Bharat Heavy Electricals Limited

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

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

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620600061	**18.09.2006**	**23.10.2006**
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	Tube Heating, Squeezing and Sizing Station with induction heating as per the technical specification & commercial conditions applicable (to be downloaded from web site **www.bhel.com**)	2 Nos.	31.08.2007

Note:

(1) The detailed Technical Specification along with technical point-by-point confirmation, Commercial Terms & Conditions applicable for this Enquiry, Confirmation of acceptance for BHEL commercial terms & conditions and Price Bid formats have been posted in BHEL Corporate web site www.bhel.com under Enquiry reference "2620600061". Your offer should be based on all the above documents.

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

Tenders should reach us before 14:00 hours on the due date Tenders will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present	Yours faithfully, For BHARAT HEAVY ELECTRICALS LIMITED Dy. Genl. Manager / Capital Purchase / MM / Manufacturing

PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF TUBE SQUEZING & SIZING STATION WITH INDUCTION HEATING

SECTION – I

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

S. No.	PARTICULARS	VENDOR's RESPONSE
1	Profile of the Company bringing-out the years of Experience of the BIDDER in the field of machine design, manufacture and supply of Tube Bending and Tube Forming machines.	
2	Number of Tube Bending / Tube Forming supplied, installed and commissioned till date (with details on machine type / model, configuration, customer and quantity)	
3	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	
4	Details on International Standards / Design Process Codes followed in Design and Manufacture of the Equipment.	
5	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centres in India. Competency & Experience of the Local Service Agency are to be provided.	
6	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – II

The BIDDER / VENDOR has to meet the following requirements to get qualified for submitting an offer for Tube Squeezing & Sizing station with Induction Heating.

S. No.	REQUIREMENTS	VENDOR's COMMENTS
7	Only those vendors, who have supplied and commissioned at least ONE Tube Bending or Tube Forming 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. The following information should be submitted by the vendor about the companies where the machines have been supplied, for qualification of their offer:	
7.1	Name of the customer / company where similar machine is installed.	
7.2	Complete postal address of the customer.	
7.3	Month and Year of commissioning.	
7.4	Application for which the machine is supplied	
7.5	Name and designation of the contact person of the customer.	
7.6	Phone, FAX no. and email address of the contact person of the customer.	
7.7	Performance certificate from the customers regarding satisfactory performance of machine supplied to them.	
7.8	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.	
8	BIDDER has to co-ordinate for the visit of BHEL Team (at BHEL Cost) to the Customer's Works, to witness capability of an existing Tube Squeezing & Sizing station, if warranted.	

SECTION – III

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

S.No.	REQUIREMENTS	VENDOR's COMPLIANCE
9	The BIDDER / VENDOR shall submit the offer in TWO PARTS -Technical **[with PART A & PART B]** & Commercial and Price Bid.	
10	The Technical Offer shall be supported by Product Catalogues & description.	
11	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.	
12	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.	
13	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation of the inclusion of all the accessories, toolings, attachments, auxiliary parts, spares, consumables, etc. with the main and basic equipment, to meet the technical specification requirements.	
14	Soft copy, giving the salient features of the proposed machine or equipment with all sub-systems and auxiliaries, and /or showing live-demo of an existing and working machine of similar configuration and capacity may be provided.	
15	BIDDER has to indicate the Country of Origin for the supply of equipment.	
16	The reference List of Customers shall be accompanied with (Phone Number and E-Mail ID) of the CONTACT PERSON for cross reference by BHEL	
17	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 TUBE SQUEEZING & SIZING STATION WITH INDUCTION HEATING

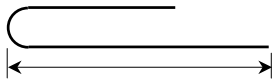
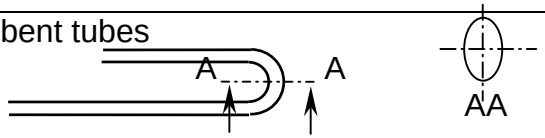
<table>
<tr><th>S. No.</th><th>PARTICULARS & BHEL SPECIFICATIONS</th><th>Bidder's OFFER [With Complete Technical Details]</th></tr>
<tr><td>1.0</td><td colspan="2">APPLICATION</td></tr>
<tr><td>1.1</td><td>A) The machine is meant for Squeezing and Sizing of 180° pre-bent seamless steel tubes, which are used for Boiler Applications.
B) The Squeezing and Sizing operation shall be done by Hydraulic means.
C) Tube heating shall be of Induction Heating type with an induction heater integral with the machine.
D) Squeezing and sizing to be done in the same machine without changing the position of the tube between the two operations.</td><td></td></tr>
<tr><td>2.0</td><td>TUBE OUTER DIAMETER AND THICKNESS:
All are OD (Outer Diameter) Controlled tubes with thickness tolerance of Max.+22 %</td><td></td></tr>
<tr><td>2.1</td><td>
<table>
<tr><th rowspan="2">S.No</th><th rowspan="2">OD, mm</th><th colspan="2">THICKNESS, mm</th></tr>
<tr><th>Minimum</th><th>Maximum</th></tr>
<tr><td>1</td><td>31.8</td><td>2.9</td><td>5.0</td></tr>
<tr><td>2</td><td>38.1</td><td>4.0</td><td>5.3</td></tr>
<tr><td>3</td><td>44.5</td><td>4.0</td><td>10.0</td></tr>
<tr><td>4</td><td>47.63</td><td>5.0</td><td>10.0</td></tr>
<tr><td>5</td><td>51.0</td><td>4.5</td><td>8.0</td></tr>
<tr><td>6</td><td>54.0</td><td>4.0</td><td>10.0</td></tr>
<tr><td>7</td><td>57.0</td><td>5.0</td><td>7.0</td></tr>
<tr><td>9</td><td>63.5</td><td>5.6</td><td>8.0</td></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr><th>S. No.</th><th>PARTICULARS & BHEL SPECIFICATIONS</th><th>Bidder’s OFFER [With Complete Technical Details]</th></tr>
<tr><td>3.0</td><td colspan="2">TUBE MATERIAL SPECIFICATIONS:</td></tr>
<tr><td>3.1</td><td colspan="2">a. Carbon Steel: SA192, SA210 Gr.A1, SA210 Gr.C

b. Alloy Steel: SA209 T1, SA213 T11, SA213T22, T23, SA213T91, T92

c. Stainless Steel : SA 213 TP304H, SA 213 TP321H, SA 213 TP347H</td></tr>
<tr><td>4.0</td><td colspan="2">TUBE PRE-BEND RADII AND SQUEEZED BEND RADII:</td></tr>
<tr><td>4.1</td><td colspan="2">
<table>
<tr><th>S.No</th><th>Tube OD, mm</th><th>Pre Bend Radius, mm</th><th>R/d Ratio</th><th>Squeezed Bend Radius, mm</th><th>R/d Ratio</th></tr>
<tr><td>1</td><td>31.8</td><td>48</td><td>1.51</td><td>31.8</td><td>1.0</td></tr>
<tr><td>2</td><td>38.1</td><td>65</td><td>1.71</td><td>38.1</td><td>1.0</td></tr>
<tr><td>3</td><td>44.5</td><td>65</td><td>1.46</td><td>22.5</td><td>0.5</td></tr>
<tr><td>4</td><td>44.5</td><td>65</td><td>1.46</td><td>48</td><td>1.08</td></tr>
<tr><td>5</td><td>47.63</td><td>71.5</td><td>1.50</td><td>28.5</td><td>0.5</td></tr>
<tr><td>6</td><td>47.63</td><td>71.5</td><td>1.50</td><td>51</td><td>1.07</td></tr>
<tr><td>7</td><td>51</td><td>76.5</td><td>1.50</td><td>25.5</td><td>0.5</td></tr>
<tr><td>8</td><td>51</td><td>76.5</td><td>1.50</td><td>51</td><td>1.0</td></tr>
<tr><td>9</td><td>54</td><td>76.5</td><td>1.42</td><td>57</td><td>1.06</td></tr>
<tr><td>10</td><td>57</td><td>90</td><td>1.58</td><td>57</td><td>1.0</td></tr>
<tr><td>11</td><td>63.5</td><td>100</td><td>1.57</td><td>63.5</td><td>1.0</td></tr>
</table>
</td></tr>
</table>

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
5.0	**TOLERANCES FOR BENDS**		
5.1	**VISUAL DEFECTS**		
5.1.1	It shall be free from harmful surface visual defects, such as scoring marks, wrinkles, tool marks and depressions, etc		
5.2	**PERCENTAGE OVALITY**		
5.2.1	% Ovality ={(Max.OD - Min.OD)/ Original OD} x100	To be Less than 15%	
5.3	**PERCENTAGE THINNING**		
5.3.1	% Thinning = {(t_{nom} - t_{min})/ t_{nom}}x100 where, t_{nom}–Nominal wall thickness of tube t_{min}–Minimum wall thickness after squeezing	Maximum allowed Thinning is 12.5%	
5.4	**FLATNESS**		
5.4.1	Squeezed bend operation	10 mm (Maximum)	
5.5	**ALLOWED PITCH DISTANCE VARIATION**	± 1.5mm	
5.6	**FLOW AREA**	80% (Minimum)	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
6.0	**OPERATING PARAMETERS:**		
6.1	Tube Diameter	Minimum: 31.8 mm Maximum: 63.5mm	
6.2	Tube Wall Thickness	As given in the table (Sl.No. 2.0)	
6.3	Squeezed Bend Radius	Minimum: 22.5mm Maximum: 63.5mm	
6.4	R/d ratio of squeezed bends	0.5 and above	
6.5	R/d ratio of Pre-Bends (refer S.No. 3)	≤1.5 for R/d ratio of 0.5 of squeezed bends	
6.6	Length over Pre-bend 	Minimum: 1200mm Maximum: 12000mm	
6.7	Bend heating Temperature before squeezing	600°C to 1150°C	
6.8	Ovality of pre-bent tubes 	Negative Ovality is induced in the pre-bending stage to facilitate squeezing.	
6.9	**PRODUCTIVITY**		
6.9.1	No.of bends per shift in OD 51 x 8mm / Alloy Steel Tubes for batch production jobs with Radius 25.5mm	200 bends in one 8 hour shift minimum	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
7.0	**MACHINE PARAMETERS**		
7.1	Squeezing and Sizing operations to be done in the same machine in the same position of the tube. The machine shall have and upper die, a lower die & job table side die. The side dies are used for squeezing and the upper and lower dies are used for sizing.	Vendor to confirm	
7.2	Squeezing and Sizing operations shall be through Hydraulic means.	Vendor to confirm	
7.3	Vendor to furnish details of the provision for easy removal job from the die after squeezing and sizing operation is completed.	Vendor to specify	
7.4	Machine construction and its mechanism shall be explained by the vendor. A general arrangement drawing shall also be provided with the offer.	Vendor to specify	
7.5	Daylight - The maximum clear space between the upper and lower die in mm	Vendor to specify	
7.6	Stroke length of the upper die in mm	Vendor to specify	
7.7	Maximum clear space between the squeezing dies in mm	Vendor to specify	
7.8	Stroke length of the side dies in mm	Vendor to specify	
7.9	Height of Lower Surface of Bent Tube as loaded on the machine has to be 1000 to 1200mm above the floor level.	Vendor to specify	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
7.10	**INDUCTION HEATING DEVICE**		
7.10.1	The induction-heating device has to be suitably selected for heating the range of tubes mentioned in S.No. 2.0 to the required temperatures. Vendor to specify the details of the Induction heating device.	Vendor to specify	
7.10.2	The Induction heating device has to be positioned in a convenient location, attached to the machine to facilitate easy loading of tube into the heating device and unloading of tube on to the squeezing die.	Vendor to specify	
7.10.3	The vendor has to detail out in their offer about the mechanical arrangement and control of the heating unit.	Vendor to specify	
7.10.4	**HF Power Source :** HF Power source with suitable cooling system to be provided.	Vendor to confirm	
7.10.5	**Inductor:** Replaceable type, HF Inductor with water cooled type	Vendor to confirm	
7.10.6	**HF Transformer**: Primary & secondary windings should be water cooled type	Vendor to specify	
7.10.7	**Induction Unit Parameters**		
7.10.7.1	Current	Vendor to specify	
7.10.7.2	Voltage	Vendor to specify	
7.10.7.3	Frequency	Vendor to specify	
7.10.7.4	KVA rating	Vendor to specify	
7.10.7.5	Rating Output	Vendor to specify	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
7.10.8	The high frequency induction unit should be Thyristorized / IGBT based inverter unit.	Vendor to specify	
7.10.9	The heating system has to enable continuous control of the heating process. The tube has to be heated to the set temperature and automatically cut off once the set temperature is reached.	Vendor to confirm	
7.10.10	The range of temperatures as mentioned in Sl. No. 4.7 shall be from 600°C to 1150°C.	Vendor to confirm	
7.10.11	The temperature setting has to be steplessly variable for the entire range mentioned.	Vendor to specify	
7.10.12	A digital temperature display unit shall be provided, showing both the set temperature and the actual temperature, separately. The digits of display unit shall be large enough to read from a distance.	Vendor to specify	
7.10.13	Suitable temperature sensing device to be provided for measurement and control of temperature.	Vendor to specify	
7.10.14	The details of rate of heating or the time taken for heating to the required temperature shall be furnished by the vendor.	Vendor to specify	
7.10.15	Suitable protection for HF Transformer & HF Inverter has to be provided against factors such as over voltage, over current, under Voltage, over temperature, Cooling Water flow failure & Short circuit protection etc.	Vendor to confirm	
7.10.16	Bidder to furnish details on the protection system provided to avoid short-circuiting of secondary side of HF (matching) Transformer with job.	Vendor to Specify	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
7.10.17	**Water Chiller**		
7.10.17.1	Closed circuit Refrigerant type Water Chiller system of cooling water circuit with temperature setting, for Induction heating coil & HF Transformer coil shall be provided. The details to be furnished in the offer giving details such as Flow, Pressure, water tank capacity, Temperature etc.	Vendor to specify	
7.10.17.2	The water chiller shall make use of additives to prevent scaling of cooling components.	Vendor to confirm	
7.10.17.3	Suitable flow sensors are to be provided to have an interlock with the induction heating system.	Vendor to confirm	
7.11	**HYDRAULICS**		
7.11.1	**Load for squeezing:** The maximum load required for Squeezing the tube sizes & materials as mentioned in the specification.	Vendor to specify	
7.11.2	**Load for sizing:** The maximum load required for Sizing the tube sizes & materials as mentioned in the specification.	Vendor to specify	
7.11.3	**Max. Pressure:** Maximum operating pressure in the Hydraulic system to be specified by the vendor for the maximum load of Squeezing / Sizing operations.	Vendor to specify	
7.11.4	**Hydraulic Power Pack:** Vendor to provide details in the offer, on Rating / Specification of Hydraulic Power-Pack.	Vendor to specify	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
7.11.5	**Hydraulic Circuits:** Hydraulics forming part of the machine and associated equipment shall be connected with steel tubes of sufficient capacity and wherever metallic tubing is not possible, reinforced synthetic rubber hoses of reputed makes shall be used.	Vendor to confirm	
7.11.6	Hydraulic power pack and Oil tank shall be separate from the Machine and positioned behind the machine conveniently to attend to any maintenance problems	Vendor to confirm	
7.11.7	The cylinders, hydraulic heavy pressure joints are to be ensured with welded nipple joints.	Vendor to confirm	
7.11.8	Clamping provisions are to be made properly for dampening and arresting vibrations induced from the machine to the hydraulic joints.	Vendor to confirm	
7.11.9	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. Ferrule joints shall not be provided in the hydraulic system.	Vendor to Specify	
7.11.10	All hydraulic pumps for the power packs should be loaded only during requirement and to be unloaded condition during idle running.	Vendor to confirm	
7.11.11	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.	Vendor to confirm	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
7.11.12	**Hydraulic Power Pack - Protection Controls:** Hydraulic Power pack shall have suitable means and measures for Temperature Control, High & Low Pressure Control, Flow control, Oil Level Sensing, etc.	Vendor to Specify	
7.11.13	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	
7.11.14	A centrifuge unit for oil, dust and moisture separation has to be offered as an optional item.	Vendor to Specify	
7.11.15	The sub vendor and bought out items of hydraulic unit internal components, item wise details for procurement of spares such as oil seals, 'O' rings, all rubber items, cylinders, piston and piston rings, bearings, bushes, etc shall be provided.	Vendor to Specify	
7.11.16	Hydraulic circuit diagram to be provided with the offer.	Vendor to Specify	
7.11.17	Initial Hydraulic oil filling to be done by supplier	Vendor to confirm	
7.11.18	**Hydraulic Oil chiller**		
7.11.18.1	A refrigerated oil chiller for the hydraulic oil cooling shall be provided.	Vendor to confirm	
7.11.18.2	Suitable flow sensors are to be provided to have an interlock with the machine operation.	Vendor to confirm	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
7.11.18.3	The details of the Oil Chiller to be furnished in the offer like the type, Flow, Pressure, Oil tank capacity, Temperature etc	Vendor to Specify	
7.11.18.4	The temperature of the hydraulic oil in the tank shall be maintained not exceeding 40 deg C	Vendor to confirm	
7.11.18.5	Lubricator, Regulator, Filter and hand wheel valve shall be fitted at the centralized location for any pneumatic circuits.	Vendor to confirm	
7.12	**Lubrication**		
7.12.1	Centralized Automatic Lubrication system with a provision for adjusting the timer shall be provided for the machine.	Vendor to Specify	
7.13	**ELECTRICAL POINTS:**		
7.13.1	**Wiring:** All electrical motors, limit switches etc, on the machine shall be Wired using PVC sheathed cable running in conduits to cable ducts to common terminal block. External wiring from / to control panel, control desk, external motors etc shall be by means of screened multi-core cables.	Vendor to confirm	
7.13.2	**Electric Panel**		
7.13.2.1	Electrical panel shall be Box type self standing with locking arrangement to be provided.	Vendor to confirm	
7.13.2.2	Electrical Panel Air-Conditioner to be provided.	Vendor to confirm	
7.13.2.3	All Ammeters, Voltmeters shall be located on the panel.	Vendor to confirm	
7.13.2.4	Machine panel shall be adequately illuminated for maintenance purpose.	Vendor to confirm	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
7.13.3	**Operator console**		
7.13.3.1	The pendant type operator console shall be provided at a convenient height for easy operation	Vendor to confirm	
7.13.3.2	Operator console shall contain push buttons, indication lamps, selector switches, digital temperature display / setting unit etc.	Vendor to confirm	
7.13.3.3	A foot pedal switch / Hand-held Portable pendant to be provided for squeezing and sizing operations.	Vendor to specify	
7.13.4	All electrics shall be tropicalised & shall have IP 54 protection	Vendor to confirm	
7.13.5	Machine lighting: Suitable for the operator to work with job.	Vendor to confirm	
7.13.6	Control voltage: The control voltage shall be 24 Volts	Vendor to confirm	
7.13.7	Type of drives used for motors to be indicated.	Vendor to specify	
7.13.8	**Input Power Supply**		
7.13.8.1	The electrical power input shall be 415 $\pm$ 10% V, 50 $\pm$ 3% Hz, 3 Phase AC supply through a 3 Wire System. No neutral conductor.	Vendor to confirm	
7.13.8.2	BHEL provides this supply at one point only and the supplier has to provide of all other electrical distribution network required for the SQUEEZING AND SIZING Station.	Vendor to confirm	
7.13.9	**Power Requirement:** Vendor to indicate the total tentative power requirement (including that for all the accessories and attachments) in kVA with the offer.	Vendor to specify	
7.14	Compressed air supply will be at 4 to 5 Kg/cm^2 for any pnematic circuits in the machine.	Vendor to confirm	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
7.15	**COMPONENTS USED:**		
7.15.1	All motors shall be from reputed makers like SIEMENS, ABB, Allen Bradley conforming to IEC Standards.	Vendor to Specify	
7.15.2	All hydraulic elements shall be of VICKERS / REXROTH, DENISONS make.	Vendor to Specify	
7.15.3	All hydraulic hoses shall be preferably of GATES make.	Vendor to Specify	
7.15.4	All electrical items shall be of reputed make like SEW / ROCKWELL Allen Bradley/ Telemechanique / Delta	Vendor to Specify	
7.15.5	All components/devices/terminals are to be incorporated with ferrules.	Vendor to confirm	
7.16	**Machine Maintenance:** The machine configuration and element arrangement should have easy accessibility, higher rigidity, self-aligning /fitting, locking & piloting arrangement of machine components and modules.	Vendor to confirm	
8.0	**TOOLINGS**		
8.1	List of tooling (Squeezing and Sizing dies etc) for all the sizes mentioned in specification and any optional tooling should be listed and quoted out item wise separately.	Vendor to specify	
8.2	Supplier to list the service tools and quantity for each.	Vendor to specify	
9.0	**Ambient Atmospheric Conditions**		
9.1	The Squeezing and sizing Machine with all Sub-Systems shall be suitable for operation in an ambient temperature of 25 to 50°C and with a Relative Humidity of 45% to 90%.	Vendor to confirm	

S. No.	PARTICULARS & BHEL SPECIFICATIONS		Bidder's OFFER [With Complete Technical Details]
9.2	The entire Equipment shall be TROPICALISED in Design and Construction.	Vendor to confirm	
10.0	**SAFETY**		
10.1	All Safety features provided in the machine shall be specified by the vendor.	Vendor to Specify	
11.0	**PAINTING**		
11.1	The heavier machine parts are to be heat-treated after fabrication (including castings and forgings) and shot blasted for surface preparation prior to painting.	Vendor to confirm	
11.2	One coat of Primer with 25 μ of DFT (Dry Film Thickness) and 48 hours of curing after painting.	Vendor to confirm	
11.3	Two coats of Enamel Paint (Colour – Apple Green) each with 25 μ of DFT and intermittent curing of minimum 16 hours.	Vendor to confirm	
12.0	**GENERAL POINTS**		
12.1	Make and Model of the machine to be mentioned. Detailed catalogs of the machine to be sent with the offer.		
12.2	Complete description of all systems & sub-systems shall form part of the technical bid.		
12.3	A schematic diagram showing the layout of the machine & associated systems with salient dimensions shall be submitted along with the offer.		
12.4	The operating sequence of the machine with broad outline of various operations involved should be furnished with the offer.		
12.5	Standards for Design, Manufacture and testing of the machine shall be in accordance with internationally accepted standards.		
12.6	Approximate weight of the Machine & Sub-Systems.		

S. No.	PARTICULARS & BHEL SPECIFICATIONS	Bidder's OFFER [With Complete Technical Details]
13.0	**SPARES (to be recommended by the vendor)**	
13.1	Itemized breakup of mechanical, hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: **(Unit Price of each item of spare should be offered)**	
13.2	**a) Mechanical & Hydraulic Spares:** All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	
13.3	**b) Electrical /Electronic Spares:** All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders etc.	
13.4	All types of spares for total machine and accessories should be available for at least ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required	
13.5	Recommended set of spares for all attachments are to be offered with details.	
13.6	Vendor to confirm that complete list of spares for machine and accessories, along with item part no / specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	

S. No.	PARTICULARS & BHEL SPECIFICATIONS	Bidder's OFFER [With Complete Technical Details]
13.7	**Essential Spares**	
13.7.1	Mechanical & Hydraulic spares: 1. Spares for mechanical wearing components due to linear movements & rotation - 4 Nos each 2. Spares for hydraulics Power Pack, Sealing rings, Hydraulic valve 'O' rings, O rings etc - 4 Nos each	
13.7.2	Electrical & Electronics: - 1. Field sensors, such as encoders, optical sensors, proximity switch, limit switches, push buttons, indicating lamps etc. - 4 Nos each	
14.0	**MACHINE DOCUMENTATION**	
14.1	**O & M MANUALS**	
14.1.1	a. Six Copies of the Operation & Maintenance Manual to be given in Hard Bound Paper Copies with three copies in CD form (SOFT COPY) b. One Hard Copy of O & M Manual shall be submitted at the time of INSPECTION of the SQUEEZING AND SIZING Machine by BHEL Officials, at the Supplier's Works. c. The following documents and details [given under the Clause Sl. No. 19.2.0] shall form part of the Operation & Maintenance Manual	

S. No.	PARTICULARS & BHEL SPECIFICATIONS	Bidder's OFFER [With Complete Technical Details]
14.2	**Documents and Technical Details**	
14.2.1	a) GA Drawing of the squeezing and sizing machine. b) GA Drawing of Individual Mechanisms. c) Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose. d) Electrical Wiring Drawings – Power & Control Circuits e) Pneumatic/Hydraulic Circuit Diagram in hard & soft copy. f) PLC (if used) Ladder Diagrams (Hard and Soft Copy) with Flash Memory Card. g) Alarm Log, Error Code, Error Messages & Remedies and On-Line Fault Diagnostics to be provided h) PLC (if used) of Allen Bradley, Siemens, Fanuc is only required. i) Fault diagnostics and remedies and on line sequence of operations should be displayed. j) Specifications/Ratings of All Bought-Out-Items. I. Warranty / Guarantee Card for all Bought-Out-Items. II. Trouble Shooting Chart for Main and all Sub-Systems.	
15.0	**MACHINE INSPECTION & ACCEPTANCE**	
15.1	**INSPECTION**	
15.1.1	The Machine shall be offered for inspection and performance trials to test the design capabilities of the machine, by BHEL Engineers before Dispatch at Supplier's works.	

S. No.	PARTICULARS & BHEL SPECIFICATIONS	Bidder's OFFER [With Complete Technical Details]
15.2	**ACCEPTANCE CRITERIA**	
15.2.1	All the features of the machines shall be operated and shown and to work as given in the specification, at supplier's works during inspection and during commissioning at BHEL works.	
15.2.2	The prove-out trials shall be for the Tube sizes, bend pattern given by BHEL during the technical discussions or at the time of releasing the Purchase Order. The bends have to pass the quality tests of all parameters (like Ovality, thinning, pitch distance and flow area etc) as mentioned in the specification.	
15.2.3	The production output of the machine shall be proved out by the commissioning Engineer at BHEL works for the Production rate mentioned in the specification.	
15.2.4	Bending on all thin walled Tubes (as per our specification) shall be proved out during commissioning.	
16.0	**ERECTION & COMMISSIONING**	
16.1	The supplier shall depute his engineer(s) for supervising the erection and commissioning of the machine at BHEL and prove-out trials	
17.0	**TRAINING**	
17.1	The supplier shall train Four BHEL's Engineers in Operation and Maintenance (Mechanical, Electrical/ Electronics and CNC System) of the Machine at supplier's works for a period not less than 10 working days.	
17.2	The supplier shall impart training to BHEL's Machine Operators and Maintenance crew in Operation and Maintenance (Mechanical, Electrical/ Electronics and CNC System) after the commissioning of the Machine at BHEL works for not less than 10 working days.	

S. No.	PARTICULARS & BHEL SPECIFICATIONS	Bidder's OFFER [With Complete Technical Details]
17.3	**The training shall include specialized coaching in** a. Safety b. Operation of the machine c. Trouble-Shooting, d. Any special features of the machine e. Electrical / Mechanical / Electronics systems	
17.4	Co-ordination by vendor for a visit of BHEL Personnel to an industry having similar / identical machine & system, in case of order realization, for system acquaintance & performance feedback	
18.0	**GUARANTEE**	
18.1	Equipment has to be guaranteed for its performance, for a minimum of 24 months from the date of commissioning.	