An ISO 9001 Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant**)**
Tiruchirappalli – 620014, TAMIL NADU, INDIA
CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY **NOTICE INVITING TENDER**	Phone: +91 431 257 79 38 Fax : +91 431 252 07 19 Email : tvenkat@bheltry.co.in Web : www.bhel.com

TWO PART BID Tender to be submitted in two Parts	**Enquiry Number:** **2620900209**	**Enquiry Date:** **29.09.2009**	**Due date for submission of quotation:** **04.11.2009**

You are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order

Please note that under any circumstances both **delayed offer** and **late offers** will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the date of tender opening.

Item	Description	Quantity
10	**System Bender for Serpentine Tube Coil formation** as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**1 No**.

Important points to be taken care during submission of offer:

1. **Delivery required 12 months from the date of purchase order.**
2. **Grace period of 2 months beyond the above delivery period will be considered.**
3. **Check-list to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.**

BHEL's General guidelines / instructions including bank guarantee formats and list of consortium banks, Commercial terms check-list can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2620900209".

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

PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF SYSTEM BENDER FOR SERPENTINE TUBE COIL FORMATION

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	VENDOR to provide the Profile of their Company	
2	The BIDDER / VENDOR shall have a minimum of TEN Years of Continuous Experience in the Design, Manufacture & Supply of CNC / PC based PLC – Tube Bending Machines / System Benders for similar applications.	
3	List of customers to whom System Benders for Tube Coil formation / CNC Tube Bending Machines were supplied, installed and commissioned till date, highlighting the customers who are in the field of Power Utility Boilers manufacturing (of High Pressure Ratings). The sizes of machines supplied may be furnished.	
4	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centres in India.	
5	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 System Bender for Serpentine Tube Coil Formation.

S. No.	REQUIREMENTS	VENDOR's RESPONSE
1	Only those vendors (**OEMs**), who have supplied and commissioned at least **ONE System Bender for Serpentine Tube Coil formation that can bend tubes upto OD 76.1mm,** in the past ten years (from the date of opening of Tender) and such equipment is presently working satisfactorily for more than one year after commissioning (from the date of opening of Tender) should quote. However, if such equipment had already been supplied to BHEL, then that machine should be presently working satisfactorily for more than six months after it's commissioning and acceptance (from the date of opening of Tender).	
	The vendor should submit following information where similar machine has been supplied:	
1.1	Name and postal address of the customer or company where similar equipment is installed.	
1.2	Name and designation of the contact person of the customer.	
1.3	Phone, FAX no and email address of the contact person of the customer.	
1.4	Month and Year of commissioning of the equipment.	
1.5	Application for which the equipment is supplied	
2	Along with the Technical offer, the Vendor should submit the Performance certificate from the customer for the satisfactory performance of the equipment supplied as per clause 1.0 above. (For obtaining the Performance certificate, a suggestive format is provided in **SECTION – IV**)	
3	Offers of only those vendors who meet the above Qualifying Criteria will be considered for further evaluation.	
4	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.	
5	DELIVERY - The bidder shall quote the best possible delivery. However the delivery period shall not exceed **12 months** from the date of Purchase Order. A grace period of 2 months in addition is provided. The additional grace period will attract loading, which is explained in the commercial terms of the enquiry. The delivery period is reckoned from the date of purchase order to date of despatch from the vendor works.	

SECTION – III

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

S. No.	REQUIREMENTS	VENDOR's COMPLIANCE
1	The BIDDER / VENDOR shall submit the offer in TWO PARTS-Technical **[with PART A & PART B]** & Commercial and Price Bid.	
2	The offer shall contain a comparative statement of Technical Specifications given by BHEL and the offered details submitted by the Bidder, against each clause. Merely stating 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words wherever 'Vendor to Specify' details in the technical comparative statement may lead to disqualification of the Technical Offer.	
3	The Technical Offer shall be supported by product Catalogues & Data Sheets and also technical details of Bought-Out-Items with copies of Product Catalogue to the extent possible.	
4	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.	
5	BIDDER has to indicate the Country of Origin for the supply of equipment.	

SECTION – IV

PERFORMANCE CERTIFICATE

(On Customer's Letter Head)

1. Supplier of the machine :

2. Make & Model of the Equipment :

3. Month & Year of Commissioning :

4. Application for which machine is used :

5. Sizes of Jobs Performed in the machine
   a. Tube diameter :
   b. Tube thickness (maximum) :
   c. Tube material :

6. Performance of the Machine : Satisfactory / Good / Average / Not Satisfactory
   (Strike off whichever is not applicable)

7. After Sales Service : Satisfactory / Good / Average / Not Satisfactory

8. Any other remarks :

Date:

Signature & Seal of the Authority
Issuing the Performance Certificate

PART B

TECHNICAL SPECIFICATION FOR SYSTEM BENDER FOR SERPENTINE TUBE COIL FORMATION

<table>
<tr><th>S. No.</th><th>PARTICULARS</th><th>BHEL SPECIFICATIONS</th><th>BIDDER's OFFER
[With Technical Details]</th></tr>
<tr><td>1.0</td><td>PURPOSE & JOB DETAILS:</td><td></td><td></td></tr>
<tr><td>1.1</td><td>Purpose:</td><td></td><td></td></tr>
<tr><td>1.1.1</td><td>The machine is meant for the cold and hot bending (if required) of seamless steel tubes to form serpentine coils for Economizer, Re-heater and Super-heater coils of large Power and Industrial Boilers</td><td>An indicative drawing is enclosed in Annexure-1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>1.2</td><td>Job Details:</td><td></td><td></td></tr>
<tr><td>1.2.1</td><td>Range of diameter, thickness of tube and radii of bends
<table>
<tr><th>S.No</th><th>Tube OD, mm</th><th>Minimum Thick,mm</th><th>Maximum Thick,mm</th><th>Minimum Radius,mm</th><th>Maximum Radius,mm</th></tr>
<tr><td>1</td><td>31.8</td><td>3.2</td><td>5.0</td><td>R 40</td><td>R 48</td></tr>
<tr><td>2</td><td>38.1</td><td>3.2</td><td>6.3</td><td>R 48</td><td>R 65</td></tr>
<tr><td>3</td><td>44.5</td><td>4.0</td><td>10.0</td><td>R 48</td><td>R 143</td></tr>
<tr><td>4</td><td>47.63</td><td>5.0</td><td>10.0</td><td>R 51</td><td>R 152</td></tr>
<tr><td>5</td><td>51.0</td><td>3.6</td><td>12.0</td><td>R 76.5</td><td>R 151</td></tr>
<tr><td>6</td><td>54.0</td><td>3.6</td><td>12.0</td><td>R 76.5</td><td>R 165</td></tr>
<tr><td>7</td><td>63.5</td><td>4.8</td><td>12.5</td><td>R 76.5</td><td>R 320</td></tr>
<tr><td>8</td><td>76.2</td><td>5.1</td><td>12.0</td><td>R 120</td><td>R 300</td></tr>
</table>
All are OD (Outer Diameter) Controlled tubes with thickness tolerance of Max.+12 %</td><td></td><td></td></tr>
</table>

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
1.3	**Tube Material:**	a. Carbon Steel: SA192, SA210A1, SA210C b. Alloy Steel: SA209T1, SA213T11, SA213T22, SA213T91, T-23, T-93 c. Stainless Steel SA 213 TP304H, SA 213 TP321H, SA 213 TP347H	
1.4	Tube length:	**Minimum tube length 20 metres** **Maximum tube length 108 metres**	
1.5	Required Minimum R/d Ratio	**R/d = 1.1**	
1.6	Bending radii	**40 mm to 320 mm**	
1.7	Bending Direction	**Left and Right bending**	
1.8	The bends will be serpentine, forming coils having **TWO** radii	Vendor to confirm	
1.9	Maximum length of serpentine coil	**20 metres**	
1.10	Maximum width of serpentine coil	**4 metres**	
1.11	Maximum weight of finished coil	Maximum : 2000 kg	
1.12	**PRODUCTIVITY**		
1.12.1	Output on the machine shall be **180 bends or more** per shift of 8 hrs on OD 44.5mm tubes and around 16m long coils, together with two radii, one of which will be close radius. The coil shall have combination of 90 deg and 180 deg bends as given in Annexure-1	Vendor to Confirm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
1.13	**TOLERANCES FOR BENDS**		
1.13.1	**Visual Defects:** It shall be free from harmful surface visual defects, such as scoring marks, wrinkles, tool marks and depressions, etc	Vendor to Confirm	
1.13.2	**Percentage Ovality:** % Ovality ={(Max.OD - Min.OD)/ Nominal OD} x100	To be Less than 10%. Vendor to confirm	
1.13.3	**Percentage Thinning:** % Thinning = {(t1–t2) / t1}x100, where, t1–nominal wall thickness before bending t2–minimum wall thickness after bending	Maximum allowed Thinning is i) 10% max. for R/d ≥ 1.5 ii) 12.5% max. for R/d < 1.5 Vendor to confirm	
1.13.4	**Minimum OD:** Minimum OD in any section of the bend should comply with this formula Min.OD shall not be less than 0.895 x Nominal OD + 0.233 x Min. Wall thickness after bending	Vendor to confirm	
1.13.5	**FLATNESS**		
1.13.5.1	Cold Bending operation	No flatness allowed	
1.13.5.1	Tolerance on Bending angle	± 0.5 °	
1.13.6	**Tolerance on Bend Radius:**		
1.13.6.1	a) For Radius < 250 mm	± 3 mm	
1.13.6.2	b) For Radius upto 320mm	± 6 mm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
2.0	**MACHINE SPECIFICATION:**		
2.1	**CONFIGURATION:**		
2.1.1	The bending system shall be Draw-Bending type by All Electric or Electro-Hydraulic means and with PC based Programmable mode of operation.	Vendor to confirm	
2.1.2	The machine to have bender /s for bending in both **LEFT and RIGHT directions.**	Vendor to confirm	
2.2	**OPERATING PARAMETERS:**		
2.2.1	Tube Outside Diameter (OD) Range:	Minimum : 31.8mm Maximum : 76.2mm (refer to table under 1.2.1)	
2.2.2	Tube Wall Thickness Range	Refer to table under 1.2.1	
2.2.3	Straight Tube length	Minimum: 20 metres Maximum: 108 metres	
2.2.4	Bending Radius	Minimum: 40mm Maximum: 320mm (refer to table under 1.2.1)	
2.2.5	Max length of coil	**20000mm**	
2.2.6	Max Width of coil	**4000mm**	
2.2.7	Minimum End Limb Length	100mm	
2.2.8	Bending Capacity of the bender in terms of Section Modulus expressed in cm3 (with tube of T91 / 347H Stainless Steel Material)	Vendor to specify	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
2.2.9	Max D/t at R/D of 1.1	Vendor to Specify	
2.2.10	Max D/t at R/D of 5	Vendor to Specify	
2.2.11	Bending Angle in Job	0 deg to 190 deg	
2.2.12	Bending Direction	Clockwise and Anti Clockwise	
2.2.13	Tube Working Height	Platform height 600 to 700mm above the shop floor level.	
2.2.14	Max Number of Bending Programs that can be stored and recalled	Vendor to Specify	
2.2.15	Min. speed of bending	Vendor to specify	
2.2.16	Max. Speed of bending	Vendor to specify	
2.2.17	Return Speed	Vendor to specify	
2.2.18	Maximum Bending Torque	Vendor to specify	
2.2.19	Clamp & Pressure Slide Stroke	Vendor to specify	
2.2.20	Follower Slide Stroke	Vendor to specify	
3.0	**TUBE BENDERS:**		
3.1	Bender operation Electro - Hydraulic OR All Electric (AC Servo Motor)	Vendor to specify	
3.2	Number of Benders. The machine to have bender /s for bending in both left and right directions	Vendor to specify	
3.3	The System bender shall have the facility for bending the coils with two different radii. One radius for left side bending and Second radius for right side bending. Both shall be split dies. The arrangement of mounting bend dies shall be explained in the offer.	Vendor to confirm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
3.4	Bending Torque	Vendor to Specify	
3.5	Capacity of the machine: The maximum Section Modulus for which the machine is designed, for.	Vendor to Specify in cm3	
3.6	Movement of the bender /s in the vertical and / or horizontal direction shall be through suitable drive arrangement and properly guided without any slackness in robust guide ways (Complete details should be furnished with the offer)	Vendor to specify	
3.7	The selection of bender should be automatically done from the program.	Vendor to Confirm	
3.8	Bending dies for Two Radii as per Annexure - 1	Vendor to Confirm	
3.9	Type of Bending Die - Both Split Dies	Vendor to Confirm	
3.10	Die clamping shall be hydraulic. The upper and lower die should be hydraulically clamped together during bending. (Detailed description should be furnished with the offer)	Vendor to Confirm	
3.11	Split die actuation shall be from bottom. Overhead actuation is not acceptable.	Vendor to Confirm	
3.12	Upper and lower die shall be easily removable and mountable with least effort by the operator.	Vendor to Confirm	
3.13	Independent upper and lower die for each diameter shall be quoted, for all diameters as given in the specification. There shall NOT be any pads to change over diameters.	Vendor to Confirm	
3.14	Programmable spring back compensation should be provided.	Vendor to Confirm	
3.15	The bending angle encoder shall be suitably placed for easy accessibility for maintenance	Vendor to Confirm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
4.0	**TUBE CLAMPING:**		
4.1	The tube clamping arrangement (Vendor to furnish complete description of the clamping arrangement in the offer)	Vendor to Specify	
4.2	Tube Clamping Length	Not more than100mm	
5.0	**PRESSURE DIE:**		
5.1	The pressure die shall be suitable for diameters and radius range specified	Vendor to confirm	
5.2	Length of pressure die	Vendor to Specify	
5.3	Pressure Die Hydraulic Pressure	Vendor to Specify	
5.4	Pressure Die force	Vendor to Specify	
5.5	Individual pressure dies shall be offered for each tube diameter. There shall NOT be any pads to change over diameters.	Vendor to Confirm	
5.6	Hitching movement to be provided for large radius bends	Vendor to Confirm	
6.0	**BOOSTER UNIT:**	(Complete description of boosting arrangement should be furnished with the offer)	
6.1	Type of Boosting	Back boosting / Clamp boosting / Pressure die assist boosting.	
6.2	Maximum Booster force	Vendor to specify	
6.3	Boosting shall be programmable It should be possible to set the required boosting power in the CNC control.	Vendor to Confirm - Details to be furnished	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
7.0	**CARRIAGE DRIVE UNIT FOR TUBE FEEDING:**		
7.1	The tube carriage should serve to take the tube to the bender by a measured accurate length and positioning at the bender die for bending operation.	Vendor to Confirm	
7.2	Carriage to be provided with a Tube Gripping Device (Hydraulic collet type preferable) for feeding Tubes into the machine.	Vendor to Confirm	
7.3	The Tube gripping device / Tube Collet should be capable of allowing weld reinforcement of **max. 8mm** on the tube diameter at the tube-to-tube joints.	Vendor to Confirm	
7.4	Vendor to give details of the different gripper / collet ranges that will be used for various diameters specified.	Vendor to Specify	
7.5	Carriage Drive - AC Servo Motor	Vendor to Specify - Details to be furnished (make, rating etc shall be specified)	
7.6	Drive arrangement	Vendor to Specify - Details to be furnished	
7.7	Method of Backlash elimination in carriage drive	Vendor to Specify	
7.8	Traveling Speed of Carriage (Not less than 30m / min)	Vendor to Specify	
7.9	Accuracy of tube positioning	Vendor to Specify	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
7.10	Carriage Feed Stroke -15 metres or more	Vendor to Confirm	
7.11	Carriage Bed length	Vendor to Specify	
7.12	Tube Rotation (Twisting) by carriage - 360 Degrees	Vendor to Confirm	
7.13	Tube Rotation drive - AC Servo Motor	Vendor to Specify - Details to be furnished (make, rating etc shall be specified)	
7.14	Rotation speed	Vendor to Specify	
7.15	Rotation Torque	Vendor to Specify	
7.16	Carriage shall be of rigid construction with capability of handling the entire range of Tubes mentioned and with anti-slip gripping of Tubes during bending operations. The size of carriage shall be designed such that the free limb of a close radius bend does not interfere with the carriage.	Vendor to Confirm	
7.17	Carriage drive motor power rating	Vendor to Specify	
7.18	Tube rotation drive motor rating	Vendor to Specify	
7.19	Supports to prevent sagging of tube during tube feeding	Vendor to Specify with details of how this is achieved in their machine.	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
8.0	**INDUCTION HEATING UNIT:** Vendor to confirm whether Induction heating is required or not, for making close radius bends. If required, Vendor to provide details in this clause. If NOT required, vendor may ignore this clause.	Vendor to Confirm	
8.1	The induction heating system is used to heat a band of tube to increase the ductility of the metal when a bend is to be made on a tight centerline radius	Vendor to confirm (Complete details of the induction heating system shall be furnished with the offer)	
8.2	Location of the Inductor with respect to the bender	Vendor to indicate in the GA drawing.	
8.3	The induction heating system shall consist of a IGBT based inverter unit, control unit, HF Transformer, cables and inductor arrangement	Vendor to Confirm	
8.4	The inductor unit shall be suitable for strip (band) heating of the entire range of tube diameters and radii	Vendor to Confirm	
8.5	Tube Heating Temperature Range Up to 850 degrees C	Vendor to Confirm	
8.6	Digital Temperature Indicator to be provided	Vendor to Confirm	
8.7	Time setting for the tube to reach the required temperature (in seconds) shall be preferably through the main Program control.	Vendor to Specify	
8.8	Tube heating unit raising / lowering arrangement	Vendor to Specify	
8.9	Display of Power, Frequency and Current of induction heating unit	Vendor to Specify	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
8.10	Cooling of inductor shall be through a closed-circuit chilled water cooling system with suitable capacity refrigerated water chilling unit.	Vendor to Confirm (Complete description of chilling unit shall be submitted with the offer)	
9.0	**TUBE STOPPER:**	To be supplied by the Supplier. Vendor to confirm	
9.1	The tube stop assembly is to enable the tube fed by pinch rollers to stop at a reference position.	Vendor to confirm	
9.2	Accuracy of positioning	Vendor to specify	
9.3	Position feedback	Electronic	
9.4	Tube stopper should be of robust design	Vendor to Confirm	
10.0	**GUIDE DURING TUBE FEEDING**		
10.1	The tube has to be guided while the carriage feeds the tube. Guides such as radial gripper are preferable. Vendor to provide details of the type of arrangement for guiding of tubes during tube feeding.	Vendor to Specify	
10.2	In case of providing the radial grippers, the radial grippers are to be located beyond the bender. It should remain below the tube level when not in operation and come up by scissor action to guide the tube	Vendor to confirm	
10.3	Operation should be automatic through program control	Vendor to confirm	
10.4	Operation	Hydraulic / Pneumatic	
10.5	Alternate arrangement for the above can also be offered	Vendor to Specify	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
11.0	**RESOLUTION & REPEATABILITY:**		
11.1	**REPEATABILITY:**		
11.1.1	Tube Feed/Transport	± 0.10 mm	
11.1.2	Tube Bending Bender-I	± 0.1deg	
11.1.3	Tube Bending Bender-II	± 0.1deg	
11.1.4	Tube Rotation for Orientation.	± 0.1deg	
11.1.5	Booster	Vendor to Specify	
11.2	**RESOLUTION:**		
11.2.1	Tube Feed/Transport	Vendor to Specify	
11.2.2	Tube Bending Bender-I	Vendor to Specify	
11.2.3	Tube Bending Bender-II	Vendor to Specify	
11.2.4	Tube Rotation for Orientation.	Vendor to Specify	
11.2.5	Booster	Vendor to Specify	
12.0	**OPERATOR'S PANEL:**		
12.1	Operator's panel having complete PC based PLC controller and machine control system with display 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	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
13.0	**PC BASED SYSTEM & FEATURES:**		
13.1	Make of Industrial PC Based System.	Vendor to specify	
13.2	Type: PC based latest version	Vendor to specify	
13.3	Model (Suitable and Latest version, as available at the time of ordering, should be supplied).	Vendor to specify	
13.4	Bending Software used – Model and version	Vendor to specify	
13.5	PLC Programming Tool with complete software should be supplied for on-line trouble shooting, software modification, upload and download of programs	Vendor to Confirm	
13.6	The system should have full alphanumeric keyboard, TFT colour display, additional draw-out type QWERTY Key Board and optical mouse, in suitable dust-proof enclosure, RS232C serial interfaces, parallel interface for printer, COM port for on-line tele diagnostics, USB Port, compact disc R/W drive unit for data input/output, hard disk of sufficient capacity - 80GB, graphic simulation and preinstalled system software & other required soft wares etc (Details should be furnished by the Vendor in the offer)	Vendor to Confirm Vendor to specify their standard size of the monitor	
13.7	Details of Standard features	Vendor to specify	
13.8	Details of optional features, recommended by vendor.	Vendor to specify	
13.9	Number of axes and axes description	Vendor to specify	
13.10	XYZ and YBC Programming	Vendor to Confirm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
13.11	Operating Modes: Automatic, Semi-automatic, and Manual (Brief description of operation in these modes should be furnished with the offer)	Vendor to Confirm	
13.12	Auto calculation of co-ordinate conversion from Cartesian co-ordinates into bending machine co-ordinates and vice-versa	Vendor to Confirm	
13.13	Pre-programming and storage of number of different bending tool-data.	Vendor to Confirm	
13.14	Storing and retrieval of all machine operating parameters including spring back applied, stretch compensation applied, bending speed, boosting parameters, tooling data etc with Program search facility sorted on various criteria of bending.	Vendor to Confirm	
13.15	Spring back and Stretch compensation facility (Vendor to provide details of how the stretch compensation is done and the intermediate distance between bends is controlled)	Vendor to Confirm	
13.16	Automatic diagnostic alarm feature with error display.	Vendor to Confirm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
14.0	**HAND HELD UNIT:**		
14.1	Hand Held unit, Type B-MPI of Siemens or any other reputed make acceptable to BHEL along with sufficient length of interfacing cable (cable length minimum-15 metres) for job setting and similar other purposes, is to be offered with complete details. Wireless not preferable.	Vendor to specify	
15.0	**FAULT DIAGNOSTIC SYSTEM:**		
15.1	Vendor's own diagnostic system with required hardware and software should be supplied and installed on the PC based machine control 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	
15.2	Help guide should be provided to use both diagnostic systems	Vendor to confirm	
16.0	**ITEMS MANUFACTURED BY BHEL**		
16.1	The machine shall be provided with the Detailed assembly & Manufacturing Drawings for manufacture at BHEL for the following items: **1. Tube Loading Stand** **2. Tube Kick-off arrangement** **3. Tube In-feed Roller Conveyor** **4. Machine Platform for coil formation** **5. Operator's Platform**	Vendor to confirm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
16.2	**TUBE LOADING STAND:** Tube loading stands will be manufactured by BHEL and the assembly and manufacturing drawings shall be provided by the supplier in case of order.	Vendor to confirm	
16.2.1	Stand shall be designed for loading 30 tubes of length **108 meters** to feed the kick off stand for ensuring continuous bending operation on the machine	Vendor to confirm	
16.2.2	The height from the floor level to the bottom of the tube shall be 600 to 700mm	Vendor to confirm	
16.2.3	The stand should have provision for keeping the tubes as bundles and as loose tubes for stock and instant feeding.	Vendor to Confirm	
16.2.4	The tube loading stands should be lined with non-metallic lining like Nylon / Teflon or equivalent to absorb the hammering noise of tubes.	Vendor to Specify	
16.2.5	The structural design should be rigid enough to withstand impact loading of tubes	Vendor to Confirm	
16.2.6	The arrangement of tube loading stand to be shown in a GA drawing.	Vendor to provide general arrangement drawing along with the offer.	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
16.3	**TUBE KICK-OFF STAND:** Tube Kick off stand will be manufactured by BHEL and the assembly and manufacturing drawings shall be provided by the supplier in case of order.	Vendor to confirm.	
16.3.1	This stand shall be designed for picking and placing the above tubes for bends one by one on to the tube in-feed roller stand as per the requirement of the machine.	Vendor to Specify	
16.3.2	Operation shall be pneumatic / electric	Vendor to Confirm	
16.3.3	Span between the kick-off arms (approx 2000mm).	Vendor to Specify	
16.4	**TUBE INFEED ROLLER CONVEYOR:** Tube Infeed roller conveyor will be manufactured by BHEL and the assembly and manufacturing drawings shall be provided by the supplier in case of order.	Vendor to confirm.	
16.4.1	The kick off arrangement shall be designed to place the tube onto the Tube In-feed roller stand. The tube is then transported by means of the Pinch rollers OR Drive rollers to feed the tube upto the tube stopper, automatically.	Vendor to confirm. In case of Pinch roller arrangement, vendor to specify the number of pinch roller drives.	
16.4.2	Length of the tube in-feed conveyor	Vendor to Specify	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
16.5	**MACHINE PLATFORM:** Machine Platform shall be fabricated by BHEL. Vendor has to provide the detailed manufacturing drawings in case of an order.	Vendor to confirm	
16.5.1	Platform height 600 to 700mm above the shop floor level.	Vendor to confirm	
16.5.2	During and after bending the coil has to be supported on a platform. (Complete description of the machine platform has to be submitted with the offer)	Vendor to Confirm	
16.5.3	Width of platform (Sufficient enough to support the coil without sag)	Vendor to Specify	
16.5.4	The platform top shall be designed to have mild steel plate of suitable thickness	Vendor to Specify	
16.5.5	Vendor to explain how the finished coil is transported out of the platform after the bending is completed.	Vendor to provide details.	
16.5.6	Suitable mechanical stoppers shall be designed to ensure that the bends of the coil do not foul with the carriage during bending	Vendor to specify	
16.6	**OPERATOR'S PLATFORM:** Operator's Platform shall be fabricated by BHEL. Vendor has to provide the detailed manufacturing drawings in case of an order.	Vendor to confirm	
16.6.1	Suitable operator's station shall be provided to give unhindered view of bending operation. The platform should have sufficient space for movement without any obstruction for convenient and safe operation. A 15 Amp. Plug Point with ON/ OFF switch is also to be provided on the Platform.	Vendor to specify	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
17.0	**HYDRAULICS**		
17.1	The System should be centralized, modular / stacked valve construction having minimum number of pipes / pipe joints and located at suitable location with easy accessibility of components for maintenance.	Vendor to Furnish Details	
17.2	Pumps, valves, accessories etc shall be of Rexroth / Vickers or equivalent reputed make acceptable to BHEL. (Details to be submitted). The seals used in cylinders shall be of Merkel / Parker / Bushak + Shamban / Hunger / Simrit make.	Vendor to confirm & furnish details	
17.3	Each pump should have an independent motor. Tandem pumps shall be avoided.	Vendor to confirm	
17.4	Suitable filtration system should be provided with Duplex / standby filter units. It is preferable to use re-usable type of filter elements in the system. The filter unit shall be of Hydac / Parker / Rexroth or equivalent reputed make acceptable to BHEL. (Details to be submitted).	Vendor to confirm & furnish details	
17.5	The flexible hoses used in the system shall be of Gates / Aeroquip / Parker or any other reputed make acceptable to BHEL.	Vendor to specify	
17.6	Failure indication for oil level, temperature, pressure, filter clogging should be provided	Vendor to confirm & furnish details	
17.7	Automatic shut off provision during hose failures, chiller failure, low oil level etc. Pump unloading feature during idle running to be provided for energy conservation. Details should be submitted.	Vendor to specify	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
17.8	Refrigerated type cooling system of sufficient capacity to maintain complete Hydraulic System at a temperature not exceeding 50 deg C irrespective of the ambient conditions. BHEL prefers to have direct cooling of oil in the chiller rather than indirect water cooling type. Complete details should be submitted with the offer.	Vendor to confirm & furnish details	
17.9	It should be possible to replace hydraulic elements like valves, manifolds etc without disturbing the associated pipelines. The positioning of hydraulic elements should allow easy maintenance	Vendor to furnish details	
17.10	Maximum Operating Pressure of hydraulic system	Vendor to specify	
17.11	Main Pump flow in lpm and Motor Power in kW	Vendor to specify	
17.12	Reservoir capacity (in litres)	Vendor to specify	
17.13	All oil pipelines shall be of seamless steel and should undergo pickling process.	Vendor to confirm	
17.14	Pressure measuring minimess check points (preferably with ¼" BSP stud end) shall be provided for important pressure measurements from operation, trouble shooting and maintenance point of view. Two sets of hand held minimess pressure gauge of suitable range with minimess hose (1.0 to 1.5m length) also to be supplied along with the power pack.	Vendor to furnish details	
17.15	All cylinders used in the machine should have standard bore and rod sizes. The piston rod shall be hard chrome plated.	Vendor to furnish details	
17.16	Suitable stand-by pump unit, filter unit, etc shall be provided for critical areas	Vendor to furnish details	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
17.17	The Power pack should be designed taking into account the energy efficiency (Hi-low pump system, proper unloading during idling, etc.). The motor used for pumps shall be energy efficient ones.	Vendor to furnish details	
17.18	All the pipe / hose end fittings shall be of standard weld nipple with O-ring seating type (DIN 3865 or equivalent). No ferrule joints are to be used in the hydraulic system. All threaded connections shall be of metric sizes	Vendor to confirm	
17.19	Suitable vibro-mounts, compensators (flexible bellows), flexible hose at the pump outlet, polypropylene clamps for pipes & hoses, etc are to be provided to minimize the vibration induced and transmitted to the hydraulic joints.	Vendor to confirm	
17.20	The oil to be used shall be of standard ISO Viscosity Grades – 32 / 46 / 68	Vendor to specify	
17.21	The maximum pressure of the system should preferably not to exceed 310 bar	Vendor to specify	
17.22	The control voltages for all the Solenoids of the valves shall be of 24-V DC and all solenoid operated DC valves should have manual over-ride provision and light indicating solenoids.	Vendor to specify	
17.23	The pipelines to be painted with standard colours as per the colour coding accepted internationally for hydraulic systems.	Vendor to furnish details	
17.24	All hydraulic pipelines, hoses and electrical control cables to be neatly laid out with proper clamps and flexible hose conveyors wherever required.	Vendor to confirm	
17.25	Suitable leakage oil collection metallic tray to be provided wherever required.	Vendor to confirm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
17.26	All the components in the hydraulic power pack shall be provided with identification numbers, as per the hydraulic circuit and should be pasted with metallic identification number plates.	Vendor to confirm	
17.27	Hydraulic oil will be supplied by BHEL during commissioning at BHEL works. Vendor to provide the oil during pre-dispatch inspection.	Vendor to confirm	
18.0	**LUBRICATION :**		
18.1	Machine lubrication: Automatic centralized lubrication system with timer control and suitable metering cartridges to be supplied.	Vendor to confirm	
18.2	**First filling of Lubrication Oil** to be supplied by the supplier. Indian equivalent shall be mentioned.	Vendor to Confirm	
18.3	**First filling of Grease** should be supplied by vendor. Indian equivalent shall be mentioned.	Vendor to specify	
19.0	**PNEUMATIC SYSTEM:**		
19.1	The pneumatic operated elements if any of the machine shall work efficiently with BHEL compressed air supply at a pressure of **5 kg/cm^2**	Vendor to confirm	
19.2	BHEL will provide compressed air at only one point near / on the machine. Vendor shall provide suitable filter-regulator-lubrication (FRL) unit at this point	Vendor to confirm	
19.3	Hydraulic, Pneumatic & Lubricating 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	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
20.0	**ELECTRICAL:**		
20.1	415V with voltage fluctuation of +10% / -10%, 50Hz with a fluctuation of +/-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 point to different parts of the machine/control cabinets, shall be the responsibility of vendor. Requirement of grounding / earthing with required material details should be informed by vendor well in advance so that it could be incorporated during construction of foundation. All cable shall be of copper.	Vendor to confirm	
20.2	Tropicalization**:** All electrical / electronic equipment shall be tropicalized.	Vendor to confirm	
20.3	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm	
20.4	All electrical and electronic panels 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	
20.5	Motors & other electrical components shall conform to IEC or Indian Standards	Vendor to confirm	
20.6	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	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
20.7	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
20.8	All electrical & electronic control cabinets & panels should be vermin and dust proof. All Electric enclosures shall have IP 54 protection	Vendor to confirm	
20.9	Motors and drives shall be of Fanuc / Siemens / Allen Bradley / ABB / Indramat / SEW or any other reputed makes acceptable to BHEL conforming to IS / IEC Standards (Vendor should indicate make and type in the offer)	Vendor to confirm	
20.10	Air Conditioners with Dehumidifiers of suitable capacity to be provided for all Electrical / Electronic Panels / Cabinets including Operator's Panel considering specified ambient conditions. **Make**: Rittal / Warner & Finley or any other reputed make acceptable to BHEL. Detailed specifications to be submitted.	Vendor to submit	
20.11	All feedback systems & field sensors, limit switches, proximity switches, pressure switches, temperature controllers, should be for heavy duty application and wired up with flexible PVC insulated screened cables. All field elements shall have easy accessibility for maintenance.	Vendor to confirm	
21.0	**SERVO VOLATGE STABILIZER:** BHEL will procure this item separately	Vendor to specify the required Rating and specification.	
22.0	**ULTRA ISOLATION TRANSFORMER** BHEL shall procure this item separately	Vendor to specify the required Rating and specification.	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
23.0	**TOOLING:**		
23.1	List of toolings to be supplied with the machine. a) Tube OD 44.5mm – Bend Radius – 65mm - 1 Set b) Tube OD 44.5mm – Bend Radius – 133.5mm – 1 Set c) Tube OD 63.5mm – Bend Radius – 200mm - 1 Set d) Tube OD 63.5mm – Bend Radius – 200mm – 1 Set e) Tube OD 76.2mm – Bend Radius – 120mm - 1 Set f) Tube OD 76.2mm – Bend Radius – 228.6mm – 1 Set 1 Set of each size mentioned in the list above shall consist of a set of Bending formers, Clamp jaw, Follower jaw etc. g) Collets for all sizes viz. 31.8mm / 38.1mm / 44.5mm / 47.63mm / 51mm / 54mm / 63.5mm / 76.2mm – 1 Set	Vendor to confirm and quote	
24.0	**FOUNDATION:**		
24.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) Foundation details viz. static / dynamic load details etc. and Final Layout drawings shall be submitted by the Vendor within three months after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for & any other accessories. BHEL shall design and construct complete foundation for the machine as per the Vendor's recommendation The Vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine	Vendor to Confirm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
25.0	**LEVELING & ANCHORING SYSTEM**		
25.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied	Vendor to confirm	
26.0	**SPARES:**		
26.1	Itemized breakup of mechanical, hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: **(Unit Price of each item of spare should be offered)**	Vendor to confirm	
26.2	**Electrical / Electronic / PC based System Spares:** All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, optical sensors, spares for PC based system, PLC spares (I/O card, digital to analogue card, CPU card, power supply board etc.), display unit, HMI, Servo Motors for Feed Drives, Power Module & Control Cards for Main Drive as well as Feed Drives etc.	Vendor to confirm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
26.3	**Mechanical & Hydraulic Spares:** All types of Pumps, Hydromotors, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	Vendor to confirm	
26.4	All types of spares for total machine and accessories should be available for at least Seven 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	
27.0	**PRE-DISPATCH INSPECTION AT SUPPLIER'S WORKS:**		
27.1	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. <u>Acceptance Criteria during pre-dispatch inspection:</u> a) All the features of the machine construction shall be operated and shown in good working condition as per the Technical Specification and Drawings approved by BHEL. Demonstration to be done of all features of the machine, control system & accessories b) Resolution and Repeatability as per specification c) Prove-out trials shall be done on tubes that will be supplied by BHEL. d) Quality tests are to be conducted by the supplier, on the bends made during prove-out trials and the results should be within the tolerance limits as per Clause 3.0.		

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
28.0	**PROVE-OUT AND ACCEPTANCE AT BHEL WORKS:**		
28.1	After the machine has been erected and energized, a few idle runs have to be done to demonstrate the good working condition of the machine. <u>Acceptance Criteria during commissioning:</u> a) Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine b) Resolution and Repeatability as per Clause 11.0 c) Prove out trials to be conducted on the tubes supplied by BHEL as per the typical configuration given in Annexure – 1, with the toolings ordered along with the machine. d) Quality tests will be conducted by BHEL, on the bends made during prove-out trials at BHEL and the bends have to meet the quality requirements of all parameters (like ovality, thinning, flow area, angle of bend, distance between bends etc) as mentioned under Clause 1.13 e) Actual jobs shall be loaded to see the performance of the machine during continuous running for two 8 hr shifts. f) Productivity should be proven as per Clause 1.12 on actual jobs or test pieces.		

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
29.0	**TRAINING:**		
29.1	The supplier shall train TWO BHEL Engineers in Operation and Maintenance (Mechanical, Electrical/ Electronics and Programming) of the Machine for FIVE working days at supplier's works after the pre-dispatch inspection.	Vendor to confirm	
29.2	Vendor to clearly mention whether the training is offered free of cost or chargeable. If chargeable, the vendor has to quote on manday basis.	Vendor to Specify	
29.3	Airfare, board & lodging for the BHEL Engineers who will be visiting supplier's works for pre-dispatch inspection and training, shall be borne by BHEL.	Vendor to note	
29.4	The Supplier shall impart training to BHEL's Machine Operators and Maintenance crew in Operation and Maintenance (Mechanical, Electrical/ Electronics and PC based control System) during commissioning of the Machine at BHEL works for 10 working days.	Vendor to confirm	
29.5	The training shall include specialized coaching in i) Safety ii) Operation of the machine iii) PC based System & Operation, iv) Trouble-Shooting, v) Software Application vi) All special features of the machine vii) Electrical / Mechanical / Electronics systems	Vendor to Confirm	
29.6	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	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
30.0	**ERECTION & COMMISSIONING**		
30.1	Supplier to take full responsibility for Supervision of the erection and for start up, testing and commissioning of machine, its controls and accessories. Supplier shall send suitable qualified Engineers for supervision of Erection and Commissioning of the machine at BHEL works.	Vendor to Confirm	
30.2	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.	Vendor to Confirm	
30.3	Successful proving of BHEL components by the Vendor shall be considered as part of commissioning. All tests, as mentioned (Machine Acceptance) shall form part of the commissioning activity.	Vendor to Confirm	
30.4	Commissioning spares, required for commissioning of the machine shall be supplied free of cost	Vendor to Confirm	
30.5	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the Vendor should supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to Confirm	
30.6	General schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to Confirm	
30.7	Charges, duration, terms & conditions for E&C should be furnished in detail separately by Vendor along with offer.	Vendor to Confirm	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
30.8	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE:**		
30.8.1	The Vendor shall bring special tools and equipment (Levelling) 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	
30.8.2	Any Test mandrel, equipment required for checking & alignment of the machine components etc. should be supplied.	Vendor to confirm.	
31.0	**DOCUMENTATION:**		
31.1	GA drawings, Machine detailed constructional drawings with dimensions, Civil Foundation layout drawings, Hydraulic / Pneumatic / Electrical / Electronic circuits with BOM, are to be submitted within 45 days from the date of ordering (in case of an order) for approval by BHEL.	Vendor to confirm	
31.2	Tooling drawings for the ordered tooling are to be submitted within 60 days from the date of placing order, for BHEL approval before manufacturing, in case of an order.	Vendor to Confirm	

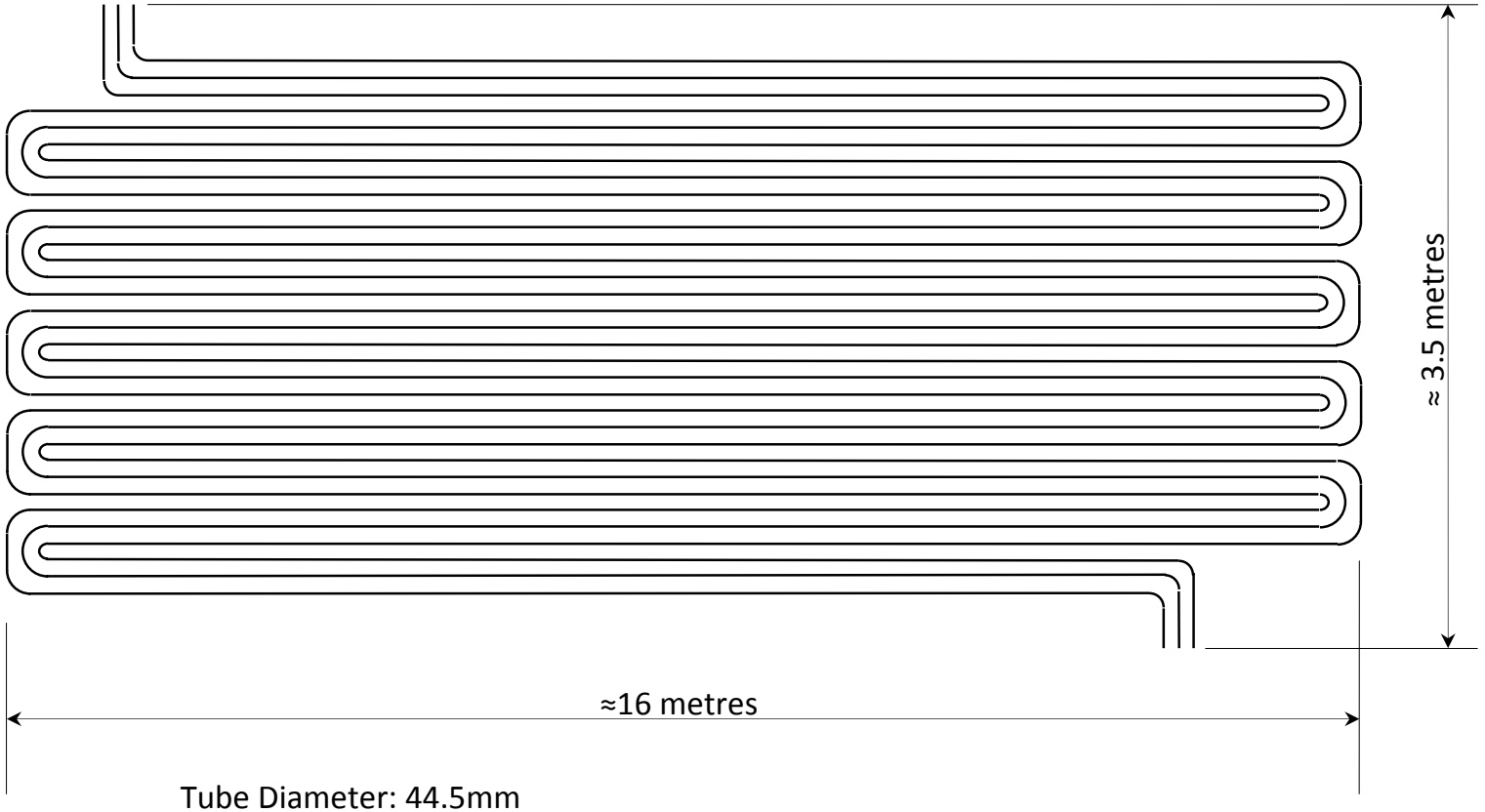
S. No.	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
31.3	The following documents in English language should be supplied along with the machine: **Hard Copies - 3 Sets** **In CD form - 1 Set** **Vendor to confirm** 1. Operating manuals of Machine & its Control System 2. Programming manuals of Machine & its Control System 3. Maintenance manuals with drawings of machine assemblies / sub-assemblies with parts list 4. Electrical circuit diagrams with bill of materials 5. Hydraulic circuit diagrams with bill of materials 6. Pneumatic circuit diagrams with bill of materials 7. Maintenance & Interface manuals for Machine Control System 8. Manufacturing drawings for all toolings, ordered along with the machine, including Bend dies, Clamp jaws, Pressure dies, Collet jaws etc. 9. Catalogues, O&M manuals for all bought out items used in the machine. 10. Operating Manuals, Maintenance Manuals & Catalogues for all supplied Accessories. 11. Detailed specification of all rubber items / hydraulic / lubrication fittings 12. PLC program print-outs with comments in English 13. PLC program and data on CD, Flash Memory Card. 14. 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. 15. Complete list of Alarm log, Error code, error messages & remedies and on line fault diagnostics to be provided by the vendor. 16. Complete list of spares for machine, along with item part no / specification / type / model and make & address of the sub-vendor.	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
32.0	**THERMAL STABILITY FOR AMBIENT CONDITIONS & ENVIRONMENTAL PERFORMANCE OF THE MACHINE:**		
32.1	The machine shall be suitable for an ambient temperature of +45 deg C and relative humidity of 90 % respectively, but both do not occur simultaneously.	Vendor to confirm	
32.2	The vendor should ensure trouble free operation of the machine with Thermal Stability of the complete machine and accuracy requirements of BHEL components, keeping in view of ambient conditions as mentioned above.	Vendor to confirm	
32.3	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 the year.	Vendor to Confirm	
32.4	The Machine should conform to following factors related to environment: Maximum noise level shall be 85 dB(A) at normal load condition, 1meter away from the machine with correction factor for back ground noise. This will be measured as per international standards like DIN 45635-16. Supplier to demonstrate compliance to noise level, if asked for.	Vendor to Confirm	
33.0	**SAFETY ARRANGEMENTS:**		
33.1	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to specify	
33.2	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, work piece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on operator display monitor and panels) should be available.	Vendor to specify	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
33.3	A detailed list of all alarms / indications provided on machine should be submitted by the Vendor.	Vendor to specify	
33.4	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to Confirm	
33.5	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm	
33.6	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to Confirm	
33.7	All lubricated parts like Bed, guide ways shall have provision for collecting the used Lubrication oil from machine guide ways and preventing them from spilling over on to the ground.	Vendor to Confirm	
33.8	Cable and hoses of the traveling axes should be well supported on suitable cable drag chains / cable carriers	Vendor to Confirm	
34.0	**PACKING:**		
34.1	Sea worthy & rigid packing for all items of complete machine, PC based control 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	

S. No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [With Technical Details]
35.0	**PAINTING:**		
35.1	Painting of Machine / Electrical Panels: **RAL 6011 Apple Green** (Polyurethane Paint)	Vendor to Confirm	
36.0	**GUARANTEE:**		
36.1	Performance Guarantee to be given for 12 months from the date of commissioning OR 18 months from the date of dispatch whichever is earlier.	Vendor to confirm	
37.0	**GENERAL:**		
37.1	Machine Model No.	Vendor to specify	
37.2	Total connected load (KVA):	Vendor to specify	
37.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify	
37.4	Total weight of the machine	Vendor to specify	
37.5	Weight of heaviest part of machine	Vendor to specify	
37.6	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to specify	
37.7	The general arrangement drawing showing the machine & associated systems with salient dimensions shall be submitted along with the offer. The drawing should be clear and legible	Vendor to provide compulsorily	

ANNEXURE - 1 **TYPICAL COIL TO BE PROVED OUT DURING COMMISSIONING AT BHEL WORKS**



Tube Diameter: 44.5mm

Tube Wall Thickness: 8mm

Radii of bending: 65mm & 133.5mm

No.of Circuits : 3 or more

Each Circuit bent separately

Sketch No. CABS-3-02N – 001

BHEL, TIRUCHIRAPPALLI