, straight edge, dial indicators with magnmetic stands, etc. for checking run-out/taper & alignment should be supplied along with the machine.	Vendor to confirm	
13.7	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm	
13.8	All Cover Plates required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor. The plates should be sourced from India	Vendor to confirm	
13.9	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.	Vendor to confirm	
13.10	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to specify	
13.11	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to specify	
<b>14.0</b>	<b>ACCURACY TESTS:</b>		
<b>14.1</b>	<b>GEOMETRICAL ACCURACIES :</b>		
14.1.1	Geometrical Accuracy Tests shall be in accordance with ISO 3070 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.	Vendor to confirm	
14.1.2	All the above accuracies to be demonstrated to BHEL engineers during pre-acceptance tests at Suppliers works and during Erection & Commissioning at BHEL Works.	Vendor to confirm	
<b>14.2</b>	<b>MACHINE POSITIONING ACCURACIES &amp; REPEATABILITY:</b>		
14.2.1	Positioning Accuracy/Repeatability Tests as per VDI-DGQ/3441	Vendor to confirm	
14.2.2	Positioning Accuracy (Pa per 1000mm) for X,Y,Z,W axes	+/- 0.01 mm	



### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
14.2.3	Repeatability (Ps per 1000mm) for X,Y,Z,W axes	+/- 0.01 mm	
14.2.4	All the above accuracies to be demonstrated to BHEL engineers during pre-acceptance at Suppliers works and during Erection & Commissioning at BHEL Works	Vendor to confirm	
<b>15.0</b>	<b>AMBIENT CONDITIONS &amp; THERMAL STABILITY :</b>		
15.1	Total machine including CNC system and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. Power Supply: Voltage: 415 V - 10%, +10% Frequency: 50 Hz +3%, - 3% No. of phases = 3 (No neutral) Ambient Conditions: Temperature = 40 degree celsius Relative Humidity = 95% max. (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 confirm	
15.2	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. Max. temperature variation is up to 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 confirm	
15.3	Thermal Stability of the complete machine keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and trouble free operation of the machine should be ensured by vendor. (Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same should be furnished by Vendor)	Vendor to confirm	
15.4	The machine, including attachments and accessories, should be suitable for 24 hrs. continuous operation to its full capacity for 24 hour a day and 7 days a week throughout. Vendor to ensure and confirm the same.	Vendor to confirm	
<b>16.0</b>	<b>PROVEOUT OF BHEL COMPONENTS :</b>		

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
16.1	Details of proveout components are given in the Annexure 2 &3 . 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 should submit the CNC programs, setting schemes, process sheets, tooling layouts, time studies etc. in advance for the prove out components. Vendor shall be fully responsible for machining of proveout components as per drawing and time estimates provided by him 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.	Vendor to confirm and give offer with break up details.	
<b>17.0</b>	<b>MACHINE ACCEPTANCE: (Tests/Activities to be Performed by Vendor)</b>		
<b>17.1</b>	<b>Tests/Activities should be carried out at supplier's works on the machine before dispatch :</b>		
17.1.1	Geometrical Accuracy Tests as per test chart.	Vendor to confirm	
17.1.2	Positioning Accuracy/Repeatability Tests as per VDI-DGQ/3441	Vendor to confirm	
17.1.3	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 confirm	
17.1.4	Demonstration of all features of the machine, CNC system and all Accessories.	Vendor to confirm	
<b>17.2</b>	<b>Test to be carried out at BHEL works while commissioning the machine :</b>		
17.2.1	Geometrical Accuracy Tests as per test chart.	Vendor to confirm	
17.2.2	Positioning Accuracy/Repeatability Tests as per VDI-DGQ/3441	Vendor to confirm	
17.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to confirm	

### CABS-3-17N CNC Horizontal Boring Machine

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
17.2.4	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 confirm	
17.2.5	Demonstration of all features of the machine, CNC system & all accessories to the satisfaction of BHEL for their efficient and effective use.	Vendor to confirm	
17.2.6	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to confirm	
17.2.8	Proveout machining within the time estimates furnished by vendor.	Vendor to confirm	
17.2.10	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works. Training of CNC programmer, mechanical, electrical and electronics maintenance engineers shall be imparted for a period 10 days.	Vendor to confirm	
<b>18.0</b>	<b>PACKING:</b>		
18.1	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 despatched in containers, all small loose items shall be suitably packed in boxes.	Vendor to confirm	
<b>19.0</b>	<b>GUARANTEE :</b>		
19.1	12 months from the date of acceptance of the machine or 18 months from the date of supply whichever is earlier.	Vendor to confirm	
<b>20.0</b>	<b>GENERAL : The vendor should submit the following information:</b>		
20.1	Machine Model	Vendor to specify	
20.2	Total connected load (KVA):	Vendor to specify	
20.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify	
20.4	Painting of Machine/ Electrical Panels: RAL 6011 Apple Green (Polyurethane Paint)	Vendor to Confirm	
20.5	Total weight of the machine	Vendor to specify	
20.6	Weight of heaviest part of machine	Vendor to specify	

## CABS-3-17N CNC Horizontal Boring Machine

[illegible]

### **Annexure- 1 SPARES LIST**

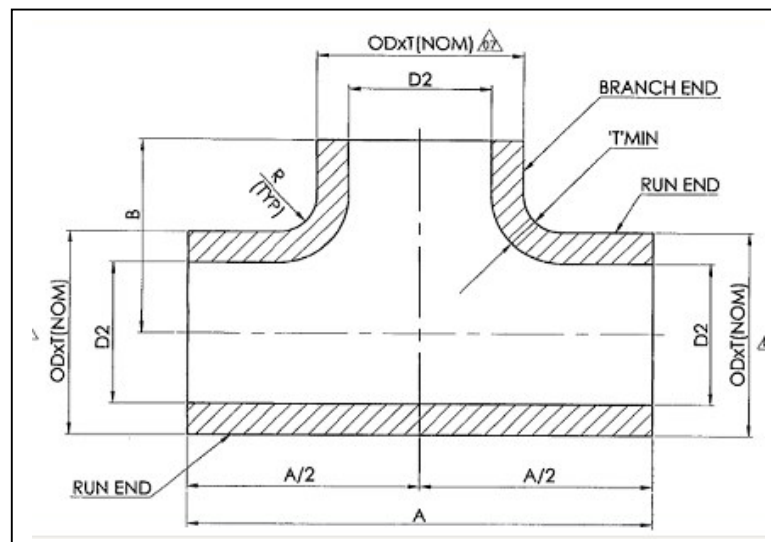
<b>I</b>	<b>MECHANICAL SPARES</b>	
1	Set of gaskets and O rings (for the entire machine) – list to be provided with part nos. at the time of drawing approval stage.	1 Set
2	Ball screw for w axis	1 No.
3	Drive belts, Feed belts and Toothed belts (1 Set means – 1 No. in each type available in the entire machine)	1 Set
4	Hydraulic pumps (1 Set means – 1 No. of each type of pump available in the hydraulic system)	1 Set
5	Set of contactors, relays and limit switches (1 Set means – 1 No. in each type available in the entire machine)	1 Set
6	Drive pinion for table rotation	1 No.
7	Hydraulic Valves (1 Set means – 1 No. in each type available in the entire machine hydraulic system)	1 Set
8	Hydraulic Pressure switches (1 Set means – 1 No. in each type available in the entire machine)	1 Set
11	Filter elements (1 Set means – 1 No. in each type available in the entire machine)	2 Sets
12	Hydraulic cylinder Seal kits (1 Set means – complete seal kit including O-rings for each type cylinder available in the entire machine) – list to be provided with part nos. at the time of drawing approval stage.	1 Set
13	Hydraulic hoses (1 Set means – 1 No. in each type)	1 Set

	available in the entire machine)	
14	Lubrication pump	1 No.
15	Lubrication – metering cartridges – 2 Nos. of each type	1 Set
16	Spindle bearings (1 Set means – complete set of bearings available in the spindle assembly)	1 Set
<b>II</b>	<b>ELECTRICAL, ELECTRONIC AND CNC SYSTEM SPARES</b>	
1	Proximity switches with suitable proximity switch cord & Limit switches (1 Set means – 1 No. in each type available in the entire machine)	1 Set
2	Push buttons (1 Set means – 1 No. in each type available in the entire machine)	2 Sets
3	Indicating lamps (1 Set means – 1 No. in each type available in the entire machine)	3 Sets
4	Semiconductor fuses (1 Set means – 1 No. in each type available in the entire machine)	2 Sets
5	Special fuses (1 Set means – 1 No. in each type available in the entire machine)	2 Sets
6	Circuit breakers (1 Set means – 1 No. in each type available in the entire machine)	1 Set
7	Encoders (1 Set means – 1 No. in each type available in the entire machine)	1 Set.
8	CNC System spares (list to be provided by vendor along with offer)	1 Set.
9	Servo motor (Model to be provided by vendor)	1 No.

10	Main spindle drive	1 No.
11	Axis drives (1 Set means – 1 No. in each type available in the entire machine)	1 Set
12	Scanner head for Y- axis linear scale	1 No.

# CNC HEADER PIPE/FITTINGS BORING AND EDGE PREPARATION MACHINE

## Equal 'T'EES



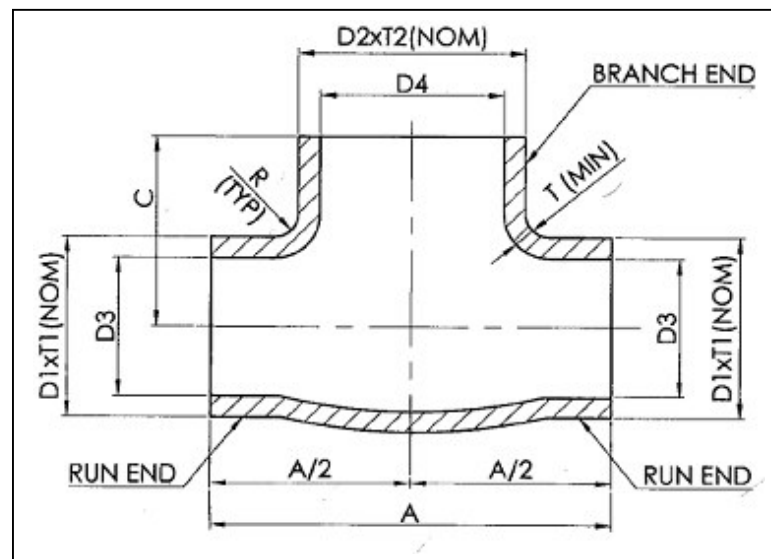
Annexure - 2  
Drg No. CABS-1-24-01  
BHEL, Tiruchirappalli

Sl. No	OD, mm	T (Nom) Thickness, mm	(A) Length, mm (To which boring to be done)	(B) Length, mm	Available Minimum ID before boring, mm	D2 - ID required after boring in, mm	MATERIALS
1	219.1	18 to 40	340	170	90 to 450	= [OD - 2 x T (Nom)]	SA234 WPB, WPC SA234 WP11, WP12, SA 234 WP22, WP91
2	244.5	43	600	200			
3	273	32 to 46	635	215			
4	323.9	36 to 46	710	255			
5	355.6	45 to 59	760	280			
6	368	28 to 70	760,820	280			
7	406.4	51 to 86	870	305			
8	457.2	25 to 80	1090	338			
9	508	28 to 137	1090,1100	385			
10	558.8	28 to 40	1100	425			



## CNC HEADER PIPE/FITTINGS BORING AND EDGE PREPARATION MACHINE

### Unequal 'T'ees



Annexure - 2  
Drg No. CABS-1-24-02  
BHEL, Tiruchirappalli

Sl.No	D1/D2, mm	T1 & T2 (Nom) Thickness mm	(A) Length, mm (To which boring to be done)	(C) Length, mm	Available Minimum ID Before Boring mm	D3 - ID required after boring on RUN END and D4 - ID required on Branch End, mm	MATERIALS
1	219.1/273	34	990	216	90 TO 450	D3= [D1 - 2 x T1 (Nom)] & D4= [D2 - 2 x T2 (Nom)]	SA234 WPB, WPC SA234 WP11, WP12 SA234 WP22, WP91
2	273/323.9	34, 37	990	254			
3	323.9/368	57, 69	790	280			
4	323.9/406.4	51 to 80	870	310			
5	368/406.4	62	870	310			
6	406.4/508	68 to 86	1100	385			
7	406.4/457.2	68	1090	338			
8	457.2/508	80	1200	381			
9	457.2/558.8	28	1230	415			
10	508/558.8	28	1230	425			

## ANNEXURE 3

### TYPICAL FORMED FITTINGS - PHOTOS



1. Ø219mm Formed 'T' Fittings



2. Ø219mm Formed 'T' Fittings





**3. One end of 'T' fitting - Closer View**



**4. Ø 273mm 'T' fitting**

## ANNEXURE 3

### TYPICAL FORMED FITTINGS - PHOTOS



5. Ø 219mm 'T' fitting



6. Ø 273mm 'T' fitting



## ANNEXURE 3

### TYPICAL FORMED FITTINGS - PHOTOS



**7. Unequal 'T' fitting**



**8. Run end of Unequal 'T' fitting**



**9. Branch end of Unequal 'T'**