



An ISO 9001
Company

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

ENQUIRY	Phone: +91 431 257 75 75 Fax : +91 431 252 07 19 Email : rmanohar@bheltry.co.in Web : www.bhel.com
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	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
	2620600057	25.08.2006	06.10.2006

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	High Productive Tube Sizing & Edge Preparation Station – length upto 15 M as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com)	1 No.	20.08.2007

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 “2620600057”. 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
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PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF
AUTOMATIC TUBE CUTTING & EDGE PREPARATION MACHINE
[including tube handling system]

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
1.0	Profile of the Company bringing-out the years of Experience of the BIDDER in the field of machine design , manufacture and supply of CUSTOM BUILT STEEL TUBE PROCESSING STATIONS involving CNC controlled tube cutting, sizing and end machining operations.	
2.0	Number of AUTOMATIC TUBE SIZING and END MACHINING STATIONS supplied, installed and commissioned till date (with details on machine type / model, configuration, customer and quantity)	
3.0	YEAR of supply of latest AUTOMATIC TUBE SIZING and END MACHINING STATION and the Technical Specifications of the Machine supplied [Furnish Details]	
4.0	Number of AUTOMATIC TUBE SIZING and END MACHINING STATIONS supplied, installed and commissioned till date for the CUSTOMERS who are the suppliers of Power Utility Boiler (of High Pressure Ratings), with brief technical specifications of the supplied machines.	
5.0	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	
6.0	Details of Design Set-Up and Technology Back-Up assured for the PRINCIPAL Equipment Manufacturer & Supplier [Details on Experience of Design Personnel, Technology Tie-Up, R & D Facilities, etc. have to be furnished]	

S. No.	PARTICULARS	VENDOR's RESPONSE
7.0	Details on International Standards / Design Process Codes followed in Design and Manufacture of the Equipment. [Copy of the English Version of relevant portion of the Standards / Codes followed, to be furnished with the Technical Offer compulsorily]	
8.0	Comprehensive Details (including Test Charts) on Performance Testing (which will be conducted at the time of INSPECTION by CUSTOMER ENGINEERS) - of the Equipment Offered, to be given with the Technical Offer	
9.0	Details of Quality System followed [Furnish the salient aspects of the Quality Assurance System followed] from the stage of raw material / bought-out-item sourcing to final performance testing at BIDDER's works (in various stages of machine building) .	
10.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centre in India. Competency & Experience of the Local Service Agency are to be elaborated.	
11.0	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 the AUTOMATIC TUBE SIZING and END PREPARATION STATION.

S. No.	REQUIREMENTS	VENDOR's COMMENTS
12.0	The BIDDER shall have a minimum of TEN Years of Continuous Experience in the field of Design, Manufacture and Supply of AUTOMATIC TUBE SIZING and END MACHINING STATIONS.	
13.0	The BIDDER shall have supplied at least one number of CNC Controlled Automatic Tube Sizing and End Machining Station (having similar CAPACITY & TECHNICAL SPECIFICATIONS given under PART B) in the recent past, say in the last five years.	

S. No.	PARTICULARS	VENDOR's RESPONSE
14.0	Reference List of Customers and Performance Certificate (for a period not less than two years) from minimum three CUSTOMERS, with full contact details of CONTACT PERSON, for whom the BIDDER had supplied similar type of AUTOMATIC TUBE SIZING and END MACHINING STATION, are to be provided with the Technical Offer.	
15.0	BIDDER has to co-ordinate for the visit of BHEL Team (at BHEL Cost) to the Customer's Works (preferable Power Utility Boiler Manufacturer), to witness the capability of an existing CNC based AUTOMATIC TUBE SIZING and END MACHINING STATION, if warranted.	
16.0	BHEL is specific about the materials of construction, basic design & dimensional aspects of various sections, structural parts, machine base, etc. forming part of the proposed tube processing station, as the machine is to be installed in a tough working environment in a major and heavy fabrication shopfloor. Hence complete details of machine building have to be presented, to meet BHEL specification requirements, as this will be one of the pre-requisites for technical qualification.	

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
17.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS - Technical [with PART A & PART B] & Commercial and Price Bid.	
18.0	The Technical Offer shall be supported by Product Catalogue and/or Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' with copies of Product Catalogue are to be enclosed.	

S.No.	REQUIREMENTS	VENDOR's COMPLIANCE
19.0	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 outright disqualification of the Technical Offer.	
20.0	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.	
21.0	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation of the inclusion of all the accessories, toolings, attachments, auxiliary parts, spares, consumables, etc. [with the main or basic equipment], to meet the BHEL specification requirements.	
22.0	Any 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 will be highly appreciated by BHEL.	
23.0	BIDDER has to indicate the Country of Origin for the supply of equipment .	
24.0	The reference List of Customers shall be accompanied with (Phone Number and E-Mail ID) of the CONTACT PERSON for cross reference by BHEL	
25.0	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 notice period of not less than 2 weeks.	

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)
1.0.0	PURPOSE & APPLICATION		
1.1.0	<p>a. The machine is to be designed and constructed for measuring, cutting and edge preparation automatically from tube feed to disposal. 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 ANNEXURE - 1] is to be obtained by CNC control.</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, with the SUPPLIER recommended PREVENTIVE MAINTENANCE MEASURES.</p>		[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]
2.0.0	WORK PIECE / JOB DETAILS		
2.1.0	TUBE DIMENSIONS		
	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 [2.0 Mtrs.]	
	Maximum Tube Length	15000 mm [15.0 Mtrs.]	

S.No	PARTICULARS AND BHEL SPECIFICATION			BIDDER'S OFFER (with complete Technical Details)
2.2.0	ABSOLUTE TUBE SIZES			
	S.No.	OD, in mm	THICKNESS, in mm	[NOTE : All are OD (Outer Diameter) controlled tubes with a tolerance of maximum +15 %, on tube wall thickness.]
	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			
3.0.0	MACHINE OUTPUT / PRODUCTIVITY			
3.1.0	<p>BIDDER has to guarantee a minimum output of 2000 ends (two thousand machined tube ends or one thousand tubes with either ends machined) edge prepared for the tubes with the following dimensions / details, in a single shift of 8 hrs. :</p> <p>a. Raw Tube Length : ≥ 14000 mm</p> <p>b. Finished Tube Length after machining both ends : 13500 mm</p> <p>c. Operations :- Buffing and Facing, Boring & Chamfering as per the EP Sketches (Bevel – J and Bevel – H) given in ANNEXURE-1.</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>			

S.No	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER (with complete Technical Details)
4.0.0	OPERATIONAL SEQUENCE	
4.1.0	<p>a. A bundle tubes is loaded on the tube stock table and than single tube to be feuded onto the in feed conveyor by the kick-in device.</p> <p>b. The required length of tube to be programmed in the operator console than the measuring carriage should move to the required length.</p> <p>c. The tube is transferred to the stopper of the tube length-measuring unit by the No.1 pinch roll or No.2 pinch roll.</p> <p>d. After the leading end of the tube touches the stopper of the tube length-measuring unit, the tube is clamped by the clamping device of the cutting unit. Then, cutting should start.</p> <p>e. The cut tube is forwarded to the discharging position by the No.2 pinch roll and is shifted to the No-1 preparation line by the transfer carrier.</p> <p>f. After completion of the end preparation, the tube shall move to No-1 buffing line by transfer carrier.</p> <p>g. First, the trailing end of the tube is ground by the No.1 buffing unit. Then, the tube is moved to the No.2 preparation unit.</p> <p>h. After completion of the No-2 preparation the tube should move to No-2 buffing line by transfer carrier</p> <p>i. After completion of buffing, the Tube is kicked-out to the tube stock table.</p> <p>j. Once the tube is transferred out of the line, a new tube comes to the line and the same processing is repeated. [NOTE : Wherever possible parallel activities are to be contemplated to improve efficiency of the machine performance and productivity.]</p>	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
5.0.0	MACHINE CONFIGURATION		
5.1.0	The machine shall consist of following components & equipments :		
	In feed and Out feed Unit	1 set	
	Tube Length Measuring Unit	2 sets	
	Cutting Unit	1 set	
	Tube End Preparation Unit	2 sets	
	Buffing Unit	2 sets	
	Conveyor and Transfer Unit (Lift and carry)	1 set	
	Pinch Roller Unit (max.)	4 sets	
	Chip Conveyor	2 sets	
	Buffing Dust Collector	2 sets	
	Air Booster with FLR Unit and Moisture Trap	1 set	
	Air Receiver cum Accumulator	1 set	
	Electrical, Electronics, AC Drives & CNC/PLC Controls with Panels and Local Operator Consoles	1 set	
	Hydraulic Unit	1 set	
6.0.0.	IN-FEED & OUT-FEED (DISCHARGE) UNIT		
6.1.0	Tube Stock Table	Suitable for 15000 mm long tubes of size 76.1 mm OD and Wall Thickness 12.5 mm, for a minimum quantity of 50 Nos.	
6.2.0	Technical Specifications	Bidder to specify Design Details & give a. Capacity of Tube Stock Table b. Tube loading device & pinch roll type feeder with speed c. Drive shall be by Hydro-Motors d. Kickers –Minimum 10 sets in one unit	
6.3.0	Discharge unit to unload tube from second end preparation unit	Suitable for 2000 mm to 14000 mm long tubes	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
7.0.0	MEASURING UNIT		
7.1.0	Technical Features	<ul style="list-style-type: none"> a. To set and measure for cutting and determining the final finished tube length. b. To travel to its preset position by the AC servomotor through rack and pinion mechanism. c. The pre-positioned measuring unit shall have receiver and reliever arms for the subsequent tubes, to avoid the measuring unit travel for each tube. d. The unit to have sensors to signal for creeping speed, to avoid hammering and breakage of component by tube hitting. e. The terminating stopper for the tube to come to halt shall have shock absorber preferably with a spring arrangement. f. Stopper shall have provision to permit the lift and carry operation without getting collided. 	
7.2.0	Measuring Range	2000 mm to 14000 mm	
7.3.0	Traveling Speed	Maximum : 60 M/min. [for design guidance only]	
7.4.0	Drive Motor	AC Servo Motor	
7.5.0	Stopper Swing Angle	100°	
7.6.0	Measuring Accuracy	± 0.1 mm	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
8.0.0	TUBE CUTTING / SIZING UNIT		
8.1.0	Basic Features	<ul style="list-style-type: none"> a. Tube has to be stationary while cutting b. The cutting unit is to cut the tube at the specified length by the metal circular saw. c. During cutting, the cutting blade has to be guided and clamped for rigidity, to ensure vibration free, smooth and sharp cut. d. It is preferred to have the downward movement of cutting unit (circular saw) for cutting operation, so that entangling of small slices of tube cut pieces with metal saw is avoided e. Tube clamping has to be hydraulic type f. Drive has to be of Inverter Controlled g. Mist Cooling for Cutting Operation 	
8.2.0	Tube Cut-Off (sized) Length	Anything in the range of 2000 to 14000 mm	
8.3.0	Circular Saw Dimensions	Diameter : 400 mm, Mounting Bore : 50 mm-H7 Carrier Bolt Holes : 4 Nos. [Diameter 15 mm at PCD of 80 mm]	
8.4.0	Specifications	Bidder to specify <ul style="list-style-type: none"> a. Drive Motor Rating b. Spindle RPM c. Cutting Slide Stroke d. Cutting Slide Feed Rate e. Tube Clamping Force 	
8.5.0	Tube Bit Collection Bin	Bin to be located in such a position that remnant lengths fall into the bin once clamp is opened [Bin to suit for remnant length of tubes up to 1000 mm]	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
8.6.0	BUFFING UNIT		
8.6.1	Purpose	a. The buffing unit is to remove rust and paint on the tube outer surface b. One set each on either end of buffing line	
8.6.2	Type	Flap Wheel or a better option (to be specified)	
8.6.3	Buffing Stroke	150 mm	
8.6.4	Buffing Wheel Drives	Inverter Controlled	
8.6.5	Technical Details	Bidder to specify a. Drive Motor Rating & Speed b. Buffing Wheel Size	
8.6.6	Dust Extraction System for Buffing Unit	a. To form part of the supply and is meant for collecting the dust, generated during buffing operation. b. The dust collector is to be designed with vacuum created suction blower and a bag filter and disposal to atmosphere. c. The vacuum shall be 2000 mm of water column with a flow rate of min. 500 cubic meter per hour [basic desirable parameters]. d. Complete Technical details are to be given with the TECHNICAL OFFER	

S.No	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
8.7.0	TUBE END MACHINING / EDGE PREPARATION UNIT		
8.7.1	Technical Features	<ul style="list-style-type: none"> a. One end is to be prepared in one line (one set) & transferred to the other line (2nd 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 ± 0.02 mm. c. The chuck shall have positioning lever for limiting the tube within the chuck at a specified location. d. The tube preparation unit shall have safety guard to prevent flying chips during edge preparation and operator viewfinder e. The self-centering chuck and the facing head with spindle-gear unit shall maintain its position aligned in order to produce accurate edge preparation with proper doweling and locking with self centering arrangement. f. Mist Cooling for Cutting Operation 	
8.7.2	Type of End Preparation	"V" & "J" Grooves (Sketch given in ANNEXURE-1)	
8.7.3	Drive Motors	Inverter Controlled	
8.7.4	Tube Clamping	Hydraulic Means	
8.7.5	Spindle Stroke	250 mm	
8.7.6	Spindle Feed Range (Preferred)	High - 60 mm/sec. Low - 0.025 to 20 mm/sec.	
8.7.7	Technical Details	Bidder to specify : <ul style="list-style-type: none"> a. Drive Motor Rating b. Spindle RPM c. Clamping Method & Clamping Force 	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
8.8.0	TUBE END DEEP BORING – OPTIONAL FEATURE		
8.8.1	Requirement	Machine to have facility to do I.D. Boring of tubes with the following parameters	
8.8.2	Tube Diameter Range	Outer Diameter[O.D.] : 44.5 mm to 76.1 mm	
8.8.3	Tube Wall Thickness	Maximum : 7 mm	
8.8.4	Length of I.D. Boring	Maximum : 150 mm [from free end of tube]	
8.8.5	I.D. Enlargement by I.D. Boring [Reduction achieved in wall thickness]	Maximum : 6 mm [3 mm reduction in tube wall thickness]	
8.8.6	Technical Details	BIDDER has to elaborate on the details, how this optional operational feature is achievable in the offered machine, with additional attachments or accessories or toolings.	
9.0.0	TUBE CONVEYOR & TRANSFER UNITS		
9.1.0	Purpose	a. Conveyors for cutting, buffing and end preparation lines b. Conveyor / Transfer units for conveying tubes from one line to other.	
9.2.0	Drive Mechanism	Through hydraulic system	
9.3.0	Tube Transferring or Lift and Carry Mechanism	Bidder to specify	
9.4.0	Conveyor & Transfer Speeds	Bidder to specify	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
10.0.0	PINCH ROLLER UNIT		
10.1.0	Features	<ul style="list-style-type: none"> a. Pinch Roller Units shall be operated by hydraulic power pack with hydro motor. b. Normal speed, creeping speed, clamping and feeding hydraulic controls are to be ensured c. All pinch rollers have to be nonmetallic. d. Bidder has to give technical specifications / details on the offered system. 	
11.0.0	COOLANT CIRCULATION SYSTEM		
11.1.0	Application	<ul style="list-style-type: none"> a. To be suitable for an effective tube cutting and tube machining operation b. Coolant Tank shall be easily removable for cleaning and maintenance c. Mist Coolant application mode is preferred 	
11.2.0	Technical Details	Bidder to Specify : <ul style="list-style-type: none"> a. Tank Capacity b. Flow Rate c. Coolant Pressure d. Pump Motor Rating e. Schematic Diagram 	
11.3.0	Scope of Supply	Complete System including coolant piping & feed nozzles, filters, strainers, etc.	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
12.0.0	CHIP CONVEYORS		
12.1.0	Application	Chip Conveyors with chip bins are to be suitable for the various units of the machine, where chips are generated – so as to have a clean working environment.	
12.2.0	Technical Details	Bidder to furnish technical specifications for the Chip Conveyor System including all the salient dimensions, motor ratings, etc.	
13.0.0	LUBRICATION		
13.1.0	Type	Automatic timer controlled centralized lubricating system shall be provided	
13.2.0	Technical Details	Bidder has to furnish make and technical specifications	
14.0.0	TOOLING		
14.1.0	Standard ISO cutting tools with indexable carbide inserts capable of generating all edge preparation styles indicated in ANNEXURE-1	Vendor to confirm and specify the following : a. Cutting Speed b. Depth of Cut c. Cutting Feed	[Sufficient quantity of Cutting Tools, Adapters, Tool Holders, etc. in all types, recommended by the BIDDER, meet machine performance prove out shall be included in the Scope of Supply]
14.2.0	Details of special cuttings tools to suit EP Styles given under Spec. Clause No 1.4.0 and tool holders are to be offered	Vendor to specify	
14.3.0	Limitation regarding length & weight of tool / tool holder clamped in different tool holders for trouble free operation	Vendor to specify	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
15.0.0	MACHINE CONSTRUCTION		
15.1.0	Video Images on CD or Hard Copy of Literature with Photographs, Drawings explaining the Technical Features of the proposed machine shall be provided with the Technical Offer	Vendor to Confirm	
15.2.0	Vendor to furnish details of material, hardness & constructional details including explanatory drawings of various components/assemblies like Measuring Unit, Cutting Unit, Chuck and Drive System, Tools & Tool Holding System, Machine Base, Tube Conveyor and Transport System, Tube Clamping System, Feedback System etc. of the machine.	Vendor to Confirm	
15.3.0	BIDDER has to give details on the type of foundation required for mounting / installing the offered machine [i.e., whether foundation involves pit formation below the floor level or through the anchoring bolts only]	Vendor to specify	
16.0.0	OPERATION AND CONTROL SYSTEM		
16.1.0	OPERATOR'S CONTROL PANEL		
16.1.1	Operator's Panel (with in-built panel cooler) 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	
16.2.0	CNC SYSTEM & FEATURES		
16.2.1	Make: Preferred Make – Fanuc / Siemens.	Vendor to specify	
16.2.1	Type: PC based latest version	Vendor to specify	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
16.2.3	Model (suitable and latest version, as available at the time of purchase order placement, shall be supplied).	Vendor to specify	
16.2.4	Details of Standard features	Vendor to specify	
16.2.5	Details of optional features, recommended by vendor.	Vendor to specify	
16.2.6	The system should have full alphanumeric keyboard, TFT colour display, 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, graphic simulation and preinstalled system software and other associated / required soft wares, etc .	Vendor to Confirm (Details shall be furnished by the Vendor in the TECHNICAL OFFER)	
17.0.0	MACHINE LIGHTS		
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	
18.0.0	AIR CONDITIONING SYSTEM		
18.1.0	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	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
19.0.0	HYDRAULIC SYSTEM		
19.1.0	BIDDER has to strictly adhere to the specifications listed under ANNEXURE-2 , giving the requirements for Hydraulics Design and Construction.	Vendor to Confirm	
19.2.0	Hydraulic system should be centralized.	Vendor to Confirm	
19.3.0	Hydraulic system should be centralized, 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	Automatic shut off provision, failure indication , etc..	Vendor to specify	
19.9.0	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	
19.10.0	Filtration System and Hydraulic Pump Capacity	Vendor to specify	
19.11.0	Each pump should have an independent motor. Tandem pumps should not be used	Vendor to specify	
19.12.0	First filling of all required Oils & Grease shall be supplied by vendor. Indian equivalent & specifications of oils/ greases are also to be provided by the vendor.	Vendor to specify	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
20.0.0	ELECTRICAL & ELECTRONICS SYSTEMS		
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 types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply during construction of foundation.	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	
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	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
21.0.0	DIAGNOSTIC SYSTEM		
21.1.0	TELE-DIAGNOSTIC SERVICE		
21.1.1	<p>a. 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 shall be provided free of charge for the guarantee period.</p> <p>b. 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. BHEL will provide the necessary telephone line near the machine.</p>	Vendor to confirm	
21.2.0	FAULT DIAGNOSTIC SYSTEM		
21.2.1	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	
21.2.2	Help guide should be provided to use both diagnostic systems	Vendor to confirm	
22.0.0	SERVO VOLTAGE STABILIZER		
22.1.0	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	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
22.2.0	Make. : NEEL / DELTA / AEI / POWER AID	Vendor to confirm	
22.3.0	Model & Rating (Suitable for the machine load. Vendor to specify the noise level also)	Vendor to Specify	
22.4.0	Spares Package for the Voltage Stabilizer for 2 years working should also be offered.	Vendor to submit	
22.5.0	Catalogue of the Voltage Stabilizer shall be submitted with the offer.	Vendor to submit	
23.0.0	ULTRA ISOLATION TRANSFORMER		
23.1.0	Indian make Ultra Isolation Transformer suitable for complete machine, its drives, controls, PLC etc. shall be supplied	Vendor to confirm	
23.2.0	Make shall be NEEL / DELTA / AEI / POWER AID	Vendor to confirm	
23.3.0	Model and Rating (Noise Level not to exceed 85 dB)	Vendor to specify	
23.4.0	Spares Package for the Ultra Isolation Transformer for two years working shall also be offered.	Vendor to submit	
23.5.0	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to submit	
24.0.0	IN-BUILT SAFETY ARRANGEMENTS		
24.1.0	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm	
24.2.0	A detailed list of all alarms / indications provided on machine should be submitted by the Vendor.	Vendor to specify	
24.3.0	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	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
24.4.0	a. 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. b. 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	
24.5.0	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm	
24.6.0	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to Confirm	
24.7.0	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	
25.0.0	ENVIRONMENTAL PERFORMANCE OF THE MACHINE		
25.1.0	The Machine should confirm to following factors related to environment:	Vendor to Confirm	
25.2.0	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	
25.3.0	There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm	
25.4.0	If any safety / environmental protection enclosure is required it shall be built in the machine by the vendor.	Vendor to confirm	
25.5.0	Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
26.0.0	MACHINE LEVELLING & ANCHORING SYSTEM		
26.1.0	Complete anchoring system including foundation bolts, anchoring materials, fixators, levelling shoes etc should be supplied	Vendor to specify	
27.0.0	TOOLS FOR ERECTION, OPERATION & MAINTENANCE		
27.1.0	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	
27.2.0	Any Test mandrel required for checking & alignment of the machine components etc. should be supplied	Vendor to confirm.	
28.0.0	MACHINE SPARES		
28.1.0	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 offered by vendor. The list is to include following, in addition to other recommended spares: (Unit Price for each item of spare shall be offered)	Vendor to confirm	
28.2.0	Mechanical & Hydraulic Spares: All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
28.3.0	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 System, Servo Motors for Feed Drives, Power Module & Control Cards for Main Drive as well as Feed Drives etc.	Vendor to confirm	
28.4.0	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	
28.5.0	Recommended set of spares for all attachments are to be offered with details.	Vendor to confirm	
28.6.0	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	
29.0.0	DOCUMENTATION		
29.1.0	Three sets of following documents (3 Hard copies,) in English language should be supplied along with the machine	Vendor to confirm	
29.2.0	Operating Manuals of Machine & CNC system	Vendor to confirm	
29.3.0	Programming Manuals of Machine & CNC system	Vendor to confirm	
29.4.0	Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
29.5.0	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	
29.6.0	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm	
29.7.0	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to confirm	
29.8.0	Operating Manuals, Maintenance Manuals & Catalogues for supplied Voltage Stabilizer, Isolation Transformer and all supplied Accessories.	Vendor to confirm	
29.9.0	PLC program printouts with comments in English.	Vendor to confirm	
29.10.0	PLC program on CD, NC data & PLC data on CD	Vendor to confirm	
29.11.0	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	
29.12.0	The vendor shall submit complete Master List of spare parts used in the machine.	Vendor to confirm	
29.13.0	One additional set of all the above documentation shall be given in the form of CD.	Vendor to confirm	
30.0.0	TRAINING		
30.1.0	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, for not less than 10 working days.	Vendor to confirm	
30.2.0	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 not less than 15 working days	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
30.3.0	Airfare, boarding & lodging for the BHEL Trainees shall be borne by BHEL.	Vendor to Confirm	
30.4.0	Vendor to quote for training on per man per week basis for training at vendor's work	Vendor to confirm	
30.5.0	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel	Vendor to Confirm	
31.0.0	MACHINE FOUNDATION		
31.1.0	<p>a. Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) / P.O. whichever is earlier. Complete Foundation / dynamic load shall be submitted by the Vendor within three months after getting BHEL's approval.</p> <p>b. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, & any other accessories.</p> <p>c. BHEL shall construct complete foundation for the machine as per the Vendor's recommendation and drawing.</p>	Vendor to submit	
31.2.0	<p>a. Vendor should arrange equipments required for the testing of foundation, if required by the Vendor.</p> <p>b. The Vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine</p>	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
32.0.0	MACHINE ERECTION & COMMISSIONING		
32.1.0	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	
32.2.0	Erection & Commissioning of Voltage stabilizer, Isolation Transformer & Air Compressor shall also be responsibility of the Vendor.	Vendor to confirm	
32.3.0	Successful proving of BHEL Requirements by the Vendor shall be considered as part of commissioning. All tests, as mentioned in SPECIFICATION CLAUSE No. 34.0.0 shall form part of commissioning activity.	Vendor to confirm	
32.4.0	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	
32.5.0	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the Vendor on returnable basis.	Vendor to confirm	
32.6.0	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm	
32.7.0	Charges, duration, terms & conditions for E&C should be furnished in detail separately by Vendor along with offer.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
32.8.0	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	
33.0.0	AMBIENT CONDITIONS & THERMAL STABILITY		
33.1.0	Total machine including CNC System and all items shall work trouble free and efficiently under following operating conditions & shall give specified accuracies. Power Supply: Voltage : 415 V \pm 10%, 3 Phase AC Frequency : 50 Hz \pm 3% 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]	Vendor to confirm	
33.2.0	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]	Vendor to confirm	
33.3.0	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	

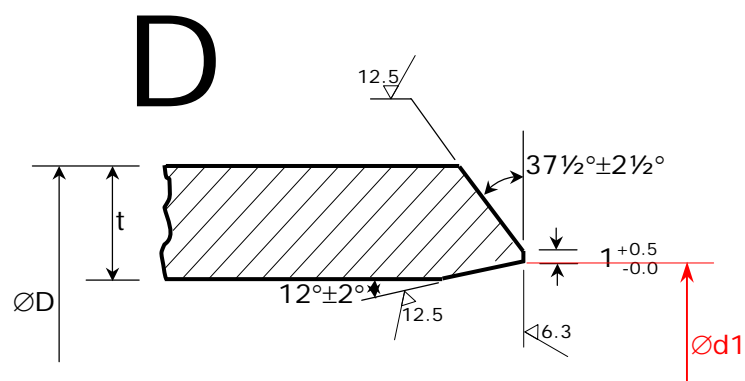
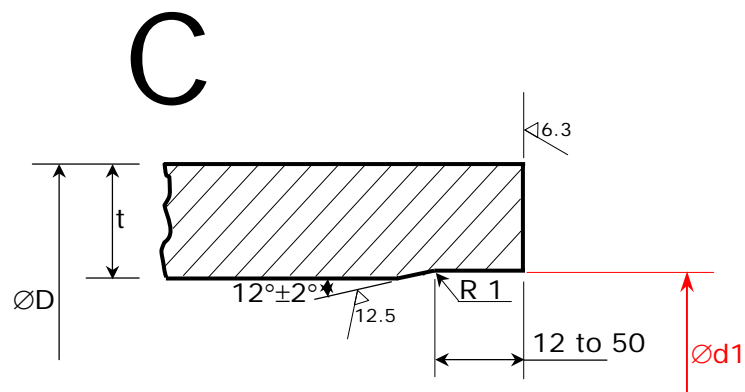
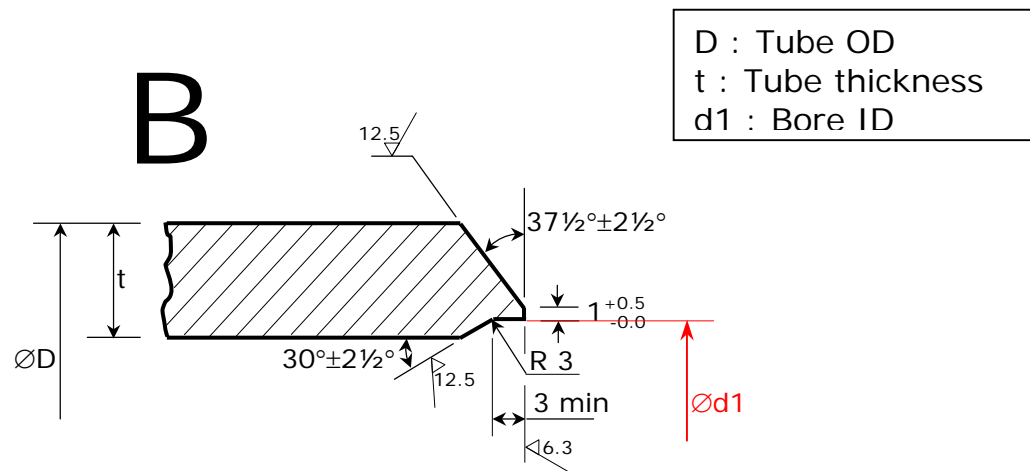
S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
34.0.0	PROVE-OUT OF BHEL COMPONENTS		
34.1.0	<p>a. The prove-out trials of the edge preparation shall be for the straight tubes for sizes given by BHEL during the technical discussions / at the time of releasing the Purchase Order.</p> <p>b. The production rate expected out of the machine, as detailed under the Specification Clause No. 3.0.0, will be the base.</p> <p>c. Stainless Steel Tubes or T 91 Material Tubes of O.D. 63.5/76.1mm and wall thickness 15 mm, have to be edge prepared and machine capability proved out with the desired output proportionate to that given under above Clause.</p>	Vendor to confirm	
35.0.0	MACHINE PACKING		
35.1.0	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	
36.0.0	GUARANTEE TERMS		
36.1.0	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)
37.0.0	GENERAL POINTS		
37.1.0	Machine Model No.	Vendor to specify	
37.2.0	Total connected load (in kVA)	Vendor to specify	
37.3.0	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify	
37.4.0	Machine Lubrication – Automatic Centralized Lubrication System.	Vendor to specify	
37.5.0	Painting of Machine / Electrical Panel – RAL 6011 Apple Green (Polyurethane Paint)	Vendor to confirm	
37.6.0	All gears are to be hardened and ground	Vendor to specify.	
37.7.0	Total weight of the machine	Vendor to specify	
37.8.0	Weight of heaviest part of machine	Vendor to specify	
37.9.0	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to specify	
37.10.0	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to specify	
37.11.0	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:

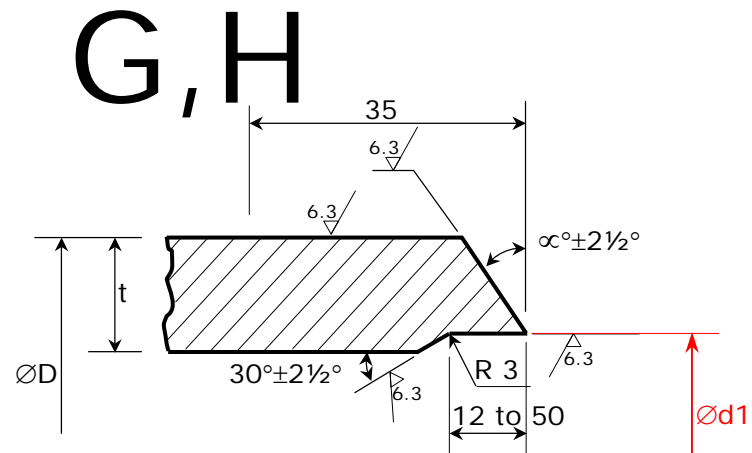
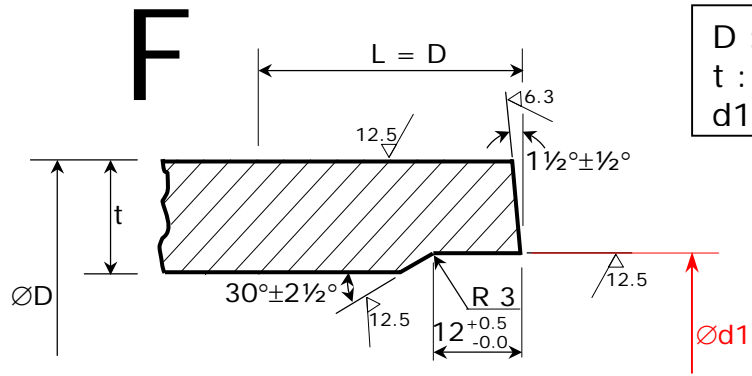
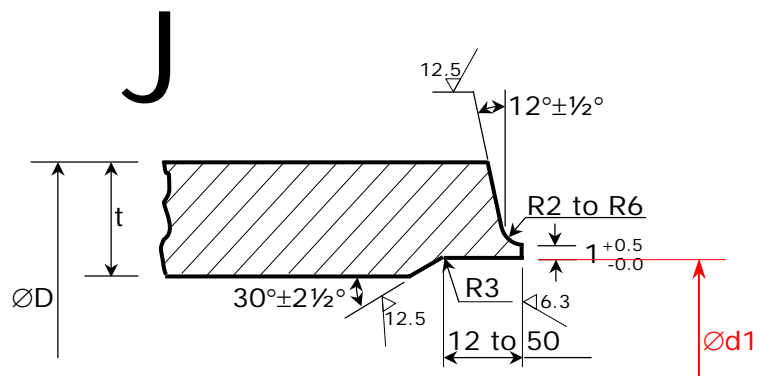
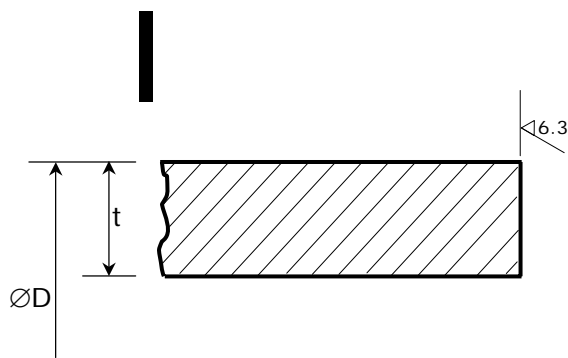
ANNEXURE - 1 : Edge Preparation Styles
 ANNEXURE - 2 : Hydraulics Design & Construction [Hydraulic Circuitry]

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

ANNEXURE - 2**HYDRAULICS DESIGN and CONSTRUCTION : -**

1. The hydraulic power pack for the machine operations like holding and moving of the tubes shall be different for that used for the flipping arm mechanism [that is, both are to be independent for maintenance simplicity].
2. All the power packs, manifold / valve cartridges, pressure and flow regulation stations are to be separately kept away from the machine. The cylinders, hydraulic heavy pressure joints are to be ensured with welded nipple joints.
3. Provisions and suitable clamping are to be made properly for dampening and arresting the vibrations induced (in the machine) and transmitted to the hydraulic joints.
4. The proposed hydraulic hoses and the joints are to be of metric size with male swivel nut and female adaptor on the cylinder ends with leak proof fittings. No ferrule joints are to be proposed in the hydraulic system.
5. All hydraulic pumps for the power packs should be loaded only during the times of machine operational requirement and to be in the unloaded condition, during ideal running conditions. All hydraulic pumps should have 100% standby provisions.
6. All hydraulic power pack return oil from cylinders, relief valves, hydro motors and other hydraulic valves are to be routed through a common return line to the oil tank. For oil cooling arrangement, the return oil to the tank can be routed through a suitable size of shell and water tube type cooler unit, to maintain the oil temperature below 40/45 °C, as the machine has to work in a TROPICALISED CONDITION throughout the year.
7. A parallel refrigerated type oil chiller for the total oil cooling may also be offered as a part of power pack, for stand by / safety measures.
8. The hydraulic valves input oil viscosity and micron level cleanliness has to be clearly mentioned in the offer.
9. As an option, a centrifuge unit for oil, dust and moisture separation has to be offered.
10. All hydraulic components of the power pack such as pump, cylinders, valves, pressure regulators, flow regulators, hydro motors, etc. are to be only of Rexroth, Vickers or Denesion.

ANNEXURE - 2

HYDRAULICS DESIGN and CONSTRUCTION : - *[continued].....*

11. The details of bought-out items, coming as the internal components of hydraulic unit, have to be given item wise for the procurement of spares [such as oil seals, 'O' rings, all rubber items, cylinders, piston and piston rings, bearings, bushes, etc.] with the main equipment.
12. The hydraulic power pack and other associated elements are to be adequately designed and selected, to enable a smoother operation of the hydraulic cylinders during linear movements and to ensure leak proof working arrangements for a nil failure or a safe sealing, during the machine operation.
13. Since the machine is intended to work in three shifts a day and for all the 365 days in an year, the BIDDER shall give complete details [including detailed schematics] on the hydraulics, with the TECHNICAL OFFER.

* * * * *