



Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

An ISO 9001
Company

ENQUIRY	Phone: +91 431 257 70 49 Fax : +91 431 252 07 19 Email : csguna@bheltry.co.in Web : www.bhel.com
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	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
	2620800022	15.05.2008	17.06.2008

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 Vertical Turning Lathe – Table Dia 2500 as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	1 No.	31.07.2009

BHEL commercial terms & conditions with Price Bid and Bank Guarantee formats along with technical specifications 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 “2620800022”.

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 Manager / Capital Equipment / MM
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PART A
CNC VERTICAL TURNING LATHE – TABLE Ø 2500

SECTION – I : QUALIFYING CRITERIA

The BIDDER has to compulsorily meet the following requirements to get qualified for considering the technical offer for the CNC VERTICAL TURNING LATHE – TABLE Ø 2500

S. No.	REQUIREMENTS	VENDOR's RESPONSE
1	<p>Only those vendors (OEMs), who have supplied and commissioned at least ONE CNC VERTICAL TURNING LATHE of table dia 2500 mm or higher, Table load carrying capacity 15 Tons or more and Height of turning 3000 mm or more in the past ten years (on the date of opening of Tender) and such machine is presently working satisfactorily for more than one year after commissioning (on the date of opening of Tender) should quote.</p> <p>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 (on the date of opening of Tender).</p>	
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.	

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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 VERTICAL TURNING LATHES have been supplied in the past.	
4.0	Specify details of CNC VERTICAL TURNING LATHES supplied to other units of BHEL, if any. (Year of commissioning, Table size, Table weight carrying capacity etc.)	
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.	

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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 offer.	
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	

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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) Table Size b) WT. Carrying Capacity c) Ram stroke d) 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		
<div style="display: flex; justify-content: space-between; align-items: flex-end; padding-top: 20px;"> <div>Date:</div> <div>Signature & Seal of the Authority Issuing the Performance Certificate</div> </div>		

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PART- B**TECHNICAL SPECIFICATION FOR DOUBLE COLUMN CNC VERTICAL TURNING LATHE - Table Dia 2500**

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details																														
1.0	<p>PURPOSE: This machine is intended for machining of different size of valve castings and forgings.</p> <p>Various operations to be carried out are: Facing, OD Turning, Boring, Cylindrical Grinding (Internal), and Thread cutting (Internal and External)</p> <p>Note: At times during facing, OD Turning& Boring, the machine will be subjected to intermittent load when machining is carried out on SS welded or Stellite hard faced surfaces. These surfaces will have hardness in the range of 425 BHN.</p>																															
1.1	<p>WORKPIECE MATERIAL SPECIFICATION:</p> <p>The work piece material is either Steel Casting or steel forging.</p> <table><tr><th>Material</th><th>Description</th><th>ASTM Specification</th><th>Hardness</th></tr><tr><td rowspan="6">Steel Casting</td><td rowspan="2">Carbon Steel</td><td>A216 WCB, WCC</td><td>185 BHN</td></tr><tr><td>A352 LCB, LCC</td><td>225 BHN</td></tr><tr><td>Alloy Steel</td><td>A 217 WC5, WC6, WC9, C12A</td><td>210 BHN</td></tr><tr><td>Stainless Steel</td><td>A351 CF3M, CF8, CF8C and CF8M</td><td>230 BHN</td></tr><tr><td rowspan="2">Alloy Steel</td><td>SA 182 F22 Class 3</td><td>210 BHN</td></tr><tr><td>SA 182 F91</td><td>225 BHN</td></tr><tr><td rowspan="3">Steel Forging</td><td>Carbon Steel</td><td>SA 105</td><td>185 BHN</td></tr><tr><td rowspan="2">Alloy Steel</td><td>SA 182 F22 Class 3</td><td>210 BHN</td></tr><tr><td>SA 182 F91</td><td>225 BHN</td></tr></table> <p>Note : Certain hardfaced (SS / Stellite)surfaces of the workpieces (SS / Stellite) will have a hardness of upto 425 BHN.</p>	Material	Description	ASTM Specification	Hardness	Steel Casting	Carbon Steel	A216 WCB, WCC	185 BHN	A352 LCB, LCC	225 BHN	Alloy Steel	A 217 WC5, WC6, WC9, C12A	210 BHN	Stainless Steel	A351 CF3M, CF8, CF8C and CF8M	230 BHN	Alloy Steel	SA 182 F22 Class 3	210 BHN	SA 182 F91	225 BHN	Steel Forging	Carbon Steel	SA 105	185 BHN	Alloy Steel	SA 182 F22 Class 3	210 BHN	SA 182 F91	225 BHN	
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Steel Casting	Carbon Steel	A216 WCB, WCC	185 BHN																													
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Steel Forging	Carbon Steel	SA 105	185 BHN																													
	Alloy Steel	SA 182 F22 Class 3	210 BHN																													
		SA 182 F91	225 BHN																													

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.0	MACHINE DETAILS & CONSTRUCTION:		
2.1	Vendor to furnish constructional details of the machine including explanatory drawings of various components or assemblies like Column, Cross rail, Ram head, Table, Turret Head, ATC and Machine Bed with details of material & their hardness. Feed Transmission System, Feed back System etc. of the machine is also to be explained.	Vendor to furnish Vendor to specify	
2.1.1	Video images on CD / Hard copy of literature with photographs & drawings explaining the technical features shall be enclosed with the offer	Vendor to furnish	
2.1.2	Movable Chip / Splash Guard: Movable type chip/ splash Guard of sufficient height with transparent windows and safety interlocks should be provided for the Table to avoid splashing of Coolant and scattering of Chips on the Operator's Platform and on the Shop Floor. The opening width of the guard should be sufficient for easy loading and unloading of job on the table.	Vendor to specify Vendor to confirm	
2.1.3	Machine should be Metric execution. (Construction wise)	Vendor to confirm	
2.2	CAPACITY AND SIZE:		
2.2.1	Largest Work piece Diameter:	2500 mm	
2.2.2	Maximum Work piece Height:	3000 mm	
2.2.3	Maximum Work piece Weight:	15 Tons	
2.2.4	Maximum swing diameter	Vendor to specify	
2.2.5	Max. Turning dia	3000 mm	
2.2.6	Minimum Boring Diameter:	400 mm	
2.2.7	Maximum Height of Turning and Facing	3000 mm	

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Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.3	TABLE		
2.3.1	Table Diameter	2500 mm	
2.3.2	Maximum Load on table:	Vendor to specify	
2.3.3	Table Speed range (Infinitely Variable):	Vendor to specify	
2.3.4	Number of stages for table speed change	Vendor to specify	
2.3.5	Power of Main Drive (S1 - Continuous Rating)	Vendor to specify	
2.3.6	The main motor and drives shall be of either FANUC / SIEMENS. Details of Main Drive viz Type, Make, Model etc.:	Vendor to specify	
2.3.7	Torque Vs Speed characteristics to be submitted.	Vendor To submit	
2.3.8	No. of Jaws:	Four	
2.3.9	External Clamping Diameter range:(Minimum /Maximum)	Vendor to specify	
2.3.10	Internal Clamping Diameter range: (Minimum /Maximum)	Vendor to specify	
2.3.11	Type and size of Bearing of the Table:	Vendor to specify	
2.3.12	Size of T - slots, their position and accuracy: Drawing of Table showing details of the T - slots etc. should be submitted.	Vendor to submit	
2.3.13	Center Bore on Table Surface (Dia x Depth -with Accuracy)	Vendor to specify	
2.4	CROSS RAIL		
2.4.1	Vertical Travel of cross rail (To suit Max Job height)	Vendor to specify	
2.4.2	Feed Rate of Vertical Traverse:	Vendor to specify	
2.4.3	No. of Positions:	Vendor to specify	
2.4.4	Positioning pitch	Vendor to specify	
2.4.5	Distance of lowest Step from Table Top:	Vendor to specify	
2.4.6	Movement of Cross Rail must be enabled through Program and also by manual Push Buttons:	Vendor to Confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.5	CROSS RAIL TOOL HEAD AND RAM		
2.5.1	No. of Columns:	Two	
2.5.2	No. of Rams:	One	
2.5.3	Cross - Section of Ram:	Vendor to specify	
2.5.4	Vertical travel of ram	1200 mm	
2.5.5	Horizontal travel of ram on +X axis: (to suit job diameter)	Vendor to specify	
2.5.6	Horizontal travel of ram on -X axis: (beyond center)	150 mm	
2.5.7	Min distance from table surface to std turning tool holder (with tool mounted)	Vendor to specify	
2.5.8	Minimum distance from table surface to grinding attachment (with wheel mounted)	Vendor to specify	
2.5.9	Thread Cutting Capacity – Pitch range:	Vendor to specify	
2.5.10	Clamping detail for mounting Turning tool holder on ram	Vendor to specify	
2.5.11	Mounting of Turning Tool Holders should be enabled through Program and also by manual Push Buttons.	Vendor to confirm	
2.6	GRINDING FACILITY:		
2.6.1	Capacity of live spindle for grinding in KW	Vendor to specify	
2.6.2	Speed of live spindle	Vendor to specify	
2.6.3	External Coolant System for Grinding	Vendor to Confirm	
2.6.4	Minimum Internal Grinding Dia =175 mm	Vendor to Confirm	
2.6.5	Maximum Grinding depth =425 mm	Vendor to Confirm	
2.6.6	Width of the grinding Wheel:	Vendor to specify	
2.6.7	Provision for Wheel Dressing on the machine	Vendor to specify	
2.6.8	Mounting of Grinding unit shall be manual:	Vendor to Confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
2.7	MACHINE GUIDEWAYS:	
2.7.1	Width of cross rail guide ways	Vendor to specify
2.7.2	Width of column guide ways	Vendor to specify
2.8	Metallic Telescopic covers of rust resistant material shall be provided with wipers for guide ways of all axes. Provision to avoid mixing of coolant and hydraulic oil.	Vendor to Confirm
2.9	FEEDS AND DRIVE SYSTEM:	
2.9.1	Cutting feed in X axis (Infinitely Variable):	Vendor to specify
2.9.2	Rapid feed in X axis:	Vendor to specify
2.9.3	Cutting feed in Z axis (Infinitely Variable):	Vendor to specify
2.9.4	Rapid feed in Z axis:	Vendor to specify
2.9.5	Simultaneous control of X and Z axes	Vendor to confirm
2.9.6	X and Z -Axes Feed Drive Motors [AC servo motors] shall be digital type of Fanuc or Siemens (Model, make, type, rating etc. shall be furnished)	Vendor to specify
2.9.7	Feed back system: Fanuc / Siemens / Heidenhain encoders (Details to be furnished in the offer)	Vendor to submit
2.9.8	Mechanism for locking X & Z axis:	Vendor to specify
2.9.9	Type of power transmission: Pre-loaded backlash-free re-circulating ball screw drive for feed drive axes. Detailed Specification for all ball screws used in the machine shall be submitted. The specification shall address the following points: (a) Diameter, (b) Pitch (c) Length (d) Make (e) Model	Vendor to specify

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Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.10	OPERATOR'S PLATFORM: Vendor to describe the details of the movable operator platform. The platform shall be ergonomically designed for the ease of operator to operate the machine control panel. It should also aid for safe and easy movement from control panel to machine. Details of its horizontal, vertical movement and weight carrying capacity shall be furnished.	Vendor to specify	
2.11	CHIP CONVEYOR AND CHIP BINS:		
2.11.1	Elevating type chip conveyor to carry both short and curly chips effectively to the chip bin on floor should be provided. Two Chip bins of appropriate size with wheel & handle should be supplied.	Vendor to Confirm	
2.11.2	Type of chip conveyor:	Vendor to specify	
2.11.3	Width of conveyor:	Vendor to specify	
2.11.4	Elevation of chip conveyor from floor level	Vendor to specify	
2.11.5	Operations of chip conveyor (forward & reverse) through push buttons on operator's panel.	Vendor to Confirm	
2.11.6	Layout showing location of chip conveyor should be submitted.	Vendor to specify	
2.12	AUTOMATIC TOOL CHANGER		
2.12.1	Type:	Vendor to specify	
2.12.2	No. of storage locations:	12 to15	
2.12.3	Tool shank: 40mm×40mm (for turning/facing), 25mm×25mm (for boring bars)	Vendor to Confirm	
2.12.4	Max tool diameter or Width (when all pockets filled):	Vendor to specify	
2.12.5	Max tool length:	Vendor to specify	
2.12.6	Tool selection method: Random.	Vendor to Confirm	
2.12.7	Maximum Permissible Weight on each Pocket:	Vendor to specify	

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Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
2.12.8	ATC Drawing should be submitted:	Vendor to submit
2.13	OPERATION AND CONTROL SYSTEM:	
2.13.1	OPERATOR'S PANEL: Operator's panel having complete CNC and machine control system with monitor of required configuration shall be provided on the Operators platform. All switches with suitable interlock with table rotation should be within reach of operator for easy & safe operation. All displays/indications should also be conveniently placed. Layout showing complete details to be submitted.	Vendor to submit
2.14	CNC SYSTEM & FEATURES:	
2.14.1	Make : Fanuc / Siemens	Vendor to specify
2.14.2	Type : PC based latest version	Vendor to specify
2.14.3	Model: Latest version (with simultaneous interpolation of two axes)	Vendor to specify
2.14.4	Details of Standard features:	Vendor to specify
2.14.5	Details of optional features, recommended by vendor to be submitted.	Vendor to submit
2.14.6	The system should have full alphanumeric keyboard, TFT colour display (preferably 17"), additional draw-out type QWERTY Key Board and mouse in suitable enclosure, RS232C serial interfaces, parallel interface for printer, COM port for telediagnostics, network ready with LAN, electronic hand wheels for all axes, CD/ DVD drive unit with writer for data input/output, hard disk of sufficient capacity (min 80 GB), graphic simulation and preinstalled system software & other required software etc. (Details should be submitted by Vendor).	Vendor to Confirm & Vendor to submit

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Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
2.14.7	The system should have a meter for showing the spindle power.	
2.14.8	The CNC system should have a feature for locking axes through M codes.	
2.15	MANUAL CONTROL: Complete manual control of machine with required switches / keys should be provided on operator's panel for selection of axis, axis direction, cutting feed, table / spindle rpm, cutting feed on/off, display of axis position values etc, for manual operation without using CNC program, CNC option Manual Turn or MDI mode. Diagram / Sketches for switches / keys provided on operators pendant should be submitted.	Vendor to specify
2.15.1	Hand Held unit: Hand held unit for axis selection and movement with pulse generator is to be offered with complete details. This is required for job setting.	Vendor to confirm
2.16	UPS FOR CNC SYSTEM: UPS of 30 minutes for CNC system with inbuilt cooling and charge status display:	Vendor to confirm
2.17	MACHINE LIGHTS:	
2.17.1	Machine Lights for sufficient illumination of complete working area on both sides of operator's platform should be provided for clear visibility.	Vendor to confirm
2.17.2	A magnetic base portable light with sufficiently long cable shall be provided.	Vendor to confirm
2.17.3	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to confirm
2.17.4	Flashing / rotary type End of Cutting and Program Stop Light.	Vendor to confirm
2.17.5	Voltage shall be 24V for hand lamp.	Vendor to confirm

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
2.18	AIR CONDITIONERS:	
2.18.1	Air Conditioners with Dehumidifiers of suitable capacity to be provided for all Electrical / Electronic Panels / Cabinets including Operator's Panel considering specified ambient conditions. Make: Rittal / Warner & Finley or any other reputed make acceptable to BHEL. Detailed specifications to be submitted.	Vendor to Submit
2.19	HYDRAULIC SYSTEM: Details should be Submitted by the Vendor	Vendor to submit
2.19.1	The System should be centralized.	Vendor to confirm
2.19.2	Hydraulic Tank shall preferably be located at floor level:	Vendor to confirm
2.19.3	Make: Rexroth / Vickers Sperry/ any other reputed make acceptable to BHEL.	Vendor to specify
2.19.4	Filtration System:	Vendor to specify
2.19.5	Failure indication:	Vendor to specify
2.19.6	Automatic shut off provision. Details should be submitted.	Vendor to submit
2.19.7	Refrigerated type cooling system of sufficient capacity to maintain complete Hydraulic System, including lubrication oil, hydraulic oil and gearbox oil, etc. at a temperature not exceeding 50 °C irrespective of the ambient conditions. Vendor should submit complete details.	Vendor to specify
2.19.8	Hydraulic pump capacity (flow / pressure):	Vendor to specify
2.19.9	Each pump should have an independent motor.	Vendor to specify

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Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
2.20	First filling of all required Oils & Grease etc. Should be supplied by vendor. Oil grade: ISO VG 46 or 68 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
2.21	COOLANT SYSTEM:	
2.21.1	Re-circulating type Flood Coolant System with all accessories shall be provided.	Vendor to specify
2.21.2	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
2.21.3	Coolant collection and re-circulation system should be leak-proof to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc.	Vendor to Confirm
2.21.4	Coolant Filtration System: Re-circulating type with suitable filtration unit. Vendor shall give details of offered filtration unit.	Vendor to submit
2.21.5	Coolant flow diagram showing filters, pumps, valves, tank etc. to be submitted.	Vendor to submit
2.21.6	Coolant pump & motor details:	Vendor to specify
2.21.7	Coolant Tank Capacity:	Vendor to specify
2.21.8	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to Confirm

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
2.22	ELECTRICAL:	
2.22.1	415V + 10% / -10%, 50HZ +/-3 HZ, 3 Phase AC (3 wire system with out neutral) Power Supply 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 the same could be incorporated during construction of foundation.	Vendor to Confirm
2.22.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized.	Vendor to Confirm
2.22.3	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to Confirm
2.22.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to Confirm
2.22.5	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
2.22.6	Motors shall conform to IEC or Indian Standards	Vendor to Confirm
2.22.7	All Electric & Electronic enclosures shall have IP 54 protection	

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
2.22.8	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all cable trays required for laying the cables should be included in the offer.	Vendor to Confirm
2.22.9	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to Confirm
2.22.10	In-cycle hour counter with reset facility and digital energy meter shall be provided	Vendor to Confirm
2.23	SAFETY ARRANGEMENTS:	
2.23.1	Machine should have adequate and reliable safety interlocks or devices to avoid damage to the machine, work piece 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
2.23.2	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to specify
2.23.3	All cables, Pipes etc. on the machine should be well supported and protected. These should not create any hindrance to machine operation.	Vendor to Confirm
2.23.4	All rotating parts of the machine should be provided with guards and should be statically & dynamically balanced to avoid undue vibration.	Vendor to Confirm
2.23.5	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to Confirm
2.23.6	Oil & water lines should not run with electric cable in the same trench.	Vendor to Confirm

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
2.24	ENVIRONMENTAL PERFORMANCE OF THE MACHINE:	
2.24.1	Maximum noise level shall not exceed 85 dB (A) at normal load condition, 1 meter away from the machine	Vendor to Confirm
2.24.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to Confirm
2.24.3	No hazardous chemicals shall be used in the machine.	Vendor to Confirm
2.24.4	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to Confirm
2.24.5	Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to Confirm
3.0	SERVO VOLTAGE STABILIZER:	
3.1	Indian make Oil / Air Cooled servo Controlled Voltage Stabilizer suitable for complete machine, its drives, controls, PLC etc with no undesirable Harmonics in the stabilizer output.	Vendor to specify
3.2	Make. : NEEL / DELTA / AEI / POWER AID	Vendor to specify
3.3	Model & Rating (Suitable for the machine load. Vendor to specify noise level also.)	Vendor to specify
3.4	Spares Package for the Voltage Stabilizer for 2 years working should also be offered.	Vendor to Confirm
3.5	Catalogue of Voltage Stabilizer to be submitted.	Vendor to Submit
4.0	ULTRA ISOLATION TRANSFORMER	
4.1	Ultra Isolation Transformer (Indian make) suitable for complete machine, its drives, controls & PLC etc. shall be supplied.	Vendor to Confirm
4.2	Make: NEEL / DELTA / AEI / POWER AID	Vendor to specify

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
4.3	Model and Rating:	Vendor to specify
4.4	Spares Package for the Ultra Isolation Transformer for 2 years working should also be offered.	Vendor to Confirm
4.5	Catalogue of the Ultra Isolation Transformer to be submitted	Vendor to Submit
5.0	Compressed air points: Compressed air at 60 to 70 psi will be supplied by BHEL at one point.. The vendor shall indicate the inlet point for compressed air in the layout drawing of the machine.	Vendor to Confirm
6.0	TOOLING:	
6.1	List of Tools required 1) Facing and turning tool holder (narrow)-2 Nos 2) Facing and turning tool holder (wide)-2 Nos 3) Angle tool holder for turning tools (left): 1 No 4) Angle tool holder for turning tools (right): 1 No 5) Tool holder for boring bars: 5 Nos 6) Boring bar of diameter 125mm and effective length 400mm: 2 Nos 7) Boring bar of diameter 70mm and effective length 350mm: 2 Nos 8) Boring bar of diameter 50mm and effective length 300mm: 2 Nos	Vendor to specify
6.2	All cutting tools, tool holders, boring bars,etc shall be supplied for machining the prove out components. Itemized pricing of the tools, tool holders, boring bars etc. Should be separately listed in the commercial offer	Vendor to Confirm

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
7.0	MEASURING SYSTEM: Automatic job measuring system, comprising of Ram 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 specify	
8.0	DIAGNOSTIC SYSTEM:		
8.1	TELE DIAGNOSTIC SYSTEM: Tele-diagnostic service should be provided through International telephone lines along with required Hardware / Software package for the supplied CNC system for remote diagnosis and correction of the problems in both CNC System and PLC of the machine. This should be provided free of charge for the guarantee period. Vendor should inform terms and conditions for this service after guarantee period. Subsequently, it should be possible to use other platforms, such as Internet or ISDN, subject to their availability in future	Vendor to confirm	
9.0	FAULT DIAGNOSTIC SYSTEM:		
9.1	Supplier's own diagnostic system with required hardware and software should be supplied and installed on the CNC system. This should include customized auto-diagnostic system with supporting hardware and software, which shows detailed cause, and remedy for the fault on the display for faults related to mechanical and electrical maintenance.	Vendor to specify	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
9.2	Help guide should be provided to use both diagnostic systems	Vendor to Confirm	
10.0	PORTABLE DATA LOADING DEVICE: (optional) Portable Data loading device with sufficient length of interface cable, HDD of size not less than 40GB, CD Drive, TFT Display of size 14" and suitable preinstalled software for loading PLC program, RS 232 Port, Ethernet chord, USB port, Machine data and CNC part programs shall be supplied with the machine. Vendor should furnish details.	Vendor to specify	
11.0	LEVELING & ANCHORING SYSTEM: 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 Confirm	
12.0	TOOLS FOR OPERATION & MAINTENANCE: The vendor shall supply special tools required for the operation and maintenance of the machine. The vendor shall also supply necessary standard tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the machine. List of all such Special and standard tools shall be submitted with offer	Vendor to Confirm Vendor to Submit	

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Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
13	SPARES:	
13.1	<p>The Vendor shall recommend and submit list of spares required for the machine for two years of trouble free operation on three shifts/day basis under two headings as</p> <p>a) Mechanical & hydraulic spares and</p> <p>b) Electrical & electronic spares.</p> <p>The list shall generally include the following items.</p> <p>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</p> <p>b) Electrical & Electronic 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, Floppy Disk Unit, I/O Cards for PLC, Servo Motors for Feed Drives, Power Module & Control Cards for Main Drive as well as Feed Drives etc.</p> <p>c) Unit Price of each item of spares shall be submitted with the commercial bid.</p> <p>d) Un-priced list should be submitted with technical offer.</p>	Vendor to Submit
13.2	<p>All types of spares for the total machine and its accessories should be available for minimum ten years, after supply of the machine. If any spares or controls are likely to become obsolete within this period, the vendor should inform BHEL and provide details of it's suppliers to enable BHEL to procure them in advance.</p>	Vendor to Confirm

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Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
13.3	In case of ordering, a complete list of spares for the machine and its accessories along with spares specification / type / model, and name & address of the spare supplier shall be submitted along with documentation while supplying the machine.	Vendor to Confirm
14.0	DOCUMENTATION:	
14.1	3 sets of following documents (3 Hard copies) in English language should be supplied along with the machine	Vendor to confirm
14.2	Operating manuals of Machine & CNC system	Vendor to confirm
14.3	Programming Manuals of Machine & CNC system	Vendor to confirm
14.4	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Coolant / Hydraulic / Lubricating circuit diagrams.	Vendor to confirm
14.5	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.	Vendor to confirm
14.6	Manufacturing drawings for all supplied tool holders, coolant connections, adapters, sleeves, fixtures etc.	Vendor to confirm
14.7	Catalogues / O&M Manuals of all bought out items.	Vendor to confirm
14.8	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to confirm
14.9	Bearings: Make& Specification for all bearings used in the machine.	Vendor to Specify
14.10	Ball Screws: Detailed Specification for all ball screws used in the machine shall be submitted. The specification shall address the following points: (a) Diameter, (b) Pitch (c) Length (d) Make (e) Model	Vendor to specify
14.11	Operating Manuals, Maintenance Manuals & Catalogues	Vendor to confirm

	for Isolation Transformer and voltage stabilizer.		
Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER	With Technical Details
14.12	PLC program printouts (Ladder diagram & Statement list) with comments in English.	Vendor to confirm	
14.13	PLC program on CD, NC data & PLC data on CD.	Vendor to confirm	
14.14	Complete back up of hard disk on GHOST CD and clear written Instructions (1 copy) to take back up and reloading of a new hard disk.	Vendor to confirm	
14.15	The vendor shall submit complete Master List of parts used in the machine.	Vendor to Submit	
14.16	One additional set of all the above documentation on CD ROM	Vendor to confirm	
15.0	TRAINING:		
15.1	The Vendor shall train three BHEL Engineers in Operation and Maintenance (Mechanical, Electrical/ Electronics and CNC System) of the Machine at Vendor's works for a period not exceeding 5 working days.	Vendor to confirm	
15.2	Airfare, boarding & lodging for the BHEL Engineers shall be borne by BHEL.		
15.3	The Vendor shall impart training to BHEL's Machine Operators and Maintenance crew in Operation and Maintenance after commissioning of the Machine at BHEL works for not less than 8 working days	Vendor to confirm	
15.4	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel	Vendor to confirm	
15.5	Vendor to quote on the basis of per man per Day for training at vendor's works.	Vendor to specify	

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
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). Vendor shall submit complete foundation details including static and dynamic loads within three months after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, & any other accessories. BHEL shall construct complete foundation for the machine.	Vendor to confirm
16.2	The Vendor shall indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine.	
17.0	ERECTION & COMMISSIONING:	
17.1	<p>1.Supplier to take full responsibility for supervision of the erection, start up, testing of machine, it's control system & all other supplied equipment, machining of test pieces etc.</p> <p>2.Service requirement like power, air & water will be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawing.</p> <p>3.Other requirements like crane and helping personnel will be provided by BHEL, free of cost.</p>	Vendor to confirm
17.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer shall also be responsibility of the vendor.	Vendor to confirm

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
17.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, mentioned under the clause " Machine Acceptance " should form part of the commissioning activity.	Vendor to confirm
17.4	Tools, Tackles, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier.	Vendor to confirm
17.5	The supplier shall arrange commissioning spares required for commissioning of the machine.	Vendor to confirm
17.6	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 colors of paint used.	Vendor to confirm
17.7	Schedule of Erection and Commissioning shall be submitted with offer.	Vendor to confirm
17.8	Duration, terms & conditions for E&C should be furnished with this technical offer in detail. Charges for the same shall be submitted with the commercial bid.	Vendor to confirm

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
18.0	ACCURACY TESTS:	
18.1	GEOMETRICAL ACCURACY:	
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 should be measured as per VDI/DGQ 3441 / ISO 230 - 2 (Latest Revision) using LASER INTERFEROMETER.	Vendor to confirm
18.2.1	Positioning Accuracy on traversing axes (Pa per 1000mm)	± 0.016 mm
18.2.2	Repeatability on traversing axes (Ps per 1000mm)	± 0.008 mm
18.2.3	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 specify
19.0	AMBIENT CONDITIONS & THERMAL STABILITY:	
19.1	Power Supply : AC 415 V $\pm 10\%$ Frequency : 50 Hz ± 3 HZ Phases : 3 phase 3 wire system Compressed air supply: 60-70 psi Ambient Temperature: max 45 °C Relative Humidity = 85% (Vendor to confirm that machine is suitable for above conditions)	Vendor to confirm

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
19.2	<p>Weather conditions are tropical. Atmosphere may be dust laden during some part of the year. Machine will be installed in the normal shop floor condition.</p> <p>(Vendor to confirm that machine is suitable for above conditions).</p>	Vendor to confirm
19.3	<p>Thermal Stability of the machine shall be good enough to withstand the specified ambient conditions in order to meet the accuracy requirements of BHEL components.</p> <p>(Vendor to confirm that machine is suitable for above conditions).</p>	Vendor to confirm
19.4	The Vendor should confirm that the machine and its accessories is suitable for continuous operation at its full capacity for 24 hours a day and 7 days a week through out	Vendor to confirm
20.0	PROVEOUT OF BHEL COMPONENTS:	
20.1	<p>1. Drawings of prove-out components are enclosed. Please refer Annexure 1 for prove out components List and operations. Material for the prove-out components will be provided by BHEL.</p> <p>2. For machining of prove-out components, Job setting plan, Machining process plan and Requirement of tools etc. shall be discussed and agreed mutually.</p> <p>(Final prove out component drawing number may change, however, the machining features of the changed components shall be in line with the original component drawing.)</p> <p>3. Using CNC programs of the vendor, Complete machining of prove-out components shall be done by vendor at BHEL works to the specified design accuracy and surface finish.</p>	Vendor to Confirm

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Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details	
20.1 contd.	<p>4. The vendor shall supply all cutting tools, tool holders, arbors, boring bars etc. necessary for machining of prove-out components.</p> <p>5. Vendor shall submit final job setting plan, machining process plan, tool layout & list with complete description, time studies etc. within two months of placement of order for the prove- out components. Vendor shall submit CNC Programs prior to start of erection of machine at BHEL Works.</p> <p>6. Vendor shall be fully responsible for machining of prove-out components as per drawing and other requirements specified by BHEL to the full satisfaction of BHEL. Clarifications, if any required by vendor, regarding accuracy requirements of the prove-out components, whether specified or not, should be discussed and cleared by vendor during initial technical discussions.</p>		
21.0	MACHINE ACCEPTANCE:		
21.1	Tests/Activities to be carried out at supplier's works on the machine before dispatch:	Vendor to Confirm	
21.1.1	Geometrical Accuracy Tests as per test chart provided by the vendor.	Vendor to Confirm	
21.1.2	Positioning Accuracy Tests as per VDI-DGQ/3441 / ISO 230 - 2	Vendor to Confirm	
21.1.3	The machine shall be test run continuously for 48 hrs. If any break down occurs during this test, the test will be repeated again for 48 hrs from restarting.	Vendor to Confirm	
21.1.4	Demonstration of all features of the machine, CNC system and all Accessories.	Vendor to Confirm	

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21.1.5	Machining of NAS Test Piece. Vendor to supply test piece and tooling for it's machining.	Vendor to Confirm	
Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
21.2	Tests/Activities to be carried out at BHEL works while commissioning the machine:	Vendor to Confirm	
21.2.1	Geometrical Accuracy Tests as per test chart	Vendor to Confirm	
21.2.2	Positioning Accuracy Tests as per VDI-DGQ/3441 / ISO 230 - 2	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 shall 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	Demonstration 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	Prove-out of BHEL components	Vendor to Confirm	
22.0	PACKAGING: Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all loose items shall be suitably packed in boxes	Vendor to Confirm	

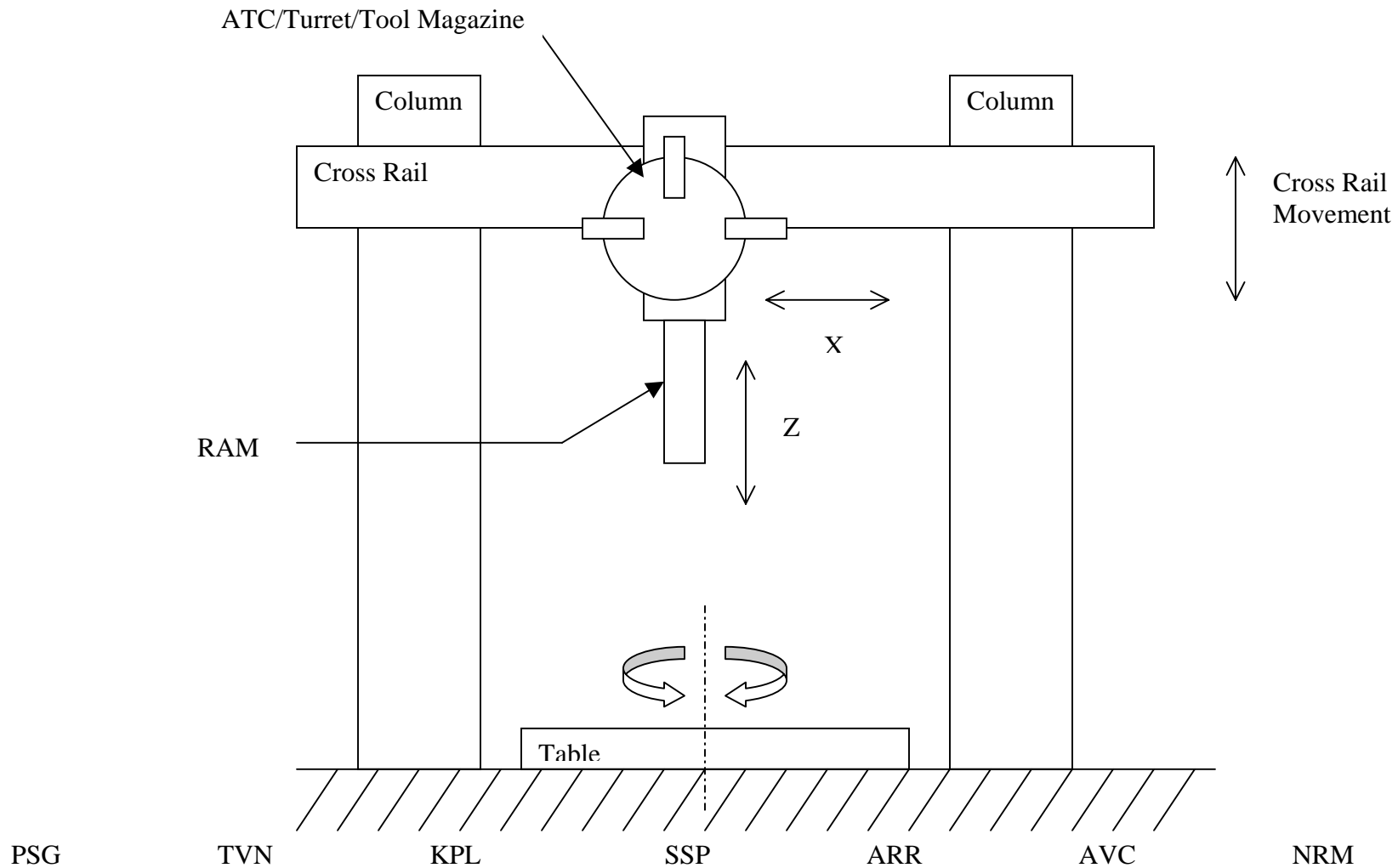
Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
23.0	GUARANTEE: 24 months from the date of acceptance of the machine.	Vendor to Confirm	
24.0	GENERAL:		
24.1	The vendor should submit the following information:	Vendor to confirm	
24.2	Machine Model	Vendor to specify	
24.3	Total connected load (KVA):	Vendor to specify	
24.4	Over all size of machine& accessories (Length x Width x Height)	Vendor to specify	
24.5	Painting of Machine/ Electrical Panels: RAL 6011 Apple Green (Polyurethane Paint)	Vendor to Confirm	
24.6	Approximate total weight of the machine	Vendor to specify	
24.7	Weight of heaviest part of machine	Vendor to specify	
24.8	Weight of the heaviest assembly/ subassembly of the Machine	Vendor to specify	
24.9	Dimensions of largest part/ subassembly of the machine	Vendor to specify	

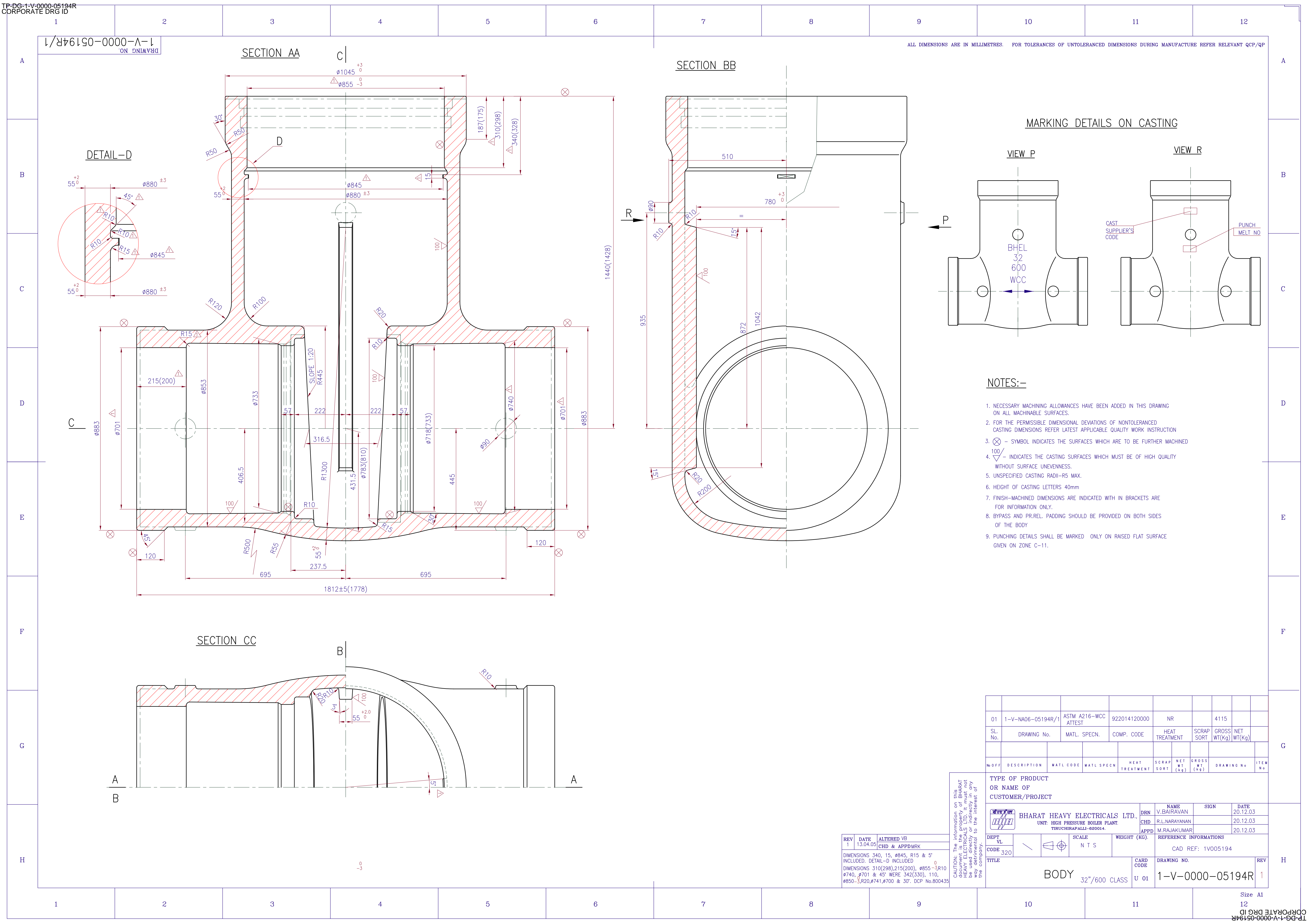
Annexure - 1: Table showing Prove out component list and operations.

Annexure - 2: Sketch showing approximate configuration of the machine.

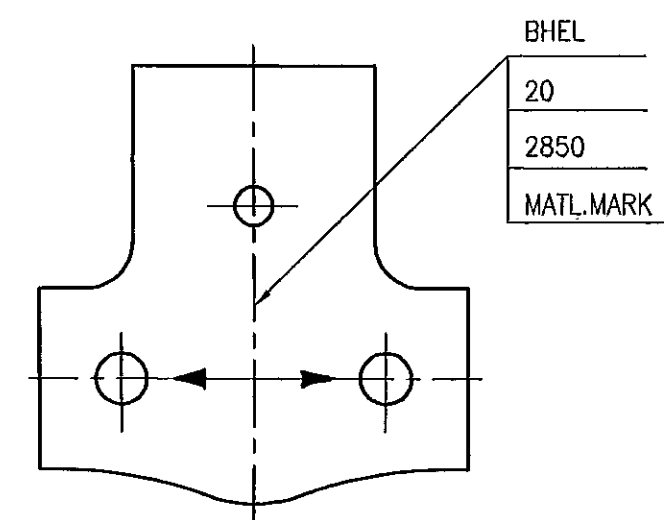
Annexure - 1

Prove out job details for CNC VTL (2500 Table)				
Prove out job Description	Prove out job Qty	Drawing No.	Title of Drg.	Operations to be done
GV 14" 2500 Body	1	2V000016417	Body Assy	Sealing bore finish machining
		2V000016411	Body Rough	Third port Machining as per Drg.
		2V000016410R	Body	Reference drg.
GV 32"600 Body	1	1V000005195	Body	Third port Rough Machining as per Drg.
		3V000023959	Body Assy	Sealing bore finishing.
		1V000005194R	Body	Reference drg.
GV 20"2850 Body	1	2V000015894R	Body	Reference drg.
		2VW75215910	Body Rough	Third port Rough Machining as per Drg.
		2VW79716320	Body Assy	Third port Finish Machining including thread as per Drg.

Annexure 2: Approximate Configuration of CNC Vertical Lathe





ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP




01. DOTTED LINES SHOWS FINISH MACHINED CONFIGURATION.
02. FOR ALL OTHER DETAILS LIKE DIMENSIONAL TOLERANCE, HYDRAULIC TEST PRESSURE ETC., REFER LATEST APPLICABLE QUALITY PROCEDURE.
03. * FOR THESE SPECIAL CLASS VALVES EMBOSSED SHALL BE '2850 SPL'.
04. BYPASS VALVE PADDING AND PRESSURE-RELIEVING PAD WILL BE ON ONE SIDE OF THE BODY ONLY.
05. * ALL THE SPECIAL CLASS RATINGS ARE TO BE SUBJECTED RT/UT ON ALL CRITICAL LOCATIONS.
06. * ALL EXTERIOR AND ACCESSIBLE INTERIOR SURFACES OF BODY SHALL BE MPI/LPI TESTED.

No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITE No
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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT	
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 365-120	BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.	DRN	NAME R.SAGAYARAJ	SIGN <i>R. Sagayaraj</i>	DATE 05.10.96	NO. VAL 
		CHD	K.RAJASEKARAN	<i>K. Rajasekaran</i>	05-10-96	
		APPD	M.RAJAKUMAR	<i>M. Rajakumar</i>	5/10/96	

DEPT	V L		SCALE	WEIGHT (KG)	REFERENCE INFORMATION	NO. ITEM
CODE	320		NTS	4800	CAD REF: T215894R	
TITLE				CARD CODE	DRAWING NO.	REV
BODY (CASTING)				U 01	2-V- <u>0000</u> -15894R	0
20/2850 CLASS)						

REV 02	DATE 9-6-2000	ALTRD RRSR <i>PR</i> CHDRAFPD, MRK <i>W</i>	REV 01	DATE 11.12.96	ALTERED <i>PR</i> CHD & APPD <i>PRC W</i>
DIMENSIONS $\phi 785, \phi 582, 160$ $420, 1285, 160$ AND 365 WERE $\phi 805, \phi 602, 170, 430, 114-90$ 170 AND 375 RESPECTIVELY. DCN NO. TA 1083			ZONE  DIMENSION 5 INCLUDED DCN NO. TA0732		

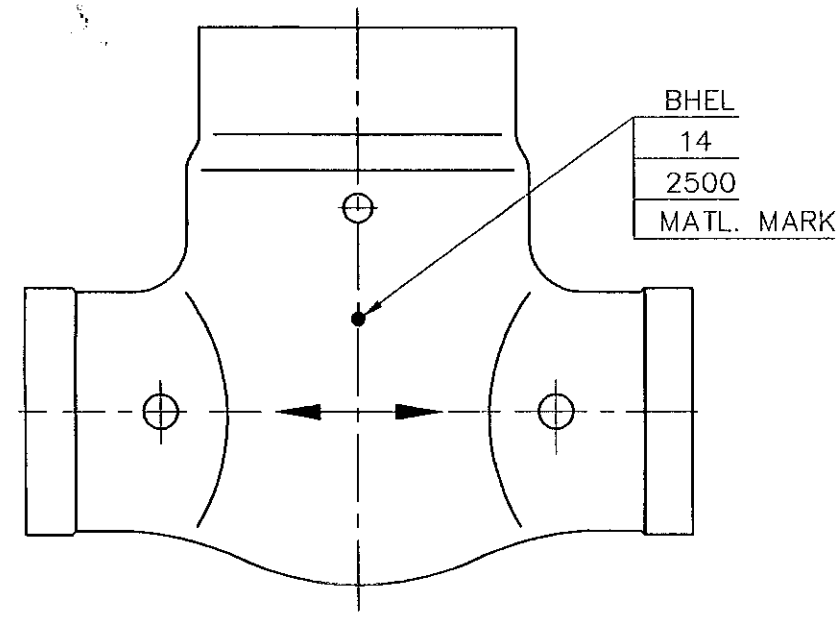
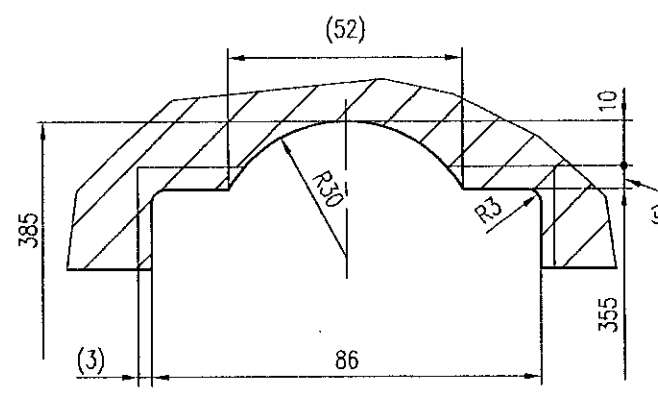
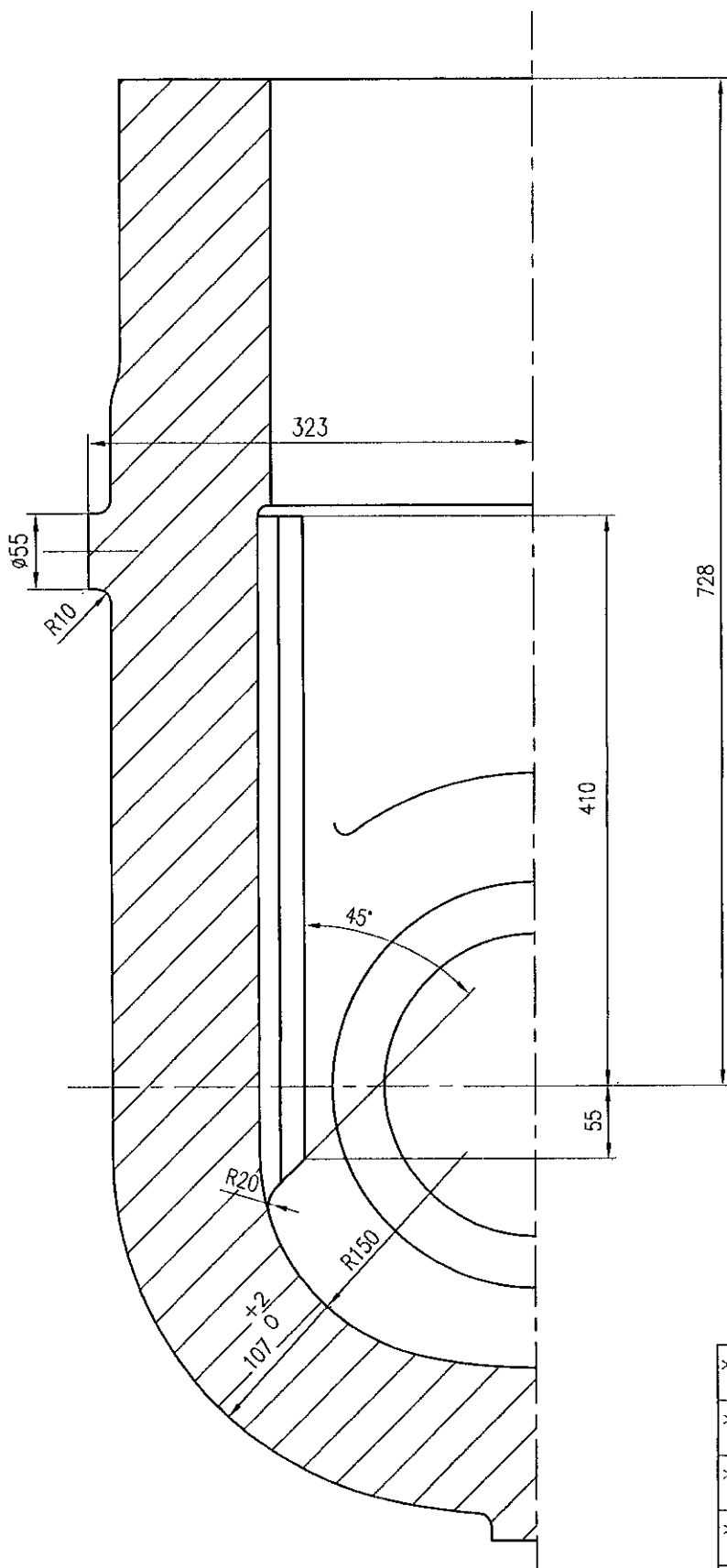
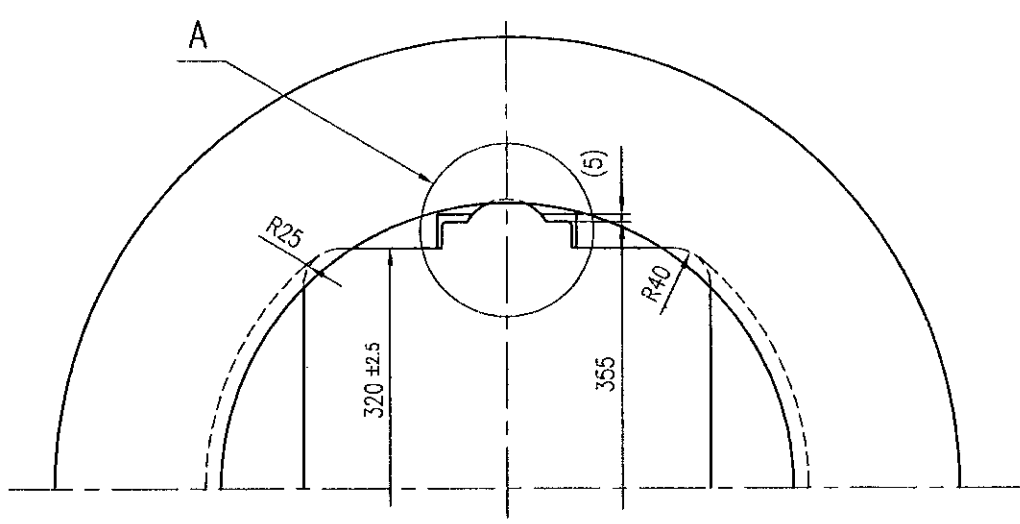
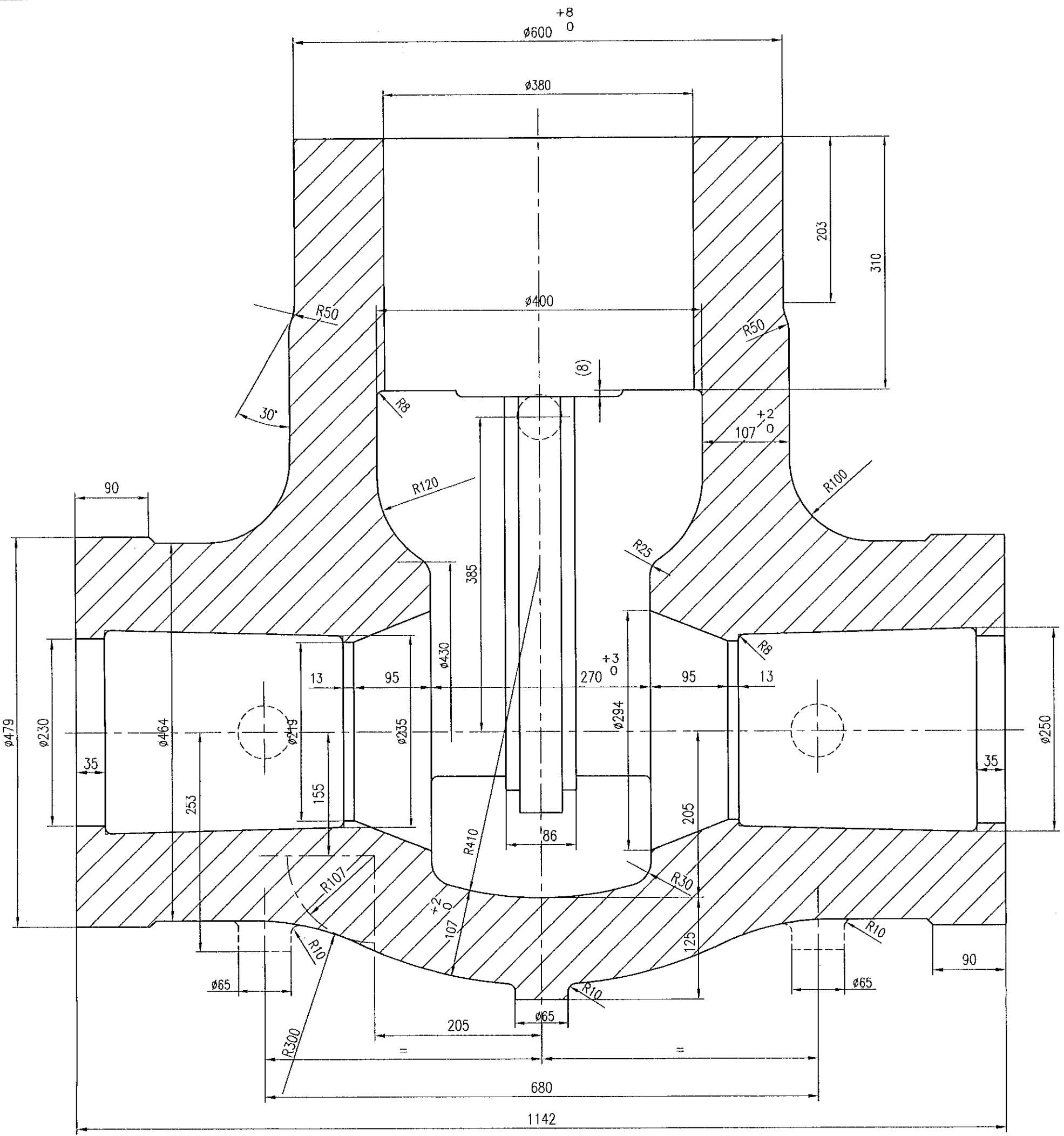
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

DRAWING NO. 2-V-0000-16410R

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP

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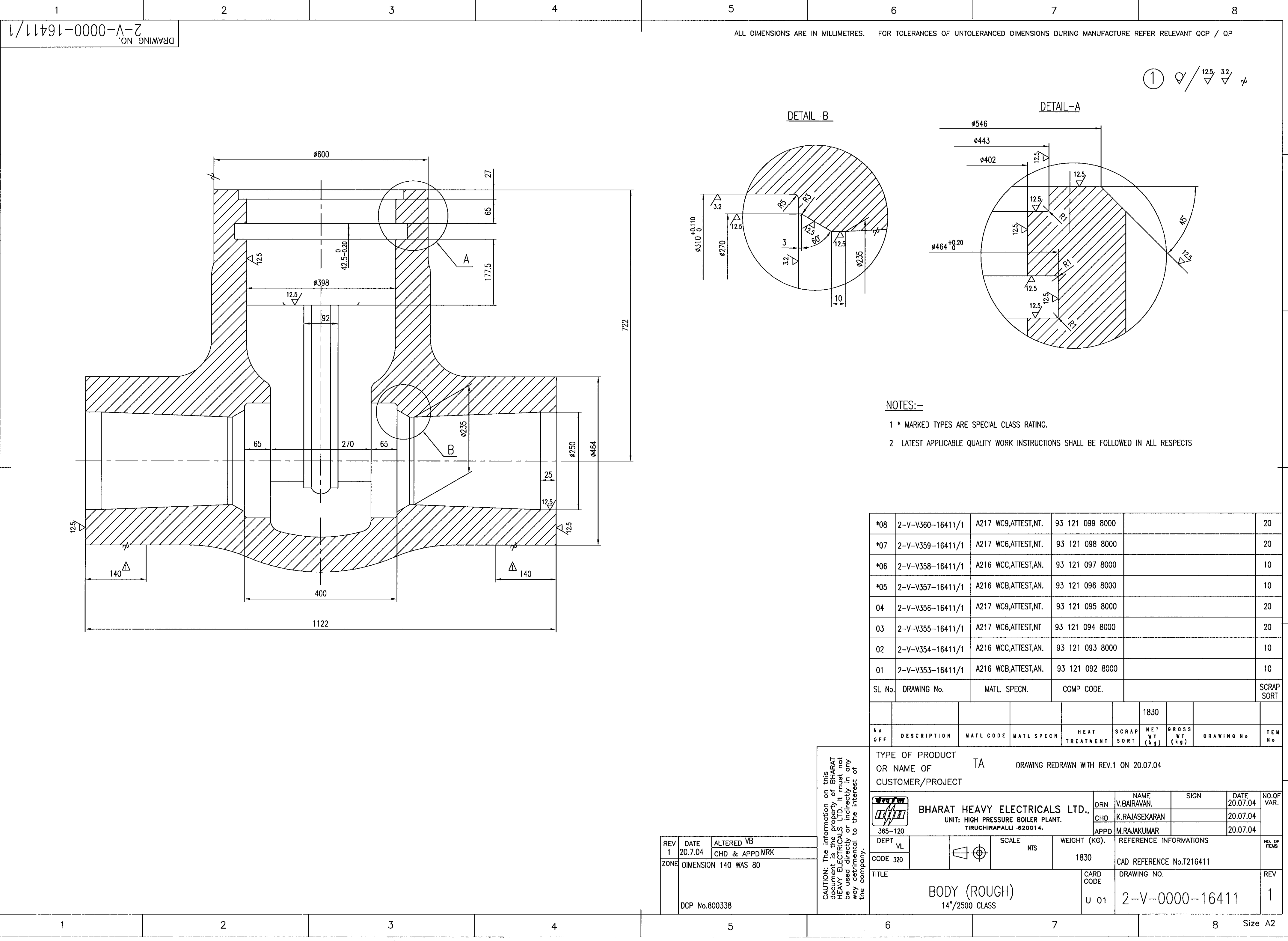
NOTES: -

- 1. FOR ALL OTHER DETAILS LIKE DIMENSIONAL TOLERANCE, EMBOSSING, ETC REFER LATEST APPLICABLE QUALITY WORK INSTRUCTIONS.
- 2. *FOR THESE SPECIAL CLASS VALVE EMBOSSING SHALL BE '2500 SPL'
- 3. *ALL THE SPECIAL CLASS CASTING ARE TO BE SUBJECTED RT/UT ON ALL CRITICAL LOCATIONS.
- 4. *ALL EXTERIOR AND ACCESSIBLE INTERIOR SURFACES OF BODY SHALL BE MPI/LPI TESTED.
- 5. BY PASS VALVE PADDING SHALL BE PROVIDED ON BOTH SIDES OF THE BODY
- 6. PRESSURE RELIEVING PAD SHALL BE PROVIDED ON BOTH SIDES OF THE BODY

*08	2-V-V368-16410R	A217 WC9,NT, ATTEST	92 152 433 0000	WC9	
*07	2-V-V367-16410R	A217 WC6,NT, ATTEST	92 152 432 0000	WC6	
*06	2-V-V366-16410R	A216 WCC,AN, ATTEST	92 152 431 0000	WCC	
*05	2-V-V365-16410R	A216 WCB,AN, ATTEST	92 152 430 0000	WCB	
04	2-V-V364-16410R	A217 WC9,NT, ATTEST	92 152 429 0000	WC9	
03	2-V-V363-16410R	A217 WC6,NT, ATTEST	92 152 428 0000	WC6	
02	2-V-V362-16410R	A216 WCC,AN, ATTEST	92 152 427 0000	WCC	
01	2-V-V361-16410R	A216 WCB,AN, ATTEST	92 152 426 0000	WCB	
SL No.	DRAWING No.	MATERIAL SPECN.	MATERIAL CODE	MATL. MARK	

No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
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REV		DATE	ALTERED	CHD & APPD	
ZONE					
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.					
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT					
BHARAT HEAVY ELECTRICALS LTD. UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.					
DEPT V L		SCALE NTS		WEIGHT (KG).	
CODE 320				REFERENCE INFORMATION	
TITLE		CARD CODE		DRAWING NO.	
BODY		U 01		2-V-0000-16410R	
		14"/2500CLASS		REV 0	



DRAWING NO. 2-V-0000-16411/1

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP

1 12.5 3.2

DETAIL-B

DETAIL-A

NOTES:-

- 1 * MARKED TYPES ARE SPECIAL CLASS RATING.
- 2 LATEST APPLICABLE QUALITY WORK INSTRUCTIONS SHALL BE FOLLOWED IN ALL RESPECTS

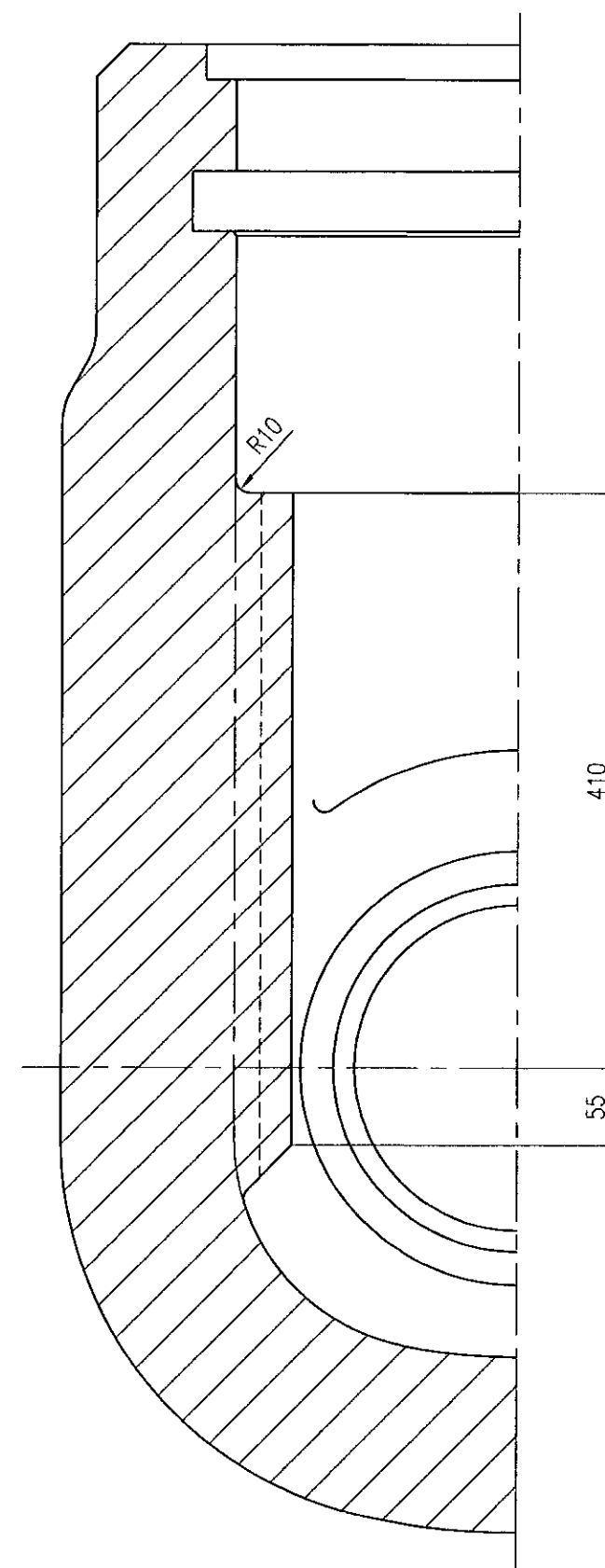
*08	2-V-V360-16411/1	A217 WC9,ATTEST,NT.	93 121 099 8000		20
*07	2-V-V359-16411/1	A217 WC6,ATTEST,NT.	93 121 098 8000		20
*06	2-V-V358-16411/1	A216 WCC,ATTEST,AN.	93 121 097 8000		10
*05	2-V-V357-16411/1	A216 WCB,ATTEST,AN.	93 121 096 8000		10
04	2-V-V356-16411/1	A217 WC9,ATTEST,NT.	93 121 095 8000		20
03	2-V-V355-16411/1	A217 WC6,ATTEST,NT	93 121 094 8000		20
02	2-V-V354-16411/1	A216 WCC,ATTEST,AN.	93 121 093 8000		10
01	2-V-V353-16411/1	A216 WCB,ATTEST,AN.	93 121 092 8000		10
SL No.	DRAWING No.	MATL. SPECN.	COMP CODE.		SCRAP SORT

No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		TA		DRAWING REDRAWN WITH REV.1 ON 20.07.04	
BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI -620014.		DRN	V.BAIRAVAN.	SIGN	DATE 20.07.04
		CHD	K.RAJASEKARAN		20.07.04
		APPD	M.RAJAKUMAR		20.07.04
DEPT VL	SCALE NTS	WEIGHT (KG).	REFERENCE INFORMATION		NO.OF VAR.
CODE 320		1830	CAD REFERENCE No.T216411		
TITLE		CARD CODE	DRAWING NO.		REV
BODY (ROUGH) 14"/2500 CLASS		U 01	2-V-0000-16411		1

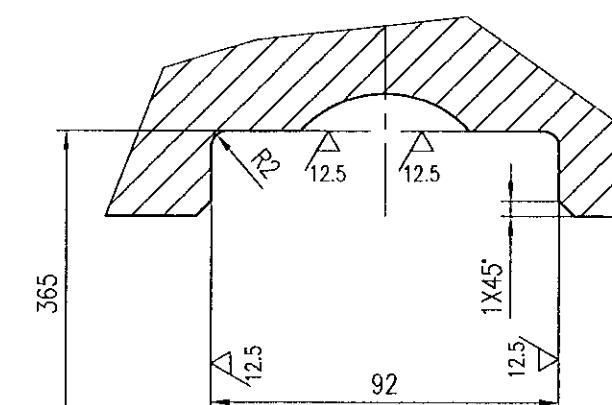
REV 1	DATE 20.7.04	ALTERED VB
ZONE	DIMENSION 140 WAS 80	
DCP No.800338		

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① $\nabla / 12.5$ $\nabla / 3.2$ $\nabla / 0.8$

ø400 H7	+0.057 0
ø445 H7	+0.063 0



SECTION-AA

NOTES:-

- 1 * MARKED TYPES ARE SPECIAL CLASS RATING.
- 2 LATEST APPLICABLE QUALITYWORK INSTRUCTION SHALL BE FOLLOWED IN ALL RESPECTS
- 3 EDGE PREPARATION SHALL BE AS PER SEPERATE INSTRUCTION.


08*	2-V-V360-16417	2-V-V360-16410R	A217 WC9,ATTEST,NT.	93 121 099 9000	E9018 B3	20
07*	2-V-V359-16417	2-V-V359-16410R	A217 WC6,ATTEST,NT.	93 121 098 9000	E8018 B2	20
06*	2-V-V358-16417	2-V-V358-16410R	A216 WCC,ATTEST,AN.	93 121 097 9000	E7018 I	10
05*	2-V-V357-16417	2-V-V357-16410R	A216 WCB,ATTEST,AN.	93 121 096 9000	E7018 I	10
04	2-V-V356-16417	2-V-V356-16410R	A217 WC9,ATTEST,NT.	93 121 095 9000	E9018 B3	20
03	2-V-V355-16417	2-V-V355-16410R	A217 WC6,ATTEST,NT.	93 121 094 9000	E8018 B2	20
02	2-V-V354-16417	2-V-V354-16410R	A216 WCC,ATTEST,AN.	93 121 093 9000	E7018 I	10
01	2-V-V353-16417	2-V-V353-16410R	A216 WCB,ATTEST,AN.	93 121 092 9000	E7018 I	10
SL No.	DRAWING No.	CASTING DRG. No.	MATL. SPECN.	COMP CODE.	ELECTRODE SPECN. (FOR PART No.91)	SCRAP SORT

No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT	
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BHARAT HEAVY ELECTRICALS LTD.,
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI -620014.

DRN	NAME	SIGN	DATE	NO. OF VAR.
CHD	V. BAIRAVAN	<i>[Signature]</i>	31/1/03	
CHD	K. RAJASEKARAN	<i>[Signature]</i>	4/1/03	
APPD	M. RAJAKUMAR	<i>[Signature]</i>	4/1/03	

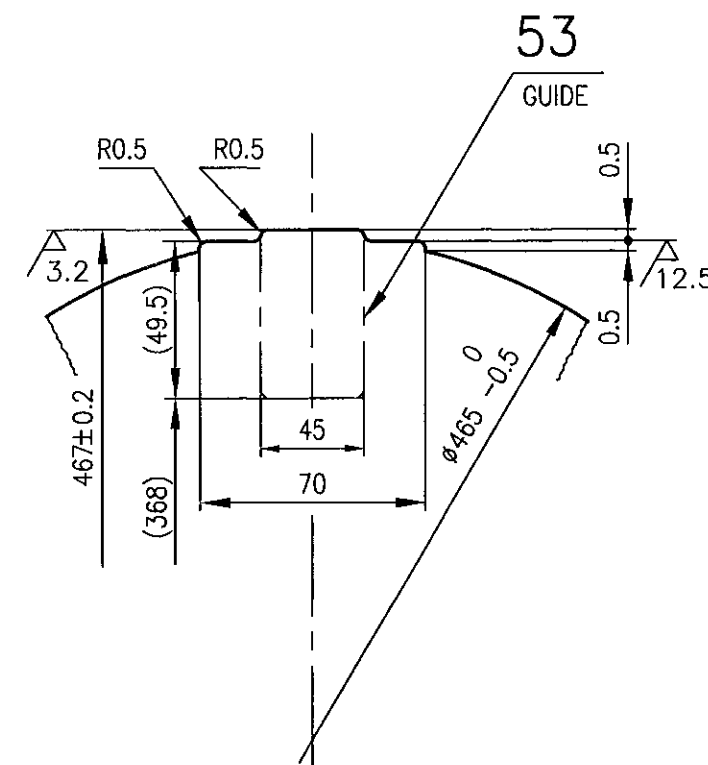
DEPT VL		SCALE	WEIGHT (KG).	REFERENCE INFORMATION	NO. OF ITEMS
CODE		N T S	1830	TOA DRAWING No. 3-035124 CAD REFERENCE No.T216417A	

TITLE	CARD CODE	DRAWING NO.	REV
BODY ASSY 14"/2500 CLASS	U 01	2-V- ^{REFER TABLE} 0000-16417	0

REV	DATE	ALTERED
		CHD & APPD
ZONE		


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P-DG-2-V-0000-16417
245
CORPORATE DRG ID 8

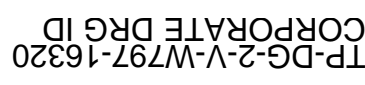


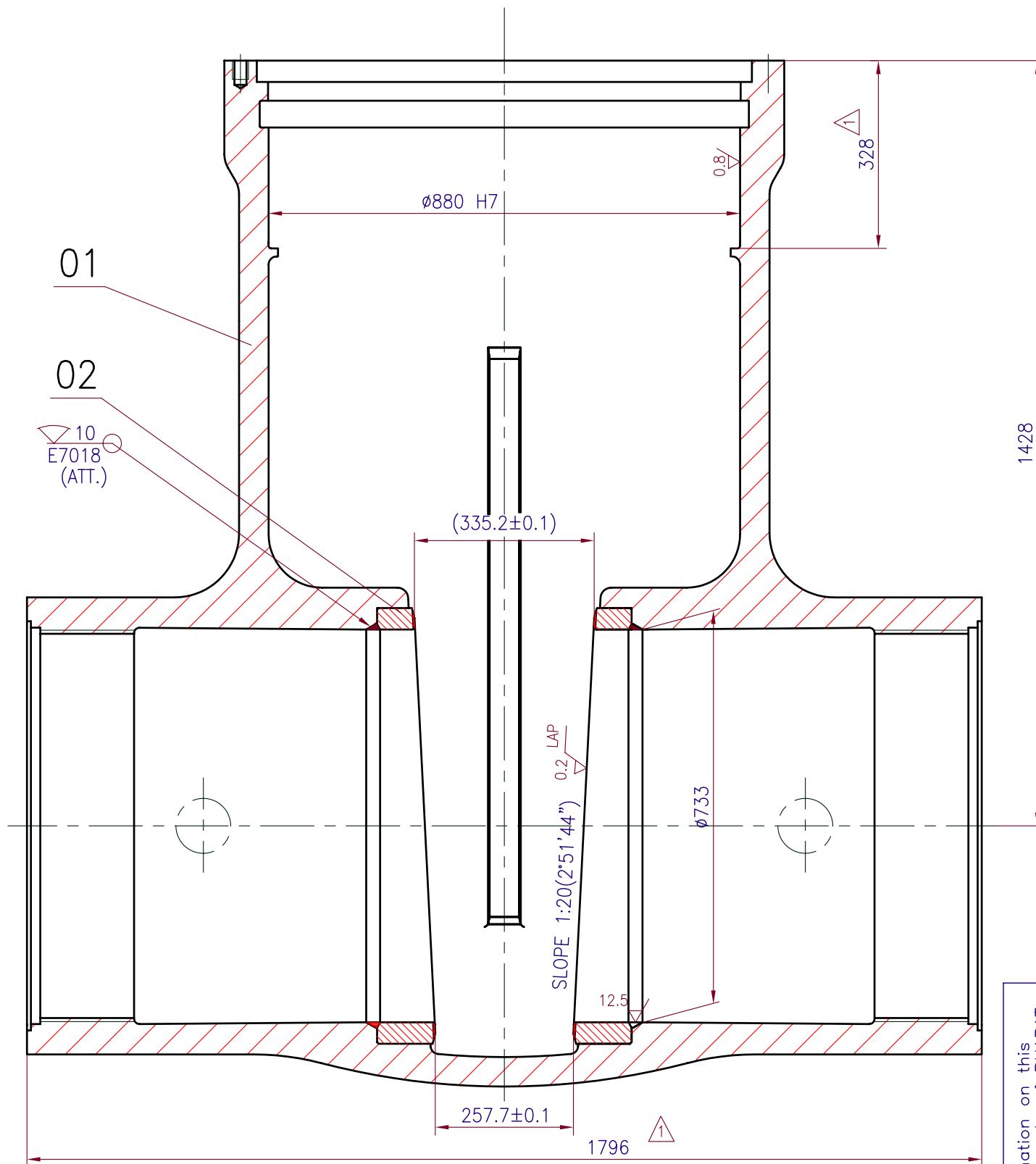
The technical drawing shows a cross-section of a mechanical component. The left side is hatched, indicating it is a solid part. Key features include:

- Top Surface:** A horizontal surface with a width dimension of 0.5 and a surface texture symbol.
- Internal Features:** A series of steps or changes in diameter along the length of the part. Dimensions include 0.5, 12.5, 3.2, R3, 58, 60°, 12.5, 12.5, and 12.5.
- External Features:** A large circular feature with a diameter of $\phi 471.5$. Other diameters shown are $\phi 463$ and $\phi 465^{+0}_{-0.5}$.
- Surface Texture:** Indicated by symbols with values like 12.5 and 3.2.
- Dimensions:** Various linear dimensions are provided, such as 0.5, 12.5, 3.2, 58, 60°, 12.5, and 12.5.

REV	DATE	ALTD: V8 <i>h</i>	REV	DATE	ALTERED <i>KRS t-pj</i>
2	28.5.01	CHD & APPD: <i>KRS t</i>	01	2.2.98	CHD & APPD <i>M.R.k</i>
DIMENSION Ø561±0.2 WAS Ø591±0.2.			ZONE  DIMENSION 160 WAS 170 DCN NO. TA0872		
DCN NO. TA1157					

08		2-V-W752-15910/2		A217 WC9,NT,ATTEST		20		93 118 767 8000	
SL. No.		DRAWING No.		MATERIAL SPECN.		SCRAP SORT		COMP CODE.	
No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT									
TA									
 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.									
DEPT V L		SCALE		WEIGHT (KG).		REFERENCE INFORMATION		NO. OF ITEMS	
CODE 320		N T S				CAD REF: T215910			
TITLE				CARD CODE		DRAWING NO.		REV	
BODY ROUGH				U 01		2-V-W752-15910		2	
(500 mm / 2850 SPL.CLASS)									







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LATEST APPLICABLE QUALITY WORK INSTRUCTION SHALL BE FOLLOWED IN ALL RESPECTS.

ø880-H7	+0.090
	0

01	3-V-NA06-23959/1	931108310000							
SL. No.	DRAWING No.	COMP. CODE							
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT									
<div><div><div>365-121</div></div><div>BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.</div></div>					DRN	NAME V.BAIRAVAN	SIGN	DATE 17.03.04	NO.OF VAR.
					CHD	R.L.NARAYANAN		17.03.04	
					APPD	M.RAJAKUMAR		17.03.04	
DEPT VL			SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS				NO. OF ITEMS
CODE 320			N T S	3932					
TITLE					CARD CODE	DRAWING NO.			REV
BODY ASSEMBLY 32"/600CLASS					U 01	3-V-0000-23959			1