An ISO 9001 Company

Bharat Heavy Electricals Limited
(High Pressure Boiler Plant**)**
Tiruchirappalli – 620014, TAMIL NADU, INDIA
MATERIALS MANAGEMENT / CAPITAL EQUIPMENT

ENQUIRY	Phone: +91 431 257 70 49 Fax : +91 431 252 07 19 Email : csguna@bheltry.co.in Web : www.bhel.com

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620900022	**21.01.2009**	**20.02.2009**
You are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order			

Item	**Description**	**Quantity**	**Delivery (Item required at BHEL on)**
10	CNC Horizontal Boring Machine as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	01 No.	25.03.2010

BHEL commercial terms & conditions with Price Bid and Bank Guarantee formats 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 "2620900022".

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

CNC HORIZONTAL BORING MACHINE – SPINDLE Ø 160

SECTION – I : QUALIFYING CRITERIA

The BIDDER has to compulsorily meet the following requirements to get qualified for considering the technical offer for the CNC HORIZONTAL BORING MACHINE – SPINDLE Ø 160

S. No.	REQUIREMENTS	VENDOR's RESPONSE
1	Only those vendors (**OEMs**), who have supplied and commissioned at least **ONE CNC TRAVELLING COLUMN FLOOR TYPE HORIZONTAL BORING MACHINE with Spindle size 160 mm or higher and minimum Spindle+ Ram travel (800 mm+1000mm)** in the past ten years (from the date of opening of Tender) and such machine is presently working satisfactorily for more than one year after commissioning (from the date of opening of Tender) should quote. However, if such machine had already been supplied to BHEL, then that machine should be presently working satisfactorily for more than six months after its commissioning and acceptance (from the date of opening of Tender).	
The vendor should submit following information where similar machine has been supplied for qualification of their offer.		
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	Application for which the machine is supplied	
1.6	Performance certificate from the customer regarding satisfactory performance of machine supplied to them.	
2.0	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.	

SECTION – I I

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

S. No.	REQUIREMENTS	VENDOR's RESPONSE
3.0	The BIDDER/VENDOR to furnish Reference List of Customers, with full address, details of contact person, where CNC HORIZONTAL BORING MACHINES have been supplied in the past.	
4.0	Details of CNC HORIZONTAL BORING MACHINES supplied to other BHEL units, if any. (Year of commissioning, Spindle size of machine, Spindle motor power)	
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:

S. No.	PARTICULARS	VENDOR'S RESPONSE
7.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS. 1. Technical Offer [with PART A & PART B] 2. Commercial and Price Bid.	
8.0	The Technical Offer shall contain a comparative statement of Technical **Specifications demanded by BHEL** and **Offer Details submitted by the Bidder**, 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.	
11.0	For obtaining the performance certificate from the customer, a suggestive format is provided in **SECTION – IV**	

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 Size & Travel b) Spindle Power c) Ram Size & travel d) Column Travel e) Rotary Table Size & Capacity f) Special Attachments g) CNC System	
6. Performance of the Machine (Strike off whichever is not applicable)		Best in the market **/** Satisfactory **/** Good **/** Average **/** Not Satisfactory
7. Any Other remarks		
Date:		Signature & Seal of the Authority Issuing the Performance Certificate

PART-B TECHNICAL SPECIFICATION FOR FLOOR TYPE CNC HORIZONTAL BORING MACHINE D160 mm

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

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
1.0	**PURPOSE & WORKPIECE MATERIAL**		
1.1	Purpose: (Operations/Jobs involved)	Machining operation details as given in Annexure 1,1A,1B,1C,1D & 1E	
1.2	Work Piece Material: (Material detail, Hardness etc.)	Quenched & Tempered steel(Hardness 180-210 BHN) ,SA 321 SS,Titanium SB 265 Gr.9&Carbon Steel.	
2.0	**SPECIFICATION:**		
2.1	**MACHINE CONFIGURATION:**		
2.2	**HEAD STOCK**		
2.2.1	Boring spindle diameter	160 mm	
2.2.2	Milling spindle diameter	–	
2.2.3	Ram Cross section (LxB)	400mmx400mm (Min.)	
2.2.4	Spindle drive power (AC Continuous Rating - S1)	60 kW (Min.)	
2.2.5	Spindle speed (Infinitely variable)	1-2000 rpm	
2.2.6	No. of speed ranges	3	
2.2.7	Max torque on the boring spindle (Nm)	Vendor to specify	
2.2.8	Max torque on the milling spindle (Nm)	Vendor to specify	
2.2.9	Spindle taper	ISO 50	
2.2.10	Torque-Power-Speed characteristics of the spindle system	Vendor to specify	
2.2.11	Oriented Spindle Stop (Any position)	Vendor to confirm	
2.2.12	Spindle Cooling System	Vendor to specify	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.3	**COLUMN:**		
2.3.1	Column longitudinal travel - X-Axis (Inclusive of AAC requirement)	10000 mm	
2.3.2	X-axis feed rate (Infinitely variable)	0.5-6000 mm/min	
2.3.3	X-axis rapid traverse rate	6000 mm/min	
2.3.4	Axis Resolution	0.001 mm	
2.4	**HEADSTOCK TRAVERSE ON COLUMN:**		
2.4.1	Headstock vertical travel (Y-Axis)	3500 mm	
2.4.2	Traverse Range (w.r.t floor plate)	400 mm (Min) to 3900 mm(max.)	
2.4.3	Y-axis feed rate (Infinitely variable)	0.5-6000 mm/min	
2.4.4	Y-axis rapid traverse rate	6000 mm/min	
2.4.5	Axis Resolution	0.001 mm	
2.5	**RAM/ SPINDLE TRAVERSE:**		
2.5.1	Boring spindle axial travel (W-Axis)	1000 mm	
2.5.2	Ram axial travel (Z-Axis)	1250 mm	
2.5.3	Spindle + Ram travel (W+Z)	2250 mm	
2.5.4	Lowest spindle position from floor plate.	400 mm	
2.5.5	Boring Spindle axis feed rate (Infinitely variable)	0.5-6000 mm/min	
2.5.6	Boring Spindle axis rapid traverse rate	6000 mm/min	
2.5.7	Ram axis feed rate (Infinitely variable)	0.5-6000 mm/min	
2.5.8	Ram axis rapid traverse rate	6000 mm/min	
2.5.9	Axis Resolution	0.001 mm	
2.5.10	Spindle & Ram Axes should be independently programmable with Independent Drives and Feed back system.	Vendor to Confirm	
2.6	**FEED AND DRIVE SYSTEM:**		
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 & Ram (Z) axes: Heidenhain linear scales.	Vendor to specify	

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	Feed back system for Spindle (W) Axis: Heidenhain Rotary Encoders	Vendor to confirm	
2.6.6	**Type of power transmission:**1. Pre-loaded backlash free Hydrostatic worm Or Pre-loaded backlash free double pinion & rack drive for X-axis. 2. Backlash free re-circulating ball screw with Pre-loaded double nut for all other axes. (Complete description of the aforesaid including diameter of Ball Screw for each axis, to be submitted with the offer)	Vendor to specify	
2.6.7	Mechanism for locking X, Y & Z axis	Vendor to specify	
2.6.8	Maximum thrust rating of all axes.	Vendor to specify	
2.7	**MACHINE GUIDEWAYS:**		
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	**Metallic Telescopic Covers** 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	
2.8	**ROTARY TABLE :**		
2.8.1	Table size (LxB)	2500mmx3000 mm	
2.8.2	Maximum load carrying capacity (Tons)	30 T	
2.8.3	Eccentric Loading permissible	Vendor to specify	
2.8.4	Table rotation (B-axis)	360,000 indexing positions	
2.8.5	Accuracy of Rotary axis: (See Clause 18)	Vendor to specify	
2.8.6	Maximum machining torque on B-axis (N-m)	Vendor to specify	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.8.7	Maximum clamping torque on B-axis (N-m)	Vendor to specify	
2.8.8	Feed rate for Table Rotary Axis. Infinitely variable	0.001-1.2 rpm	
2.8.9	Rapid Traverse Rate for Rotary Axis	1.2 rpm	
2.8.10	Size of T-slots	For M24 studs	
2.8.11	T-slots pitch (as per DIN standard)	Vendor to specify	
2.8.12	Central slot tolerance	H7	
2.8.13	Perpendicular Lateral slot size/ tolerance	Vendor to specify	
2.8.14	Size of bore at the center.	100H7	
2.8.15	Linear traverse	2000 mm	
2.8.16	Feed Force on Linear Axis	Vendor to specify	
2.8.17	Feed Rate for Linear axis (mm/min Infinitely variable)	0.5-6000 mm/min	
2.8.18	Rapid Traverse rate for Linear axis (mm/ min)	6000 mm/min	
2.8.19	Minimum distance between ram face and table face.	Vendor to specify	
2.8.20	**Walk on type Metallic Telescopic Covers** of stainless steel material are to be supplied with wipers for Table Linear axis. Joints of telescopic covers should be so sealed to avoid mixing of coolant and Hydrostatic oil.	Vendor to confirm	
2.8.21	Feed back devices :	Vendor to confirm	
	a) Heidenhain rotary encoder for B-Axis		
	b) Heidenhain Electronic Scale for linear axis.	Cleaning if required -Vendor to specify	
2.8.22	Feed drives : Fanuc/Siemens digital AC Servo drives. Details of Make, Model, Type etc. to be submitted by Vendor.Synchronisation with the main axes of the machineto be ensured.	Vendor to Confirm	
2.8.23	Loading chart of the table to be submitted.	Vendor to specify	
2.8.24	Mechanism for locking/ clamping of Table axes	Vendor to provide details	
2.8.25	Location of the Table	X axis start/end	
2.8.26	Spindle should reach extreme end of rotary table	Vendor to Confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.8.27	Level of Rotary table should be such that it can freely rotate without interfering with the floor plates.	Vendor to confirm	
2.8.28	Hydrostatic Guideways for Table Rotation	Vendor to Confirm	
2.8.29	Hydrostatic Guideways for Table Linear Traverse	Vendor to Confirm	
2.8.30	4 x 90 deg Precision Positioning (Details to be submitted.)	Vendor to specify	
2.9	**FLOOR PLATE:**		
2.9.1	Floor Plate Area (LxB)	12000x4500mm	
2.9.2	Number of Floor Plates	Vendor to specify	
2.9.3	Size of each Floor Plate	Vendor to specify	
2.9.4	Load Bearing Capacity, Tons/Sq. Meter	15	
2.9.5	Thickness	Vendor to specify	
2.9.6	T-Slot Size	For M24 studs	
2.9.7	T-Slots Pitch as per DIN standard	Vendor to confirm	
2.9.8	Direction of Tee Slots in the Floor Plates: Mutually perpendicular	Vendor to Confirm	
2.10	**CONSTRUCTION:**		
2.10.1	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	
2.10.2	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 furnish	
2.10.3	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 posssible cutters/ attachments offered. Details of the offered system should be submitted with offer.	Vendor to furnish	
2.10.4	Head Stock Counterbalancing System. (Details of the offered system to be submitted)	Vendor to furnish	
2.11	**OPERATOR'S PLATFORM:**		

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2.11.1	Operator's platform of sufficient load carrying capacity to be provided. The platform shall be Headstock Mounted Type or with Independent Motorised Vertical Movement for total Vertical Traverse as well as forward stroke of sufficient length . Push Button switches are to be provided on the Operator's Platform at suitable location for motorised movement. A 15 Amp 230 V Plug Point with ON/ OFF switch is also to be provided on the Platform.	Vendor to furnish	
2.11.2	Horizontal movement of complete Platform.	1000mm	
2.11.3	Weight carrying Capacity of the Platform.	Vendor to specify	
2.11.4	Minimum Height of Platform from Shop Floor.	Vendor to specify	
2.11.5	Splash / Chip guards on operator platform for protection of operator, operator's panel and to avoid spillage of coolant & chips on operator's platform.	Vendor to furnish	
2.12	**OPERATION AND CONTROL SYSTEM:**		
2.12.1	**OPERATOR'S PANEL:**		
2.12.1.1	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	
2.12.1.2	An auxiliary pendant, which can be taken to the table for job setting and similar other purposes, sould be provided.	Vendor to furnish	
2.12.2	**CNC SYSTEM & FEATURES :**		
2.12.2.1	Make :	Siemens/Fanuc	
2.12.2.2	Type : Open Architecture system	Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.12.2.3	Latest version, as available at the time of ordering, should be supplied.	Vendor to specify	
2.12.2.4	Details of Standard features.	Vendor to specify	
2.12.2.5	Details of optional features.	Vendor to specify	
2.12.2.6	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	
2.12.2.7	Provision for automatic safe shut down of CNC Control in case of Power Failure	Vendor to specify	
2.12.3	**MANUAL CONTROL :**		
	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	
2.12.4	**HAND HELD UNIT:**		
2.12.4.1	Hand Held unit, Type B-MPI of Siemens make or equivalent alongwith sufficient length of interfacing cable is to be offered with complete details.	Vendor to Confirm	
2.12.5	**UPS FOR CNC SYSTEM:**		
2.12.5.1	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	
2.13	**MACHINE LIGHTS:**		

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.13.1	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	
2.13.2	A magnetic base portable spot light with sufficiently long cable should also be provided.	Vendor to specify	
2.13.3	Any lights required in the foundation/ pit area shall also be foreseen and supplied by the vendor.	Vendor to specify	
2.13.4	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to specify	
2.13.5	Flashing / rotary type End of Cutting and Program Stop Light.	Vendor to Confirm	
2.14	**AIR CONDITIONERS:**		
2.14 .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	
2.15	**HYDRAULIC SYSTEM :**		
2.15.1	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	
2.15.2	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	
2.15.3	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	
2.15.4	Al 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	

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2.15.5	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	
2.15.6	The power pack should be tropicalised for Indian conditions-for 40 deg C ambient temperature.Suitable oil cooling arrangement preferably with oil chiller & Heat Exchanger,considering 3 shift operation and to maintain oil temperature within 50 deg C.	Vendor to specify	
2.15.7	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	
2.15.8	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	
2.15.9	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	
2.15.10	Suficient number of filter units for the required level of cleanliness is to be provided with clog indicators and preferably with reusable type of filter elements.As an option,a centrifuge/electrostatic filter unit for oil,dust and moisture separation shall be offered.	Vendor to specify	
2.15.11	The pipelines to be painted with standard colours.The supplier shall provide the hydraulic circuit with bill of materils giving complete purchase specifications for each item.	Vendor to specify	
2.15.12	Documentation:Hydraulic circuits,functional diagram,list of O-rings,seals and wipers.Pump layout & piping layout,cross sectional assembly drawing for allcylinderswith all details.Detailed catalogues for all compononents in the system.	Vendor to specify	

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2.15.13	First filling of all required Oils & Grease etc. Should be supplied by vendor. Oil grade: ISO VG46 or 68 Grease: Servo gem grade 2 (prefered) Indigenous (Indian) source or Indian equivalent and specifications of oils/ greases are also to be provided by the vendor.		
2.16	**COOLANT SYSTEM :**		
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 provided on the Operator's panel as well.	Vendor to specify	
	a) Recirculating Type Flood Coolant System.	Vendor to specify	
	b) High Pressure Coolant thru Spindle(for Delta drilling application)	Vendor to specify	
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 confirm	
2.16.3	Coolant collection and recirculation system should be leakproof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc.	Vendor to confirm	
2.16.4	Coolant Filteration System: Recirculating type coolant system with Cartridge Type Filtration System and magnetic separator.	Vendor to confirm	
2.16.5	Coolant Flow Diagram showing filters, pumps, valves, tanks etc. to be submitted with the offer.	Vendor to furnish	
2.16.6	Pressure & rate of flow of coolant for different variants should be furnished in the offer. The Pressure should be sufficient for the coolant to reach the tool tip at full pressure.	Vendor to furnish	
2.16.7	Coolant Tank Capacity (min)	2000 Litres	
2.16.8	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 furnish	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
2.16.9	Coolant pump & motor details for all variants of coolant system are to be submitted with the offer.	Vendor to furnish	
2.16.10	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to confirm	
2.17	**ELECTRICAL SYSTEM :**		
2.17.1	415V + 10% / -10%, 50HZ +/- 1.5 HZ, 3 Phase AC (3 wire system with out 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, shall be the resposibility 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	
2.17.2	**Tropicalisation:** All electrical / electronic equipment shall be tropicalized. All control cables should be of copper.	Vendor to confirm	
2.17.3	All electrical & electronic control cabinets & panels should be dust and vermin proof and shall have IP 54 protection.	Vendor to confirm	
2.17.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm	
2.17.5	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	
2.17.6	Motors shall conform to IEC Standards	Vendor to confirm	
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 confirm	
2.17.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	

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2.17.9	In-cycle hour counter with reset facility is to be included in the offer.	Vendor to confirm	
2.18	**SAFETY ARRANGEMENTS:**	Vendor to confirm	
	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.		
	2. A detailed list of all alarms / indications provided on machine should be submitted by the supplier.		
	3. All the pipes, cables etc. on the machine should be well supported and protected.		
	4. All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.		
	5. Emergency Switches at suitable locations as per International Norms are to be provided.		
	6. Oil & water pipe lines should not run with electrical cable in the same tray / trench.		
	7. Safety Lights at both ends of moving column (preferably Flashing during X-travel).		
2.19	**ENVIRONMENTAL PERFORMANCE OF THE MACHINE :**	Vendor to confirm	
	The Machine shall conform to following factors related to environment :		
	(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	

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	(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	
3.0	**CHIP CONVEYOR :**		
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	
4.0	**SERVO VOLTAGE STABILIZER:**		
4.1	Indian make Oil / **Air** 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	M/s NEEL or other make acceptable to BHEL.	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
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	
5.0	**ULTRA ISOLATION TRANSFORMER**		
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	M/s NEEL or other make acceptable to BHEL.	
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	
6.0	**PNEUMATIC SYSTEM:**		
6.1.	COMPRESSED AIR POINTS: BHEL will provide compressed air at 60 to 70 psi pressure (which is not 100 % dry) at one point near the machine. The vendor shall indicate the inlet pipe size and location for compressed air in the layout drawing of the machine.	Vendor to confirm and specify.	
6.2.	Vendor to provide required pressure booster and suitable air drier (refrigerant type / electrical heater type) to maintain the air quality as per requirement of the machine.	Vendor to confirm and provide the details of the air control equipments used.	
7.0	**TOOLINGS:**		
7.1	Complete Description of offered Tooling System	Vendor to specify	
7.2	All cutting tools, tool holders, arbors, boring bars, clamping elements,inserts etc recommended for machining of prove out components shall be listed out & quoted.	Vendor to furnish	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
8.0	**MEASURING SYSTEMS:**		
8.1	Automatic job measuring system, comprising of Spindle Mounted Renishaw make Wireless system, with measuring cycles, calibration system and all types of probes/ stylii required for measuring all machined dimensions of the prove-out components. Vendor to furnish detailed description of the system along with offer.	Vendor to offer	
8.2	Automatic Tool Offset measuring system with measuring cycles, calibtration system etc suitable for all types of tools recommended for prove-out components. Vendor to furnish detailed description of the system along with offer.	Vendor to offer	
9.0	**DIAGNOSTIC SYSTEM:**		
9.1	**TELE-DIAGNOSTIC SERVICE :**		
9.1.1	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 telediagnostics, 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	
9.2	**FAULT DIAGNOSTIC SYSTEM:**		
9.2.1	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 offer	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
9.3	Help guide should be provided to use both diagnostic systems	Vendor to offer	
10.0	**LEVELING & ANCHORING SYSTEM**		
10.1	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	
11.0	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE :**		
11.1	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	
11.2	Test mandrel for checking spindle run-out & alignment should be supplied	Vendor to offer	
12.0	**ACCESSORIES:**		
12.1	**AUTOMATIC ATTACHMENT CHANGER (AAC):**		
12.1.1	All attachments shall be suitabe for loading / unloading through AAC	Vendor to specify	
12.1.2	No. of storage positions	Vendor to specify	
12.1.3	Location of the attachment changer	End of Table	
12.1.4	Mounting plates as required for attachments should be supplied	Vendor to confirm	
12.1.5	Maximum Permissible Weight on each Position.	Vendor to specify	
12.1.6	Maximum Permissible Weight on Complete AAC.	Vendor to specify	
12.1.7	Additional Longitudinal Traverse of X-axis required to accommodate and use of AAC beyond the specified X-axis traverse shall be seperately offered by the vendor.	Vendor to confirm	
12.2	**CNC UNIVERSAL MILLING HEAD**		
12.2.1	Power	25 kW	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
12.2.2	Max torque	1000 N-m	
12.2.3	Speed Range (Infinitely Variable)	0-1600	
12.2.4	Speed ratio (1:1 between spindle of Machine and Head)	Vendor to specify	
12.2.5	Spindle taper	ISO 50	
12.2.6	Traverse Range	360°	
12.2.7	Resolution	1°	
12.2.8	Power-Torque-Speed characteristic diagram to be submitted	Vendor to confirm	
12.2.9	Weight of the head	Vendor to specify	
12.2.10	Coolant system: Internal (thru spindle) **&** External coolant with requisite	Vendor to Confirm	
12.2.11	Pull Stud for mounting the Head and for mounting the Tools in the taper of the	Vendor to Confirm	
12.3	**CNC BORING & FACING HEAD:**		
12.3.1	Make and Model No	Vendor to specify	
12.3.2	Head body diameter	500 mm	
12.3.3	Speed Range	Vendor	
12.3.4	Radial axis independent positioning	Vendor	
12.3.5	Slide stroke	Vendor	
12.3.6	Slide feed rate	Vendor	
12.3.7	Machining range in Boring for internal diameter	1000 mm	
12.3.8	Accuracy of Bore Size (Bore Tolerance), Surface Finish of bores and Facial and Radial Run outs.	H7 Size, Ra 1.6 surface finish,0.02 mm run out.	
12.3.9	Diameter range for machining external diameter indicating max. depth	1000 mm.Vendor to furnish maximum depth.	
12.3.10	Machining range in facing indicating maximum depth.	1000 mm.Vendor to furnish maximum depth.	
12.3.11	The U-axis in the Boring / Facing head should also be controlled by the main CNC system. Suitable synchronisation to be incorporated.	Vendor to Confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
12.3.12	Maximum boring depth without entry of Boring Head.	Vendor	
12.3.13	Maximum torque	Vendor	
12.3.14	Maximum cutting force in boring	Vendor	
12.3.15	Maximum cutting force in facing	Vendor	
12.3.16	Slide Counter Balance mechanism	Vendor	
12.3.17	Item wise details of complete set of standard Tool Holders and Tools, available with the offered Head, are to be submitted with the offer. Complete details of any special arrangement offered to meet the specified requirement of Boring range are also to be submitted.	Vendor	
12.3.18	Tool Holder with BT 50 taper for presetting of the Tools for offered Boring and Facing Head is to be offered with complete details.	Vendor	
12.3.19	Catalogue of the offered Head is to be submitted with the offer.	Vendor	
12.3.20	Coolant system: External coolant with requisite flexible pipes on its snout is to be provided. The arrangement for its supply may be made through the coolant supply system available on the Head Stock.	Vendor	
13.0	**SPARES:**		
13.1	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: **(Unit Price of each item of spare should be offered)**	Vendor (Indentor to identify spares to be procured along with the machine)	
	a) Mechanical & Hydraulic Spares: All types of pumps, All types of Valves, All types of pressure switches / transducers, All types of filters, All types of seals	Vendor	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
	b) Electrical /Electronic / CNC Spares: 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	
13.2	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	
13.3	Recommended set of spares for all attachments are to be offered with details.	Vendor	
13.4	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	
14.0	**DOCUMENTATION :**	Vendor	
14.1	Operating manuals of Machine & CNC system		
14.2	Programming Manuals of Machine & CNC system		
14.3	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Coolant / Hydraulic circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also. The hydraulic / pneumatic / electrical circuits to be supplied with bill of materials giving item description, part no., complete maker's specification and make of all the components in it.		
14.4	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.		
14.5	Manufacturing drawings for all supplied tool holders, coolant connections, tailstock center, adapters, sleeves, fixtures etc.		
14.6	Catalogues, O&M Manuals of all bought out items including drawings,wherever applicable.		

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
14.7	Detailed specification of all rubber items and hydraulic/lube fittings		
14.8	Operating Manuals, Maintenance Manuals & Catalogues for supplied Automatic Tool Offset & Job Measuring Systems, Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.		
14.9	PLC program print-outs with comments in English.		
14.10	PLC program on CD, CNC data & PLC data on CD.		
14.11	Complete back-up of hard disk on GHOST CD and clear written Instructions (3 copies) to take back-up and reloading of a new hard disk.		
14.12	Complete Master List of parts used in the machine shall be submitted by the vendor.		
14.13	One additional set of all the above documentation on CD ROM, wherever possible.		
15.0	**TRAINING:**		
15.1	BHEL Persons should be trained at supplier's Works for mutually agreed period in the area of (a) CNC Part Programming/ Technology, Use of all CNC Features, Programming for Measuring Systems & supplied accessories etc. (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments (d) Operation of the machine & other supplied equipments.	Vendor	
15.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor	
15.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor	
15.4	Vendor to quote for training on man / week basis	Vendor	
15.5	Vendor should commit to organize and quote for training of Electronics Engineer and Programmer at the CNC System Manufacturer's works for advanced features and specialised training if so required by BHEL	Vendor	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
16.0	**FOUNDATION:**		
16.1	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, Air Compressor, 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 procedureetc. for foundation bolts of the machine.	Vendor	
17.0	**ERECTION & COMMISSIONING**		
17.1	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.		
17.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the vendor.		
17.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at **clause 21** (Machine Acceptance) shall form part of the commissioning activity.		

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
17.4	Test mandrel for checking run-out/taper & alignment should be supplied	0.015 for X,Y,Z, W & V Axes 0.030 for W Axis	
17.5	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.		
17.6	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	0.010 for X,Y,Z,W & V Axes 0.020 for W Axis	
17.7	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	6"	
17.8	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 specify	
17.9	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to specify	
17.10	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to confirm	
18.0	**ACCURACY TESTS:**		
18.1	**GEOMETRICAL ACCURACIES :**		
18.1.1	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	
18.1.2	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	
18.2	**MACHINE POSITIONING ACCURACIES & REPEATABILITY:**		

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
18.2.1	Positioning Accuracy (Pa per 1000mm) for X,Y,Z,W,U & V axes	+/- 0.016 mm	
18.2.2	Positioning Accuracy Pa for B-axis	+/- 3.6 sec	
18.2.3	Repeatability (Ps per 1000mm) for X,Y,Z,W,U & V axes	+/- 0.008 mm	
18.2.4	Repeatability Ps B axis	+/- 3.6 sec	
18.2.5	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	
19.0	**AMBIENT CONDITIONS & THERMAL STABILITY :**		
19.1	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	
19.2	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	
19.2	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	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
19.3	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	
20.0	**PROVEOUT OF BHEL COMPONENTS :**		
20.1	Drawings of proveout components are given in the Annexure 1 ,1A to1E. Vendor to submit preliminary process, time study & tool list recommended by them along with the offer. Change in process/tools may be mutually discussed and agreed. 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 technica discussions.	Vendor to confirm and give offer with break up details.	
20.2	During proveout, all tools shall be set by using supplied Tool Offset Measuring System and final job inspection shall be done by supplied Job Measuring System. Vendor shall be responsible for any deviation/rejection in proveout component 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.	Vendor to confirm	
21.0	**MACHINE ACCEPTANCE: (Tests/Activities to be Performed by Vendor)**		

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
21.1	**Tests/Activities should be carried out at supplier's works on the machine before dispatch :**		
21.1.1	Geometrical Accuracy Tests as per test chart.	Vendor to confirm	
21.1.2	Positioning Accuracy/Repeatability Tests as per VDI-DGQ/3441	Vendor to confirm	
21.1.3	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	
21.1.4	Demonstration of all features of the machine, CNC system and all Accessories.	Vendor to confirm	
21.1.5	Machining of **NAS Test Piece.** Vendor to supply test piece and tooling for it's machining..	Vendor to confirm	
21.2	**Test to be carried out at BHEL works while commissioning the machine :**		
21.2.1	Geometrical Accuracy Tests as per test chart.	Vendor to confirm	
21.2.2	Positioning Accuracy/Repeatability Tests as per VDI-DGQ/3441	Vendor to confirm	
21.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to 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 confirm	
21.2.5	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	
21.2.6	Demostration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to confirm	
21.2.7	Machining of **NAS Test Piece.** Vendor to supply test piece and tooling for it's machining..	Vendor to confirm	
21.2.8	Proveout machining within the time estimates furnished by vendor.	Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
21.2.9	Two weeks supervision of independent operation of machine by BHEL after job proveout.	Vendor to 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. Training of CNC programmer, mechanical, electrical and electronics maintenance engineers shall be imparted for a period specified by the vendor.	Vendor to confirm	
22.0	**PACKING:**		
22.1	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	
23.0	**GUARANTEE :**		
23.1	24 months from the date of acceptance of the machine.	Vendor to confirm	
24.0	**GENERAL : The vendor should submit the following information:**		
24.1	Machine Model	Vendor to specify	
24.2	Total connected load (KVA):	Vendor to specify	
24.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify	
24.4	Painting of Machine/ Electrical Panels: RAL 6011 Apple Green (Polyurethane Paint)	Vendor to Confirm	
24.5	Total weight of the machine	Vendor to specify	
24.6	Weight of heaviest part of machine	Vendor to specify	
24.7	Weight of the heaviest assembly/ subassembly of the Machine	Vendor to specify	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
24.8	Dimensions of largest part/ subassembly/ assembly of the machine	Vendor to specify	
24.9	Vendor to submit, along with offer, the reference list of customers where similar machines have been supplied mentioning the customer, Machine Model, major specifications of the supplied machine, CNC System, Year of Supply etc	Vendor to Furnish	
24.10	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to Furnish	
24.11	Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible pipings are essential.All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to confirm	
25.0	**OTHER FEATURES:**		
25.1	**NETWORKING:**	Vendor to give as optional with separate quote	
25.1.1	Machine control should have necessary hardware and software for interfacing with gigabit Ethernet Local Area Network with 100 MB/sec through UTP cables for CNC program and other related data transfer. This network to be connected to wide area network/Internet. The networking should have following capabilities.		
	a) The machine shall appear as a node in the Entire Network. (Network Neighborhood)	Vendor to confirm	
	b) 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 confirm	
	c) The program transfer between CNC system and network should also be possible in CNC Mode.	Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
25.2	**MACHINE MONITORING SYSTEM (MMS) SIGNALS**	Vendor to confirm	
25.2.1	Following MMS signals would be made available on a specifically earmarked terminal strip. These MMS signals would be sourced from a SIMATIC S-7 PLC output card separately.		
	a) Control ON	Vendor to confirm	
	b) Cycle ON	Vendor to confirm	
	c) Spindle Running	Vendor to confirm	
	d) Feed Active (Any of the axes moving)	Vendor to confirm	
	e) M30 (Program Stop)	Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT		SPECIFIED / TO BE CONFIRMED BY	REMARKS

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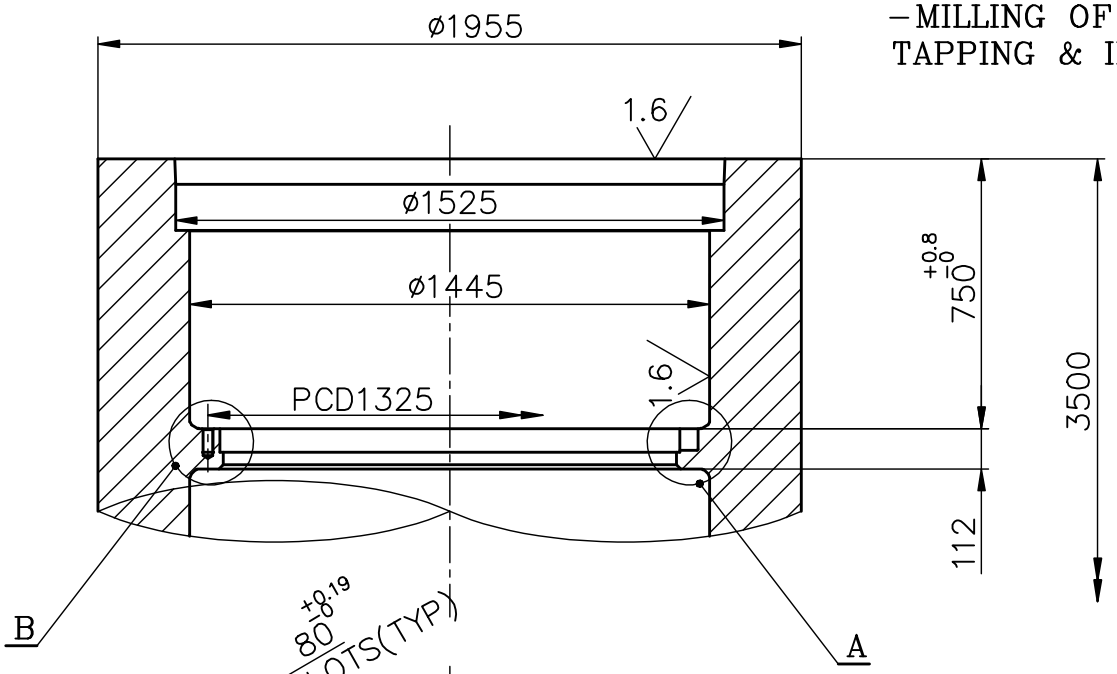
SNO	DESCRIPTION FOR BHEL REQUIREMENT		SPECIFIED / TO BE CONFIRMED BY	REMARKS

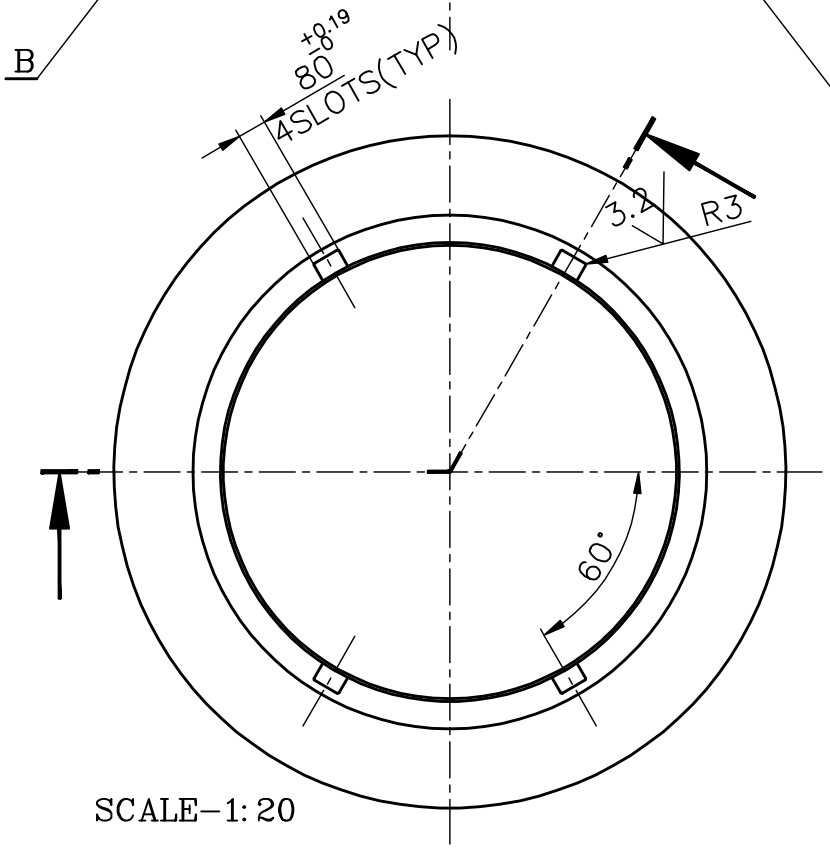
SNO	DESCRIPTION FOR BHEL REQUIREMENT		SPECIFIED / TO BE CONFIRMED BY	REMARKS

ANNEXURE–1

HORIZONTAL BORING MACHINE OPERATIONS

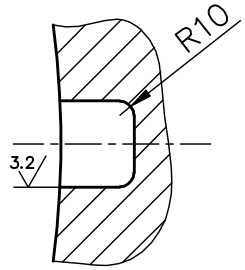
–MILLING OF SLOTS
TAPPING & ID BORING



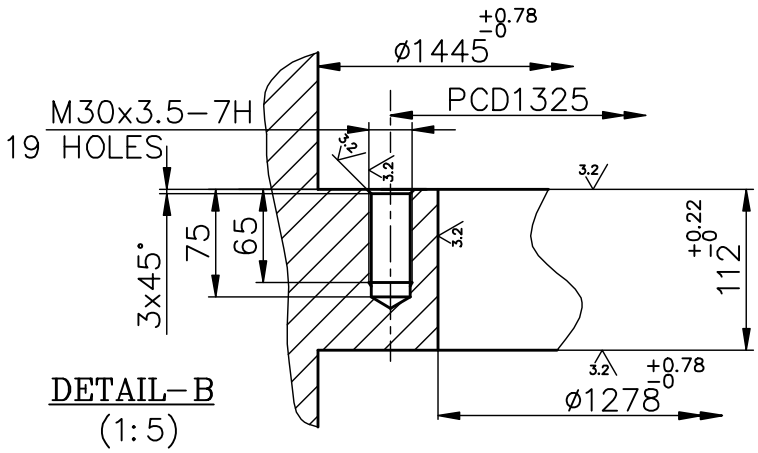


SCALE–1:20

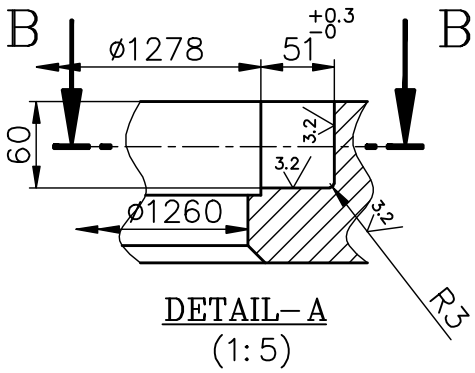
MATERIAL: SA321
(STAINLESS STEEL)



SECTION–BB



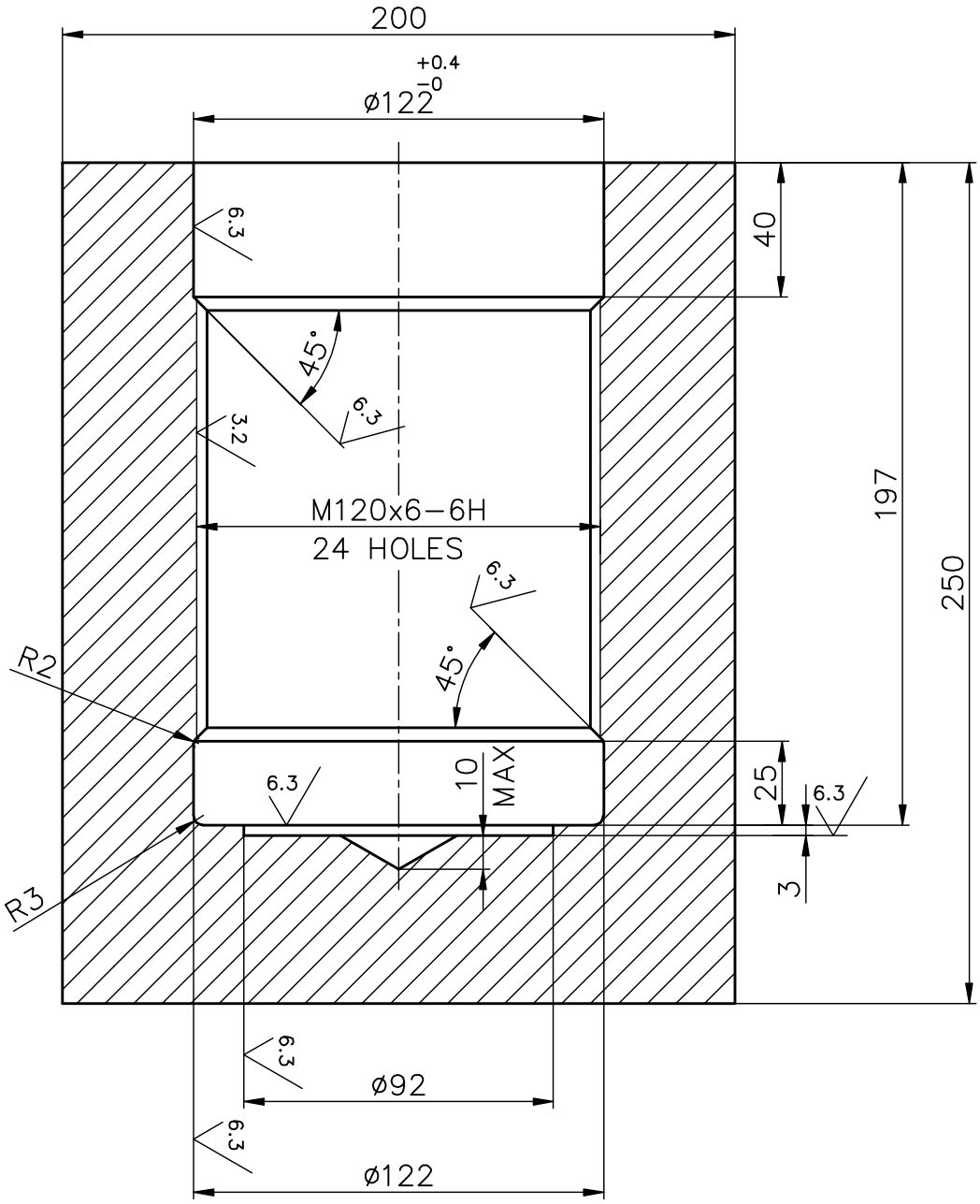
DETAIL–B
(1:5)



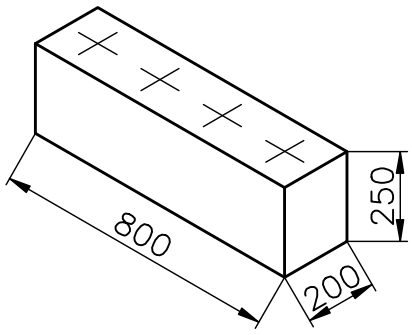
DETAIL–A
(1:5)

ANNEXURE–1A

HORIZONTAL BORING MACHINE OPERATIONS



SCALE–1: 2



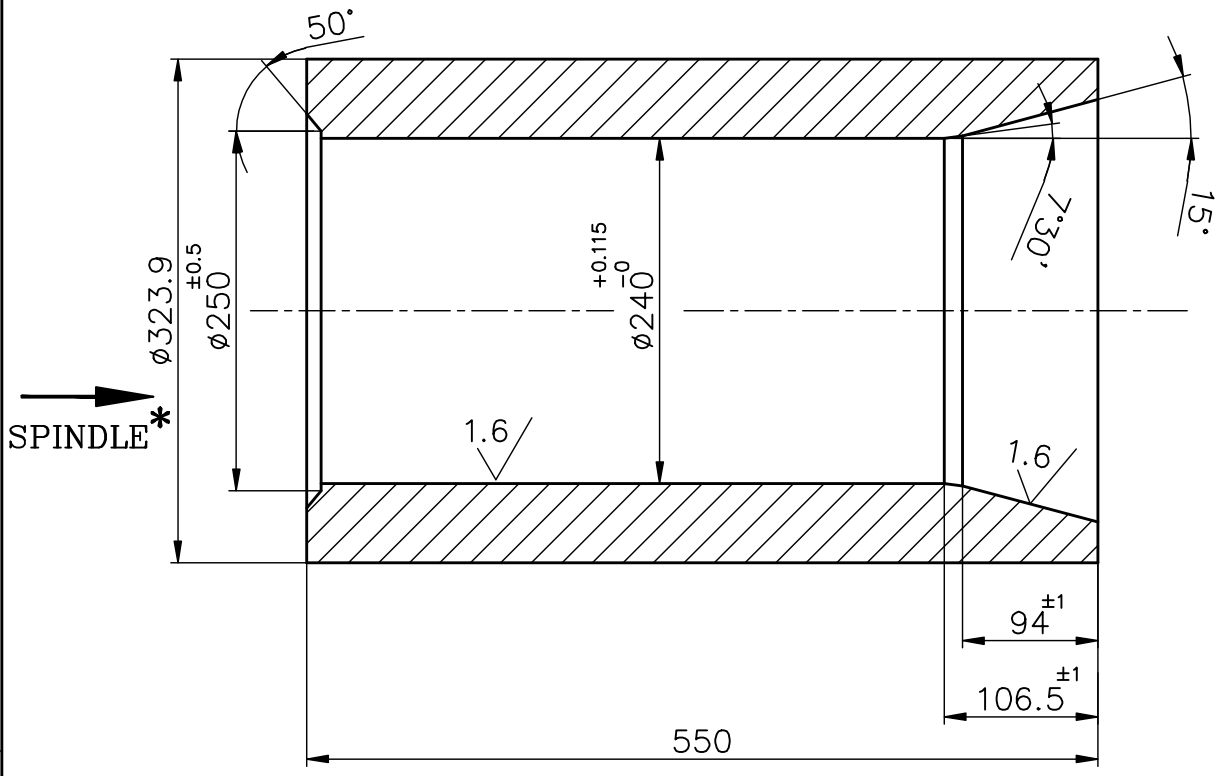
TRAIL BLOCK

MATERIAL: Q&T STEEL

ANNEXURE–1B

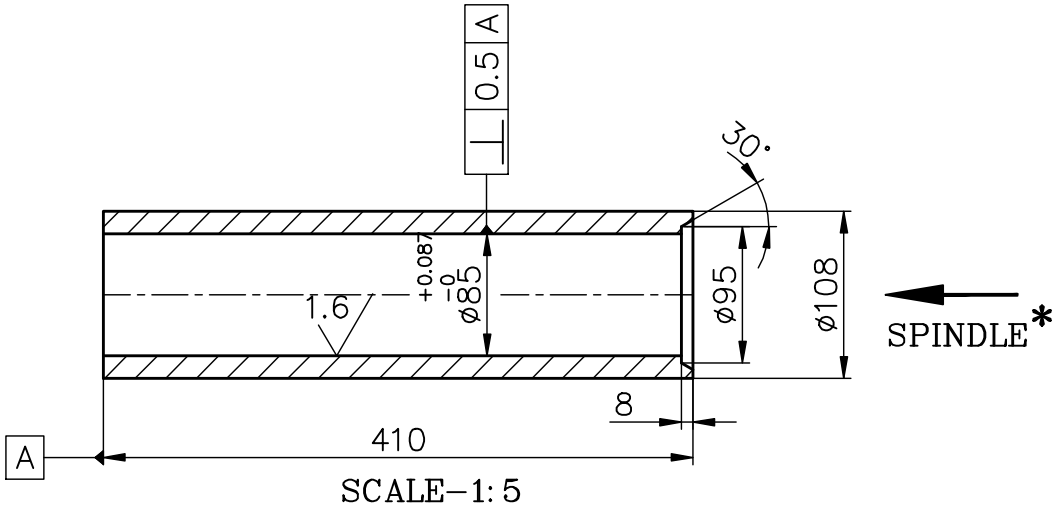
HORIZONTAL BORING MACHINE OPERATIONS

TRAIL PIPE SIZE: OD323.9x50t
MATERIAL: SA106Gr.B



SCALE–1: 5

TRAIL PIPE SIZE: OD108x16t
MATERIAL: CARBON STEEL

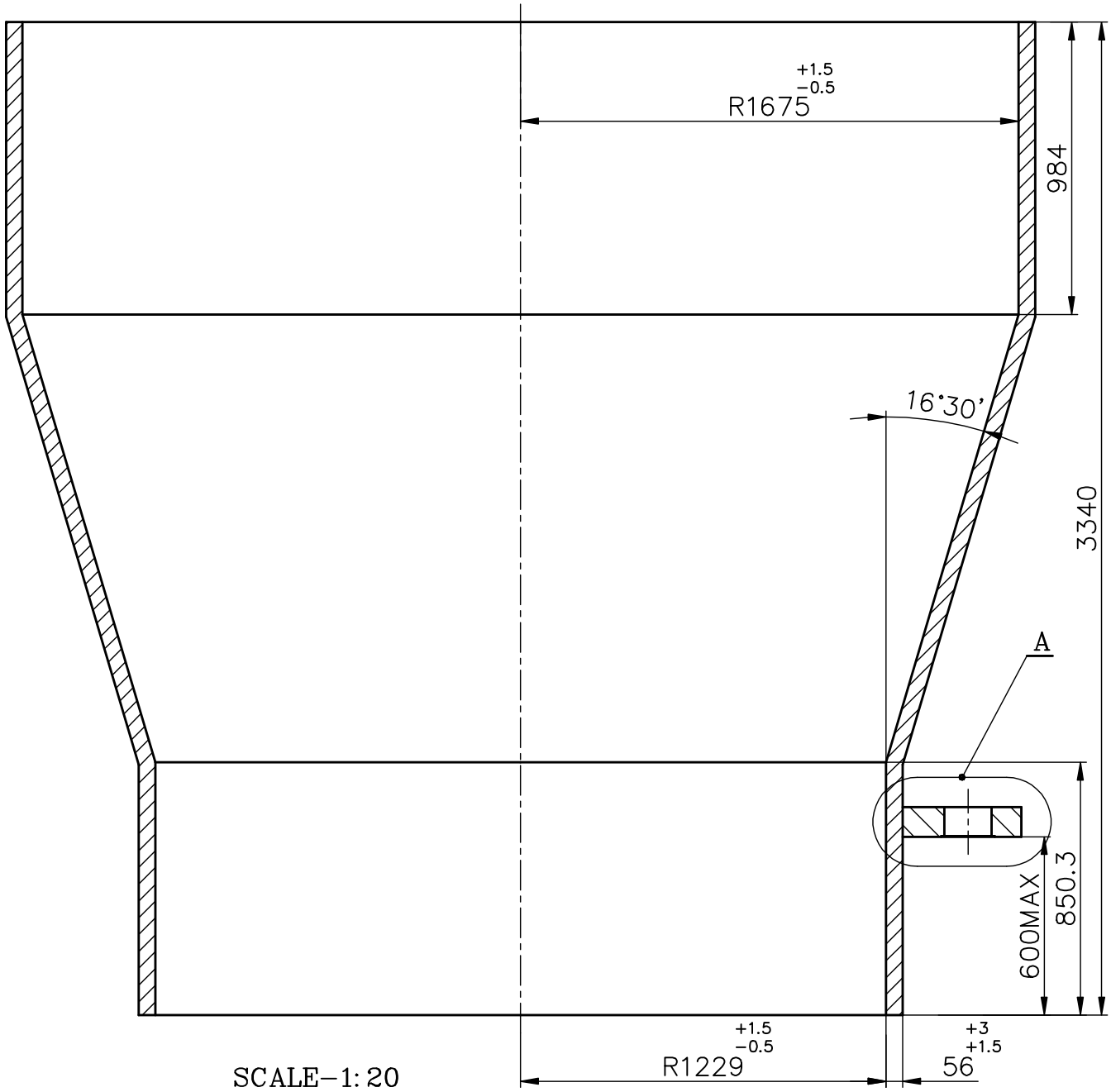


SCALE–1: 5

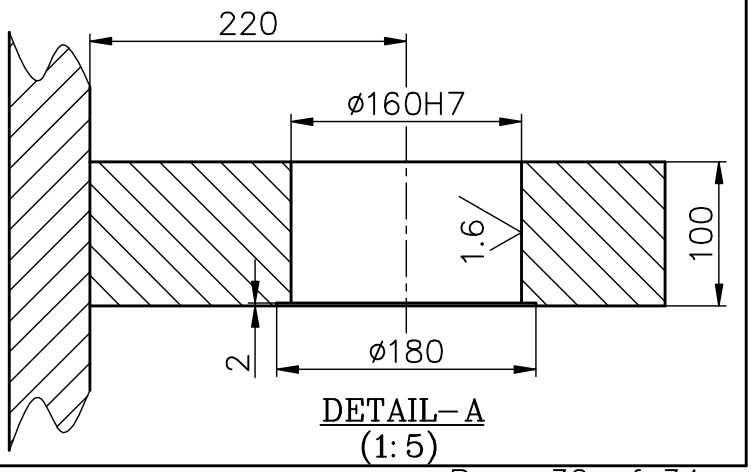
*COMPLETE MACHNING TO BE CARRIED OUT FROM THE SPINDLE DIRECTION INDICATED.

ANNEXURE–1C

HORIZONTAL BORING MACHINE OPERATIONS



SCALE–1: 20

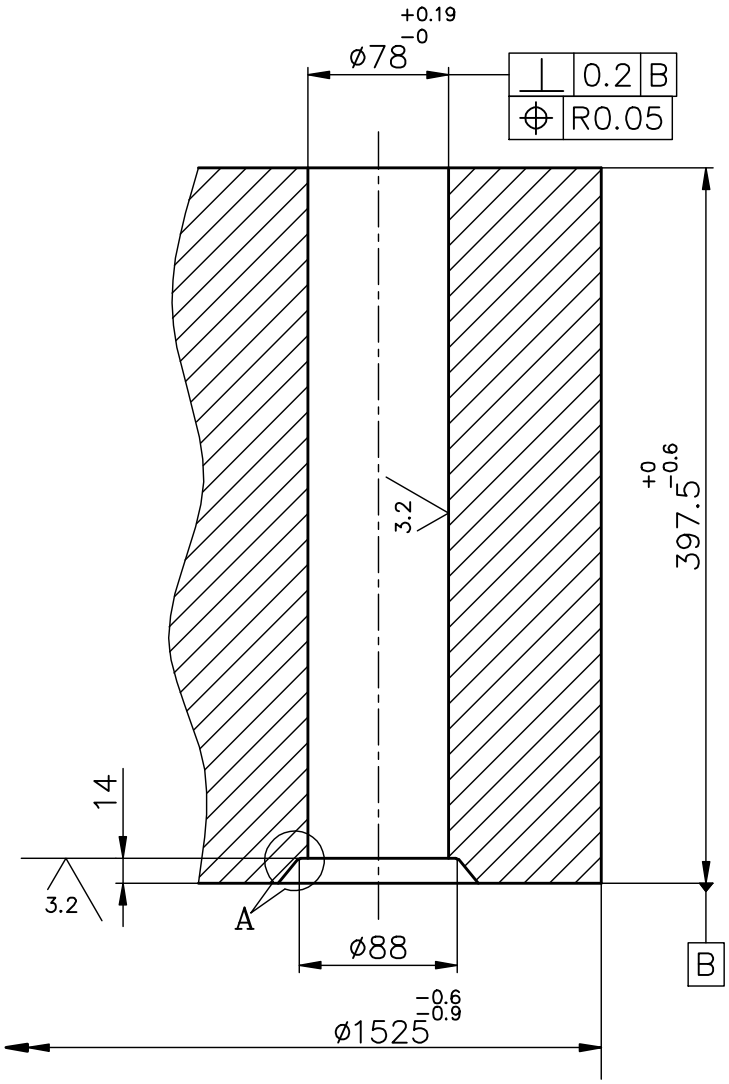


DETAIL–A
(1: 5)

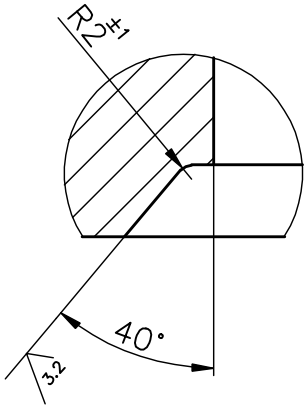
MATERIAL: Q&T STEEL

ANNEXURE–1D

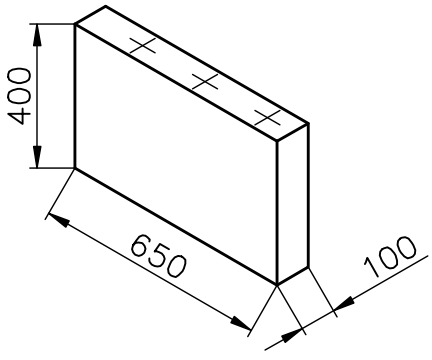
HORIZONTAL BORING MACHINE OPERATIONS



SCALE–1: 2.5



DETAIL–A
SCALE–1: 1

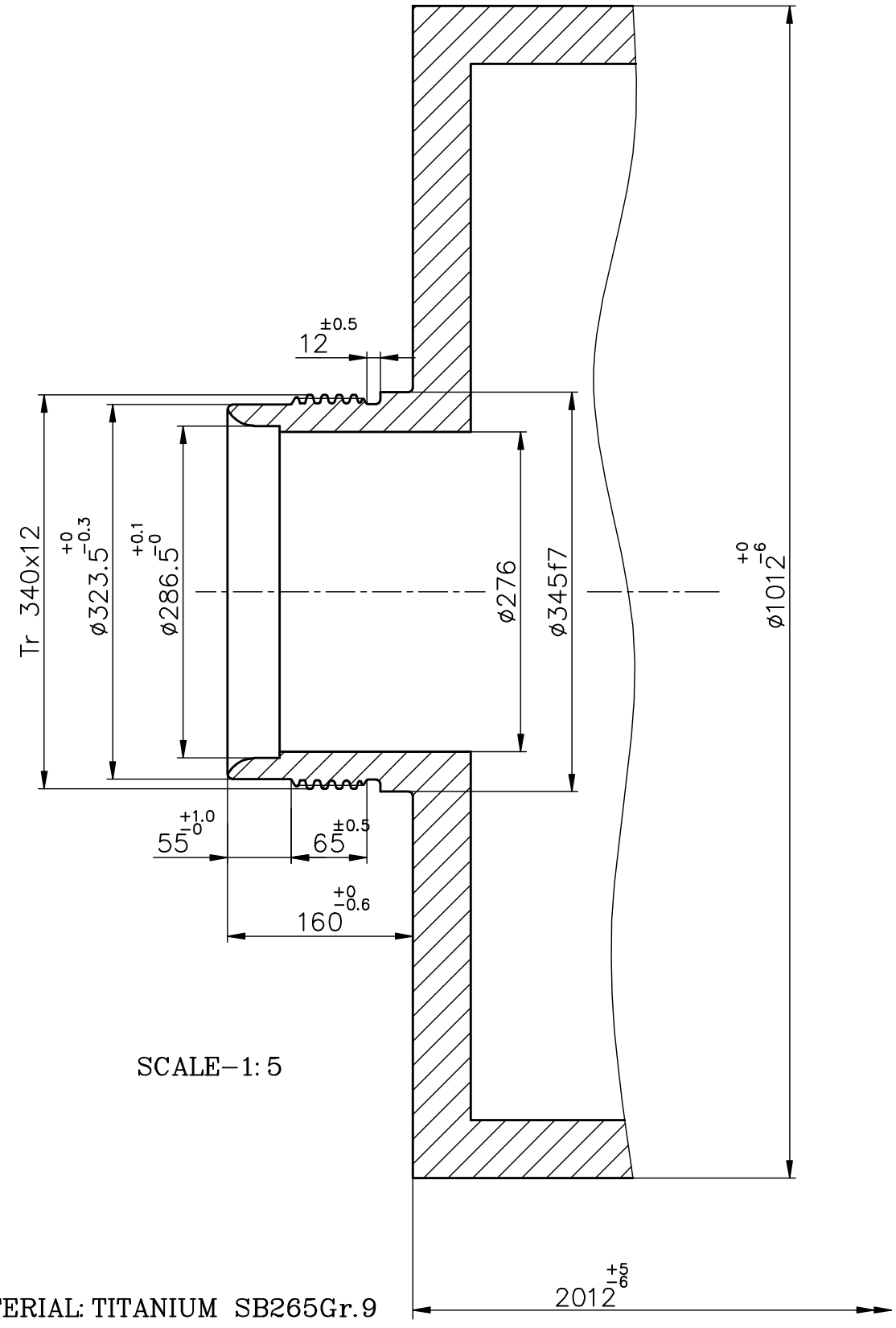


MATERIAL: Q&T STEEL

TRAIL BLOCK

ANNEXURE–1E

HORIZONTAL BORING MACHINE OPERATIONS



SCALE–1: 5

MATERIAL: TITANIUM SB265Gr.9