



An ISO 9001
Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY	Phone: +91 431 257 79 38 Fax : +91 431 252 07 19 Email : tvenkat@bheltry.co.in Web : www.bhel.com
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	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
	2620800041	19.06.2008	23.07.2008

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 Horizontal Machining Centre as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	1 No.	31.05.2009

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 “2620800041”.

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

PART A**HORIZONTAL MACHINING CENTER****SECTION – I : QUALIFYING CRITERIA**

The BIDDER has to compulsorily meet the following requirements to get qualified for considering the technical offer for the HORIZONTAL MACHINING CENTER.

S. No.	REQUIREMENTS	Vendor's Response
1	<p>Only those vendors (OEMs), who have supplied and commissioned at least one CNC Horizontal Machining Center / CNC Horizontal Bed type Milling & Drilling Machine with</p> <p>1. Spindle power 18 KW or more</p> <p>2. Table size of 1400 mm x 1250 mm or more and</p> <p>3. Table Load carrying capacity 1800 Kg or more</p> <p>in the past ten years and such machine should be working satisfactorily for a minimum period of one year after commissioning, as on the date of opening of this Tender are eligible to quote.</p> <p><i>(However, if such machine is already supplied to BHEL, then that machine should be working satisfactorily for a minimum period of six months after commissioning, as on the date of opening of this Tender.)</i></p>	
The vendor should submit the following information where similar machine has been supplied, for qualification of this 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	Parameters of machine supplied, viz. Table size, Table load carrying capacity, Spindle power and the application for which the machine is supplied	

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1.6	Along with the Technical offer, the Vendor should submit one Performance certificate from the customer for the satisfactory performance of the machine supplied to them. For obtaining the Performance certificate, a suggestive format is provided in SECTION – IV .	
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 HORIZONTAL MACHINING CENTERS / CNC Horizontal Bed type Milling & Drilling Machines have been supplied in the past.	
4.0	Details of HORIZONTAL MACHINING CENTERS / CNC Horizontal Bed type Milling & Drilling Machines supplied to other BHEL units, if any. (Year of commissioning, Table size, Table load carrying capacity, Spindle 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.	

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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] and Commercial offer. 2. 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.	

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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) Table load Carrying Capacity c) Max Job envelope d) Spindle Power (cont. rating) e) Spindle Taper	
6. Performance of the Equipment (Tick whichever is applicable)		Best in the market
		Satisfactory
		Good
		Average
		Not Satisfactory
7. Any Other remarks		
<div style="text-align: right;"> Signature & Seal of the Authority Issuing the Performance Certificate </div> <div>Date:</div>		

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PART-B**TECHNICAL SPECIFICATION FOR HORIZONTAL MACHINING CENTER**

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER’S OFFER With Technical Details																														
1.0	PURPOSE: The machine is intended for machining valve components. The following machining operations shall be carried out on the machine. Milling. Drilling. Tapping, Reaming and Spot facing (internal & external).																															
1.1	WORKPIECE MATERIAL SPECIFICATION: The work piece material is either Steel Casting or Steel Forging <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> Largest Job Size (L x B x H) = 1200 mm × 1000 mm × 1200 mm	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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		SA 182 F91	225 BHN																													

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.0	CONFIGURATION: Approximate configuration of the Machine is shown in annexure – 2.		
2.1	CONSTRUCTION		
2.1.1	Vendor to furnish constructional details of the machine including explanatory drawings of various components/ assemblies like Column, Table, ATC, Machine Bed, Feed Transmission System, Feed back System etc. of the machine with details of material & their hardness.	Vendor to specify	
2.1.2	Movable Chip / Splash Guard with sufficient transparent windows to view the machining should be provided for the Table with sufficient height to avoid splash of Coolant and scattering of Chips on Operator's Platform and on Shop Floor. Details of the same shall be submitted	Vendor to specify	
2.1.3	Video images on CD / Hard copy of literature with photographs & drawings explaining the technical features shall be enclosed with the offer	Vendor to specify	
2.1.4	Machine should be metric execution.	Vendor to confirm	
2.2	TABLE		
2.2.1	Type: Indexing Rotary Table	Vendor to confirm	
2.2.2	No. of indexing positions:	360000 positions	
2.2.3	Size of Clamping Surface / Table (L X B): Min.1400×1250 mm	Vendor to specify	
2.2.4	Max. Weight of Work-piece:	1800 Kg	
2.2.5	Maximum Rotating Speed of Table:	Vendor to specify	
2.2.6	Details of T-Slots (No / Size / Pitch):	Vendor to specify	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.2.7	Load carrying capacity of Table:	Vendor to specify	
2.2.8	Central Slot tolerance:	Vendor to specify	
2.2.9	Lateral Slot size and tolerance:	Vendor to specify	
2.2.10	Table surface and central slot should be accurately machined and they will be used as reference surfaces.	Vendor to confirm	
2.3	SPINDLE		
2.3.1	Spindle Diameter:	Vendor to specify	
2.3.2	Spindle Motor Power (AC Continuous Duty S1): The spindle drive and motor shall be of Fanuc / SIEMENS (Details of model, make, type etc. to be furnished in the offer)	Min 18 KW Vendor to specify	
2.3.3	Spindle Bearing Diameters:	Vendor to specify.	
2.3.4	Taper in Spindle:	ISO # 50	
2.3.5	Spindle speed range (Infinitely variable): 30 – 3000 RPM	Vendor to specify	
2.3.6	No of speed ranges (Selectable through program):	Vendor to specify	
2.3.7	Torque/Power/Speed diagram of spindle motor is to be submitted with the offer.	Vendor to submit	
2.3.8	Minimum and maximum height between Spindle Center line and Table Top surface.	Vendor to specify	
2.3.9	Min. distance from Spindle Face to Table center: 0 mm	Vendor to confirm	
2.3.10	Drilling Capacity	60 mm	
2.4	TRAVERSES		
2.4.1	Longitudinal Travel of Table or column –X Axis: Min. 1500 mm.	Vendor to specify	
2.4.2	Spindle Head Vertical Travel- Y Axis: Min 1200 mm.	Vendor to specify	
2.4.3	Table or Column Cross Travel- Z Axis: Min 800 mm.	Vendor to specify.	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.5	FEEDS AND DRIVE SYSTEM		
2.5.1	Rapid Feed Rate in X, Y& Z Axes:	Vendor to specify	
2.5.2	Feed Rate in X, Y& Z Axes (Infinitely variable):	Vendor to specify	
2.5.3	Feed drive motors [AC servo motors] shall be digital type of Fanuc / Siemens (Details of model, make, type etc. to be furnished with the offer)	Vendor to furnish	
2.5.4	Feed back system: Fanuc/ Siemens/ Heidenhein encoders. (Details to be furnished with the offer)	Vendor to confirm & furnish detail	
2.5.5	Feed back system for B-axes: Heidenhain Rotary Encoder (Details to be submitted with the offer)	Vendor to confirm & furnish detail	
2.5.6	Mechanism for locking / clamping the axes:	Vendor to specify	
2.5.7	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	
2.5.8	Metallic Telescopic Covers of rust resistant material shall be provided with wipers for guide ways of all axes. Provision should be made to avoid mixing of coolant & hydraulic oil.	Vendor to specify	
2.6	AUTOMATIC TOOL CHANGER		
2.6.1	Type: (Chain Type / Drum Type):	Vendor to specify	
2.6.2	Tool selection method: Random & Shortest Path	Vendor to specify	
2.6.3	Tool Taper:	ISO # 50	
2.6.4	Number of Tools in the Magazine:	Around 40	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.6.5	Maximum Diameter of Tool: a) When all Pockets are Filled: b) When adjacent Pockets are Filled:	Vendor to specify	
2.6.6	Max Length of Tool:	Vendor to specify	
2.6.7	Max Weight of Tool:	Vendor to specify	
2.6.8	Limitation regarding length & weight of tool / tool holder clamped in different tool holders for trouble free operation:	Vendor to specify	
2.6.9	Tool Change Time (Tool-to-Tool):	Vendor to specify	
2.6.10	The machine shall have provision for loading / unloading of Tools through push buttons provided on the machine as well as Auxiliary Hand pendant.	Vendor to specify	
2.6.11	The spindle taper and tool pocket at changer station will have the provision of cleaning by compressed air blow during ATC cycle. (The spindle taper will also have the provision of compressed air blow through push button provided on machine for manual tool change.)	Vendor to Confirm	
2.6.12	Auxiliary Control, with suitable interlocks, for manual insertion / withdrawal of tool from the tool magazine shall be provided.	Vendor to Confirm	
2.6.13	Suitable arrangement, Software custom screen based and manual key based pendant, should be provided to extract a tool trapped anywhere in the ATC cycle. Details of both the system to be provided along with the offer.	Vendor to Confirm	
2.6.14	The Machine operation should be possible with or without referencing ATC.	Vendor to Confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.6.15	One set of tool holder retention stud equal to number of stations in the Tool magazine shall be provided with the machine.	Vendor to Confirm	
2.6.16	Working of Tool Changer arm should be explained in detail. Full ATC catalogue should be submitted.	Vendor to specify	
2.7	OPERATION AND CONTROL SYSTEM		
2.7.1	OPERATOR'S PANEL		
2.7.1.1	Preferably swiveling type operator's panel having complete CNC and machine control system with CRT of required configuration shall be provided at an ergonomically suitable location. All switches should be within reach of operator for easy & safe operation. All displays/indications should also be conveniently placed accordingly. Layout showing complete details should be submitted.	Vendor to submit	
2.7.2	CNC SYSTEM & FEATURES		
2.7.2.1	Make: Fanuc / Siemens	Vendor to specify	
2.7.2.2	Type: PC based latest version (With Simultaneous interpolation of three axes)	Vendor to Confirm	
2.7.2.3	Model: Suitable and Latest version, as available at the time of ordering, should be supplied.	Vendor to Confirm	
2.7.2.4	Details of Standard features:	Vendor to specify	
2.7.2.5	Details of optional features, recommended by vendor.	Vendor to specify	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.7.2.6	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 for LAN, electronic hand wheels for all axes, CD/DVD drive unit with CD/DVD writer for data input/output, hard disk of sufficient capacity (not less than 80 GB), graphic simulation and preinstalled system software & other required software etc. (Details should be submitted by Vendor).	Vendor to Confirm	
2.7.3	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, table/ spindle speed, cutting feed on/off, display of axis position values etc. for manual operation without using CNC program, CNC option Manual Turn or MDI mode. Diagrams/ sketches for switches/ keys provided on operator pendent should be submitted.	Vendor to confirm	
2.7.4	HAND HELD UNIT: Hand Held unit along with sufficient length of interfacing cable for axis selection; axis movement with pulse generator, axis position display and emergency stop is to be offered with complete details. This is required for job setting.	Vendor to specify	
2.7.5	UPS FOR CNC SYSTEM: UPS of 30 minutes for CNC system with inbuilt cooling and charge status display	Vendor to specify	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.8	MACHINE LIGHTS		
2.8.1	Machine Lights for sufficient illumination of complete working area should be provided for clear visibility.	Vendor to confirm	
2.8.2	A magnetic base portable spot- light with sufficiently long cable should also be provided.	Vendor to confirm	
2.8.3	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to confirm	
2.8.4	Flashing / rotary type End of Cutting and Program Stop Light.	Vendor to confirm	
2.8.5	Voltage shall be 24V for the hand lamp	Vendor to confirm	
2.9	AIR CONDITIONERS: 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	
2.10	HYDRAULIC SYSTEM:		
2.10.1	Make: Rexroth / Vickers Sperry or any other reputed make acceptable to BHEL.	Vendor to specify	
2.10.2	Hydraulic system should be centralized. Hydraulic Tank shall preferably be located at floor level All hydraulic pipelines to be neatly laid out. (Details should be furnished at contract stage)	Vendor to Confirm	
2.10.3	Hydraulic circuits shall be designed with minimum number of control valves and to suit oil of ISO VG 46 or 68 only. Also minimum number of check- points to be provided wherever pressure is required to be measured for setting and trouble shooting. MINIMESS Pressure Gauge - 1 No with Connecting Hose to be provided.	Vendor to Confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.10.4	The control voltage for all solenoid operated valves shall be 24 V DC	Vendor to Confirm	
2.10.5	Filtration System.	Vendor to specify	
2.10.6	Failure indication:	Vendor to specify	
2.10.7	Automatic shut off provision.	Vendor to specify	
2.10.8	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	
2.10.9	Hydraulic pump capacity (flow / pressure)	Vendor to specify	
2.10.10	Each pump should have an independent motor.	Vendor to Confirm	
2.11	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.	Vendor to specify	
2.12	COOLANT SYSTEM:		
2.12.1	Coolant System with all accessories for following types shall be provided. Selection of required type shall be enabled through program as well as manual (by push buttons on the Operator's panel).	Vendor to Confirm	
2.12.2	a) Re-circulating type Flood Coolant System.	Vendor to Confirm	
2.12.3	b) High Pressure Coolant system through Spindle.	Vendor to Confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.12.4	Coolant Pressure for each type to be furnished.	Vendor to Furnish	
2.12.5	Coolant flow rate for each type be furnished.	Vendor to Furnish	
2.12.6	All Spindle mounted tool holders, boring bars and adapters etc. shall have through tool coolant provision.	Vendor to Confirm	
2.12.7	Coolant collection and re-circulation system shall be leak proof to avoid spillage on shop floor.	Vendor to Confirm	
2.12.8	Coolant Filtration System: Re-circulating type with suitable filtration unit. Vendor shall give details of offered filtration unit.	Vendor to specify	
2.12.9	Coolant Flow Diagram showing filters, pumps, valves, tanks etc. to be submitted with the offer.	Vendor to Submit	
2.12.10	Coolant pump & motor details for all types of coolant system are to be submitted with the offer.	Vendor to specify	
2.12.11	Coolant tank Capacity	Vendor to specify	
2.12.12	The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.	Vendor to Confirm	
2.13	ELECTRICAL:		
2.13.1	415V \pm 10%, 50 HZ \pm 3 HZ, 3 Phase AC (3 wire system with out neutral) Power Supply Voltage 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	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.14	Tropicalisation: All electrical / electronic equipment shall be tropicalized.	Vendor to Confirm	
2.14.1	All electrical & electronic control cabinets & panels should be dust and vermin proof and shall have IP 54 protection.	Vendor to Confirm	
2.14.2	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to Confirm	
2.14.3	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	
2.14.4	Motors shall conform to IEC or Indian Standards	Vendor to Confirm	
2.14.5	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	
2.14.6	Vendor should ensure proper earthing for the machine and its peripherals.	Vendor to Confirm	
2.14.7	In-cycle hour counter with reset facility and digital energy meter shall be provided	Vendor to Confirm	
2.15	SAFETY ARRANGEMENTS:		
2.15.1	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	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
2.15.2	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to specify	
2.15.3	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to Confirm	
2.15.4	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.	Vendor to Confirm	
2.15.5	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to Confirm	
2.15.6	Oil & water lines should not run with electrical cable in the same tray / trench.	Vendor to Confirm	
2.16	ENVIRONMENTAL PERFORMANCE OF THE MACHINE:		
2.16.1	Maximum noise level shall not exceed 85 dB(A) at normal load condition, 1 meter away from the machine.	Vendor to Confirm	
2.16.2	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to Confirm	
2.16.3	There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to Confirm	
2.16.4	No hazardous chemicals shall be used in the machine.	Vendor to Confirm	
2.16.5	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to Confirm	
2.16.6	Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to Confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
2.17	CHIP CONVEYOR	
2.17.1	A chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin on the floor, should be provided at the side of the machine. Two chip bins of appropriate size of Indian make, with wheels and handle for movement, should also be supplied.	Vendor to Confirm
2.17.2	Type of chip conveyor:	Vendor to specify
2.17.3	Width of conveyor	Vendor to specify
2.17.4	Elevation of chip conveyor for chip bin:	Vendor to specify
2.17.5	Material of chip conveyor (to be rust resistant):	Vendor to Confirm
2.17.6	Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor should be possible.	Vendor to Confirm
2.17.7	Layout showing location of chip conveyor should be submitted.	Vendor to Submit
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 the 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

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
4.0	ULTRA ISOLATION TRANSFORMER		
4.1	Indian make Ultra Isolation Transformer suitable for complete machine, its drives, controls, PLC etc. shall be offered.	Vendor to Confirm	
4.2	Make: Make. : NEEL / DELTA / AEI / POWER AID	Vendor to specify	
4.3	Model & 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 shall be submitted.	Vendor to Submit	
5.0	Compressed air points: Compressed air at 60 to 70 psi will be made available at one point by BHEL. 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	All supplied Tool holders, Cutting Tools, adapters etc. shall have through coolant provision so that coolant is available directly on the cutting tip during all possible operations.	Vendor to Confirm	
6.2	Adaptors for drilling: The vendor shall supply the following tang end Morse taper drilling adaptors. a) ISO # 50 - MT # 4 : 2 nos. b) ISO # 50 - MT # 3 : 2 nos c) ISO # 50 - MT # 2 : 2 nos d) ISO # 50 collet Type: 2 nos (with 2 set of collets range 6 mm to 32 mm)	Vendor to Confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
6.3	Adaptors for milling: The vendor shall supply the following milling adaptors (screwed end) a) ISO # 50 - MT # 4 : 2 nos. b) ISO # 50 - MT # 3 : 2 nos c) ISO # 50 - MT # 2 : 2 nos d) ISO # 50 Adaptors for face/shoulder mills with ID=22,27,32,40mm: each 1 no.	Vendor to Confirm
6.4	All cutting tools, adaptors, sleeves & tool holders shall be supplied for machining of prove-out components:	Vendor to Confirm
6.5	TAPPING ATTACHMENT: Vendor to supply tapping attachment for Thread Diameter Range: M16 to M56. (Prove out to include tapping of prove out jobs listed in Annexure- 1)	Vendor to Confirm
7.0	MEASURING SYSTEM: 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 specify

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
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 Confirm	
9.2	Help guide should be provided to use both diagnostic systems		
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	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
11.0	LEVELING & ANCHORING SYSTEM: Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied.	Vendor to Confirm	
12.0	TOOLS FOR OPERATION & MAINTENANCE: Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer.	Vendor to Confirm Vendor to Submit	
13.0	ACCESSORIES		
13.1	Machine vice: a) Type: Heavy Duty b) Length of jaws (for Job holding): 250 mm c) Maximum opening of jaws: 250 mm	Vendor to Confirm Vendor to specify	
13.2	The following items shall be supplied for Job holding. a) Two Sets of Adjustable V Blocks (in pairs) to accommodate job diameters ranging from 150mm to 450mm. b) Two pairs of Clamping chains preferably with ratchet mechanism and tenons to suit the table T-Slots, for quick clamping. c) Fixtures for prove out machining of wedges indicated in Annexure – 1.	Vendor to Confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
14	SPARES:	
14.1	<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: The list may generally include all types of pumps, Valves, pressure switches / transducers, filters, seals etc.</p> <p>b) Electrical & electronic spares: The list may generally include 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) Un-priced list of spares with quantities, specified at a&b above, should be submitted with this technical offer.</p> <p>d) Unit Price of each item figuring in c shall be submitted in a sealed cover with the price bid.</p>	Vendor to Submit

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER With Technical Details
14.2	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.	Vendor to Confirm
14.3	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
15.0	DOCUMENTATION:	
15.1	3 sets of following documents (3 Hard copies) in English language should be supplied along with the machine	Vendor to confirm
15.2	Operating manuals of Machine & CNC system	Vendor to confirm
15.3	Programming Manuals of Machine & CNC system	Vendor to confirm
15.4	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Coolant / Hydraulic circuit diagrams.	Vendor to confirm
15.5	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.	Vendor to confirm
15.6	Manufacturing drawings for all supplied tool holders, coolant connections, adapters, sleeves, fixtures etc.	Vendor to confirm
15.7	Catalogues / O&M Manuals of all bought out items.	Vendor to confirm
15.8	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to confirm
15.9	Bearings: Make& Specification for all bearings used in the machine.	Vendor to Specify

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
15.10	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	
15.11	Operating Manuals, Maintenance Manuals & Catalogues for Isolation Transformer and voltage stabilizer.	Vendor to confirm	
15.12	PLC program printouts (Ladder diagram & Statement list) with comments in English.	Vendor to confirm	
15.13	PLC program on CD, NC data & PLC data on CD.	Vendor to confirm	
15.14	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	
15.15	The vendor shall submit complete Master List of parts used in the machine.	Vendor to Submit	
15.16	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to confirm	
16.0	TRAINING:		
16.1	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	
16.2	Airfare, boarding & lodging for the BHEL Engineers shall be borne by BHEL.	Vendor to confirm	
16.3	The Vendor shall impart training to BHEL's Machine Operators and Maintenance crew in Operation and Maintenance after the commissioning of the Machine at BHEL works for not less than 6 working days	Vendor to Confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
16.4	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel	Vendor to confirm	
16.5	Vendor to quote on the basis of per man per Day for training at vendor's works.	Vendor to specify	
17.0	FOUNDATION:		
17.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI). 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	
17.2	The Vendor shall indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine.	Vendor to Specify	
18.0	ERECTION & COMMISSIONING		
18.1	<p>1.Supplier to take full responsibility for supervision of the erection, start up, testing of machine, it's control system & all types of other supplied equipment, machining of test pieces etc.</p> <p>2.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.</p> <p>3.Other requirements like crane and helping personnel shall also be provided by BHEL, free of cost.</p>	Vendor to confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
18.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer shall also be responsibility of the vendor.	Vendor to confirm	
18.3	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned in clause " Machine Acceptance " shall form part of the commissioning activity.	Vendor to confirm	
18.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier.	Vendor to confirm	
18.5	The supplier shall arrange commissioning spares required for commissioning of the machine.	Vendor to confirm	
18.6	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	
18.7	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm	
18.8	Duration, terms & conditions for E&C should be furnished with this technical offer in detail. Charges for the same shall be submitted with the price bid.	Vendor to confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
19.0	ACCURACY TESTS:		
19.1	GEOMETRICAL ACCURACY:		
19.1.1	Geometrical Accuracy Tests shall be in accordance with ISO 10791 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.	Vendor to confirm	
19.1.2	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	
19.2	Machine positioning accuracies & repeatability should be measured as per VDI/DGQ 3441 / ISO 230 – 2 (latest revision) using laser interferometer.	Vendor to confirm	
19.2.1	Positioning Accuracy on traversing axes (Pa per 1000mm)	±0.016 mm	
19.2.2	Repeatability on traversing axes (Ps per 1000mm)	± 0.008 mm	
19.2.3	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 confirm	
20.0	AMBIENT CONDITIONS & THERMAL STABILITY:		
20.1	Power Supply : AC 415 V ±10% Frequency : 50 Hz ±3HZ 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
20.2	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. Vendor to confirm that machine is suitable for above.	Vendor to confirm	
20.3	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. Vendor to confirm for trouble-free operation of the machine.	Vendor to confirm	
20.4	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	
21.0	PROVEOUT OF BHEL COMPONENTS:		
21.1	<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. (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> <p>4. The vendor shall supply all cutting tools, Job holding fixtures, 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</p>	Vendor to Confirm	

21.1 contd.	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. 6. Vendor shall be fully responsible for machining of prove-out components as per drawing and other requirements specified by BHEL. Clarifications regarding accuracy requirements of the prove-out components, whether specified or not, should be discussed by vendor during initial technical discussions.	Vendor to Confirm	
Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
22.0	MACHINE ACCEPTANCE: (Tests/Activities should be Performed by Vendor)		
22.1	Tests/Activities should be carried out at supplier's works on the machine before dispatch:	Vendor to Confirm	
22.1.1	Geometrical accuracies as per test chart.	Vendor to Confirm	
22.1.2	Machine positioning accuracies & repeatability should be measured as per VDI/DGQ 3441 / ISO 230 – 2 (latest revision) using laser interferometer.	Vendor to Confirm	
22.1.3	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 restarting.	Vendor to Confirm	
22.1.4	Demonstration of all features of the machine, control system & accessories.	Vendor to Confirm	
22.1.5	Machining of test piece as per NAS/AFNOR/ISO. Vendor to supply test piece and tooling for it's machining.	Vendor to Confirm	
22.2	Tests/Activities should be carried out at BHEL works while commissioning the machine:	Vendor to Confirm	
22.2.1	Geometrical accuracies as per test chart.	Vendor to Confirm	
22.2.2	Machine positioning accuracies & repeatability should be measured as per VDI/DGQ 3441 / ISO 230 – 2 (latest revision)	Vendor to Confirm	

	using laser interferometer.		
Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
22.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to Confirm	
22.2.4	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 restarting.	Vendor to Confirm	
22.2.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine	Vendor to Confirm	
22.2.6	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to Confirm	
22.2.7	Machining test piece as per NAS/AFNOR/ISO. Vendor to arrange Test pieces and tooling for it's machining	Vendor to Confirm	
22.2.8	Prove-out machining.	Vendor to Confirm	
23.0	PACKING: Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes.	Vendor to Confirm	
24.0	GUARANTEE: 24 months from the date of acceptance of the machine.	Vendor to Confirm	

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER With Technical Details
25.0	GENERAL		
25.1	The Vendor should submit the following information.	Vendor to Confirm	
25.2	Machine Model:	Vendor to Specify	
25.3	Total connected load (KVA): Vendor to specify	Vendor to Specify	
25.4	Floor area required (Length, Width, Height) for complete machine & accessories: Vendor to specify.	Vendor to Specify	
25.5	Painting of Machine / Electrical Panels: RAL 6011 Apple Green (Polyurethane Paint)	Vendor to Confirm	
25.6	Total weight of the machine: Vendor to specify	Vendor to Specify	
25.7	Weight of heaviest part of machine: Vendor to specify	Vendor to Specify	
25.8	Weight of the heaviest assembly / sub-assembly of the Machine: Vendor to specify	Vendor to Specify	
25.9	Dimensions of largest part/ sub-assembly/ assembly of the machine: Vendor to specify	Vendor to Specify	

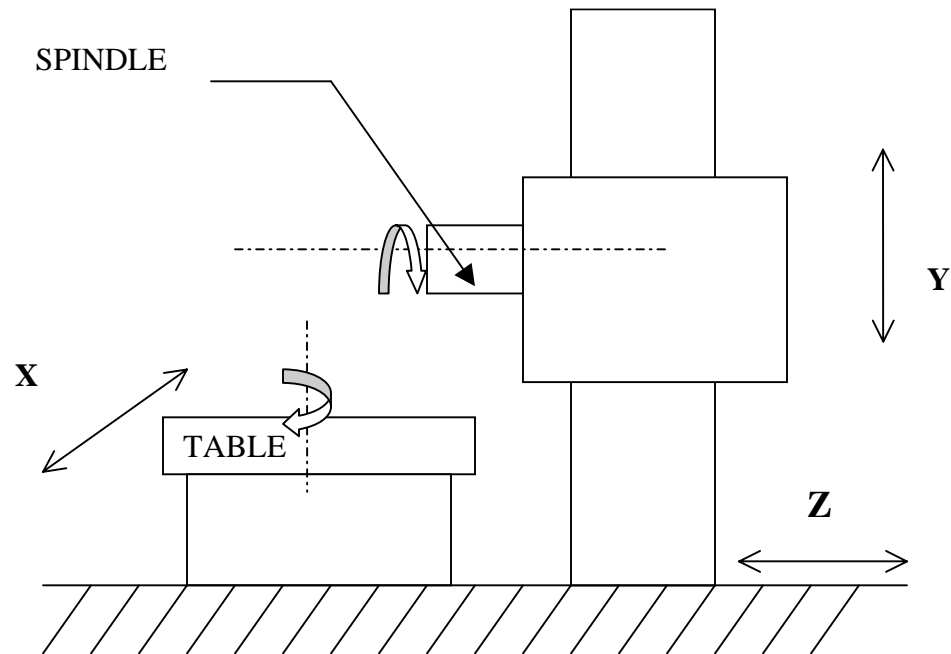
Annexure - 1: Table showing Prove out component list and operations.

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

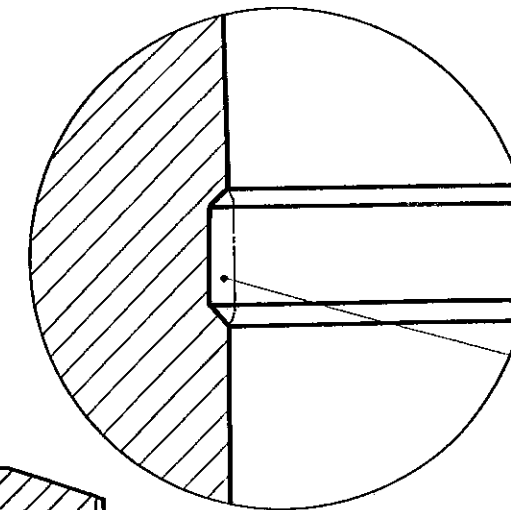
Annexure - 1

Prove out job details for Horizontal Machining Center				
Prove out job Description	Prove out Job qty	Prove out Drawing No.	Title of Drg.	Operations to be done
FV 14" 2500 Body	1 No.	2V000015044R	Body	Reference Drg.
		2V000015173	Body Assy	Hinge Pin and Lifting hole.
FV 6" 2500 Body	1 No.	2V000015000	Body	Reference Drg.
		2V000015072	Body Assy	Hinge Pin and Lifting hole
GV 32" 600 Wedge	1 No.	2VNA0613558R	Wedge	Reference Drg.
		2-V-0000-13575	Wedge	Guide and T slot milling
GV 8" 2500 Wedge	1 No.	3V000021030R	Wedge	Reference Drg.
		3V000021179	Wedge	Guide and T slot milling

**Annexure-2: Approximate Configuration of
CNC Horizontal Milling Machine**

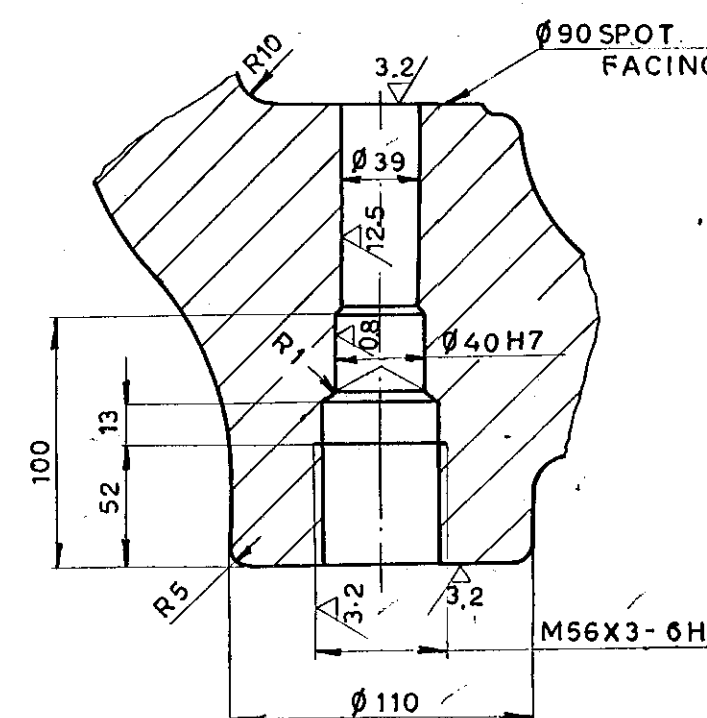


DRAWING NO. 2-V-0000-15173/02

[illegible]

Ø325H7	+ 0.057
	0
Ø40H7	+ 0.025
	0.

1. * MARKED TYPES ARE SPECIAL CLASS RATINGS.
2. LATEST APPLICABLE QUALITY PROCEDURE SHALL BE FOLLOWED IN ALL RESPECTS
3. EDGE PREPARATION SHALL BE AS PER SEPERATE INSTRUCTION.
4. * EFFECTIVE DIA SHOULD BE FINISHED WITHIN THE RANGE OF ± 0.3 TO ± 0.5 FROM (17) RETAINING RINGS.




SECTION - CDEF

8*	2-V-L044-15173/02	A 217 WC9, ATTEST, NT 93 112 370 0000	91	ER 90 SB3 ATTEST	20
7*	2-V-L043-15173/02	A 217 WC6, ATTEST, NT 93 112 369 0000	91	ER 80 SB2 ATTEST	20
6*	2-V-L042-15173/05	A 216 WCC, ATTEST, AN 93 112 368 0000	91	E7018 A1 ATTEST	10
5*	2-V-L041-15173/03	A 216 WCB, ATTEST, AN 93 112 367 0000	91	E7018 A1 ATTEST	10
4	2-V-L032-15173/02	A 217 WC9, ATTEST, NT 93 112 366 0000	91	ER 90 SB3 ATTEST	20
3	2-V-L031-15173/02	A 217 WC6, ATTEST, NT 93 112 365 0000	91	ER 80 SB2 ATTEST	20
2	2-V-L030-15173/03	A 216 WCC, ATTEST, AN 93 112 364 0000	91	E7018 A1 ATTEST	10
1	2-V-L029-15173/02	A 216 WCB, ATTEST, AN 93 112 363 0000	91	E7018 A1 ATTEST	10
S.NO.	DRG. NO.	MATL SPECN COMP CODE	PART NO.	JOINING WELD MATL	SCRAP SORT

MF 738-155



BHARAT HEAVY ELECTRICALS LTD.,
BOILER PLANT UNIT, TIRUCHIRAPALLI-620 014

DEPT VL		CODE 320				SCALE N.T.S		WEIGHT (KG) 1234.0		REF. TO ASSY. DRG 3-E 23325 (481)		IT NO.	
TITLE <h1 style="text-align: center;">BODY ASSY</h1> A 472 B - 35 H (1472500 C)						DRAWN EC 02		NAME		SIGN		DATE	
						CHECKED MRC		MRC		MRC		21/10/88	
						APPROVED VR		VR		VR		21/10/88	
DIMENSIONS TO BE CONTROLLED WITHIN LIMITS AS SHOWN. MACHINING TOLERANCE ± 0.25 UNLESS OTHERWISE SHOWN NON-MACHINING TOLERANCE ± 0.5						1		4		DRAWING NO.		15 16 REV. 17	
						CARD CODE U01		REF. TABLE		2 - V - 0000		15173	

SIZE A2

2-V-0000-13575
DRAWING NO.

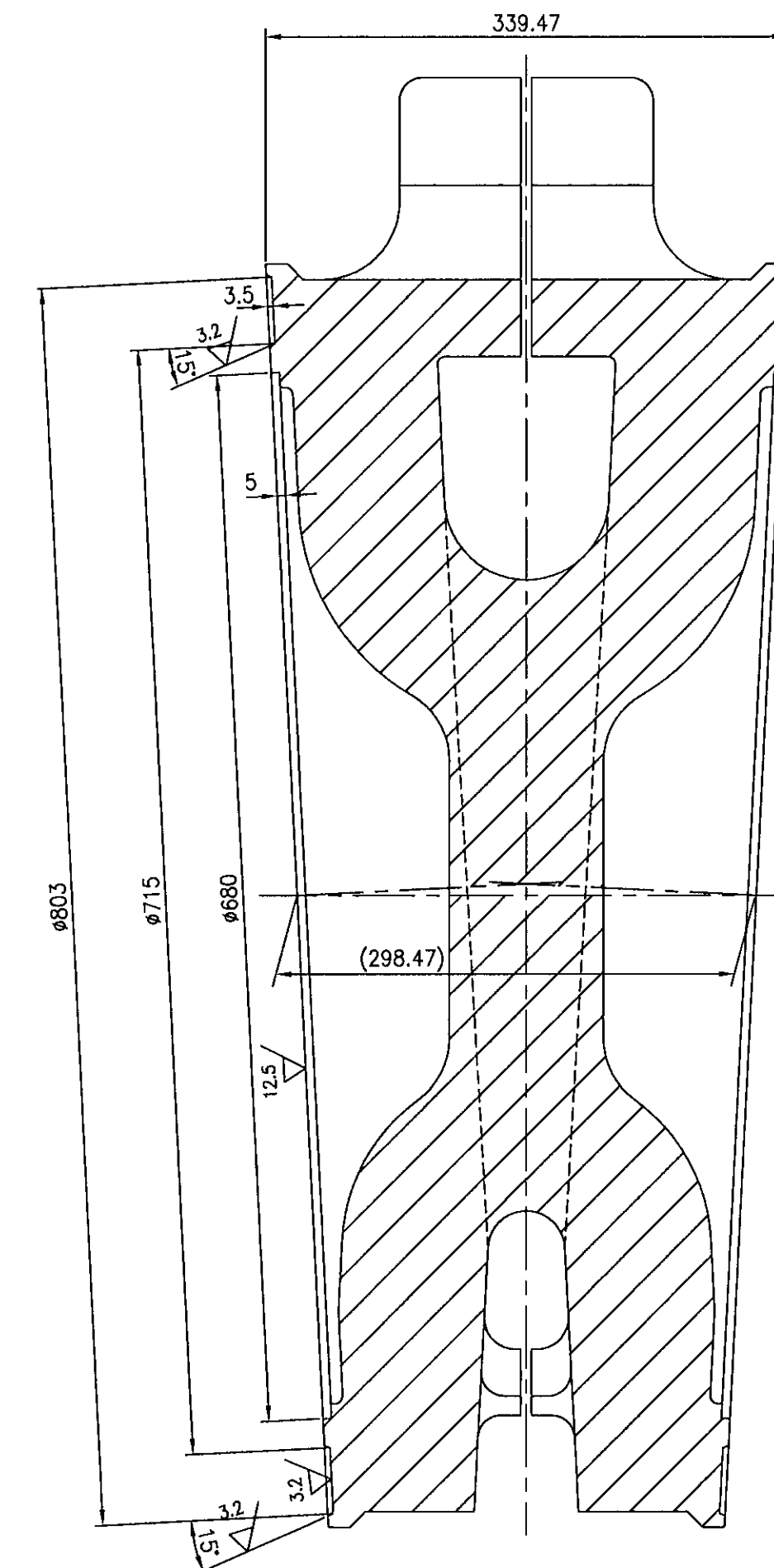
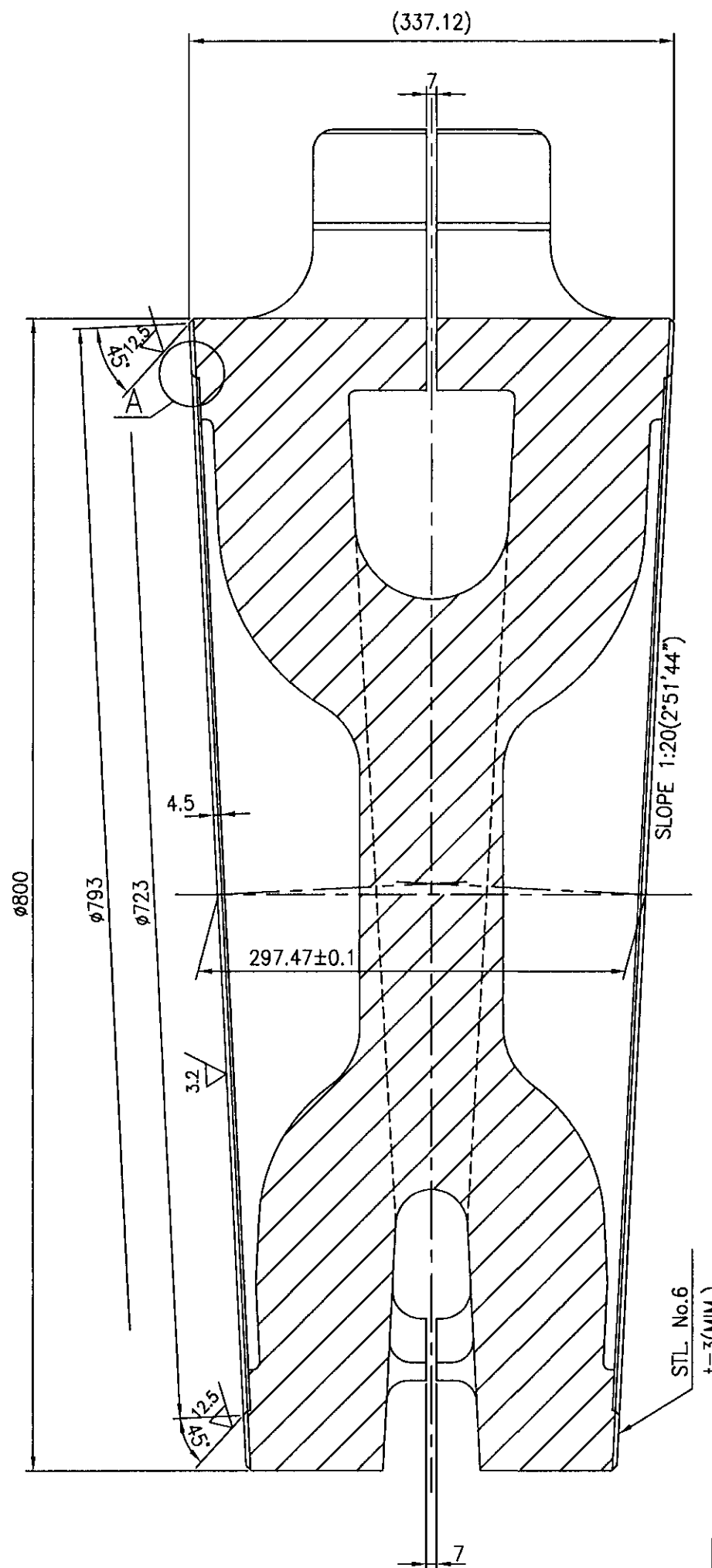
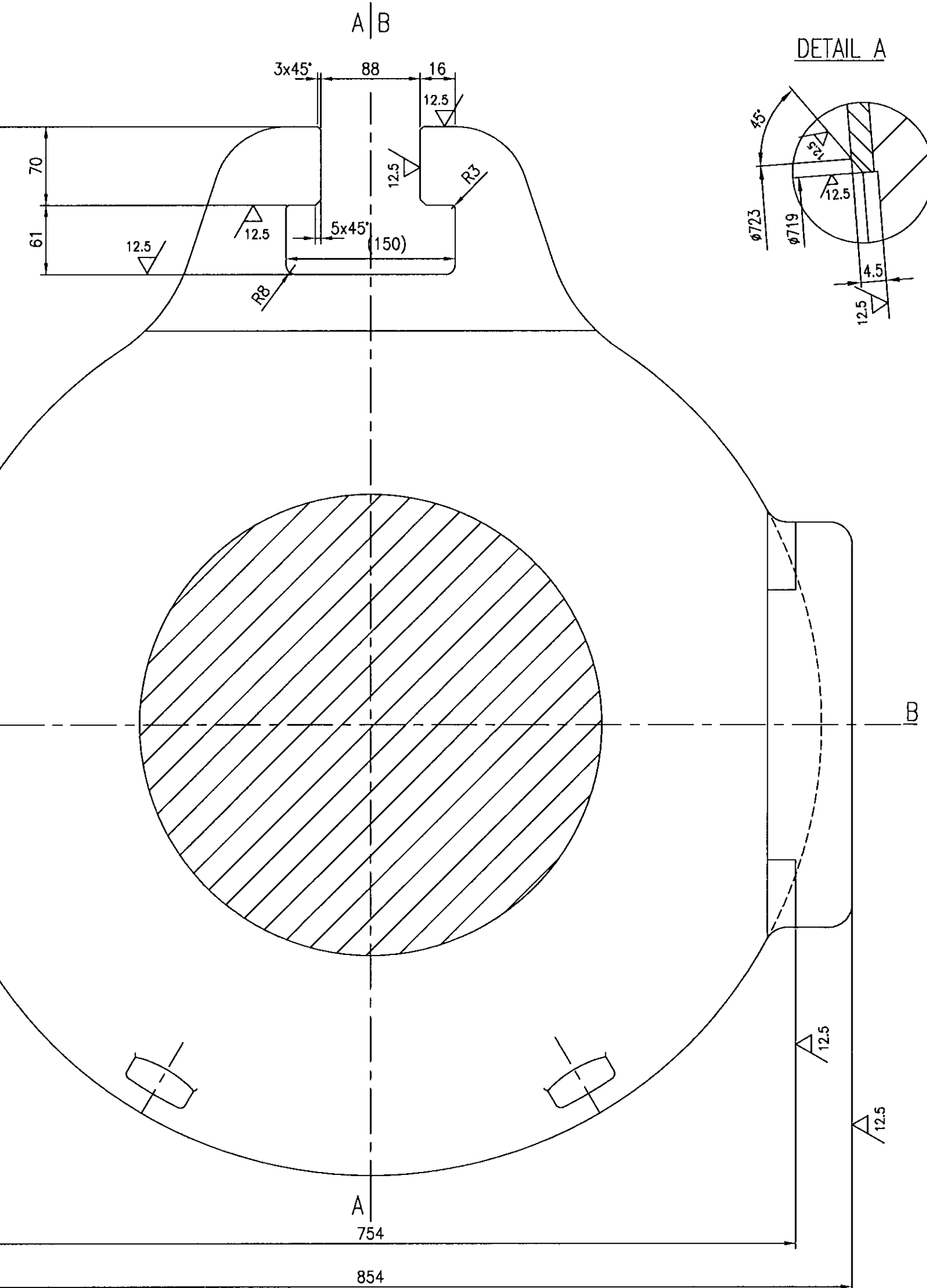
ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP

SECTION-AA

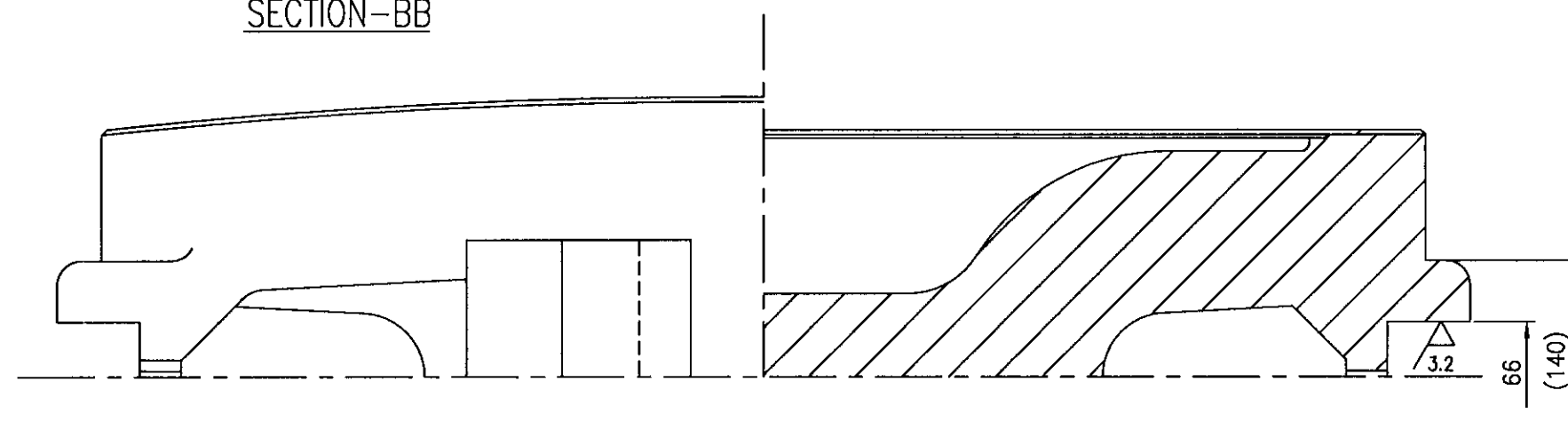
GROOVE PREPARATION FOR
STELLITE WELDING

12.5 / 3.2

DETAIL A



SECTION-BB



NOTE:

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

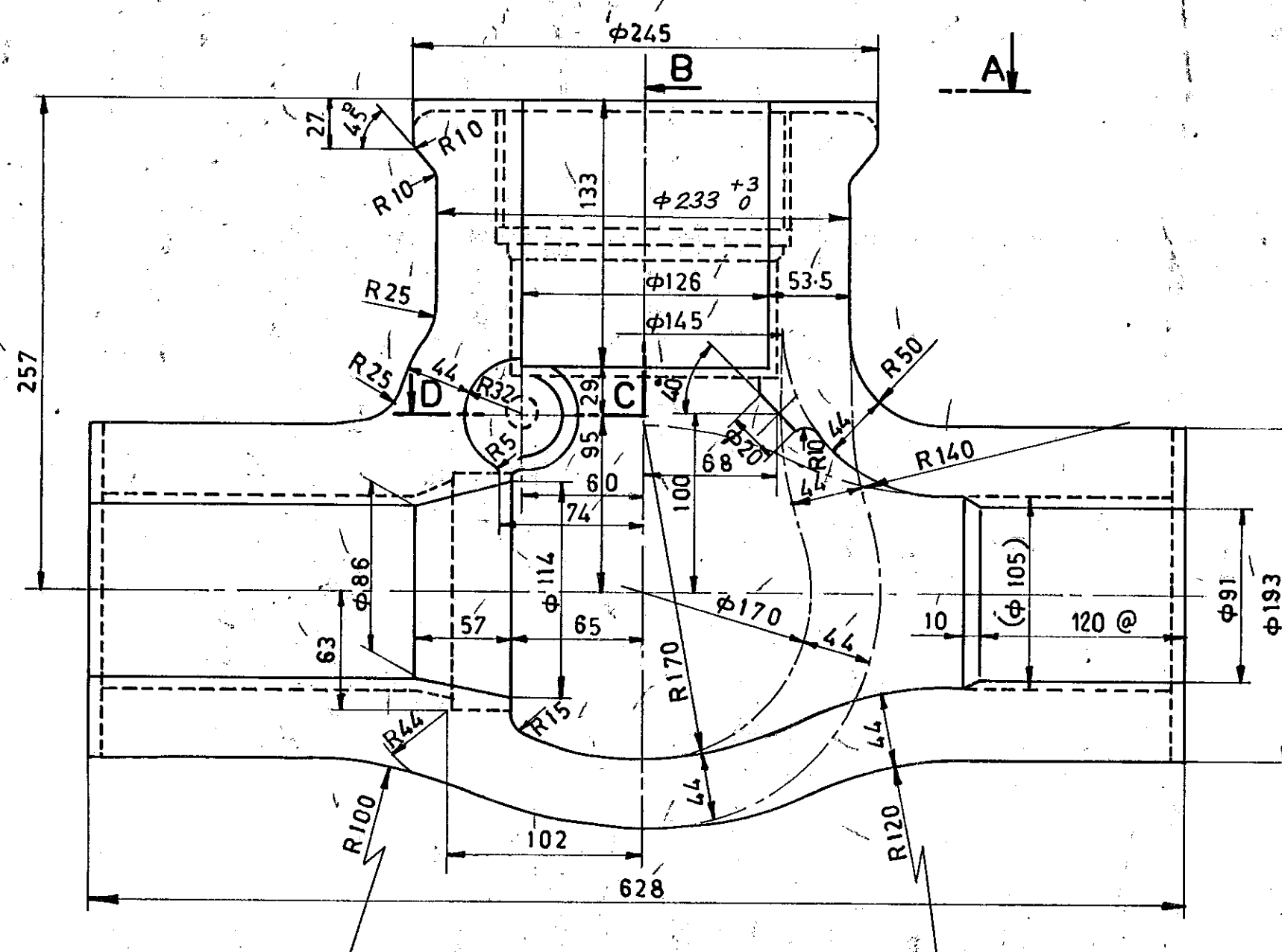
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SL. NO.	DRAWING No.	COMP. CODE	MATL. SPECN.	HEAT TREATMENT		SCRAP SORT	NET WT.(kg)	GROSS WT.(kg)
No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT								
BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI -620014.				DRN	V.BAIRAVAN	SIGN	DATE	NO.OF VAR.
365-120				CHD	R.L.NARAYANAN		17.3.04	
DEPT VL				APPD	M.RAJAKUMAR		17.3.04	
CODE 320				REFERENCE INFORMATION				NO. OF ITEMS
TITLE				CAD REF.C213575				
WEDGE				CARD CODE	DRAWING NO.	REV		
32"/600 CLASS				U 01	2-V-0000-13575	0		

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.

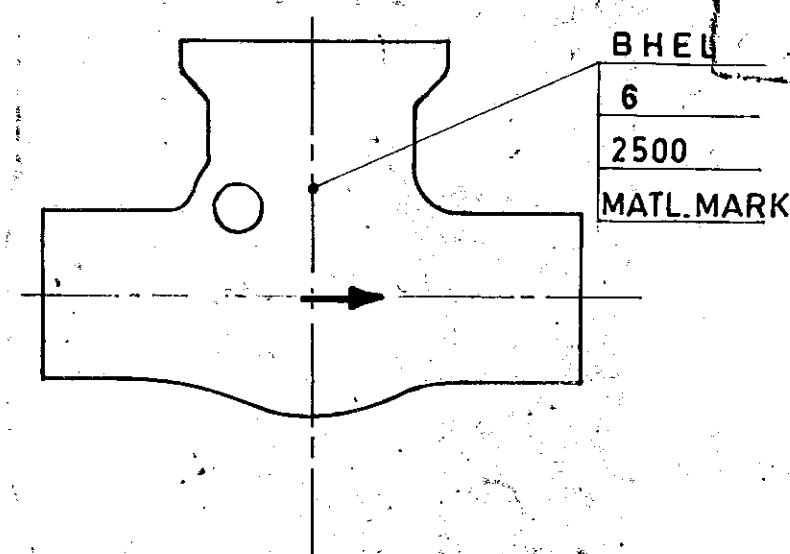
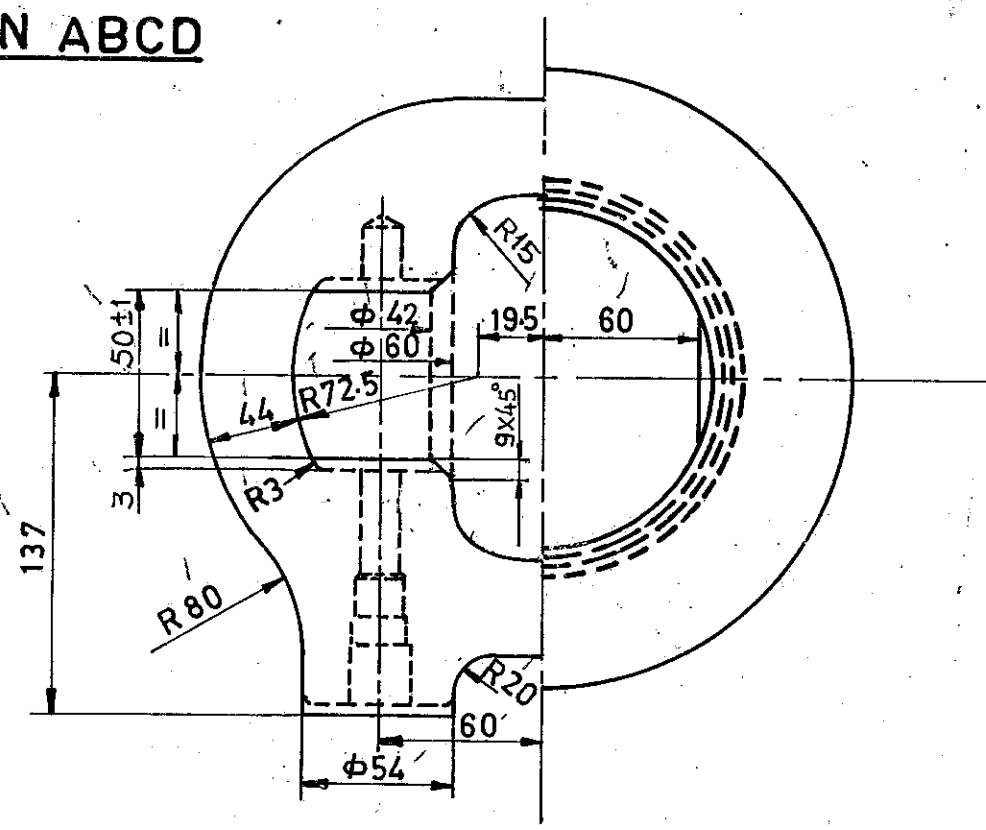
REV	DATE	ALTERED
ZONE		CHD & APPD

FIRST ANGLE PROJECTION (ALL DIMENSIONS IN MILLIMETRES)

2-V-0000-15000R
DRAWING NO.



SECTION ABCD



NOTES:

- ★ ALL THE SPECIAL CLASS CASTINGS ARE TO BE SUBJECTED RT/UT ON ALL CRITICAL LOCATIONS.
- ★ ALL EXTERIOR AND ACCESSIBLE INTERIOR SURFACES OF BODY SHALL BE MPI/LPI TESTED.
- DOTTED LINES SHOWS FINISH MACHINED CONFIGURATION.
- FOR ALL OTHER DETAILS LIKE DIMENSIONAL TOLERANCE, PUNCHING DETAILS AND EMBOSSING ETC. REFER LATEST APPLICABLE TDC.
- ★ FOR THESE SPECIAL CLASS VALVE EMBOSSING SHALL BE 2500SL

8	★	2 V L018 15000R	A217 WC9, ATTEST, NT.	92 150 088	WC9
7	★	2 V L017 15000R	A217 WC6, ATTEST, NT.	92 150 087	WC6
6	★	2 V L016 15000R	A216 WCC, ATTEST, AN.	92 150 086	WCC
5	★	2 V L013 15000R	A216 WCB, ATTEST, AN.	92 150 085	WCB
4		2 V L006 15000R	A217 WC9, ATTEST, NT.	92 150 084	WC9
3		2 V L005 15000R	A217 WC6, ATTEST, NT.	92 150 083	WC6
2		2 V L004 15000R	A216 WCC, ATTEST, AN.	92 150 082	WCC
1		2-V-L001-15000R	A216 WCB, ATTEST, AN.	92 150 081	WCB
SL. NO.		DRAWING NO.	MATERIAL SPECN.	MATERIAL CODE	MATERIAL MARK

REV.	DATE	ALTD.	REV.	DATE	ALTERED M.R.K.
2		CHKD.	01	20-3-85	CHECKED S. KUMAR
					ZONE

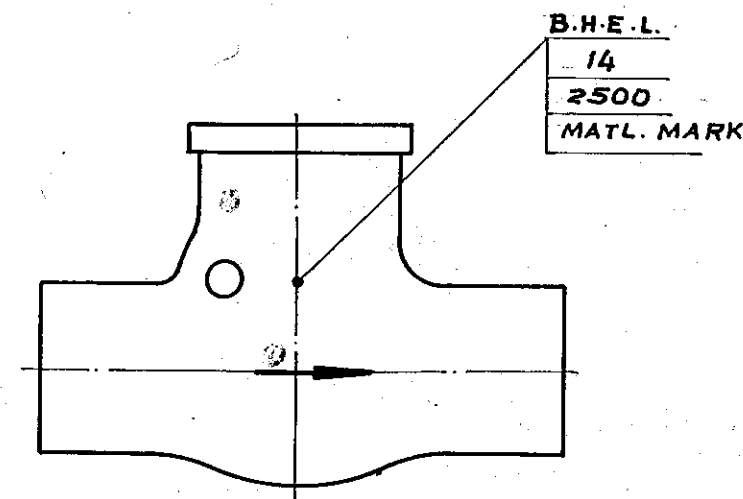
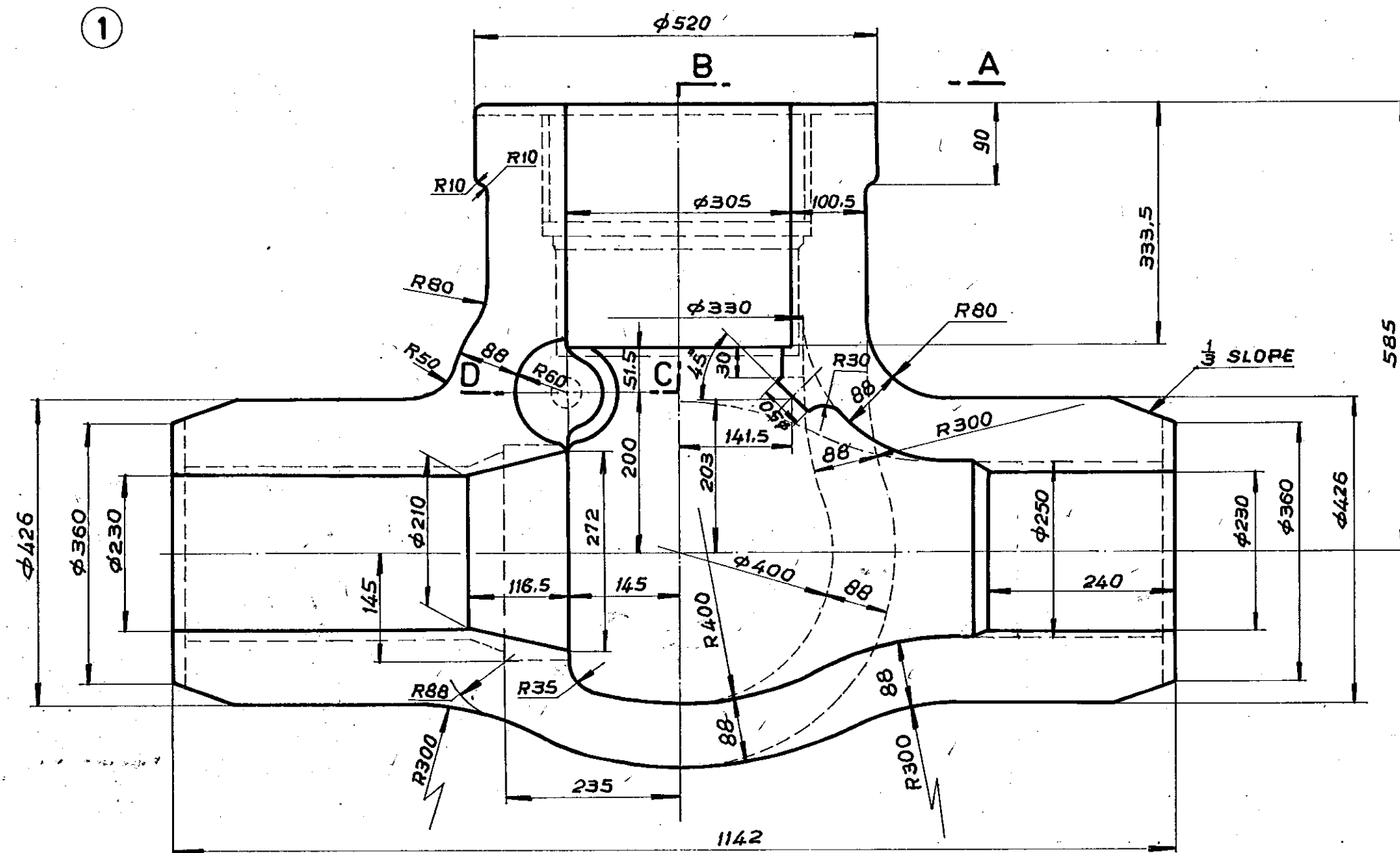
@ DIMENSION 270 CORRECTED AS 120, FOR SL. No. 1, 2 & 3
NOTES MODIFIED.

		BHARAT HEAVY ELECTRICALS LTD., BOILER PLANT UNIT, TIRUCHIRAPALLI-620 014	
DEPT.	CODE	SCALE	WEIGHT (KG)
VL	320	NTS	170.0
REF. TO ASSY. DRG 3-E26101 (0261)		Y. NO. 7-7-86	
TITLE BODY 6"/2500CL		NAME M. R. S. K. N.	
A4728B-15		SIGN M. R. S. K. N.	
DIMENSIONS TO BE CONTROLLED WITHIN LIMITS AS SHOWN. MACHINING TOLERANCE ±0.25 UNLESS OTHERWISE SHOWN NON-MACHINING TOLERANCE ±		DATE 19/8/85	
DRAWING NO. REF. TABLE 2-V-0000-15000R		15 IS REV. 17	

SIZE A2

FIRST ANGLE PROJECTION (ALL DIMENSIONS IN MILLIMETRES)

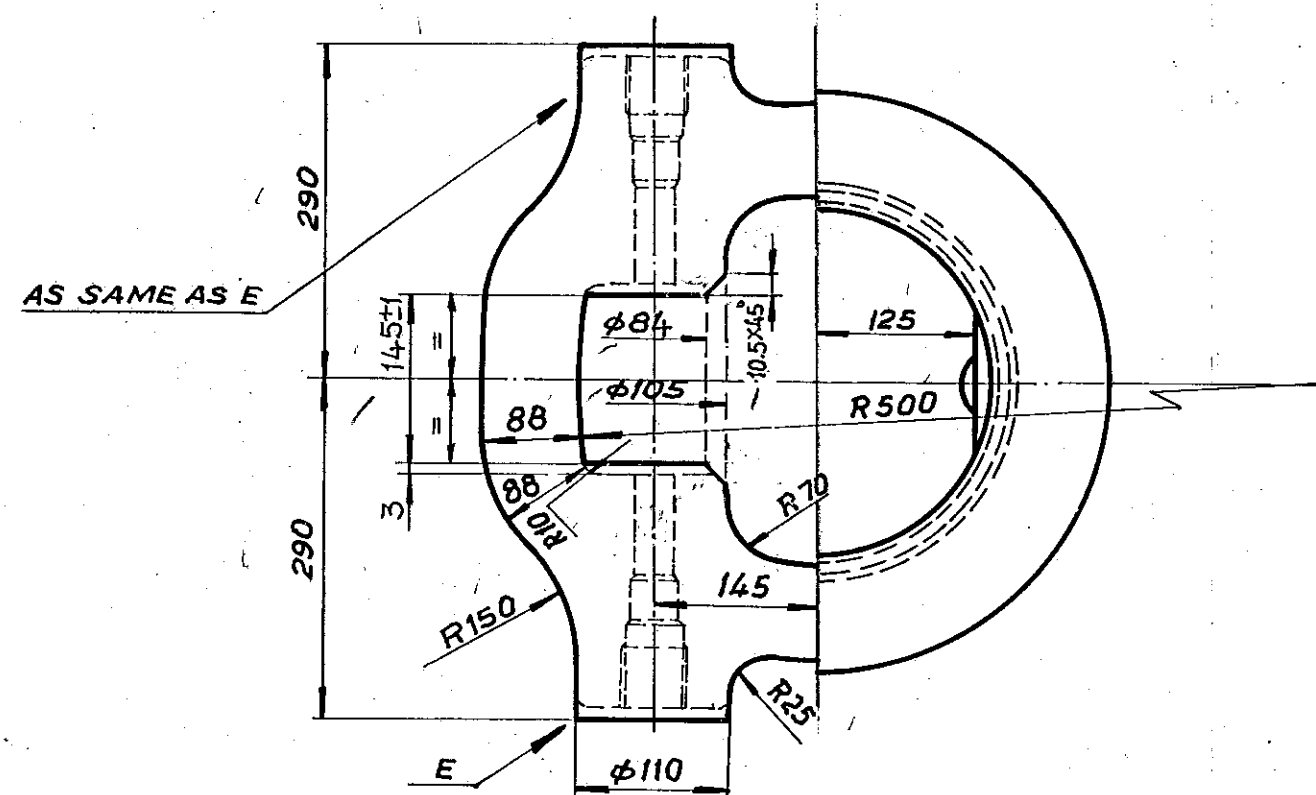
REF. TABLE
DRAWING NO. 2-V-0000-15044R



NOTE:

1. DOTTED LINES SHOWS FINISH MACHINED CONFIGURATION.
2. * FOR THESE SPL. CLASS VALVES EMBOSING SHALL BE 2500 SPL.
3. * ALL THE SPECIAL CLASS CASTINGS 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. FOR ALL OTHER DETAILS LIKE DIMENSIONAL TOLERANCE, HYDRAULIC TEST PRESSURE ETC. REFER LATEST APPLICABLE TDC.

SECTION-ABCD



SL. NO.	DRAWING NO.	MATL. SPECN.	MATL. CODE	MATL. MARK
8 *	2-V-L044-15044 R	A 217 WC9, ATTEST, NT	92 150 246	WC9
7 *	2-V-L043-15044 R	A 217 WC6, ATTEST, NT	92 150 247	WC6
6 *	2-V-L042-15044 R	A 216 WCC, ATTEST, AN	92 150 248	WCC
5 *	2-V-L041-15044 R	A 216 WCB, ATTEST, AN	92 150 249	WCB
4	2-V-L032-15044 R	A 217 WC9, ATTEST, NT	92 150 250	WC9
3	2-V-L031-15044 R	A 217 WC6, ATTEST, NT	92 150 251	WC6
2	2-V-L030-15044 R	A 216 WCC, ATTEST, AN	92 150 252	WCC
1	2-V-L029-15044 R	A 216 WCB, ATTEST, AN	92 150 253	WCB



BHARAT HEAVY ELECTRICALS LTD.,
BOILER PLANT UNIT, TIRUCHIRAPALLI-620 014

DEPT	VL	CODE	320	SCALE	N.T.S.	WEIGHT (KG)	1356	REF. TO ASSY. DRG	3-E 56 966 (479)	IT NO.	
<p>TITLE</p> <p>BODY (CASTING DRAWING)</p> <p>A 4728 - 35-</p> <p>14/2500C</p> <p>DIMENSIONS TO BE CONTROLLED WITHIN LIMITS AS SHOWN. MACHINING TOLERANCE ± 0.25 mm UNLESS OTHERWISE SHOWN NON-MACHINING TOLERANCE \pm</p> <p>1 CARD CODE U01</p> <p>4 DRAWING NO. 2-V-0000-15044R</p> <p>15 16 REV. 17</p>											

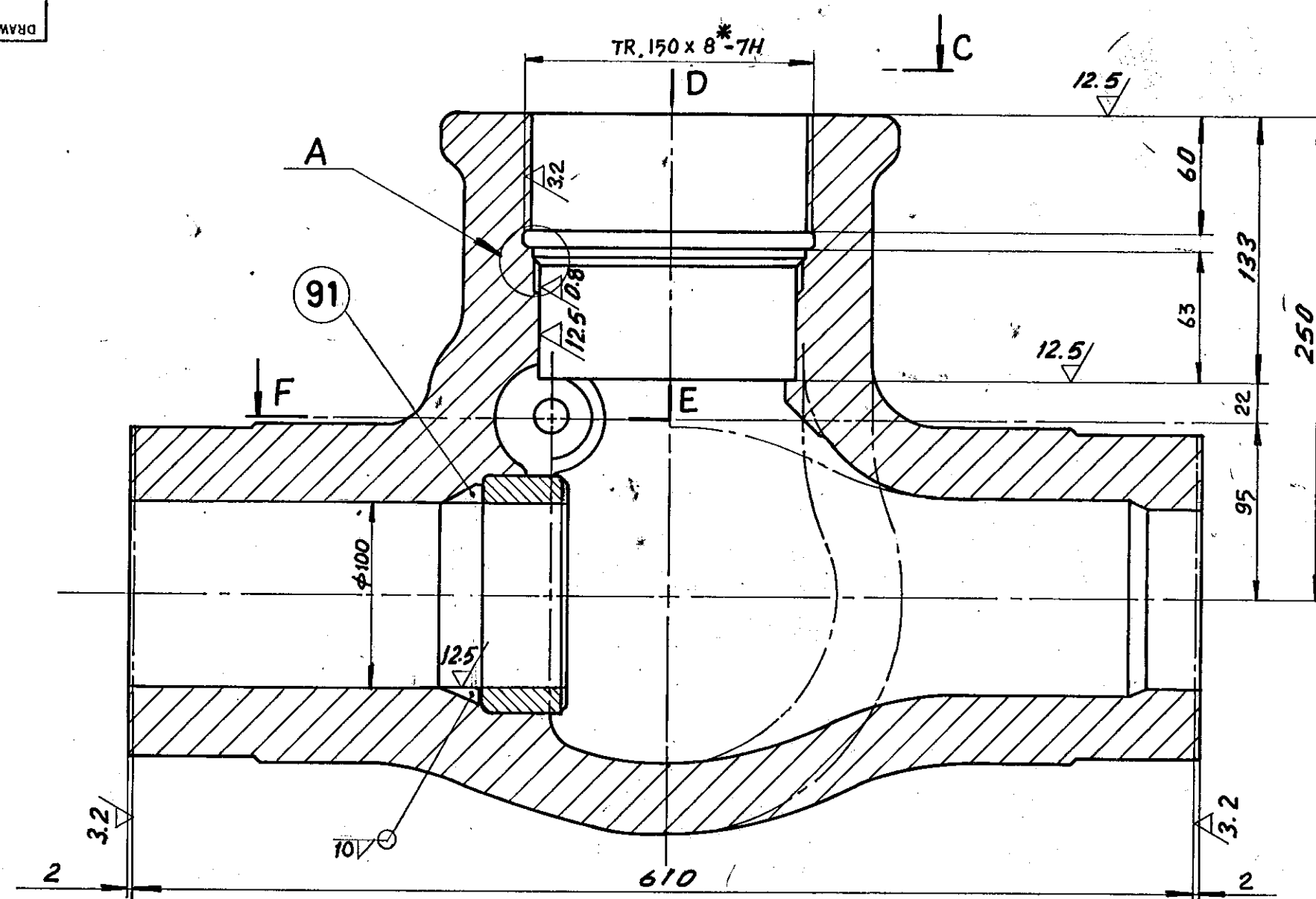
REV.	DATE	ALTERED	CHKD.	REV.	DATE	ALTERED	CHKD.
01							

MF 758202

SIZE A2

DRAWING NO. REF. TABLE

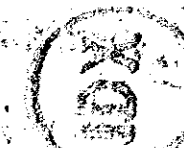
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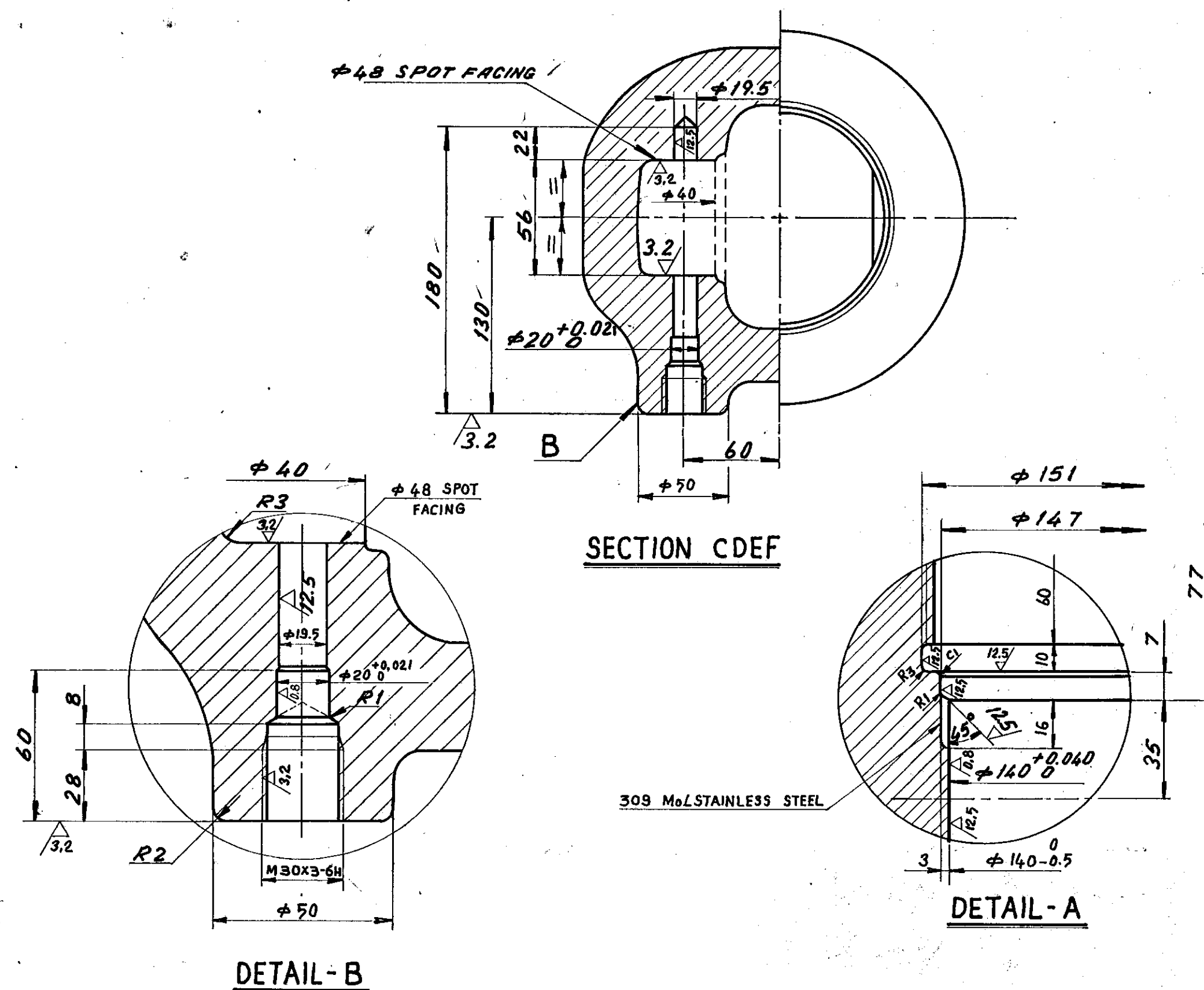
UNSPECIFIED TOLERANCES								
BREAK CORNERS : 0.5 MAX								
REFERENCE SID : AA 0230203								
DIMENSION	ABOVE	0.5	6	30	120	315	1000	2000
	UNTIL AND INCLUDING	6	30	120	315	1000	2000	6000
TOLERANCE		± 0.1	± 0.1	± 0.1	± 0.1	± 0.3	± 0.4	± 0.6

NOTE :-

1. * MARKED TYPES ARE SPECIAL CLASS RATING
2. LATEST APPLICABLE QUALITY PROCEDURE SHALL BE FOLLOWED IN ALL RESPECTS.
3. EDGE PREPARATION SHALL BE AS PER SEPERATE INSTRUCTION
4. * EFFECTIVE DIA. SHOULD BE FINISHED WITH IN THE RANGE OF ± 0.3 TO 0.5 mm. FROM (17) RETAINING RINGS



MF 738505



REV. 04	DATE 20-11-96	ALT. Y.A. <i>[Signature]</i> CHD & APPD. M.R.K. <i>[Signature]</i>
NOTES UPDATED. DCN No TA0712		

REV.	DATE	ALT. P.L. <i>[Signature]</i>
3	10.7.92	CHE. C.V. <i>[Signature]</i>

JOINING WELD SPECN. E7018A
(ATT) WAS E8018 B2 I BR FOR
SL. NOS. 1, 2, 546.
DCN No. TA 0184.

REV.	DATE	ALTERED
2	26.5.88	CHECKED: V. GABU

INLET & OUTLET CONFIGURATIONS ARE CHANGED.

DCN NO: TA 0025

REV.	DATE	ALTERED
01	29.03.87	R. KANNAN (bank)

28-05-67	CHECKED	V.B. <i>[Signature]</i>
ZONE	TOL. 7H WAS 7e	

Q.C.P. 2:7:352 WAS


	Q.C.P. 2:7:330.	
4		

SL. NO.	DRAWING NO.	MATERIAL SPECN	PART NO.	JOINING WELD DETAIL	SCRAP SORT
8.★	2-V- L018 - 150721/3 93 111 773 0000	A217 WC9, ATTEST, NT 2-V- L018 - 1500OR/1	91	E 9018 B3 ATTEST	20
7.★	2-V- L017 - 150721/3 93 111 772 0000	A217 WC6, ATTEST, NT 2-V- L017 - 1500OR/1	91	E 8018 B2 ATTEST	20
6.★	2-V- L016 - 150721/4 93 111 771 0000	A216 WCC, ATTEST, AN 2-V- L016 - 1500OR/1	91	E 7018 A1 ATTEST	10
5.★	2-V- L013 - 150721/4 93 111 770 0000	A216 WCB, ATTEST, AN 2-V- L013 - 1500OR/1	91	E 7018 A1 ATTEST	10
4.	2-V- L006 - 150721/3 93 111 769 0000	A217 WC9, ATTEST, NT 2-V- L006 - 1500OR/1	91	E 9018 B3 ATTEST	20
3.	2-V- L005 - 150721/3 93 111 768 0000	A217 WC6, ATTEST, NT 2-V- L005 - 1500OR/1	91	E 8018 B2 ATTEST	20
2.	2-V- L004 - 150721/1 93 111 767 0000	A216 WCC, ATTEST, AN 2-V- L004 - 1500OR/1	91	E 7018 A1 ATTEST	10
1.	2-V- L001 - 150721/1 93 111 766 0000	A216 WCB, ATTEST, AN 2-V- L001 - 1500OR/1	91	E 7018 A1 ATTEST	10



05-228/B

BHARAT HEAVY ELECTRICALS LTD.,
BOILER PLANT UNIT, TIRUCHIRAPALLI-620 014

DEPT	CODE		SCALE	WEIGHT (KG.)	REF. TO ASSY. DRG	IT
V1	330		N.T.S.	136.6	T02 88C 40-3 517205 (0263)	

TITLE	NAME	SIGN	DATE
	K. C. B.	4-13-17	1710

6" / 0500CL

BODY ASSY

DRAWN	M.S.A	M.S.A	M.S.A
CHECKED	M.B.R.	M.B.R.	11/12/11

8/25/2002 DIMENSIONS TO BE CONTROLLED WITHIN LIMITS AS		4 DRAWING NO.	15 REV
---	--	------------------	-----------

SHOWN. MACHINING TOLERANCE ± 0.25 UNLESS
OTHERWISE SHOWN NON-MACHINING TOLERANCE \pm

CARD
CODE
U01

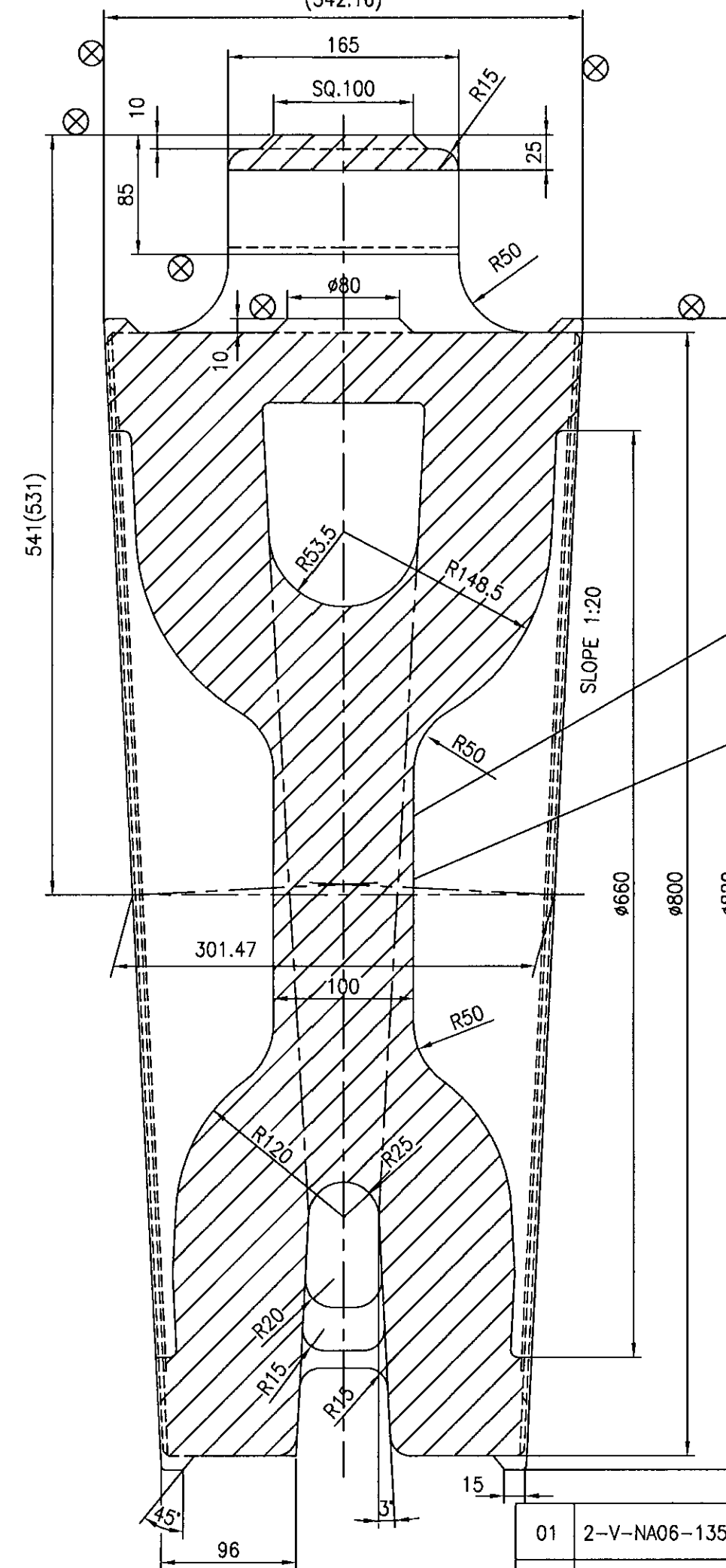
2-V- 0000-15072

SIZE A2

DRAWING NO. 2-V-0000-13558R

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

SECTION BB



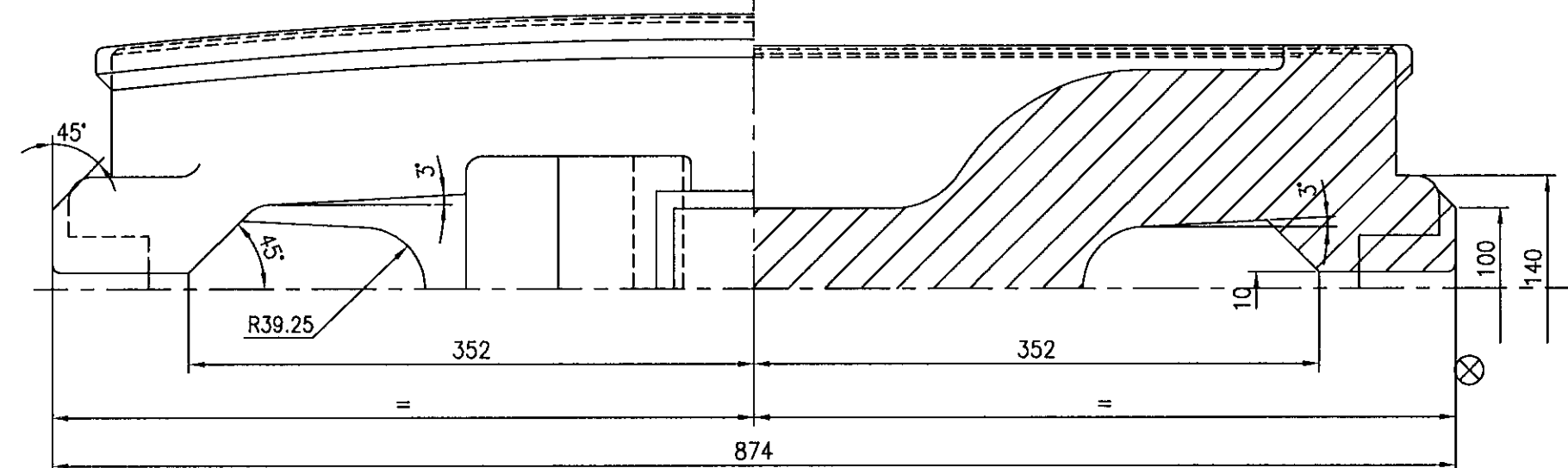
BHEL
32
600
WCB

PUNCH MELT NO.

NOTES:

1. CASTING SHALL COMPLY WITH THE REQUIREMENT OF LATEST APPLICABLE QUALITY WORK INSTRUCTION IN ALL RESPECTS.
2. NECESSARY ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
3. PERMISSIBLE DIMENSIONAL DEVIATIONS OF CASTING SURFACES REFER LATEST APPLICABLE QUALITY WORK INSTRUCTION
4. FINISH MACHINED CONFIGURATIONS ARE SHOWN BY DOTTED LINES
5. UNSPECIFIED CASTING RADII 3-5mm.
6. ⊗ SURFACE TO BE MACHINED.
7. HEIGHT OF CASTING LETTERS 100mm.

SECTION CC

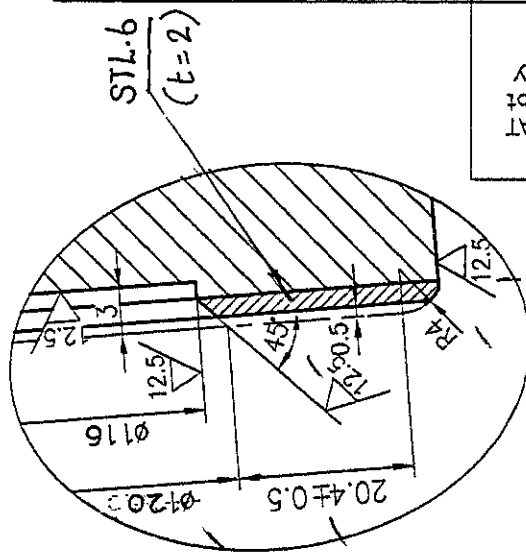
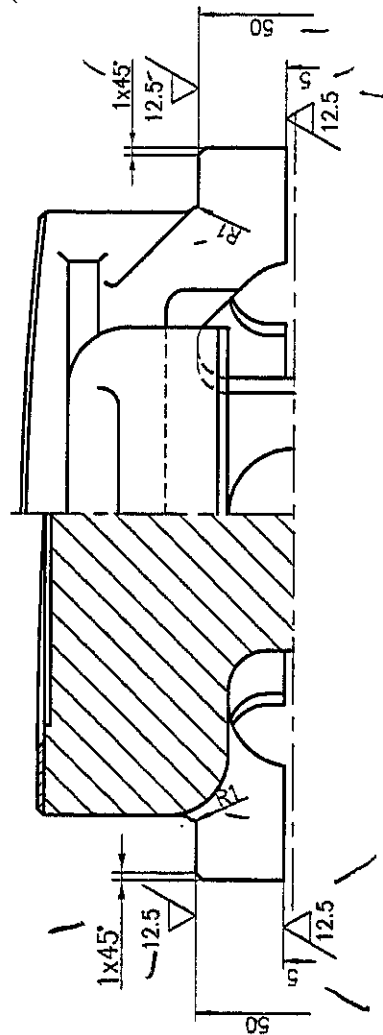


01	2-V-NA06-13558R	ASTM A216 WCB, CERTIFY	922014170000	NR		1340		
SL. No.	DRAWING No.	MATL. SPECN.	COMP. CODE	HEAT TREATMENT	SCRAP SORT	GROSS WT(Kg)	NET WT(Kg)	
No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT								
BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI - 620014.				DRN	V.BAIRAVAN	SIGN	DATE	NO.OF VAR.
365-120				CHD	R.L.NARAYANAN		20.12.03	
DEPT VL				APPD	M.RAJAKUMAR		20.12.03	
CODE 320				REFERENCE INFORMATION				NO. OF ITEMS
TITLE				CAD REF.C213558R				
WEDGE				DRAWING NO.				REV
32"/600 CLASS GV				2-V-0000-13558R				0
CARD CODE				U 01				

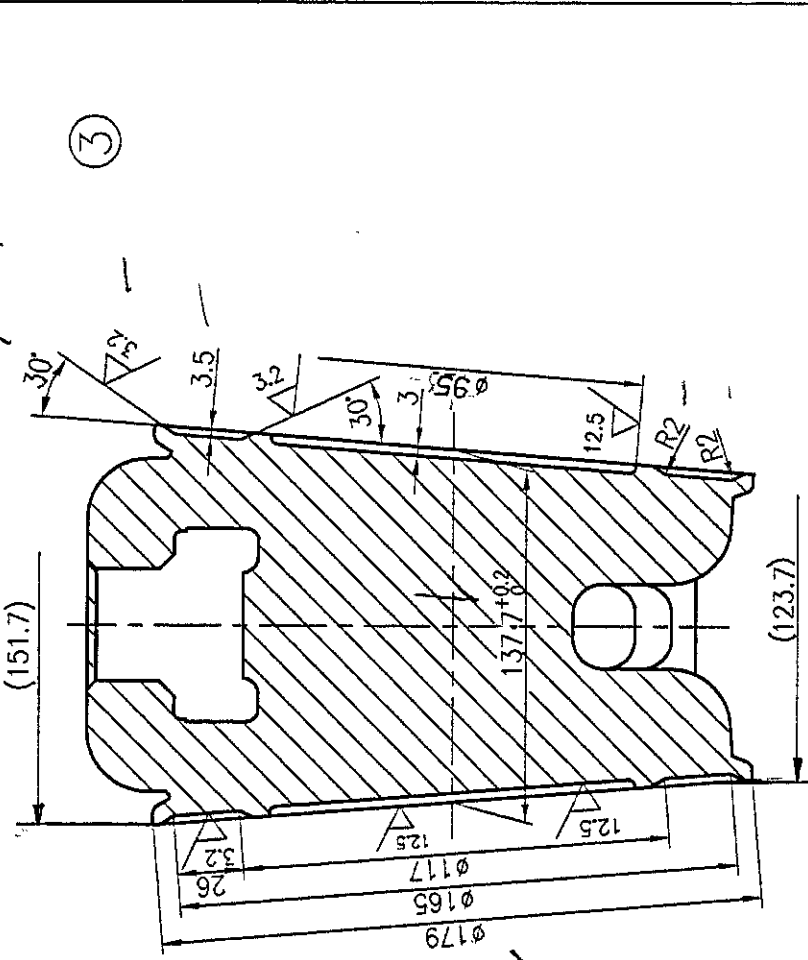
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REV	DATE	ALTERED
		CHD & APPD
ZONE		

1








(BEFORE LAPPING)


$$\frac{\text{STL-6}}{(t=2)}$$


BEFORE STELLITE WELDING

NO	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING NO.	ITEM No.
02	3-V-V304-21179	931202590000	A217 C12A,NT PRODUCT ATTEST						20
02	3-V-V308-21179	931202580000	A217 WC9,NT PRODUCT ATTEST						20
01	3-V-V305-21179	931202570000	A216 WCB,AN PRODUCT ATTEST						10
SL. No.	DRAWING No.	COMP. CODE	MATL. SPECN						SCRAP SORT

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

		BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.				DRN V.BAIRAVAN		NAME V.BAIRAVAN		SIGN 		DATE 14/6/00		NO.OF VAR.			
						CHD K.RAJASEKARAN		K.RAJASEKARAN				14/6/00					
						APPD S.KUMAR		S.KUMAR				15/6/00					
DEPT VL		SCALE  N T S		WEIGHT (KG) 25		REFERENCE INFORMATION TOA DRG. No.3-035149(629) CAD REF DRG No.1321179										NO. OF ITEMS	
CODE 320						CARD CODE U 01		DRAWING NO. 3-V-0000-21179								REV 0	
TITLE WEDGE		200mm/2500 CLASS															

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REV	DATE	ALTERED
		CHD & APPD

WEDGE

200mm/2500 CLASS

Size A3

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

DRAWING NO.
3-V-0000-21030R/1

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(6)

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