Bharat Heavy Electricals Limited

(High Pressure Boiler Plant**)**
Tiruchirappalli – 620014, TAMIL NADU, INDIA
An ISO 9001 Company
CAPITAL PURCHASE / MATERIALS MANAGEMENT / MANUFACTURING

ENQUIRY	Phone: +91 431 257 75 75 Fax : +91 431 252 07 19 Email : rrmanohar@bheltry.co.in Web : www.bhel.com

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620600060	**11.09.2006**	**16.10.2006**
Your 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 Schedule**
10	CNC Header Pipe / Fitting Boring Edge Preparation Machine – 800 mm Capacity as per the technical specification & commercial conditions applicable (to be downloaded from web site **www.bhel.com**)	1 No.	31.08.2007

Note:

(1) The detailed Technical Specification along with technical point-by-point confirmation, Commercial Terms & Conditions applicable for this Enquiry, Confirmation of acceptance for BHEL commercial terms & conditions and Price Bid formats have been posted in BHEL Corporate web site www.bhel.com under Enquiry reference "2620600060". Your offer should be based on all the above documents.

(2) Also, you are requested to fill in the Supplier Registration formats available in www.bhel.com (under Advancement – Supplier Registration) and send it along with your offer.

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 Dy. Genl. Manager / Capital Purchase / MM / Manufacturing

PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF CNC HEADER PIPE/FITTINGS BORING & EDGE PREPARATION MACHINE

SECTION – I

The BIDDER is expected to give complete details against each clause in the table given below, with additional sheets those may be attached (giving clear reference number) to furnish and cover the requisite details / documents.

S. No.	PARTICULARS	VENDOR's RESPONSE
1	Profile of the Company bringing-out the years of Experience of the BIDDER in the field of machine design, manufacture and supply of CNC CHAMFERING AND BORING Machines for PIPES/FITTINGS like Tees & Elbows/ VALVES etc.	
2	Number of CNC CHAMFERING AND BORING Machines for PIPES/FITTINGS like Tees & Elbows/ VALVES etc supplied, installed and commissioned till date (with details on machine type / model, configuration, customer and quantity)	
3	YEAR of supply of latest CNC CHAMFERING AND BORING Machines for PIPES/FITTINGS like Tees & Elbows/ VALVES etc. upto Job OD of around 600mm and the Technical Specifications of the Machine supplied [Details to be furnished]	
4	Details on the Firm's Registration and the FINANCIAL STRENGTH of the COMPANY (Balance Sheet for the last **3** years) shall be submitted with the TECHNICAL OFFER	
5	Details on International Standards / Design Process Codes followed in Design and Manufacture of the Equipment.	
6	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centres in India. Competency & Experience of the Local Service Agency are to be provided.	
7	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – II

The BIDDER / VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer for CNC HEADER PIPE/FITTINGS BORING & EDGE PREPARATION MACHINE

S. No.	REQUIREMENTS	VENDOR's COMMENTS
8	Only those vendors, who have supplied and commissioned at least **ONE** CNC Chamfering of upto Job OD of around 600mm or higher sizes for similar applications 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. However, if such machine (s) has/ had been supplied to BHEL, then such machine should be presently working satisfactorily for more than six months after its commissioning and acceptance (on the date of opening of Tender) in BHEL. The following information should be submitted by the vendor about the companies where similar machines have been supplied, for qualification of their offer.	
8.1	Name of the customer / company where similar machine is installed.	
8.2	Complete postal address of the customer.	
8.3	Month and Year of commissioning.	
8.4	Application for which the machine is supplied	
8.5	Name and designation of the contact person of the customer.	
8.6	Phone, FAX no. and email address of the contact person of the customer.	
8.7	Performance certificate from the customers regarding satisfactory performance of machine supplied to them.	
8.8	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.	
9	BIDDER has to co-ordinate for the visit of BHEL Team (at BHEL Cost) to the Customer's Works, to witness capability of an existing CNC Chamfering and Boring Machine of upto Job OD of around 600mm or higher sizes for similar applications, if warranted.	

SECTION – III

The BIDDER has to comply with the following, for accepting the Technical Offer for scrutiny by the Purchaser :

S. No.	REQUIREMENTS	VENDOR's COMPLIANCE
10	The BIDDER / VENDOR shall submit the offer in TWO PARTS-Technical **[with PART A & PART B]** & Commercial and Price Bid.	
11	The Technical Offer shall be supported by Product Catalogues & description.	
12	The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. A mere 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement (without any supporting technical write-ups, photos and datasheets] may lead to disqualification of the Technical Offer.	
13	The BIDDER / VENDOR shall assure a continuous support for the supply of SPARES and SERVICE for TEN Years, from the date of commissioning of the equipment at BHEL Works.	
14	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 of the inclusion of all the accessories, toolings, attachments, auxiliary parts, spares, consumables, etc. with the main and basic equipment, to meet the technical specification requirements.	
15	Soft copy, giving the salient features of the proposed machine or equipment with all sub-systems and auxiliaries, and /or showing live-demo of an existing and working machine of similar configuration and capacity may be provided.	
16	BIDDER has to indicate the Country of Origin for the supply of equipment.	
17	The reference List of Customers shall be accompanied with (Phone Number and E-Mail ID) of the CONTACT PERSON for cross reference by BHEL	
18	In case of preliminary qualification of the offer, on technical grounds, the BIDDER may be called for a detailed technical discussion on the original technical offer at BHEL Works, with a sufficient notice period.	

PART – B

TECHNICAL SPECIFICATION FOR HEAVY DUTY CNC PIPE EDGE PREPARATION MACHINE

S.No	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER (With complete Technical Details)
1.0	**PURPOSE & WORKPIECE MATERIAL:**	
1.1	The machine is meant for Boring, Facing and Edge Preparation of Tee's and Facing and Edge preparation of Straight pipes, Bend pipes and Elbows, which form high pressure components for Power Boilers, and Industrial boilers of Process Industries. The machine shall be capable of generating various profiles of edge preparation on the above said components and perform 'Through Boring' operation on Tee's. The Edge preparation of the above jobs shall be done by tool mounted on a rotating chuck, keeping the work piece stationary by clamping it on self-centering Electric / Hydraulic clamping system. The edge preparation profile is obtained by vectorial combination of longitudinal movement of chuck and transverse movement of the tool slide under CNC control.	
1.2	**Material specification:**	
	A) CARBON STEEL: SA 106 Gr.B /Gr C (ASTM), AP15L Gr B (ASTM) **B) ALLOY STEEL:** SA 335 P11, P12 & P22, P91 SA 312 TP304H, SA 312 TP316 L	
1.3	**Surface conditions of Tees & Elbows:** Tees and Elbows are press formed components and surfaces are rough, uneven and the ID shape is irregular (not circular)- The ends are flame cut before loading on the machine. Please refer Annexure-3	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
1.4	**Material Sizes**		
1.4.1	The machine shall be suitable for - Refer **Annexure 2 & 3** a) Pipe size OD from 219 mm to 813 mm and thickness from 6 mm to 75 mm b) Tees & Elbows size OD from 219mm to 609.6 mm and thickness 18 mm to 137mm.		
1.4.2	The standard sizes of pipes, Tees & Elbows are furnished under **Annexure 2**. Max. Length of the pipe 10000m		
1.5	**Edge Preparation Styles**		
1.5.1	Edge Preparation Profile Styles to be machined as per Annexure 1 Edge preparation to be done on all the Three ends of Tees and Two ends of Elbows.		
2.0	**MACHINE DETAILS:**		
2.1	**HEADSTOCK:**		
2.1.1	Geared Head stock unit shall be of fully enclosed type unit mounted on the spindle nose.	Vendor to specify the arrangement of head stock. Brief description to be given.	
2.1.2	Minimum & Maximum Facing diameter	a) Straight & Bend pipes: 219 mm to 813 mm b) Tees & Elbows: 219 mm to 609.6 mm	
2.1.3	Maximum turning diameter	813 mm	
2.1.4	Maximum weight of the job	8,000 kgs.	
2.1.5	Maximum Boring & Turning length	a) Straight & bend pipes :250mm b) Boring' length on Tees :1230mm	
2.1.6	Min. ID before boring on Tees	90 mm to 450 mm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.1.7	Inside Diameter (D2 & D3) Required after boring for 'T'ees	Refer **Annexure 2**	
2.1.8	Headstock longitudinal travel.	Vendor to Specify	
2.1.9	Feed rate of Headstock longitudinal travel (steplessly variable)	0.5mm /min – 1500mm/min	
2.1.10	Torque of the AC servomotor for Headstock traverse.	Vendor to Specify	
2.1.11	Spindle speed (Infinitely variable)	5 to 300 rpm	
2.1.12	No. of speed ranges	Vendor to Specify	
2.1.13	Spindle speed range selection	Electro Hydraulic system through CNC (Hydraulic cylinders to be located conveniently for easy maintenance.)	
2.1.14	KW rating of AC spindle motor (S1duty) (Vendor to furnish complete technical details along with offer)	Minimum 29 kW Vendor to Specify	
2.1.15	Torque-Power-Speed characteristics of the spindle system to be submitted by the vendor along with offer	Vendor to specify	
2.1.16	Forward and reverse rotation of spindle motor with suitable braking mechanism. (Complete details with drawings, explanations to be submitted along with the offer.)	Vendor to specify	
2.1.17	Sliding type Chip guard on the headstock for the safety of the operator, operator's panel and to avoid spillage of chips on shop floor (Details should be furnished in offer)	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.2	**FACING UNIT:**		
2.2.1	Heavy steel casting fitted on the nose of main spindle, incorporating the tool holder slide with tool holder for radial feed.	Vendor to Confirm and furnish details in the offer	
2.2.2	Maximum diameter of the face plate	Vendor to specify	
2.2.3	Tool holder slide traverse X-Axis	Vendor to Specify	
2.2.4	Min. distance between the faceplate and the clamping vice bed.	Vendor to specify	
2.2.5	Torque of the A.C.servo motor for tool slide	Vendor to specify	
2.2.6	Feed rate of Tool holder slide X–axis (Steplessly variable)	0.5mm /min – 1000 mm/min	
2.2.7	Tool holder slide counter balance arrangement. (If required)	Vendor to specify.	
2.3	**MACHINE BED:**		
2.3.1	No. Of Guide ways	Vendor to specify	
2.3.2	Bed width across ways	Vendor to specify	
2.3.3	Type of guide ways: (Details should be furnished in the offer)	Vendor to specify	
2.3.4	Hardness of guide ways	Vendor to specify	
2.3.5	**Metallic Telescopic Covers** of rust resistant material shall be provided with wipers for guide ways. Joints of telescopic covers should be so sealed to avoid ingress of dust.	Vendor to specify	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.4	**FEED DRIVE SYSTEM:**		
2.4.1	Feed drives/ motors for X & Z axes [AC servo motors] shall be digital type of either Siemens or Fanuc or any other reputed make (Details of model, make, type etc. to be furnished in the offer)	Vendor to specify	
2.4.2	Maximum feed force for all axes	Vendor to specify	
2.4.3	Feed back system for X & Z axes: Siemens/Fanuc/Heidenhain Rotary encoders. (Details to be furnished in the offer)	Vendor to specify	
2.4.4	Feed back system for Spindle rpm: Seimens / Fanuc / Heidenhain Rotary Encoders (Details to be submitted by the vendor with offer)	Vendor to specify	
2.4.5	**Type of power transmission:** Pre-loaded backlash-free re-circulating ball screw drive for X & Z axes. (Complete description of the aforesaid including diameter of Ball Screw for each axis, to be furnished in the offer)	Vendor to specify	
2.5	**CLAMPING SYSTEM:**		
2.5.1	The clamping system shall be suitable for self centering and clamping straight pipes, bends, Tees and Elbows. Note: The surface over Tees & Elbows are rough. (Complete details should be furnished in the offer)	Vendor to Confirm	
2.5.2	The clamping system shall be equipped with a suitable electric / hydraulically operated.	Vendor to Confirm The type of jaws has to be specified by the supplier in the offer.	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.5.3	Diameter range a) Straight & bend pipes b) Elbows and Tees	 a) 219 mm to 813 mm b) 219 mm to 609.6 mm.	
2.5.4	Bed width	Vendor to specify	
2.5.5	Bed length	Vendor to specify	
2.5.6	Clamping force /pressure	Vendor to specify	
2.5.7	Min straight length of the job for clamping	a) 500 mm for both straight and bend pipes. b) For Tees & Elbows - Refer **Annexure 2**	
2.5.8	Clamping force/ pressure should be able to be selected automatically by the system through CNC for different combination OD of pipes, Tees, Elbows and thickness mentioned in our specification. (Clause no 1.3 / Annexure 2) The suppler should design and specify the clamping force/ pressure according to our material sizes to avoid pipes deformation due to clamping.	Vendor to submit the details along with offer	
2.5.9	Job clamping & setting operation with minimum intervention of operator.	Vendor to specify	
2.5.10	Job clamping elements (Complete details should be furnished)	Vendor to Specify	
2.5.11	Safety system to prevent the rotation of the cutting tool unless the job is properly clamped. (Details should be furnished in the offer)	Vendor to confirm.	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.5.12	Motorized longitudinal and vertical movement of the clamping system for job centering. Motor to be provided with chip guard (Vendor to furnish details of the system, motor capacity etc in the offer)	Vendor to confirm	
2.6	**PIPE SUPPORTING STEADY: (OPTIONAL)**		
2.6.1	Electrically operated Vertically adjustable "V" type supports for supporting the free end of pipes and bends. The supports shall have facility to be moved to accommodate different lengths of pipes & bends. (Vendor to submit complete details with drawings of the supports in the offer)	Vendor to confirm	
2.7	**CONSTRUCTION:**		
2.7.1	The machine should be designed for machining and generation of EP styles on straight & bend pipes, Tees & Elbows for the sizes mentioned as per clause 13.2 (Annexure 2). The machine should also be capable of performing '**THROUGH BORING'** operations on Tees. The generation of Edge preparation styles on the two ends of the Elbows and, on three ends with 'through boring' on "T"ees has to be performed on the machine in the same job clamp setup. ie, The clamping system shall have automatic job Indexing facility for changing over of the machining end to the required angle without unclamping the job.	Vendor to confirm and explain the details.	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.7.2	Vendor to furnish details of material, hardness & constructional details including explanatory drawings of various components/assemblies like Headstock, Facing Unit, Tool Holder Slide, Machine Bed, Feed Transmission System, Pipe & Pipe Bend Clamping System, Feedback System etc. of the machine.	Vendor to Confirm	
2.7.3	Video images on CD / Hard copy of literature with photographs & drawings explaining the technical features should be enclosed with the offer	Vendor to Confirm	
2.8	**OPERATION AND CONTROL SYSTEM:**		
2.8.1	**OPERATOR'S PANEL:**		
2.8.1.1	Operator's panel having complete CNC and machine control system with CRT of required configuration shall be provided for convenient and efficient operation. All switches should be within reach of operator. All displays/indications should also be conveniently placed (Layout showing complete details should be submitted with the offer)	Vendor to Confirm	
2.8.2	**CNC SYSTEM & FEATURES:**		
2.8.2.1	Make: Fanuc / Siemens.	Vendor to specify	
2.8.2.2	Type: PC based latest version	Vendor to specify	
2.8.2.3	Model (Suitable and Latest version, as available at the time of ordering, should be supplied).	Vendor to specify	
2.8.2.4	Details of Standard features	Vendor to specify	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.8.2.5	Details of optional features, recommended by vendor.	Vendor to specify	
2.8.2.6	Details of other optional features	Vendor to specify	
2.8.2.7	The system should have full alphanumeric keyboard, TFT colour display (10.4" or more), additional draw-out type Qwerty Key Board and mouse in suitable enclosure, RS232C serial interfaces, parallel interface for printer, COM port for tele diagnostics, electronic hand wheels for all axes (MPG), compact disc drive unit for data input/output, hard disk of sufficient capacity (Largest size available at the time of order shall be supplied), graphic simulation and preinstalled system software & other required soft wares etc (Details should be furnished by the Vendor in the offer)	Vendor to Confirm	
2.8.3	**HAND HELD UNIT:**		
2.8.3.1	Hand Held unit, Type B-MPI of Siemens make or equivalent along with sufficient length of interfacing cable which can be taken near to the face plate for job setting and similar other purposes. Is to be offered with complete details.	Vendor to specify	
2.9	**MACHINE LIGHTS:**		
2.9.1	Machine Lights for sufficient illumination of complete working area should be provided for clear visibility. (Details should be furnished in the offer)	Vendor to Confirm	
2.9.2	A spot light with sufficiently long cable should also be provided.	Vendor to Confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.9.3	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to Confirm	
2.9.4	Flashing / rotary type End of Cutting and Program Stop Light.	Vendor to Confirm	
2.10	**AIR CONDITIONERS:**		
2.10.1	Air Conditioners with Dehumidifiers of suitable / sufficient capacity to be provided for all Electrical / Electronic Panels / Cabinets including Operator's Panel considering specified ambient conditions. Detailed specifications of the same are to be submitted.	Vendor to submit	
2.11	**HYDRAULICS:**		
2.11.1	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 in the offer)	Vendor to Confirm	
2.11.2	Make Rexroth / Vickers Sperry or equivalent from a reputed manufacturer. (Details to be submitted)	Vendor to specify	
2.11.3	Hydraulic hose end fittings shall be of suitable material with female swivel nut (with 24^0 cone).	Vendor to specify	
2.11.4	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 read for setting and trouble shooting. MINIMESS Pressure Gauge - 1 No with Connecting Hose to be provided.	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.11.5	The control voltage for all solenoid operated valves	24 V DC	
2.11.6	Filtration System, Details should be submitted.	Vendor to specify	
2.11.7	Failure indication	Vendor to specify	
2.11.8	Automatic shut off provision, Details should be submitted.	Vendor to specify	
2.11.9	Cooling system of sufficient capacity to maintain complete Hydraulic System, including lubrication oil, hydrostatic oil and gearbox oil, etc. at a temperature not exceeding 50 deg C irrespective of the ambient conditions. Complete details should be submitted	Vendor to specify	
2.11.10	Hydraulic pump capacity (flow / pressure)	Vendor to specify	
2.11.11	Each pump should have an independent motor. Tandem pumps should not be used	Vendor to specify	
2.11.12	**First filling of all required Oils & Grease etc**. should be supplied by vendor. Indigenous (Indian) source or Indian equivalent and specifications of oils/ greases are also to be provided by the vendor.	Vendor to specify	
2.12	**ELECTRICAL:**		
2.12.1	415V + 10% / -10%, 50HZ +/-3 Hz, 3 Phase AC (3 wire system without 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 during construction of foundation.	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.12.2	Tropicalization**:** All electrical / electronic equipment shall be tropicalized.	Vendor to confirm	
2.12.3	All electrical & electronic control cabinets & panels should be dust and vermin proof	Vendor to confirm	
2.12.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm	
2.12.5	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	
2.12.6	Motors & other electrical components shall conform to IEC or Indian Standards	Vendor to confirm	
2.12.7	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all the cable trays required for laying of cables should be included in the offer.	Vendor to confirm	
2.12.8	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
2.12.9	In-cycle hour counter with reset facility should be provided.	Vendor to confirm	
2.12.10	All Electric enclosures shall have IP 54 protection	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.13	**SAFETY ARRANGEMENTS:**		
2.13.1	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm	
2.13.2	Machine should have adequate and reliable safety interlocks / 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 specify	
2.13.3	A detailed list of all alarms / indications provided on machine should be submitted by the Vendor.	Vendor to specify	
2.13.4	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	
2.13.5	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm	
2.13.6	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to Confirm	
2.13.7	All lubricated parts like Bed, guide ways shall have provision for collecting the used Lubrication oil from machine guide ways and preventing them from spilling over on to the ground.	Vendor to Confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
2.14	**ENVIRONMENTAL PERFORMANCE OF THE MACHINE:**		
2.14.1	The Machine should confirm to following factors related to environment:	Vendor to Confirm	
2.14.2	Maximum noise level shall be 85 dB(A) at normal load condition, 1meter away from the machine with correction factor for back ground noise.	Vendor to demonstrate compliance to noise level,	
2.14.3	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm	
2.14.4	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm	
2.14.5	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 VOLATGE 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 confirm	
3.2	Make. : NEEL / DELTA / AEI / POWER AID	Vendor to confirm	
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 submit	
3.5	Catalogue of the Voltage Stabilizer shall be submitted with the offer.	Vendor to submit	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete 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 supplied	Vendor to confirm	
4.2	Make NEEL / DELTA / AEI / POWER AID	Vendor to confirm	
4.3	Model and Rating	Vendor to specify and noise level also	
4.4	Spares Package for the Ultra Isolation Transformer for 2 years working should also be offered.	Vendor to submit	
4.5	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to submit	
5.0	**TOOLING:**		
5.1	Tooling system shall consist of 1. A base tool holder mounted on faceplate slide using Standard ISO Indexable carbide inserts capable of generating all edge preparation styles as indicated in **ANNEXURE-1** for all jobs. 2. Toolings suitable for performing ID boring of 'T'ees Cutting Parameters: Cutting speed: 100-150m / min Depth of cut: 5-18 mm. Cutting feed: 0.2-0.6 mm / rev.	Vendor to specify	
5.2	Details of special cuttings tools to suit the actual profiles to be machined (ref Clause No 1.4), Tool size for different tool holders	Vendor to specify	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
5.3	Limitation regarding length & weight of tool / tool holder clamped in different tool holders for trouble free operation	Vendor to specify	
5.4	5sets of Cutting tools, 2 Nos. of tool holders, 2 Sets of boring tools with sufficient quantity of adapters etc. as recommended by vendor for complete machining of prove out components (at BHEL works) should be offered.	Vendor to confirm	
6.0	**DIAGNOSTIC SYSTEM**		
6.1	**TELE-DIAGNOSTIC SERVICE:**		
6.1.1	Tele-diagnostic service should be provided through International telephone lines along with required Hardware / Software package for the supplied CNC system for remote diagnosis and correction of the problems in both CNC System and PLC of the machine. This should be provided free of charge for the guarantee period. The Vendor should inform terms and conditions for the service after guarantee period. Subsequently, it should be possible to use other platforms, such as Internet or ISDN, subject to their availability in future. BHEL will provide the necessary telephone line near the machine.	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
6.2	**FAULT DIAGNOSTIC SYSTEM:**		
6.2.1	Vendor'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	
6.2.2	Help guide should be provided to use both diagnostic systems	Vendor to confirm	
7.0	**LEVELING & ANCHORING SYSTEM:**		
7.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied	Vendor to specify	
8.0	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE:**		
8.1	The Vendor shall bring special tools and equipment required for erection of the machine. 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	
8.2	Any Test mandrel required for checking & alignment of the machine components etc. should be supplied	Vendor to confirm.	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
9.0	**SPARES:**		
9.1	Itemized breakup of mechanical, hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: **(Unit Price of each item of spare should be offered)**	Vendor to confirm	
9.2	**Mechanical & Hydraulic Spares:** All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	Vendor to confirm	
9.3	**Electrical /Electronic / CNC Spares:** All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, , spares for CNC, Servo Motors for Feed Drives, Power Module & Control Cards for Main Drive as well as Feed Drives etc.	Vendor to confirm	
9.4	All types of spares for total machine and accessories should be available for at least ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
9.5	Recommended set of spares for all attachments are to be offered with details.	Vendor to confirm	
9.6	Vendor to confirm that complete list of spares for machine and accessories, along with item part no / specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Vendor to confirm	
10.0	**DOCUMENTATION:**		
10.1	Three sets of following documents (3 Hard copies,) in English language should be supplied along with the machine	Vendor to confirm	
10.2	Operating manuals of Machine & CNC system	Vendor to confirm	
10.3	Programming Manuals of Machine & CNC system	Vendor to confirm	
10.4	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Hydraulic circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also	Vendor to confirm	
10.5	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.	Vendor to confirm	
10.6	Manufacturing drawings for all supplied tool holders, cutting tools, adapters, sleeves, fixtures etc.	Vendor to confirm	
10.7	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm	
10.8	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
10.9	Operating Manuals, Maintenance Manuals & Catalogues for supplied Voltage Stabilizer, Isolation Transformer and all supplied Accessories.	Vendor to confirm	
10.10	PLC program printouts with comments in English.	Vendor to confirm	
10.11	PLC program on CD, NC data & PLC data on CD	Vendor to confirm	
10.12	Complete back up of hard disk on GHOST CD and clear written Instructions (3 copies) to take back up and reloading of a new hard disk.	Vendor to confirm	
10.13	The vendor shall submit complete Master List of parts used in the machine.	Vendor to confirm	
10.14	One additional set of all the above documentation on CD	Vendor to confirm	
11.0	**TRAINING:**		
11.1	The Vendor shall train Four BHEL's Engineers in Operation and Maintenance (Mechanical, Electrical/ Electronics and CNC System) of the Machine at Vendor's works	Vendor to confirm	
11.2	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 8 working days	Vendor to confirm	
11.3	Airfare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor o Confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
11.4	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel	Vendor to Confirm	
11.5	Vendor to quote for training on per man per week basis for training at vendor's work	Vendor to confirm	
12.0	**FOUNDATION:**		
12.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI). 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 as per the Vendor's recommendation.	Vendor to submit	
12.2	Vendor should arrange equipments required for the testing of foundation, if required by the Vendor. The Vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
13.0	**ERECTION & COMMISSIONING**		
13.1	Vendor to take full responsibility for supervision of the erection, vendor shall start up, test the machine, it's control & all types of other supplied equipment, carrying out machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by Vendor in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL.	Details of these requirements should be informed by Vendor in advance	
13.2	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the Vendor.	Vendor to confirm	
13.3	Successful proving of BHEL components by the Vendor shall be considered as part of commissioning. All tests, as mentioned in (clause 17.0) shall form part of the commissioning activity.	Vendor to confirm	
13.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the Vendor.	Vendor to confirm	
13.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the Vendor on returnable basis.	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
13.6	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 colours of paint used.	Vendor to confirm	
13.7	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm	
13.8	Charges, duration, terms & conditions for E&C should be furnished in detail separately by Vendor along with offer.	Vendor to confirm	
14.0	**ACCURACY TESTS:**		
14.1	**GEOMETRICAL ACCURACY**		
14.1.1	Geometrical Accuracy Tests shall be in accordance with applicable standard recommended by the Vendor. Detailed Test Charts for the same, clearly showing the accuracies to be achieved on the machine, shall be submitted with the offer.	Vendor to confirm	
14.1.2	All other accuracies shall confirm to Vendors Test chart.	Vendor to confirm	
14.1.3	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Vendors works and during Erection & Commissioning at BHEL Works.	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
14.2	**MACHINE POSITIONING ACCURACIES & REPEATABILITY:**	Vendor to confirm	
14.2.1	Positioning accuracy in X axis (Pa) per 1000 mm	+/-0.1mm vendor to specify	
14.2.2	Positioning accuracy in Z axis (Pa) per 1000 mm	+/- 0.1mm vendor to specify	
14.2.3	Repeatability in X axis (Ps)	+/- 0.01mm vendor to specify	
14.2.4	Repeatability in Z axis (Ps)	+/- 0.01mm vendor to specify	
14.2.5	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at Vendors works and during Erection & Commissioning at BHEL Works	Vendor to confirm	
15.0	**AMBIENT CONDITIONS & THERMAL STABILITY:**		
15.1	Total machine including CNC system and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. Power Supply: Voltage: 415 V ± 10% Frequency: 50 Hz ± 3%, 3 Phase The machine shall be suitable for an ambient temperature of +50 ° C and relative humidity of 85 % respectively, but both do not occur simultaneously	Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
15.2	Weather conditions are tropical, Atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition	Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor	
15.3	Thermal Stability of the complete machine keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and vendor should ensure trouble free operation of the machine.	Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same should be furnished by Vendor	
15.4	The machine, including attachments and accessories, should be suitable for 24 hrs. Continuous operation to its full capacity for 24 hour a day and 7 days a week throughout.	Vendor to Confirm	
16.0	**PROVEOUT OF BHEL COMPONENTS:**		
16.1	The prove-out trials of the edge preparation shall be for the straight & bend pipes, Tees & Elbows for sizes given by BHEL during the technical discussions / at the time of releasing the Purchase Order. The pipe / Tees / Elbows ends subjected to facing, boring and edge preparation will be either flame cut or saw cut. 5 jobs each shall be proved in the size range & edge preparation style specification for straight pipe, bend pipe, tees and elbows	Vendor to confirm	

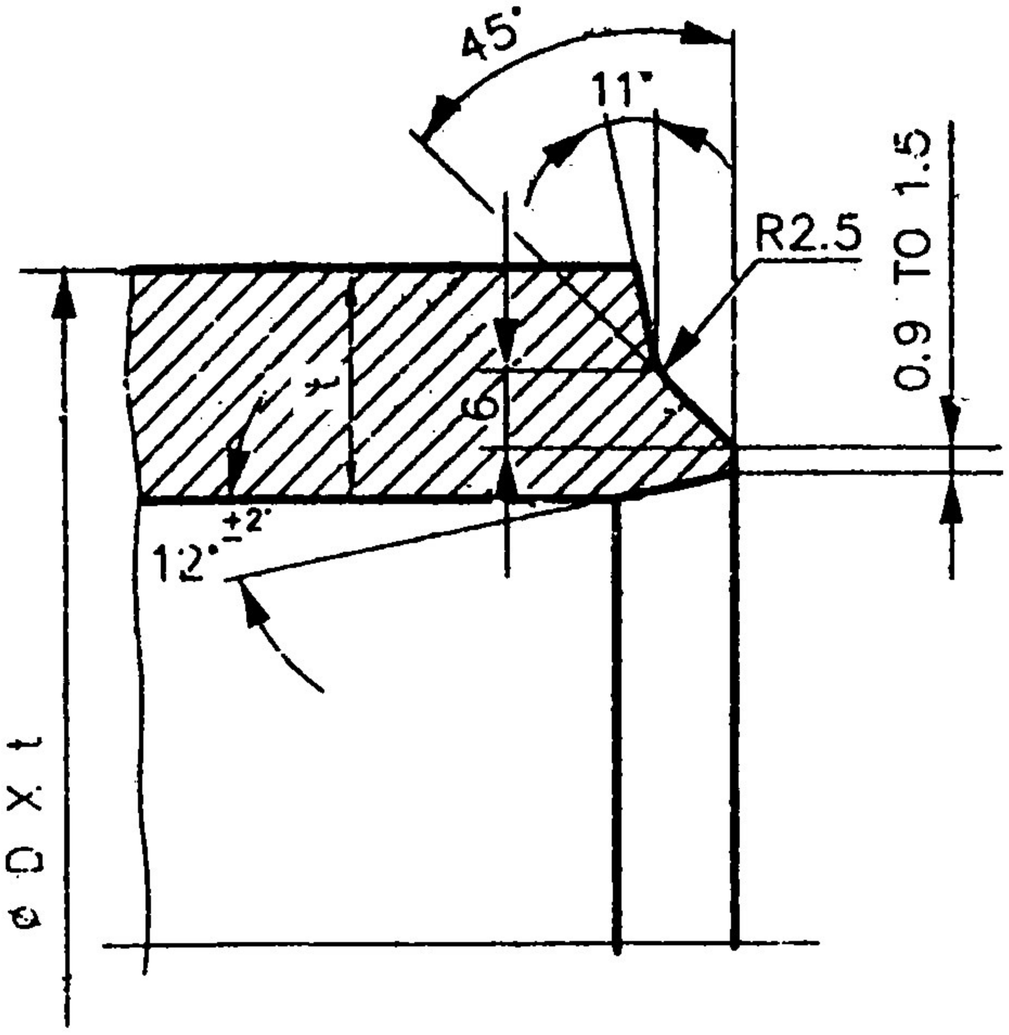
S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
17.0	**MACHINE ACCEPTANCE: (Tests/Activities to be Performed by Vendor)**		
17.1	**Tests/Activities to be carried out at Vendor's works on the machine before dispatch:**		
17.1.1	Geometrical accuracies as per applicable standard test chart recommended by the Vendor	Vendor to confirm	
17.1.2	Positioning accuracies as per Applicable standard method recommended by the Vendor.	Vendor to confirm	
17.1.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to confirm	
17.1.4	Demonstration of all features of the machine, control system & accessories	Vendor to confirm	
17.2	**Tests / Activities to be carried out at BHEL works while commissioning the machine:**		
17.2.1	Geometrical accuracies as per. Applicable standard test chart recommended by the Vendor	Vendor to confirm	
17.2.2	Positioning accuracies as per Applicable standard method recommended by the Vendor.	Vendor to confirm	
17.2.3	Full load test to demonstrate the maximum power & cutting capacity of the machine.	Vendor to confirm	
17.2.4	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	
17.2.5	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
17.2.6	Machining of test pieces to perform the edge preparation profiles **(as per sl.no 1.4)**	Vendor to confirm	
17.2.7	The prove-out trials **as per Clause 16.0**	Vendor to confirm	
17.2.8	Supervision by vendors of independent operation of machine by BHEL after job prove out during the training period of 8 working days	Vendor to confirm	
18.0	**PACKING:**		
18.1	Sea worthy & rigid packing for all items of complete machine, CNC System, all accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes	Vendor to confirm	
19.0	**GUARANTEE:**		
19.1	24 months from the date of acceptance of the machine.	Vendor to confirm	
20.0	**GENERAL:**		
20.1	Machine Model No.	Vendor to specify	
20.2	Total connected load (KVA):	Vendor to specify	
20.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify	
20.4	Machine lubrication	Automatic centralized lubrication system.	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (With complete Technical Details)
20.5	Painting of machine / electrical panel	RAL6011Apple Green (Polyurethane paint)	
20.6	All gears are to be hardened and ground	Vendor to specify.	
20.7	Total weight of the machine	Vendor to specify	
20.8	Weight of heaviest part of machine	Vendor to specify	
20.9	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to specify	
20.10	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to specify	
20.11	Vendor to submit, along with offer, reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, Load Carrying Capacity, Main Drive Rating, CNC System etc	Vendor to confirm	
20.12	Detailed catalogues, sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to confirm	
20.13	Hydraulic, Pneumatic & oil piping should be preferably metallic except places where flexible piping is essential. All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to confirm	

Enclosures:
Annexure 1: Edge Preparation Styles
Annexure 2: Standard sizes of pipes, Tees (Equal & Unequal) and Elbows.
Annexure 3: Typical T and Elbow fittings Photos

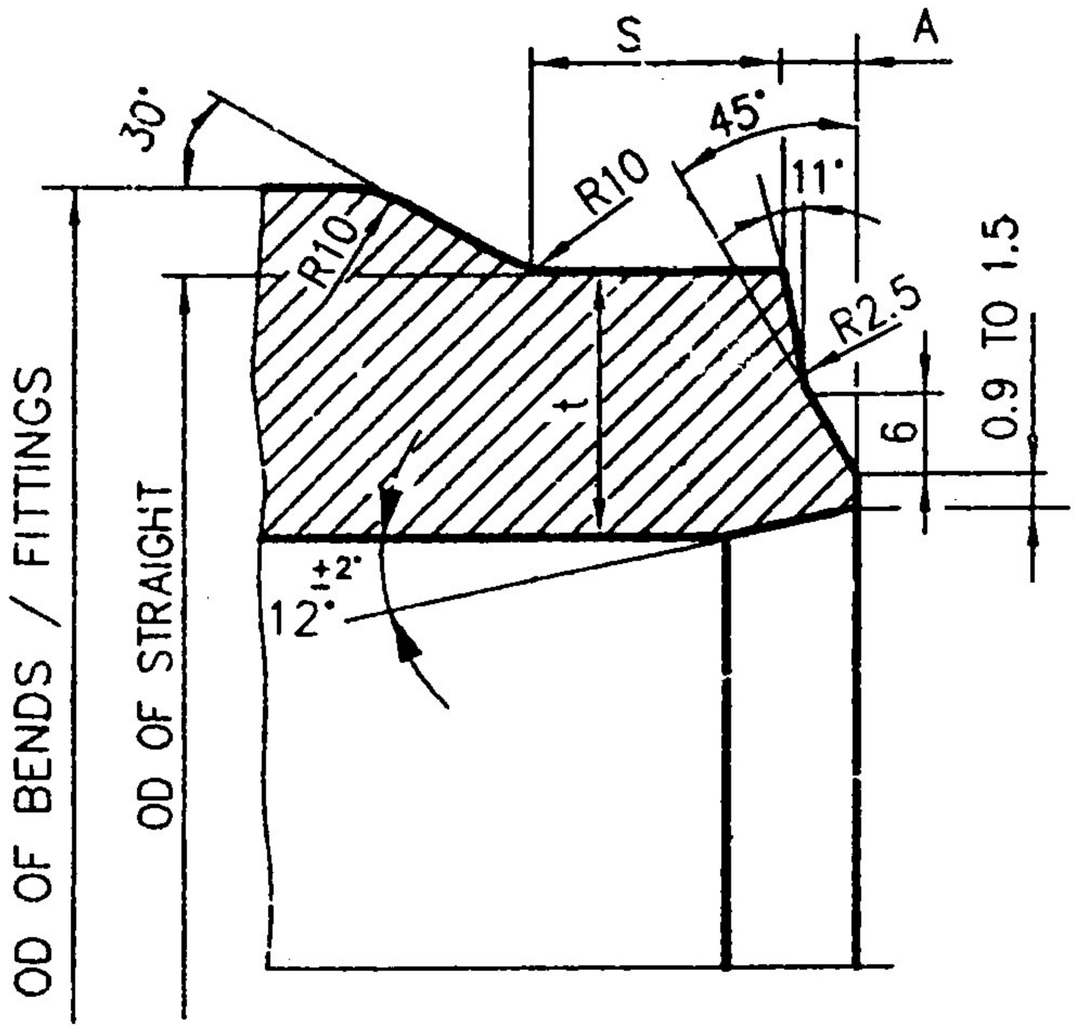
ANNEXURE - 1
Drg No. CABS-1-16 - 01
BHEL, Tiruchirappalli



USE WHEN t ≥ 14.2 mm.

STYLE – P

02. WHEN t<65 S+A = 65 Min. & t>65,S=65 Min.
WHERE t=THK OF CONN.PIPE(STRAIGHT).



STYLE – Pa

ANNEXURE - 1
Drg No. CABS-1-16-02
BHEL, Tiruchirappalli

NOTES: –

01. APPLICABLE FOR P91 MATERIAL
02. FOR OD MISMATCHING REF. FIGURE–Xa.
03. α = 6° FOR WALL THICKNESS ≤ 30 mm
04. α = 10° FOR WALL THICKNESS > 30 mm

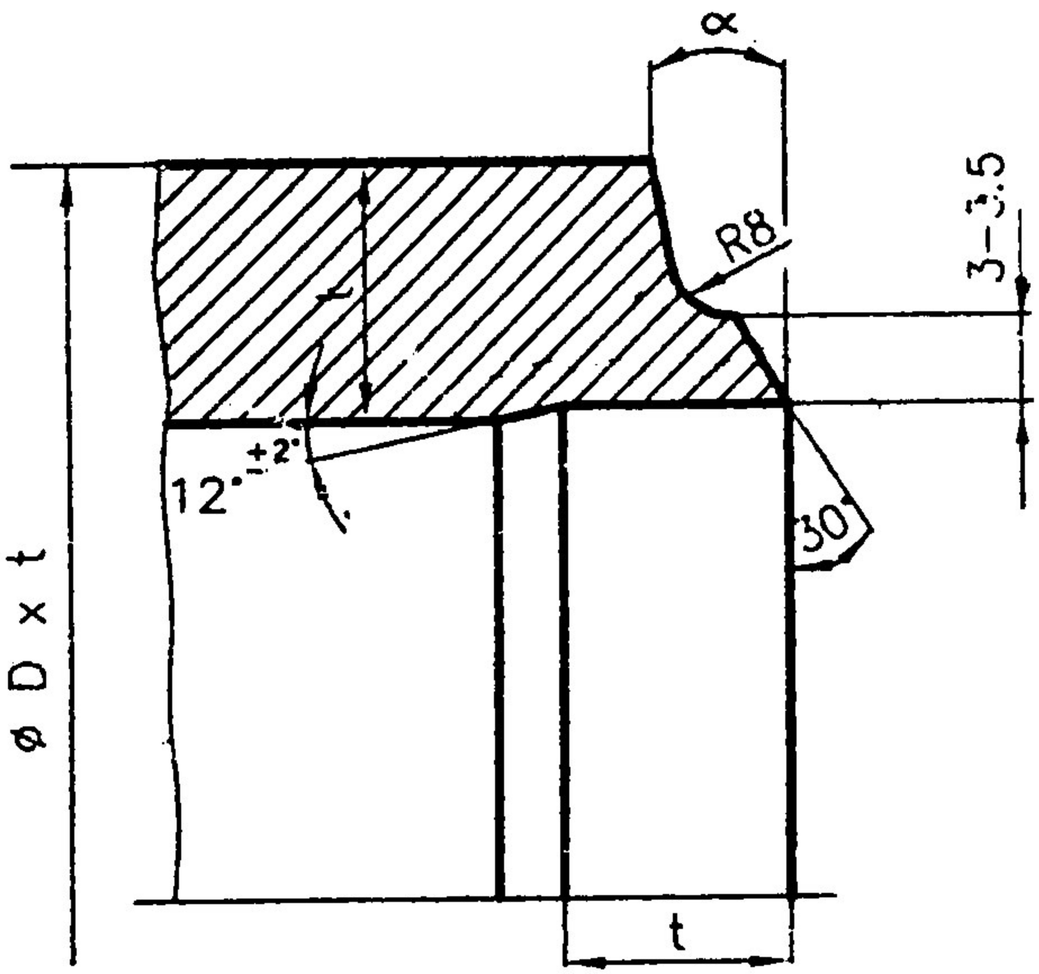


FIGURE – X

NOTES: –

01. OD OF STRAIGHT TO BE PHYSICALLY MEASURED/VERIFIED
02. α = 6° FOR WALL THICKNESS ≤ 30 mm
03. α = 10° FOR WALL THICKNESS > 30 mm

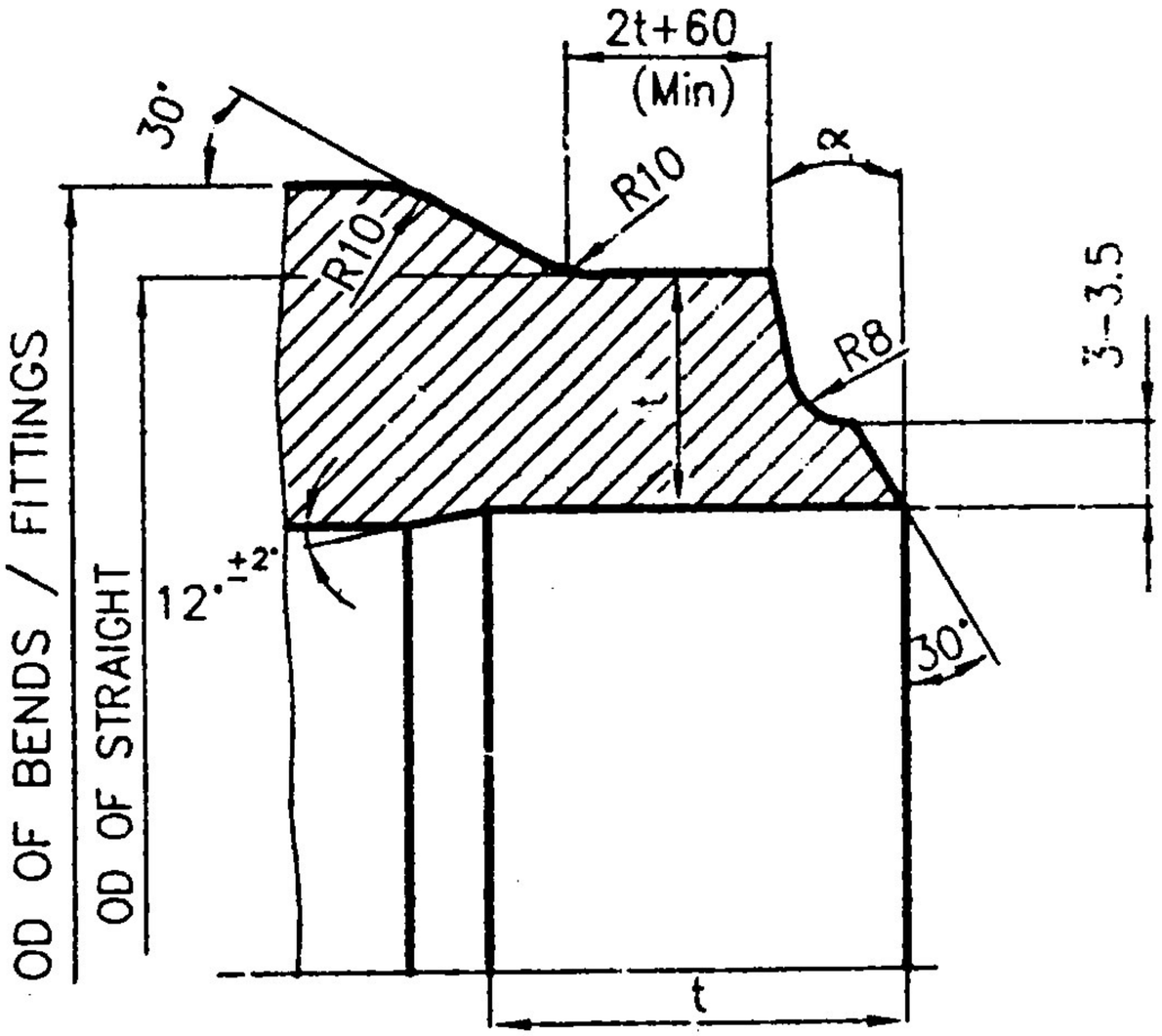


FIGURE – Xa

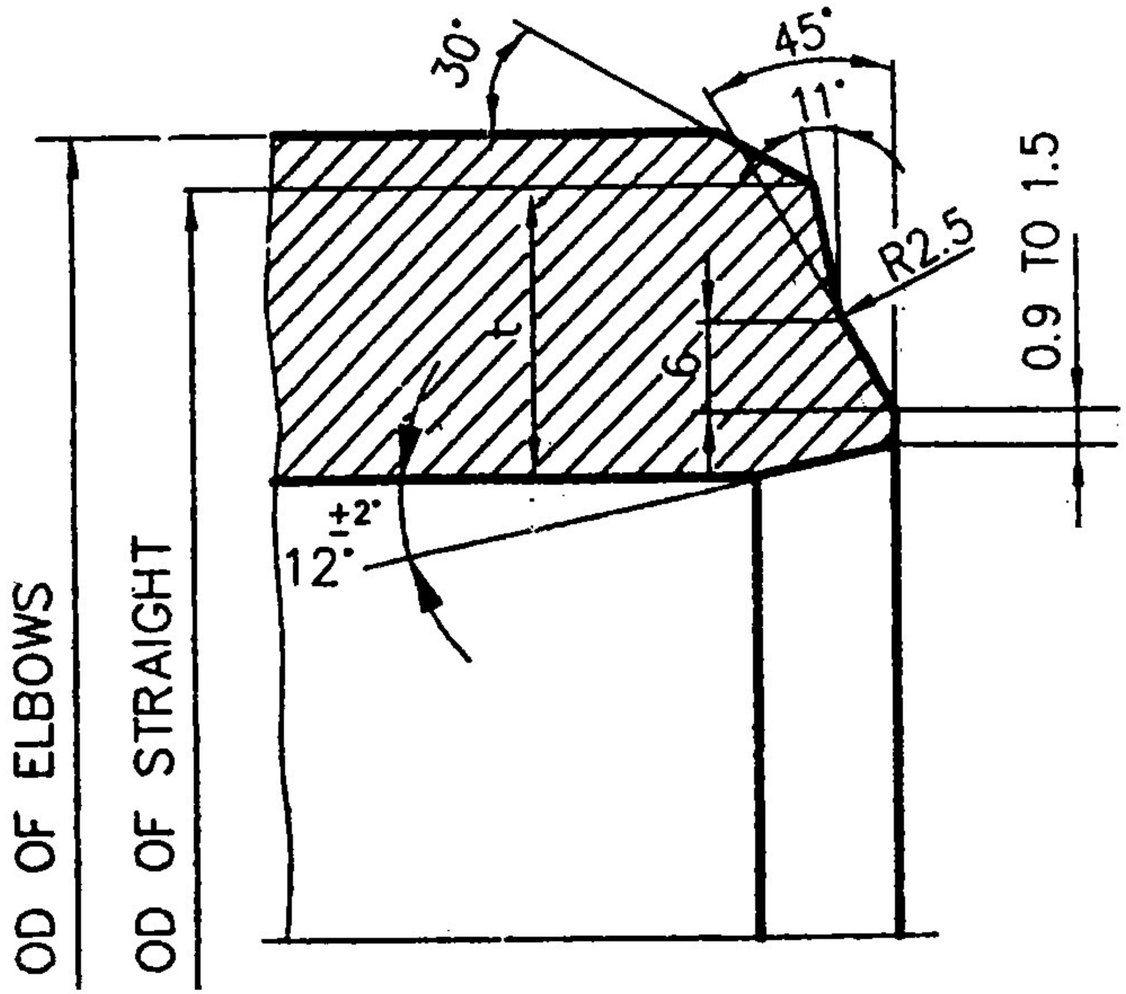
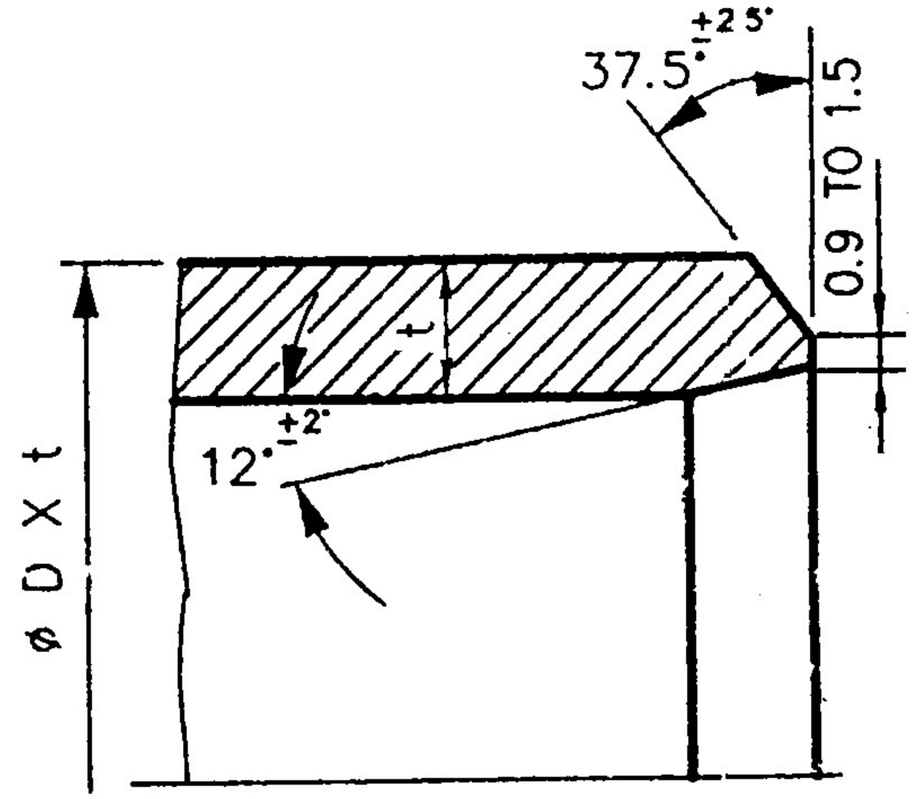


FIGURE – Z



STYLE – D

NOTES: –

01. USE WHEN t < 14.2 mm.

ANNEXURE - 1
Drg No CABS-1-16 - 03
BHEL, Tiruchirappalli

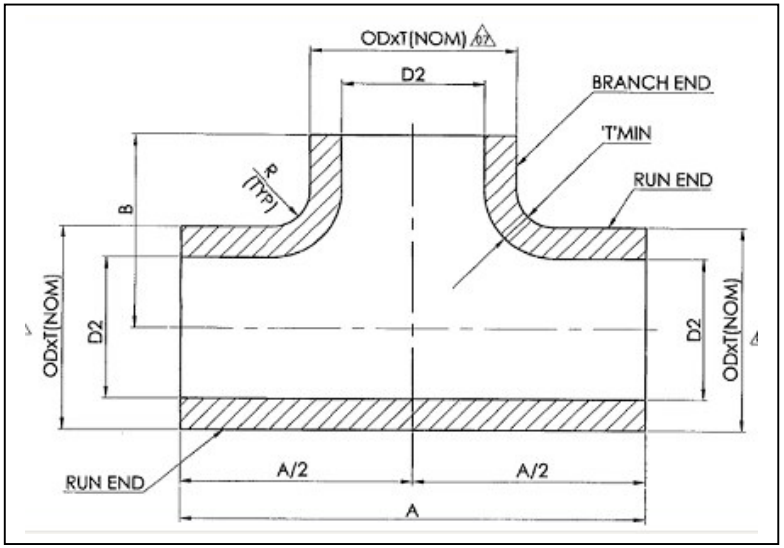
Annexure - 2
CABS-1-24-Pipe Sizes
BHEL, Tiruchirappalli

PIPE SIZES

Sl. No.	Pipe Size (OD), mm	Wall Thickness Range, mm
1	219.1	6 to 24
2	273	6 to 25
3	323	6 to 50
4	355.6	10 to 40
5	457	12 to 45
6	508	6 to 72
7	558	6 to 72
8	609.6	14 to 30
9	660	14 to 45
10	711	20 to 45
11	720	50
12	813	40

CNC HEADER PIPE/FITTINGS BORING AND EDGE PREPARATION MACHINE

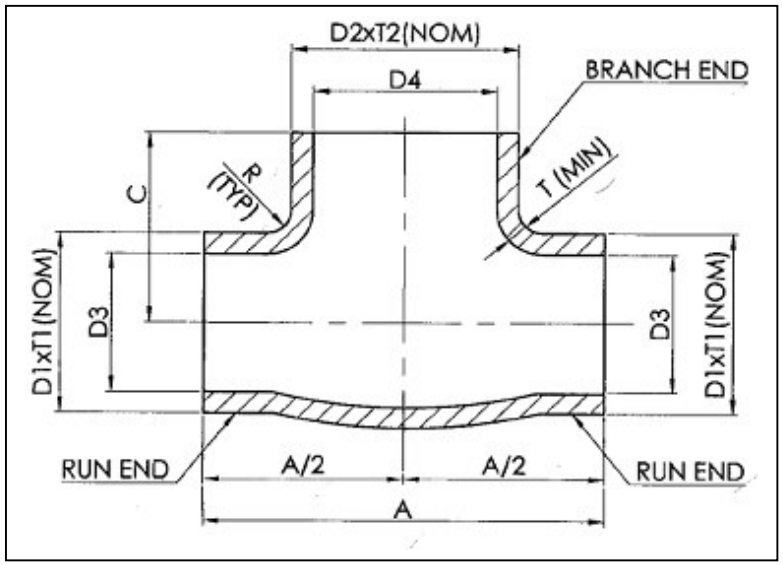
Equal ‘T’EES



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

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

Unequal ‘T’ees

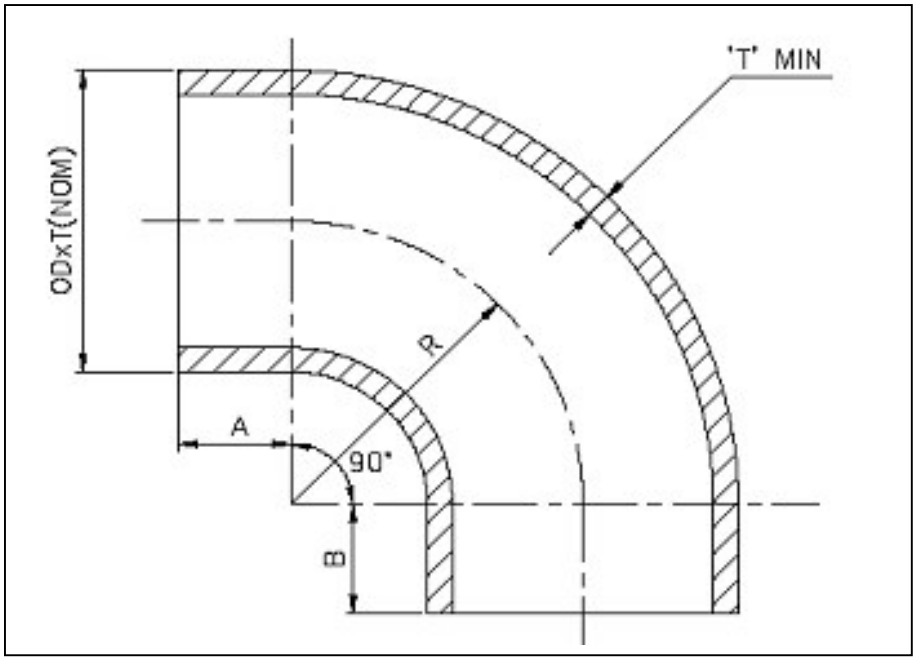


Annexure - 2
Drg No. CABS-1-24-02
BHEL, Tiruchirappalli

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

CNC HEADER PIPE/FITTINGS BORING AND EDGE PREPARATION MACHINE

Elbows



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

Sl.No	OD, mm	T (Nom) Thick, mm	(R) Radius, mm	Angle, Deg	A or B or Both A & B	MATERIALS
1	219.1	18 to 40	203.2,305	30, 45, 60 & 90	0 to 50 mm	SA234 WPB,WPC, SA234 WP11,WP12 SA234 WP22,WP91
2	273	32 to 45	254,381		0 to 75 mm	
3	323.9	29 to 52	304.8,457		0 to 100 mm	
4	355.6	35 to 55	355.6,533		0 to 125 mm	
5	368	36 to 59	368,533		0 to 150 mm	
6	406.4	25 to 69	406.4,610		0 to 200 mm	
7	457.2	25 to 65	457.2,686		0 to 225 mm	
8	508	25 to 71	508,762		0 to 250 mm	
9	558.8	28 to 40	558.8,832		0 to 250 mm	
10	609.6	30 to 40	609.6,914		0 to 250 mm	

ANNEXURE 3

TYPICAL FORMED FITTINGS - PHOTOS

1. ∅219mm Formed ‘T’ Fittings

2. ∅219mm Formed ‘T’ Fittings

ANNEXURE 3

TYPICAL FORMED FITTINGS - PHOTOS

3. One end of ‘T’ fitting - Closer View

4. ∅ 273mm ‘T’ fitting

ANNEXURE 3

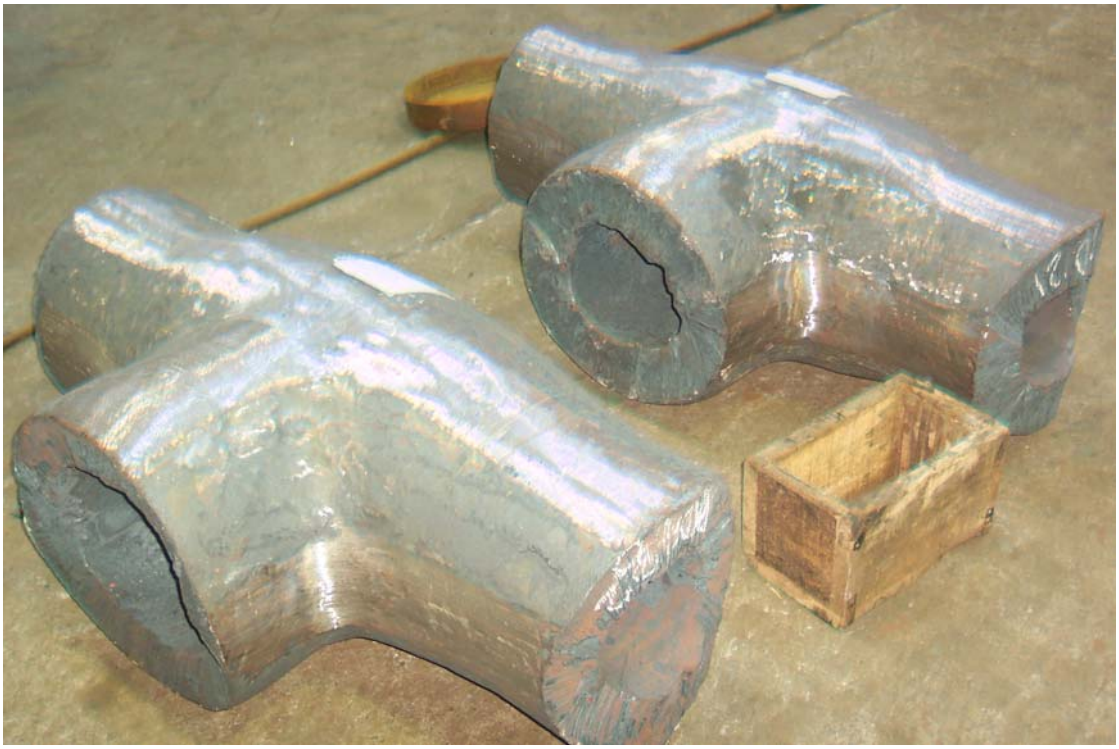
TYPICAL FORMED FITTINGS - PHOTOS

5. ∅ 219mm 'T' fitting

6. ∅ 273mm 'T' fitting

ANNEXURE 3

TYPICAL FORMED FITTINGS - PHOTOS



7. Unequal ‘T’ fitting

8. Run end of Unequal ‘T’ fitting

9. Branch end of Unequal ‘T’

ANNEXURE 3

TYPICAL FORMED FITTINGS - PHOTOS

10. Typical Elbow Fittings

11. Typical Machined Elbow Fitting