



An ISO 9001  
Company

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

<b>ENQUIRY</b>	Phone: +91 431 257 75 75 Fax : +91 431 252 07 19 Email : <a href="mailto:rrmanohar@bheltry.co.in">rrmanohar@bheltry.co.in</a> Web : <a href="http://www.bhel.com">www.bhel.com</a>
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	<b>Enquiry Number:</b>  <b>2620700003</b>	<b>Enquiry Date:</b>  <b>21.02.2007</b>	<b>Due date for submission of quotation:</b>  <b>04.04.2007</b>
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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	High Productive Tube Sizing & Edge Preparation Station as per the technical specification & commercial conditions applicable (to be downloaded from web site <a href="http://www.bhel.com">www.bhel.com</a> )	1 No.	31.08.2007

<b>Note:</b> (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 <a href="http://www.bhel.com">www.bhel.com</a> under Enquiry reference “2620700003”. Your offer should be based on all the above documents. (2) Also, you are requested to fill in the Supplier Registration formats available in <a href="http://www.bhel.com">www.bhel.com</a> (under Advancement – Supplier Registration) and send it along with your offer.
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Tenders should reach us before 14:00 hours on the due date Tenders will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present	Yours faithfully, For BHARAT HEAVY ELECTRICALS LIMITED  Sr. Dy. Genl. Manager / Capital Purchase / MM / Manufacturing
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## **PART A**

### **AUTOMATIC TUBE CUTTING & EDGE PREPARATION MACHINE** ***[including tube handling system]***

#### **SECTION – I : QUALIFYING CONDITION:**

The VENDOR (OEM) has to compulsorily meet the following requirements to get qualified for consideration of their offer for AUTOMATIC TUBE CUTTING & EDGE PREPARATION MACHINE [including tube-handling system]

<b>S. No.</b>	<b>REQUIREMENTS</b>	<b>Vendor's Response</b>
1	Only those vendors (OEMs), who have supplied and commissioned at least one Automatic Tube Cutting & Edge Preparation Machine complete with unit for cutting to size, end preparation stations and tube conveying and transfer mechanisms for tube of diameter 76mm or above and length 15m or above 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.	
2	The following information should be submitted by the vendor where similar machines have been supplied, for qualification of their offer.	
2.2	Name and postal address of the customer / company where similar machine is installed.	
2.3	Name and designation of the contact person of the customer.	
2.4	Phone, FAX no. and email address of the contact person of the customer.	
2.5	Month and Year of commissioning.	
2.6	Application for which the machine is supplied	
2.7	Performance certificate from the customers regarding satisfactory performance of machine supplied to them. The certificate should be current and on the letterhead of the Customer. It should contain information regarding model / Size of machine, month & year of commissioning and performance of M/c.	
2.8	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.	

**SECTION – II**

The BIDDER is expected to give complete details against each clause in the table given below:

<b>S. No.</b>	<b>PARTICULARS</b>	<b>Vendor's Response</b>
3	Profile of the Company bringing-out the years of Experience of the BIDDER in the field of machine design, manufacture and supply of Automatic Tube Cutting and end Preparation Machines	
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 Centers 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 – III**

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

<b>S. No.</b>	<b>REQUIREMENTS</b>	<b>Vendor's Response</b>
8	The BIDDER / VENDOR shall submit the offer in TWO PARTS-Technical [with PART A & PART B] & Commercial and Price Bid.	
9	The Technical Offer shall be supported by Product Catalogues and description.	
10	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.	
11	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.	
12	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, tooling, attachments, auxiliary parts, spares, consumables, etc. with the main and basic equipment, to meet the technical specification requirements.	
13	Soft copy if any, giving the salient features of the proposed machine 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.	
14	BIDDER has to indicate the Country of Origin for the supply of equipment.	
15	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 SPECIFICATIONS for AUTOMATIC TUBE SIZING & EDGE PREPARATION MACHINE [including tube handling system]

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>1.0.0</b>	<b>PURPOSE &amp; APPLICATION</b>		
1.1.0	<p>a. The machine is to be designed and constructed for measuring, cutting and edge preparation automatically from tube feed to <b>discharge</b>. The edge preparation involves cutting, facing, chamfering, boring to correct size of ID and buffing, depending on job requirement.</p> <p>b. The edge preparation profile [normally to form "V" Groove and "U" Groove style Weld Joint preparation – Refer to <b>ANNEXURE - 1</b>] is to be obtained.</p> <p>c. The Basic Machine with all the Sub-Systems and Accessories are to be designed for working in three shifts (8 hour shift) a day and all the 365 Days in a year.</p> <p><b>BIDDER is expected to give technical write up on machine design, construction and operational features to bring out the capability of the proposed equipment, to meet the BHEL specification requirements</b></p>		
<b>2.0.0</b>	<b>WORK PIECE / JOB DETAILS</b>		
<b>2.1.0</b>	<b>TUBE DIMENSIONS</b>		
	Range of Diameter [O.D.]	31.8 mm to 76.1 mm	
	Range of Wall Thickness	2.4 mm to 15 mm	
	Minimum Tube Length	2000 mm (2 meters)	
	Maximum Tube Length	15000 mm (15 meters)	

S.No	PARTICULARS AND BHEL SPECIFICATION				BIDDER'S OFFER (with complete Technical Details)
2.2.0	TUBE SIZES:  [NOTE: All are OD (Outer Diameter) controlled tubes with a tolerance of maximum +22%, on tube wall thickness.]				
		S.No.	OD, in mm	THICKNESS, in mm	
		1	31.8	3.2 / 3.6 / 4.0 / 5.0	
		2	38.1	3.2 / 4.0 / 5.0 / 6.3	
		3	44.5	4.0 / 4.5 / 5 / 6.3 / 8 / 9 / 10	
		4	47.63	5 / 6.3 / 8 / 10	
		5	51.0	3.6 / 4 / 4.5 / 5 / 6.3 / 8 / 10 / 12	
		6	54.0	3.6 / 4 / 4.5 / 5 / 6.3 / 8 / 10 / 12	
		7	57.0	4 / 5 / 6.3 / 8 / 10	
		8	60.3	4 / 5 / 6.3 / 8 / 10 / 12.5	
		9	63.5	4.8 / 5.6 / 6.3 / 10 / 12.5	
		10	76.1	7.1 / 10 / 12.5	
2.3.0	MATERIAL SPECIFICATION				
	A)	CARBON STEEL:	SA 192, SA 210A1, SA 210C [ASTM]		
	B)	ALLOY STEEL:	SA 209T1, SA 213T11, SA 213T22, T-23 SA 213T91, T-93		
	C)	STAINLESS STEEL:	SA 213 TP304H, SA 213 TP321H, SA 213 TP347H		

S.No	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER (with complete Technical Details)
<b>3.0.0</b>	<b>MACHINE OUTPUT / PRODUCTIVITY</b>	
3.1.0	<p>BIDDER has to guarantee a minimum output of around 1000 end preparations (around one thousand end preparations for the tubes with the following dimensions / details, in a single shift of 8 hrs:</p> <p>a. Raw Tube Length: <math>\geq 14000</math> mm</p> <p>b. Finished Tube Length after machining both ends: 13500 mm</p> <p>c. Operations: - Buffing and Facing, Boring &amp; Chamfering as per the EP Sketches (Bevel – J and Bevel – H) given in <b>ANNEXURE-1</b>.</p> <p>d. Tube Size: 38.1 mm (OD) x 6.3 mm (thickness) OR 44.5 mm (OD) x 4.5 mm (thickness)</p> <p>e. Tube Material: Carbon Steel</p> <p>f. Metal Removal by I.D. Boring: Maximum 3 mm in Tube Wall Thickness</p>	
<b>4.0.0</b>	<b>OPERATIONS INVOLVED:</b>	
a	Loading of single tubes from tube bundle placed on tube stock table onto the in-feed conveyor by suitable kick-in device.	
b	Movement of tube, by suitable tube conveying device, to programmed tube length for cut-off	
c	Clamping of tube and tube cut off.	
d	Kickoff of remnant length (2000mm to 7000mm), if any, by suitable kickoff arrangement in the tube infeed line	
e	Tube transfer to next position for buffing / End preparation of one end of tube.	
f	Transfer of tube to subsequent stations for buffing / end preparation of the other end of tube. Operation is repeated till buffing and end preparation of both ends of tube is completed	
g	After completion of operation in the final station, the Tube is moved to the tube discharge stock table and kicked-off.	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
h	Once the tube is transferred out of the line, a new tube comes to the line and the same processing is repeated.		
i	Remnant lengths of 1000mm and below should fall in a bin placed in the gap between tube infeed conveyor and the tube cutting unit		
	[NOTE: Wherever possible parallel activities are to be contemplated to improve efficiency of the machine performance and productivity.]		
<b>5.0.0</b>	<b>MACHINE CONFIGURATION:</b>		
5.1.0	The machine shall consist of following components & equipments:		
	Tube Stock Table and In feed Conveyor	1 set	
	Tube Length Measuring Unit	1 set-	
	Cutting Unit	1 set	
	Tube End Preparation Unit	2 sets	
	Buffing Unit	2 sets	
	Conveyor and Transfer Conveyor between Cutting Line, Buffing Lines and End Preparation Lines	1 set	
	Out Feed (Discharge)Unit	1 set	
	Chip Collection System & chip bin-	2 sets	
	Buffing Dust Collector	2 sets	
	Air Compressor with tank, FLR Unit and Moisture Separator-	1 set	
	Electrical, Electronics, AC Drives & CNC/PLC Controls with Panels and Local Operator Consoles	1 set	
	Hydraulic Unit	1 set	
	Additional kick-off unit on the tube infeed side for balance useful length of 2m to 7m	1 Set	



S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>6.0.0.</b>	<b>TUBE STOCK TABLE, IN-FEED &amp; OUT-FEED (DISCHARGE) UNIT, KICK-OFF UNIT FOR REMAINING LENGTH:</b>		
<b>6.1.0</b>	<b>TUBE STOCK TABLE:</b>		
6.1.1	The tube stock table shall have a flat portion and a sloping rack	Vendor to Confirm	
6.1.2	The flat portion shall be suitable for placing 3 tube bundles, each having 25 to 50 tubes of OD 44.5mm x 10mm thick	Vendor to Confirm	
6.1.3	One tube bundle from above is opened so that tubes spread out on the sloping rack. The width of the sloping rack shall be suitable for 50 tube of OD 44.5 mm x 10mm thick	Vendor to Confirm	
<b>6.2.0</b>	<b>TUBE INFEED:</b>		
6.2.1	Number of Tube Pickup arms	Minimum 10	
6.2.2	Tube conveyor type	Pinch-Roll Type / Roller Type	
6.2.3	Max Tube conveyor speed	Not less than 60 m / min	
6.2.4	Tube Conveyor Drive Type	Vendor to Specify	
6.2.5	Number and power rating of each drive unit of tube conveyor	Vendor to Specify	
<b>6.3.0</b>	<b>OUT-FEED (DISCHARGE) UNIT:</b>		
6.3.1	Discharge unit to unload tube from final station	Should be suitable for 2000mm to 15000 mm long tubes	
6.3.2	Size of discharge table	Vendor to Specify	
6.3.3	Number of Tube Kick-Off arms	Minimum 10	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>6.4.0</b>	<b>KICK-OFF UNIT FOR REMAINING LENGTH:</b>		
6.4.1	Useful Length of remaining tube after cut-off	2000mm to 7000mm	
6.4.2	Kick-off arrangement should be located on the infeed conveyor side	Vendor to confirm	
6.4.3	Number of Tube Kick-off arms	Vendor to Specify	
<b>6.5.0</b>	Complete technical description of stock loading table, single-tube kick-in device, tube conveyor, tube discharge arrangement and kick-off unit for remaining length should be furnished along with offer . A layout drawing to be furnished.		
<b>7.0.0</b>	<b>MEASURING UNIT:</b>		
7.1.0	Technical Features		
a	To set and measure for cutting		
b	To travel to its programmed position by the AC servomotor through rack and pinion mechanism.		
c	The measuring unit shall not travel to its reference position for subsequent tubes of the same cut length		
d	The unit to have sensors to signal for creeping speed, to avoid hammering and breakage of component by tube hitting.		
e	There shall be no rubbing / collision of tube with length measuring unit during tube transfer to next station		
7.2.0	Measuring Range	2000 mm to 15000 mm	
7.3.0	Max Traveling Speed	Approx: 60 m/min.	
7.4.0	Rating of AC Servo Motor	Vendor to Specify	
7.5.0	Measuring Accuracy	± 0.1 mm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>8.0.0</b>	<b>TUBE CUTTING/ SIZING UNIT</b>		
8.1.0	<b>Basic Features</b>		
a	The cutting unit is for cutting the tube at the programmed length by a metal circular saw		
b	Tube has to be stationary while cutting		
c	During cutting, the cutting blade has to be guided and clamped for rigidity, to ensure vibration free, smooth and sharp cut		
d	Movement of cutting unit (circular saw) shall be horizontal or downward for cutting operation		
e	Mist Cooling of circular saw blade shall be provided for Cutting Operation		
8.2.0	Tube Cut-Off (sized) Length	Any length in the range of 2000 to 15000mm	
8.3.0	Circular saw Drive	Inverter Controlled	
8.4.0	Circular Saw Speed	Vendor to Specify	
8.5.0	Circular Saw Drive Rating	Minimum 7.5 KW	
8.4.0	Cutting Feed	Hydraulic	
8.7.0	Cutting Feed Range	Vendor to Specify	
8.8.0	Cutting Stroke	Vendor to Specify	
8.9.0	Tube Clamping	Hydraulic	
8.10.0	Tube Clamping Force	Vendor to Specify	
8.11.0	Circular Saw Dimensions	Diameter: 400 mm, Mounting Bore: 50 mm-H7 Carrier Bolt Holes: 4 Nos. [Diameter 15 mm at PCD of 80 mm]	
8.12.0	<b>Tube Bit Collection Bin:</b> A gap of about 1000mm has to be provided between Tube Cutting Unit and In-feed Conveyor for a bin to be located in such a position that remnant lengths fall into the bin once clamp is opened [Bin should be supplied to suit for remnant length of tubes up to 1000 mm]	Vendor to confirm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>9.0.0</b>	<b>BUFFING UNIT</b>		
9.1.0	<b>Purpose:</b> The buffing unit is to remove rust and paint on the tube outer surface. The unit shall be so designed that there is no removal of parent material from any portion of the tube even if the tube has a slight bend		
9.2.0	Type	Flap Wheel or a better option (Vendor to Specify)	
9.3.0	Required buffing length	100mm (min)	
9.4.0	Buffing Wheel Drive	Vendor to specify	
9.5.0	Drive Unit Power Rating	Vendor to Specify	
9.6.0	Buffing Wheel Speed	Vendor to Specify	
9.7.0	Buffing Wheel Size (Dia and Width)	Vendor to Specify	
9.8.0	<b>Dust Extraction System for Buffing Unit:</b>	For collecting the dust generated during buffing operation.	
9.8.1	a) The dust collector should have a Vacuum Suction unit, bag filter, etc	Vendor to confirm	
9.8.2	Vacuum	2000mm Water Column	
9.8.3	Flow Rate	500 m <sup>3</sup> / hour	
9.9.0	Complete details of buffing unit and dust collector unit should be furnished along with the offer		

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>10.0.0</b>	<b>TUBE END MACHINING / EDGE PREPARATION UNIT:</b>		
10.1.0	Type of End Preparation	"V" & "J" Grooves (As per sketch given in <b>ANNEXURE-1</b> )	
10.2.0	Technical Features:		
a)	One end of tube is to be prepared in one line (one set) & transferred to the other line (2 <sup>nd</sup> set) for the other end preparation with Tube Stationary in either locations		
b)	Operations - edge chamfering, boring and facing to the specified dimensions with an accuracy of $\pm 0.1$ mm		
c)	There shall be a stopper to position the tube end at a particular location for tube end preparation		
d)	Suitable sliding chip guard shall be provided to protect the surroundings and personnel from flying metal chips. Viewing port with toughened glass shall be provided for viewing the machining in progress		
10.3.0	Drive Motor for End Preparation Unit	Inverter Controlled	
10.4.0	Drive motor rating	Minimum: 15 KW	
10.5.0	Gear Reduction Ratio	Vendor to Specify	
10.6.0	Spindle rpm range	Vendor to Specify	
10.7.0	Spindle Stroke	Vendor to Specify	
10.8.0	Spindle Feed Range (Preferred)	Rapid - 4 m/min. Cutting feed - 0.05 mm/rev to 2 mm/rev	
10.9.0	Feed drive	Hydraulic / Electric	
10.10.0	Type of self-centering tube clamping arrangement (Horizontal V-Clamp / Collet chuck etc)	Vendor to Specify	
10.11.0	Clamping operation	Hydraulic / Electric	
10.12.0	Clamping Force	Vendor to specify	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>11.0.0</b>	<b>TUBE CONVEYOR &amp; TRANSFER UNITS</b>		
11.1.0	<b>Purpose:</b>		
a)	For moving the tubes in each end preparation and buffing lines		
b)	Transfer the tube from each line, starting with cutting line, to the next, right up to discharge table		
11.2.0	Drive Mechanism for tube movement within each line.	Vendor to Specify	
11.3.0	Number of drives and rating of each drive in each line for tube movement	Vendor to Specify	
11.4.0	Speed of movement of tube in each line	60 m / min	
11.5.0	Tube Transfer Mechanism from one line to the next	Vendor to Specify	
11.6.0	Tube Transfer Speed	Vendor to Specify-	
<b>12.0.0</b>	<b>CHIP COLLECTION SYSTEM:</b>		
12.1.0	Application	Metal chips from each end preparation unit should be collected in respective suitable chip bins to be supplied for each unit to ensure a clean working environment.	
12.2.0	Technical Details	Vendor to furnish technical details of the system	
<b>13.0.0</b>	<b>LUBRICATION</b>		
13.1.0	Suitable lubrication arrangement should be provided where required.		
13.2.0	Vendor to furnish the technical details		

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>14.0.0</b>	<b>TOOLING</b>		
14.1.0	Standard ISO cutting tools with indexable carbide inserts capable of generating all edge preparation styles indicated in ANNEXURE-1 <b>[Vendor to furnish details and supply sufficient quantity of Cutting Tools, Adapters, Tool Holders, etc. in all types, to meet machine performance prove out]</b>		
a)	Cutting Speed	Vendor to Specify	
b)	Max Cutting Depth	Vendor to Specify	
c)	Max Cutting Feed	Vendor to Specify	
<b>15.0.0</b>	<b>MACHINE CONSTRUCTION</b>		
15.1.0	Complete description of each unit of the system and layout drawings explaining the Technical Features of the proposed machine shall be provided with the Technical Offer		
<b>16.0.0</b>	<b>OPERATION AND CONTROL SYSTEM</b>		
<b>16.1.0</b>	<b>OPERATOR'S CONTROL PANEL:</b>		
16.1.1	Control shall be PLC or CNC based		
16.1.2	Operator's Panel having complete machine control system with suitable display unit 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	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>16.2.0</b>	<b>PLC or CNC SYSTEM &amp; FEATURES</b>		
16.2.1	Make: Preferred Make – Fanuc / Siemens / Other Reputed makes	Vendor to specify	
16.2.2	Model (suitable and latest version, as available at the time of purchase order placement, shall be supplied).	Vendor to specify	
16.2.3	Details of Standard features	Vendor to specify	
16.2.4	Details of optional features, recommended by vendor.	Vendor to specify	
16.2.5	The system should have full alphanumeric keyboard, display of suitable size, 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, preinstalled system software and other associated / required soft wares, etc . (Details shall be furnished by the Vendor in the TECHNICAL OFFER)	Vendor to Confirm	
16.2.6	Display type and size	Vendor to Specify	
<b>17.0.0</b>	<b>MACHINE LIGHTS</b>		
17.1.0	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	
17.2.0	A spot light with sufficiently long cable should also be provided.	Vendor to Confirm	
17.3.0	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to Confirm	



S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>18.0.0</b>	<b>AIR CONDITIONING SYSTEM</b>		
18.1.0	Air Conditioners of sufficient capacity to be provided for all Electrical / Electronic Panels / Cabinets considering specified ambient conditions. Detailed specifications of the same are to be submitted.	Vendor to Specify-	
<b>19.0.0</b>	<b>HYDRAULIC SYSTEM</b>		
19.2.0	Hydraulic system should be centralized.	Vendor to Confirm	
19.3.0	Hydraulic Tank shall be located at floor level with hydraulic pipelines neatly laid out (Details should be furnished in the offer)	Vendor to Confirm	
19.4.0	Make Rexroth / Vickers Sperry or equivalent from a reputed manufacturer. (Details to be submitted)	Vendor to specify	
19.5.0	Quick-Fix type End Couplings are to be used for inter-connections and shall be of international standards.	Vendor to specify	
19.6.0	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	
19.7.0	The control voltage for all solenoid operated valves	24 V DC	
19.8.0	Cooling system of sufficient capacity to maintain complete Hydraulic System at a temperature not exceeding 40 deg C irrespective of the ambient conditions should be provided. Complete details should be submitted along with offer	Vendor to specify	
19.9.0	Filtration System and Hydraulic Pump Capacity	Vendor to specify	
19.10.0	Each pump should have an independent motor. Tandem pumps should not be used	Vendor to specify	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
19.11.0	<b>Vendor shall supply First filling of required Grease.</b> Indian equivalent & specifications of oils/greases are also to be provided by the vendor.	Vendor to specify	
<b>20.0.0</b>	<b>ELECTRICAL &amp; ELECTRONICS SYSTEMS</b>		
20.1.0	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 cables, connections, circuit breakers etc. required for connecting BHEL's power supply to the machine shall be in the scope of vendor.	Vendor to confirm	
20.2.0	Tropicalization: All electrical / electronic equipment shall be tropicalized.	Vendor to confirm	
20.3.0	All electrical & electronic control cabinets & panels should be dust and vermin proof	Vendor to confirm	
20.4.0	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm	
20.5.0	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	

<b>S. No.</b>	<b>PARTICULARS AND BHEL SPECIFICATION</b>		<b>BIDDER'S OFFER (with complete Technical Details)</b>
20.6.0	Motors & other electrical components shall conform to IEC or Indian Standards	Vendor to confirm	
20.7.0	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	
20.8.0	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
20.9.0	In-cycle hour counter with reset facility should be provided.	Vendor to confirm	
20.10.0	All Electric enclosures shall have IP 54 protection	Vendor to confirm	
<b>21.0.0</b>	<b>DIAGNOSTIC SYSTEM</b>		
<b>21.1.0</b>	<b>TELE-DIAGNOSTIC SERVICE</b>		
21.1.1	Tele-diagnostic service should be provided through International telephone lines along with required Hardware / Software package for the supplied PLC or CNC system for remote diagnosis and correction of the problems in-CNC / PLC System of the machine. The telediagnostic service shall be provided free of charge for the guarantee period. BHEL will provide the necessary telephone line near the machine	Vendor to confirm	
21.1.2	The Vendor shall 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.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>21.2.0</b>	<b>FAULT DIAGNOSTIC SYSTEM:</b>		
21.2.1	Fault diagnostic system should be provided to show the faults on the display and detailed cause, and remedy for the-faults related to mechanical and electrical maintenance.	Vendor to confirm	
<b>21.3.0</b>	Help guide should be provided to use both diagnostic systems	Vendor to confirm	
<b>22.0.0</b>	<b>PNEUMATIC SYSTEM:</b>		
22.1.0	Pneumatic systems, if any, on the machine shall be suitable for operation at BHEL compressed air supply pressure of <b>4 Kg / sq.cm (max)</b> . If higher air pressure is required for efficient operation of the machine, vendor shall furnish the following information:	Vendor to confirm	
a)	Required compressed air pressure	Vendor to specify	
b)	Required Flow rate	Vendor to specify	
<b>23.1.0</b>	<b>IN-BUILT SAFETY ARRANGEMENTS</b>		
23.1.0	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm	
23.2.0	A detailed list of all alarms / indications provided on machine should be submitted by the Vendor.	Vendor to specify	
23.3.0	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	
23.4.0	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.	Vendor to specify	

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23.5.0	Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on the display and operator panels) should be available.	Vendor to Confirm	
23.6.0	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm	
23.7.0	Emergency Switches should be provided at suitable locations as per International Norms.	Vendor to Confirm	
23.8.0	All lubricated parts like Bed, guide ways shall have provision for collecting the used Lubrication oil from machine guide ways and preventing them from spilling over on to the ground.	Vendor to Confirm	
<b>24.0.0</b>	<b>ENVIRONMENTAL PERFORMANCE OF THE MACHINE</b>		
24.1.0	The Machine should confirm to following factors related to environment:	Vendor to Confirm	
24.2.0	Maximum noise level shall be 85 dB(A) at normal load condition, 1 meter away from the machine with correction factor for back ground noise.	Vendor has to demonstrate	
24.3.0	If any safety / environmental protection enclosure is required it shall be built in the machine by the vendor.	Vendor to confirm	
24.4.0	Paint of the machine should be oil / coolant resistant and should not peel off	Vendor to confirm	
<b>25.0.0</b>	<b>MACHINE LEVELLING &amp; ANCHORING SYSTEM</b>		
25.1.0	Complete anchoring system including foundation bolts, anchoring materials, fixators, levelling shoes etc should be supplied	Vendor to specify	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>26.0.0</b>	<b>TOOLS FOR ERECTION, OPERATION &amp; MAINTENANCE</b>		
26.1.0	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	
26.2.0	Any Test mandrel required for checking & alignment of the machine components etc. should be supplied	Vendor to confirm.	
<b>27.0.0</b>	<b>MACHINE SPARES:</b>		
27.1.0	Itemized break-up of mechanical, hydraulic, electrical and electronic spares used in the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis shall be furnished by vendor along with offer. The list is to include following, in addition to other recommended spares: <b>(Unit Price for each item of spare shall be offered)</b>	Vendor to confirm	
27.2.0	<b>Mechanical &amp; Hydraulic Spares:</b> All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	Vendor to confirm	
27.3.0	<b>Electrical / Electronic / CNC Spares:</b> All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, Spares for PLC / CNC System, Servo Motors for Feed Drives, Power Module & Control Cards for Main Drive as well as Feed Drives etc.	Vendor to confirm	

<b>S. No.</b>	<b>PARTICULARS AND BHEL SPECIFICATION</b>	<b>BIDDER'S OFFER (with complete Technical Details)</b>
27.4.0	All types of spares for total machine and accessories shall 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
27.5.0	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
<b>28.0.0</b>	<b>DOCUMENTATION</b>	
28.1.0	Three sets of following documents (3 Hard copies,) in English language should be supplied along with the machine	Vendor to confirm
28.2.0	Operating Manuals of Machine & PLC or CNC system	Vendor to confirm
28.3.0	Programming Manuals of Machine & PLC or CNC system	Vendor to confirm
28.4.0	Maintenance, Interface & commissioning manuals for PLC or CNC system, spindle & feed drives.	Vendor to confirm
28.5.0	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
28.6.0	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm

<b>S. No.</b>	<b>PARTICULARS AND BHEL SPECIFICATION</b>		<b>BIDDER'S OFFER (with complete Technical Details)</b>
28.7.0	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to confirm	
28.8.0	Operating Manuals, Maintenance Manuals & Catalogues for all supplied Accessories.	Vendor to confirm	
28.9.0	PLC program printouts with comments in English.	Vendor to confirm	
28.10.0	PLC program on CD , NC data / PLC data on CD	Vendor to confirm	
28.11.0	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	
28.12.0	Complete Master List of spare parts used in the machine.	Vendor to confirm	
28.13.0	One additional set of all the above documentation shall be given in the form of CD.	Vendor to confirm	
<b>29.0.0</b>	<b>TRAINING</b>		
29.1.0	The Vendor shall train Four BHEL's Engineers in Operation and Maintenance (Mechanical, Electrical/ Electronics and PLC or CNC System) of the Machine at Vendor's works, for 10 working days.	Vendor to confirm	
29.2.0	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 10 working days	Vendor to confirm	
29.3.0	Airfare, boarding & lodging for the BHEL Trainees shall be borne by BHEL.	Vendor o Confirm	
29.4.0	Vendor to quote for training on per man per week basis for training at vendor's work	Vendor to confirm	
29.5.0	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel	Vendor to Confirm	



S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>30.0.0</b>	<b>MACHINE FOUNDATION:</b>		
30.1.0	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI). Complete details like static and dynamic loads etc required for foundation design shall be submitted by the Vendor within three months after getting BHEL's approval.	Vendor to confirm	
30.2.0	BHEL shall design and construct complete foundation for the machine as per the Vendor's recommendation	Vendor to confirm	
30.3.0	The Vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc for foundation bolts of the machine	Vendor to Specify	
<b>31.0.0</b>	<b>MACHINE ERECTION &amp; COMMISSIONING</b>		
31.1.0	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	
31.2.0	Successful proving of BHEL jobs Requirements by the Vendor shall be considered as part of commissioning. All tests, as mentioned in <b>SPECIFICATION CLAUSE No. 33.2.0</b> shall form part of commissioning activity.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER (with complete Technical Details)
31.3.0	Tools, Tackles, Test Mandrels, instruments and other necessary equipment including Laser equipment, if any, required to carry out all above activities should be brought by the Vendor.	Vendor to confirm
31.4.0	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the Vendor. Commissioning spares not used can be taken back by the vendor	Vendor to confirm
31.5.0	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm
31.6.0	Charges, duration, terms & conditions for E&C should be furnished in detail separately by Vendor along with offer.	Vendor to confirm
31.7.0	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 shall supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to confirm

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>32.0.0</b>	<b>AMBIENT CONDITIONS &amp; THERMAL STABILITY</b>		
32.1.0	<p>Total machine including PLC / CNC System and all items shall work trouble free and efficiently under following operating conditions &amp; shall give specified accuracies.</p> <p><b>Power Supply:</b>  Voltage : 415 V <math>\pm</math> 10%, 3 Phase AC  Frequency : 50 Hz <math>\pm</math> 3%</p> <p>The machine shall be suitable for an ambient temperature of +50 ° C and relative humidity of 85 % respectively, but both do not occur simultaneously  [The offered machine shall be suitable for the above and details of provisions on the machine for the same are to be furnished by Vendor]</p>	Vendor to confirm	
32.2.0	<p>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–  [The offered machine shall be suitable for the above and details of provisions on the machine for the same are to be furnished by Vendor]</p>	Vendor to confirm	
32.3.0	<p>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.</p>	Vendor to Confirm	

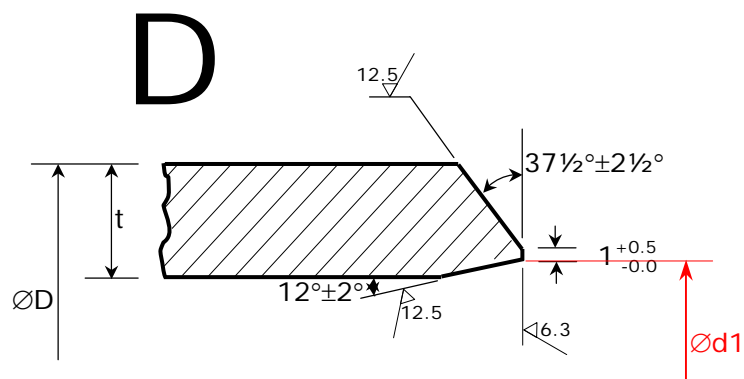
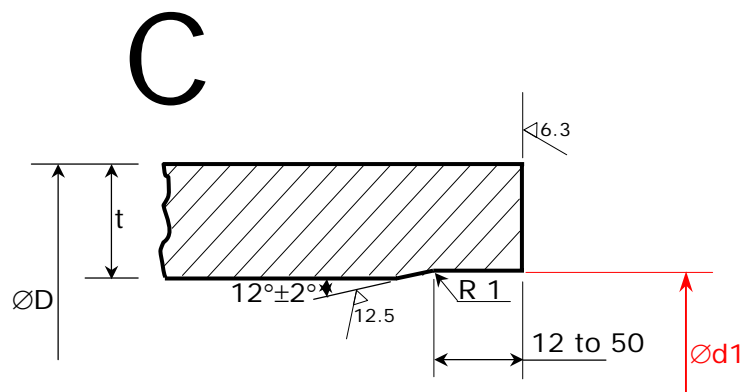
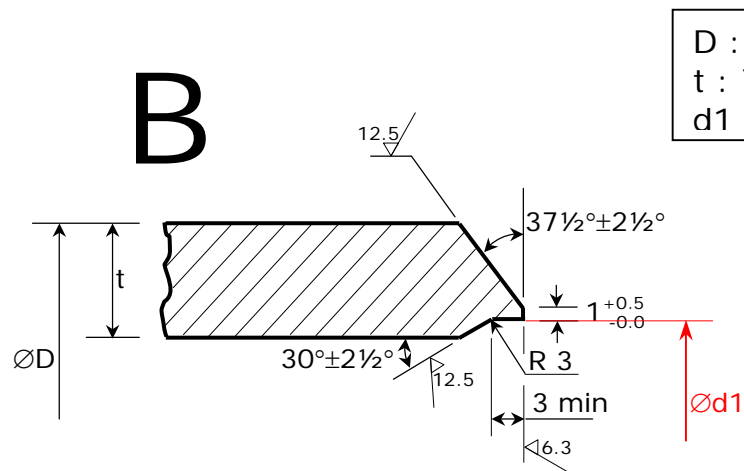
S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>33.0.0</b>	<b>MACHINE INSPECTION &amp; ACCEPTANCE:-</b>		
<b>33.1.0</b>	<b>AT VENDOR'S WORKS:</b>		
33.1.1	Machine shall be offered for inspection by BHEL engineers at vendor's works	Vendor to confirm	
33.1.2	Trials to demonstrate satisfactory operation of the machine including cutting, end preparation and buffing on a few tubes shall be performed. Required tube for the same shall be supplied by BHEL	Vendor to confirm	
<b>33.2.0</b>	<b>AT BHEL WORKS:</b>		
33.2.1	The production rate mentioned in <b>clause 3.0.0</b> shall be proved out by vendor for the tube sizes mentioned therein-	Vendor to confirm	
33.2.2	The prove-out trials of the cutting, edge preparation and buffing shall also be carried out by vendor for 500 ends of at least three tube sizes and material to be mutually agreed to between BHEL and Vendor	Vendor to confirm	
<b>34.0.0</b>	<b>MACHINE PACKING:</b>		
34.1.0	Sea worthy & rigid packing for all items of complete machine, PLC / 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	
<b>35.0.0</b>	<b>GUARANTEE TERMS</b>		
35.1.0	Performance Guarantee for a minimum period of 24 months (for the machine in total and sub-systems or bought-out items in particular) from the date of acceptance of the machine.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
<b>36.0.0</b>	<b>GENERAL POINTS</b>		
36.1.0	Machine Model No.	Vendor to specify	
36.2.0	Total connected load (in kVA)	Vendor to specify	
36.3.0	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify	
36.4.0	Painting of Machine / Electrical Panel – RAL 6011 Reseda Green (Polyurethane Paint)	Vendor to confirm	
36.5.0	All gears are to be hardened and ground	Vendor to specify.	
36.6.0	Total weight of the machine	Vendor to specify	
36.7.0	Weight of heaviest part of machine	Vendor to specify	
36.8.0	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to specify	
36.9.0	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to specify	
36.10.0	Hydraulic, Pneumatic & lubrication 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:**

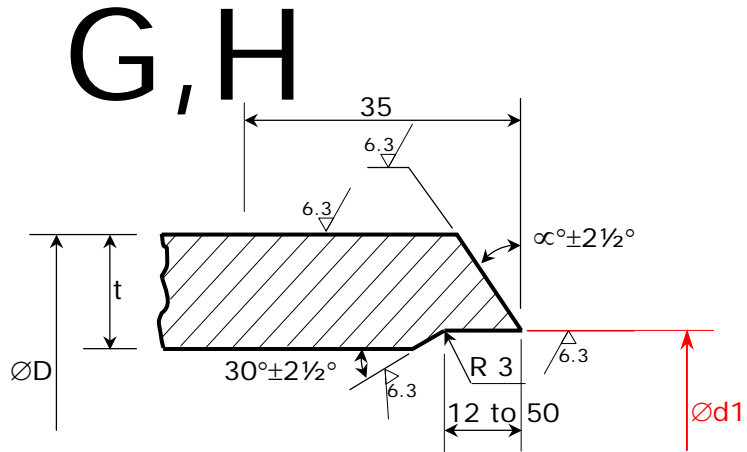
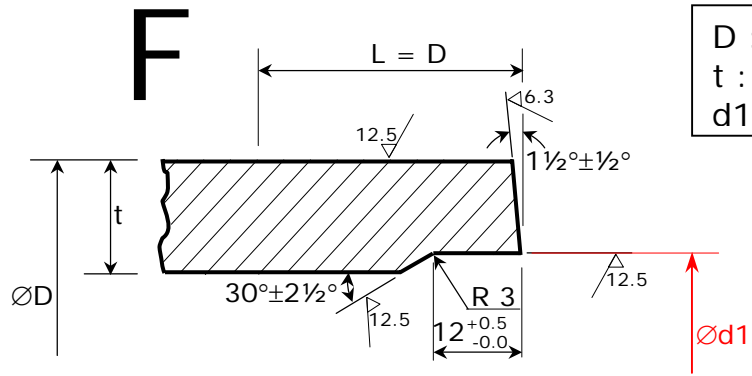
ANNEXURE - 1: Edge Preparation Styles

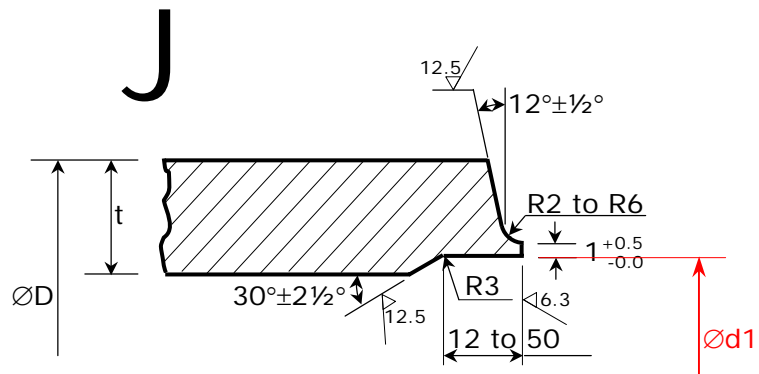
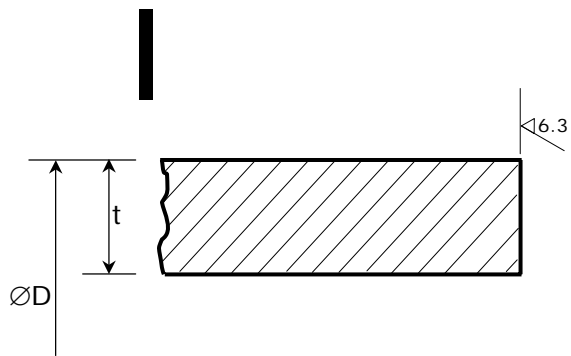
## TUBE EDGE PREPARATION DETAILS



All dimensions are in mm  
**Drawing No. CABS-1-03-01**  
**BHEL, TIRUCHIRAPPALLI**

## ANNEXURE - 1


$$\alpha = 37\frac{1}{2}^\circ \text{ for } t \leq 5.7\text{mm}$$

$$\alpha = 45^\circ \text{ for } t > 5.7\text{mm}$$


All dimensions are in mm  
**Drawing No. CABS-1-03-02**  
**BHEL, TIRUCHIRAPPALLI**