



Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY	Phone: +91 431 257 76 53 Fax : +91 431 252 00 31 Email : skaruna@bheltry.co.in Web : www.bhel.com
NOTICE INVITING TENDER	

TWO PART BID Tender to be submitted in two Parts	Enquiry Number: 2731300013	Enquiry Date: 19.09.2013	Due date for submission of quotation: 19.10.2013
<p>You are requested to quote the Enquiry number date and due date in all your correspondence. This is only a request for quotation and not an order.</p> <p>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.</p>			

Item	Description	Quantity
10	Electric Tube Expansion System (for Incoloy Tubes) as per the respective technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	2 Sets.
20	Tube Cone Rolling Equipment as per the respective technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	01 Set
30	Tube Expansion System (for Titanium Tubes) as per the respective technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	02 Nos.

Important points to be taken care during submission of offer

1. The rate of EMD for this Tender will be (INR) : 1,00,000/-
2. The Checklist for Acceptance of Commercial Terms & Conditions to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.
3. All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.
4. The CEBG clause in the checklist for acceptance of commercial terms & conditions is to be agreed by the vendors, however it shall be applicable, only when the Total Purchase Order value (Supply + E&C) exceeds Rs.20 Lakhs.

BHEL's General guidelines / instructions (refer **MM/CE/GENL/001-EMD) 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 above Enquiry reference.**

Tenders should reach us before 14:00 hours on the due date
Tenders will be opened at 14:30 hours on the due date
Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present

Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**

Sr. Manager / Capital Equipment / MM

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.

Sl. No.	PARTICULARS	BIDDER's RESPONSE
1	BIDDER to provide the Profile of their Company	
2	The Bidder (OEM) shall have a minimum of Three Years of Continuous Experience in the field of Design, Manufacture and Supply of Electric Tube Expansion system.	
3	List of customers to whom Electric Tube Expansion system were supplied, installed and commissioned till date.	
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.	

Part –A (Qualifying Criteria)

SECTION – II: The BIDDER has to compulsorily meet the following requirements to get qualified for submitting an offer for the “Electric Tube Expansion System”.

Sl. No.	REQUIREMENTS	BIDDER's RESPONSE
1	Only those Bidders (OEMs) should quote, who have supplied and commissioned at least three numbers of wattage based Electric Tube Expansion system, in the past three years (on the date of opening of Tender) and such equipment should presently be working satisfactorily for more than one year after commissioning (on the date of opening of Tender).	
	The Bidder should submit following information where the wattage based Electric Tube Expansion systems have 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 Bidder should submit the <u>Performance certificates from any one of the customers for the satisfactory performance of the equipment supplied as per clause 1.0 above</u> (For obtaining the Performance certificate, a suggestive format is provided in SECTION – IV).	
3	Offers of only those Bidders who meet the above Qualifying Criteria will be considered for further evaluation.	
4	BHEL reserves the right to verify the information provided by Bidder. In case the information provided by Bidder is found to be false/ incorrect, the offer shall be rejected.	

SECTION – III

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

S. No.	REQUIREMENTS	BIDDER's COMPLIANCE
1	The BIDDER 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 'Bidder 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, tooling's, 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 "Wattage based Electric Tube Expansion System" :

2. Make & Model of the "Wattage based Electric Tube Expansion System" :

3. Month & Year of Commissioning :

4. Application for which the "Wattage based Electric Tube Expansion System" is used :

5. Size of the tube and length of Expansion for which the "Wattage based Electric Tube Expansion System" is used :

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

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)

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDERS OFFER
1.0	Purpose: The Electric Tube Expansion system operatable with 230 V AC power supply - is for Strength expansion of Incoloy Tubes in the Alloy Steel Tube sheet Holes. Job details are explained in Cl. 2.0. The control system should work on wattage based principle to take care of the fluctuations in input voltage. All the accessories being supplied along with this shall be compatible with each other to perform the required expansion operation.	Vendor to note
2.0	Job profile: Incoloy Tubes of size OD : 19.0^{+0.12/-0.03} mm X Thk: 1.1^{+/- 0.11} mm. Hole Size : Dia 19.22^{+0.13/-0.0} Tube Sheet Thickness : 426 mm. For Further details on materials and expansion requirements, please refer the enclosed Sketch No. 30-T-33- 35900/A .	Vendor to note& confirm
3.0	Scope of Supply: The Electric Tube expansion system (Wattage based) suitable for the purpose and Job profile specified vide Cl. 1.0 and 2.0, shallconsists of : <ol style="list-style-type: none"> 1. Electric Torque control unit with foot Switch - 2 No. 2. Electric Drive Unit to use with the above Torque Controller - 2 No. 3. Telescopic Shaft (Collapsible L=950 approx. and Extended Length = 1350 approx.) – 2 No. 4. Adopter 1: suitable between the Telescopic Shaft& expanders - 10 No. 5. Adopter 2: suitable between the Drive Unit and Telescopic Shaft - 10 No. 6. Spares for two years of trouble free operation & maintenance as per Annexure-I - 2 Sets. 7. Tool Kit for Operation & Maintenance - 2 Sets. 8. Voltage Stabilizers - 2 No. 9. Movable Trolley with Spring balancer - 2 No. 10. Tube Expander-1 for front side - 25 No. 11. Tube Expander-2 for Rear side - 25 No. 12. Spare Mandrel for Tube Expander – 1 - 25 No. 13. Spare Mandrel for Tube Expander – 2 - 25 No. 14. Spare Rollers (Set of three) - 50 Sets. 	Vendor to provide offer with model No. / Ordering code for the items, wherever applicable.
3.1.0	Electric Torque Control Unit with Foot Switch:	
3.1.1	Should able to take care of the load requirements for the product requirement specified vide Cl: 1.0 and 2.0	Vendor to confirm

Part –B (Technical)

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDERS OFFER
3.1.2	The torque controller Unit shall be of “Wattage based control system” and it shall be of solid state design	Vendor to confirm	
3.1.3	Control functions shall be of Micro-controller based.	Vendor to confirm	
3.1.4	Shall be provided with soft start for all drives	Vendor to confirm	
3.1.5	Appropriate wattage range is to be automatically selected for the connected drive.	Vendor to confirm	
3.1.6	Provision shall be made for the display of actual drive wattage during expansion and also display shall be available to see the set wattage.	Vendor to confirm	
3.1.7	The Torque Control Unit shall have a facility for operating the drive “Forward / Reverse / Stop” by manual mode with the use of push buttons.	Vendor to confirm	
3.1.8	The Torque Control Unit shall also be provided with a “foot Switch” with sufficient length of cable for forward, stop and reverse controls.	Vendor to confirm	
3.1.9	Adjustable range for “Reverse time”	Vendor to specify	
3.1.10	Adjustable range for “Trip time”	Vendor to specify	
3.1.11	Adjustable range for “Pause time”	Vendor to specify	
3.1.12	Suitable provisions shall be made to protect the Unit against Over current, Short Circuits, Voltage fluctuations, etc.	Vendor to confirm	
3.1.13	Foot Switches shall be robust, safe and should have switches (pedals) for “Forward, Stop & Reverse” operations.	Vendor to confirm	
3.2.0	Electric Drive Unit :		
3.2.1	Electric Drive Unit shall be suitable for the job requirement specified vide Cl. 2.0 and shall be compatible and operatable with the Controller specified vide 3.1.0.	Vendor to confirm	
3.2.2	Construction of the Drive units shall be rigid and robust.	Vendor to confirm	
3.2.3	It should consist of a heavy duty Motor shall be able to cope up for frequent forward / reverse rotation – continuing for a longer period of time for more number of expansion cycles.	Vendor to confirm	
3.2.4	Drive Unit shall have the manually operated switch for “Forward / Reverse / Off”.	Vendor to confirm	
3.2.5	In addition to the handles for holding the drive unit manually, hook shall be provided at proper location to hold the Drive unit using the “Spring Balancer (Refer 3.9.0), in such a way to keep the axis of drive unit in horizontal position.	Vendor to confirm	

Part –B (Technical)

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDERS OFFER
3.3.0	Telescopic Shaft:		
3.3.1.	Telescopic shafts shall be robust in construction and should be able to transmit the torque without any loss.	Vendor to confirm	
3.3.2.	It should free the operator from loading the drive Unit.	Vendor to confirm	
3.3.3.	Trouble free operation of the Telescopic shafts should be confirmed.	Vendor to confirm	
3.3.4.	Morse taper at the drive end	Vendor to specify	
3.4.0	Adapter 1 should be suitable to use between the Telescopic Shaft and the expanders	Vendor to confirm	
3.5.0	Adapter 2 should be suitable to use between the Drive Unit and Telescopic Shaft	Vendor to confirm	
3.6.0	All spares specified vide Annexure –I for two years trouble free operation of the control system and its accessories should be supplied. Spares for telescopic shaft and any other spares required are also to be included in the Annexure I and un-priced list to be submitted with this offer. All types of spares for the 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 & Vendors to enable BHEL to procure these in advance, if required.	Vendor to confirm, fill up Annexure I & submit	
3.7.0	Tool Kit : Tool Kit should contain the tools required for maintenance and operation of the system and expanders, in sufficient numbers.	Vendor to confirm	
3.8.0	Voltage Stabilizers should be suitable for the Control Unit being supplied.	Vendor to confirm	
3.9.0	Trolley: Suitable Trolley with good quality caster wheels shall be provided to accommodate the Torque Control system, Voltage Stabiliser and provision for holding the telescopic shaft. It should have free movement in any direction along the shop floor.	Vendor to confirm	
3.10.0	Tube Expander-1 for front side , shall be suitable for the expansion of length 50 mm at a distance of 15 mm from the entry side face of the Tube sheet (Refer Skt. 30-T-33-35900). None of the part should get broken / damaged inside the tube and should not produce any scratch mark in the tube surface. Minimum diameter for entry of expander (Cage) is 16.2 mm due to weld projection. Increase in ID of Tube Diameter after expansion is 0.5 to 0.7mm (ie. Dia 17.3 to 17.5 from 16.8 mm)	Vendor to confirm	

Part –B (Technical)

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDERS OFFER
3.11.0	Tube Expander-2 for rear side , shall be suitable for the expansion of length 50 mm at a distance of 373 mm from the entry side face of the Tube sheet (Refer Skt. 30-T-33-35900). None of the part should get broken / damaged inside the tube and should not produce any scratch mark in the tube surface. Minimum diameter for entry of expander (Cage) is 16.2 mm due to weld projection. Increase in ID of Tube Diameter after expansion is 0.5 to 0.7mm (ie. Dia 17.3 to 17.5 from 16.8 mm)	Vendor to confirm	
3.12.0	Spare mandrel for Expander-1 shall be suitable for the expander-1 with the specifications described in Cl. 3.10.0	Vendor to confirm	
3.13.0	Spare mandrel for Expander-2 shall be suitable for the expander-2 with the specifications described in Cl. 3.11.0	Vendor to confirm	
3.14.0	Spare Rollers shall be suitable for the expander-1 as well as for the Expander-2 with the specifications described in Cl. 3.10.0 / 3.11.0	Vendor to confirm	
4.0	<u>Commissioning & Acceptance at BHEL Works:</u> Installation and commissioning of the “Tube Expansion system” at BHEL shall be in the scope of vendor. All equipment / accessories being supplied are to be demonstrated at BHEL for their proper performance in the prove out job as specified in 2.0. Tube sheet block and Tubes will be provided by BHEL for the demonstration.	Vendor to confirm	
5.0	<u>Electrical:</u>		
5.1	230 V \pm 10%, 50HZ \pm 3 HZ, AC Power Supply will be provided by BHEL.	Vendor to confirm	
5.2	Suitable protection system should be provided to prevent the operator from electric shock.	Vendor to confirm	
5.3	Motors shall conform to IEC or Indian Standards	Vendor to confirm	
5.4	The KW rating of the motors to be specified and the make of the motor should be acceptable to BHEL.	Vendor to specify	
5.5	All adapters / receptacles should have compatibility with Indian equivalents.	Vendor to confirm	
6.0	Delivery Period :Supplier to specify the best possible delivery period	Vendor to specify	
7.0	<u>Painting</u> :All non-working surfaces and control panels shall be given a primer coat & two coats of paint as specified in Vendor’s Painting scheme. All unpainted surfaces shall be protected from rust during transit.	Vendor to confirm	

Part –B (Technical)

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDERS OFFER
8.0	Documentation: 3 sets of the following documents shall be furnished during inspection and supply:	Vendor to confirm	
8.1.1	GA drawing: Exploded view & Cross section assembly of gearing unit to be given. Make of Bought out items with Part no/Specification	Vendor to confirm	
8.1.2	The operator instruction manual	Vendor to confirm	
8.1.3	Maintenance instruction manual	Vendor to confirm	
8.1.4	Guarantee / warranty cards of all bought-outs	Vendor to confirm	
9.0	Packing : The “Tube Expansion system”, other accessories, expanders etc shall be packed rigidly to avoid any transit damage and dispatched	Vendor to confirm	
10.0	GUARANTEE: 12 months from the date of commissioning of the equipment at BHEL or 18 months from dispatch whichever is earlier	Vendor to confirm	
11.0	Check List : Please ensure that the following documents are submitted along with this “ Technical offer ”	Vendor to furnish	
11.1	Filled Up “ Part-A ” of Technical specification	Vendor to furnish	
11.2	“ Performance Certificate ” as specified in Section IV of Part-A	Vendor to furnish	
11.3	Filled up– Scope of supply (Ref: Cl. 3.0)	Vendor to furnish	
11.4	Filled up “ Annexure I ”	Vendor to furnish	
11.5	GA drawing / detailed catalogue of the offered “Tube Expansion system” with details & dimensions.	Vendor to furnish	
11.6	List and Makes of the bought-outs	Vendor to furnish	

Part –B (Technical)

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDERS OFFER
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Annexure I**List of Essential Spares for 2 years trouble free Operation (for 2 sets)**

Sl. No	Item Description	Quantity
	<u>Spares for TCW controller</u>	
01	MCB	
02	Line Filter	
03	Transformer T1	
04	Transformer T2	
05	Transformer CT	
06	Calibration PCB	
07	Drive Card	
08	Main PCB	
09	Display card	
10	Front Panel	
11	Memory IC	
12	Program IC	

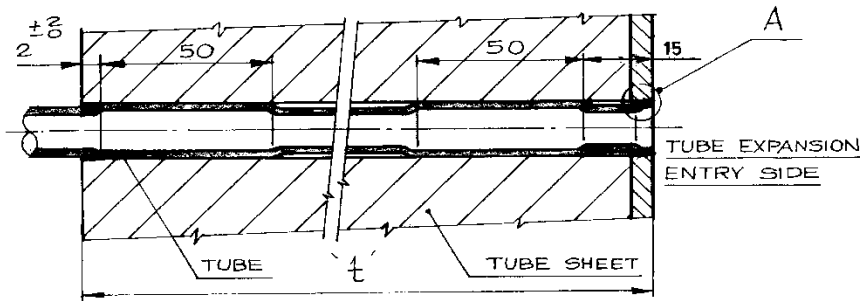
Sl. No	Item Description	Quantity
	<u>Spares for Expansion Drive</u>	
01	Armature	
02	Field Coil	
03	Trigger Switch	
04	Armature Bearing (bottom)	
05	Armature Bearing (top)	
06	Gear Box bearing assembly	
07	Bearing Bracket	
08	Helical Gear	
09	Spindle Bearing	
10	Brush Plate	
11	8 Core Cable with 12 pin Plug	
12	Carbon Brushes	

Sl. No	Item Description	Quantity
	<u>Spares for Telescopic Shaft</u>	
01		

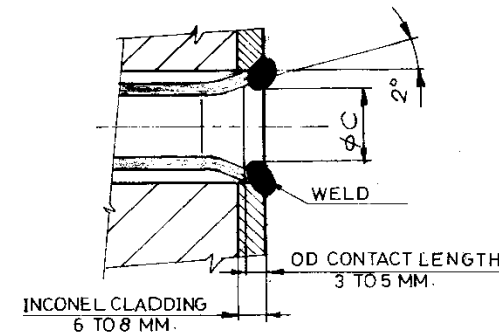
ATP/MCTD/TESElectric Tube Expansion System: Qty-2 Sets
Part -B (Technical)

Page 7 of 7

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDERS OFFER
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EXPANSION DETAILS

SL NO	't'	MIN. ϕ FOR EXP. ENTRY ϕ C	TUBE OD IN mm	TUBE THICKNESS IN mm	HOLE SIZE ON TUBE PLATE IN mm
1	4.06	ϕ 16	ϕ 16 $^{+0,1}_{-0,03}$	1 $^{+0,1}_{-0,03}$	ϕ 16,22 $^{+0,13}_{-0,03}$
1	4.26	ϕ 16.2	ϕ 19 $^{+0,12}_{-0,03}$	1,1 $^{+0,11}_{-0,03}$	ϕ 19,22 $^{+0,13}_{-0,03}$



DETAIL - A

	TUBE	TUBE PLATE
MATERIAL	INCOLOY 800	20MnMoNi 55
STRENGTH(YIELD)	334 N/mm ²	390 N/mm ²
HARDNESS	180 BHN	200 BHN
COMPOSITION	%	%
CARBON	0,03	0,17 - 0,23
NICKEL	32 - 35	0,5 - 0,8
CHROMIUM	20 - 23	0,2
MANGANESE	0,4 - 1,0	1,2 - 1,5
ALUMINIUM	0,15 - 0,45	0,01 - 0,04
PHOSPHOROUS	0,02	0,012
SILICON	0,3 - 0,7	0,15 - 0,3
MOLYBDENUM	—	0,4 - 0,55

NO. OF PIECES	DESCRIPTION	SEM. PRO. SEQ. NO.	INT. MAT. / RES. NO.	FINAL MATERIAL	SCRAP WT (kg)	NET WT (kg)	GROSS WT (kg)	DRAWING NO.	ITEM NO.
	COMP. DRG. No	0.93.150.01518/00							
	COMP. DES.	SUB ASSY. 32							
	TYPE & GROUP	93.150	W.C: D165						

REF.No. 00.00604-00

BHARAT HEAVY ELECTRICALS LTD.,
BOILER PLANT UNIT, TIRUCHIRAPALLI-14

FIRST ANGLE	SCALE	DRAWN	TOTAL NET WT. (kg)
CHECKED			TYPE
APPROVED			NEW/OLD DRG. NO.
ALL DIMENSIONS IN MILLIMETRES	DATE	TITLE	

CAUTION
THE INFORMATION CONTAINED IN THIS
DRAWING IS THE PROPERTY OF
BHARAT HEAVY ELECTRICALS LTD.,
BOILER PLANT UNIT, TIRUCHIRAPALLI-14
AND SHALL NOT BE USED WITHOUT THEIR
EXPRESS WRITTEN PERMISSION IN ANY
FORM OR PART THEREOF FOR ANY
OTHER PURPOSE THAN FOR WHICH
IT IS SENT TO YOU.

EXPANSPECN

DRAWING NO.
30.T.33.35900

REVISION

A

A	DATE	ALTERED	KVV
11.08.00	CHECKED		
TUBESHEET 't'			
ADDED IN THIS TABLE			

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.

Sl. No.	PARTICULARS	BIDDER's RESPONSE
1	BIDDER to provide the Profile of their Company	
2	The Bidder (OEM) shall have a minimum of TEN Years of Continuous Experience in the field of Design, Manufacture and Supply of Electric Tube Expansion system.	
3	List of customers to whom Electric Tube Expansion system were supplied, installed and commissioned till date.	
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.	

PART – A: QUALIFYING CRITERIA FOR THE SUPPLY OF
“ElectricTube Expansion system for Titanium Tubes - Qty 2 Nos.

SECTION – II: The BIDDER has to compulsorily meet the following requirements to get qualified for submitting an offer for the “Electric Tube Expansion System for Titatnium Tubes”.

Sl. No.	REQUIREMENTS	BIDDER'S RESPONSE
1	Only those Bidders (OEMs) should quote, who have supplied and commissioned at least Five numbers of wattage based “Electric Tube Expansion system” or higher, in the past three years (on the date of opening of Tender) and such equipment should presently be working satisfactorily for more than one year after commissioning (on the date of opening of Tender),.	
	The Bidder should submit following information where the wattage based Electric Tube Expansion systems have 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 Bidder should submit at least One Performance certificates from the customers 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 Bidders who meet the above Qualifying Criteria will be considered for further evaluation.	
4	BHEL reserves the right to verify the information provided by Bidder. In case the information provided by Bidder is found to be false/ incorrect, the offer shall be rejected.	

SECTION – III

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

S. No.	REQUIREMENTS	BIDDER's COMPLIANCE
1	The BIDDER 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 'Bidder 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, tooling's, 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 “Wattage based Electric Tube Expansion System” :
2. Make & Model of the “Wattage based Electric Tube Expansion System” :
3. Month & Year of Commissioning :
4. Application for which the “Wattage based Electric Tube Expansion System” is used :
5. Size of the tube and length of Expansion for which the “Wattage based Electric Tube Expansion System” is used:
6. Performance of the equipment : Satisfactory / Good / Average /
(Strike off whichever is not applicable) Not Satisfactory
7. After Sales Service : Satisfactory / Good / Average /
Not Satisfactory
8. Any other remarks :

Date:

Signature & Seal of the Authority
issuing the Performance Certificate

Electric Tube Expansion system for Titanium Tubes– Qty : 2 Sets.Page 1 of 8

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDERS OFFER With Technical Details
1.0	<p><u>Purpose:</u>The Electric Tube Expansion system operatable with 230 V AC power supply - is for Strength expansion of Titanium Tubes in the Titanium Tube sheet Holes. Job details are explained in Cl. 2.0. The control system should work on <u>wattage based</u> principle to take care of the fluctuations in input voltage. All the accessories being supplied along with this shall be compatible with each other to perform the required expansion operation.</p>	Vendor to note	
2.0	<p><u>Job profile:</u> Titanium Tubes of size OD : $13.8^{+0.32}_{-0.075}$ mm & ID : $11.1^{+0.00}_{-0.07}$ mm.</p> <p>Tube hole Size in Tube sheet : Dia $13.90^{+0.043}_{-0.0}$ mm.</p> <p>Tube Sheet Thickness : 92 mm.</p> <p>For Further details on materials and expansion requirements, please refer sheet No.1 and 2 of Annexure -1.</p>	Vendor to note	
3.0	<p><u>Scope of Supply:</u> The Electric Tube expansion system shall be suitable for the job specified vide Cl. 2.0, consists of :</p> <ol style="list-style-type: none"> 1. "<u>Wattage</u> based Torque Controller unit with foot Switch - 2 No. 2. Tube expansion Drive Unit - 2 No. 3. Contact Rolling Tube expanders - 250 No. 4.a Stage I Tube Expanders - 500 No. 4.b Stage II Tube Expanders - 250 No. 4.c Stage III Tube Expanders - 250 No. 5. Voltage stabilizer - 2 No. 6. Movable Trolley - 2 No. 7. Spring balancer - 2 No. 8. Adopters for driving the Tool - 10 No. 9. Tool Kit for Operation & Maintenance - 2 Set 10. Spares for two years of trouble free operation & maintenance as per Annexure-II - 2 Set 	Vendor to confirm	

ElectricTube Expansion system for Titanium Tubes– Qty : 2 Sets.Page 2of8

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDERS OFFER With Technical Details
3.1.0	Wattage based Torque Controller Unit with foot switch:		
3.1.1	The torque controller Unit shall be of “Wattage based control system” and it shall be of solid state design	Vendor to confirm	
3.1.2	Control functions shall be of Micro-controller based.	Vendor to confirm	
3.1.3	Shall be provided with soft start for all drives	Vendor to confirm	
3.1.4	Connected drive is to be automatically recognized and indicated in the display of the Torque Controller Unit.	Vendor to confirm	
3.1.5	Appropriate wattage range is to be automatically selected for the connected drive.	Vendor to confirm	
3.1.6	Provision shall be made for the display of actual drive wattage during expansion and also display shall be available to see the set wattage.	Vendor to confirm	
3.1.7	The Torque Control Unit shall have a facility for ‘manual reversing” of the drive by means of a push button.	Vendor to confirm	
3.1.8	The Torque Control Unit shall also be provided with a foot Switch for “ Forward, Stop and Reverse ” controls.	Vendor to confirm	
3.1.9	Adjustable range for “Reverse time”	Vendor to specify	
3.1.10	Adjustable range for “Trip time”	Vendor to specify	
3.1.11	Adjustable range for “Pause time”	Vendor to specify	
3.1.12	Suitable provisions shall be made to protect the Unit against Over current, Short Circuits, Voltage fluctuations, etc.	Vendor to specify	
3.1.13	Foot Switches shall be robust, safe and should have switches (pedals) for “Forward, Stop & Reverse” operations.	Vendor to confirm	
3.2.0	<u>Drive Units:</u>		
3.2.1	The drive units shall be capable of performing the tube expansion in the job specified vide Cl. 2.0 .	Vendor to confirm	
3.2.2	Construction of the Drive units shall be rigid and robust.	Vendor to confirm	
3.2.3	It should consists of a heavy duty Motor shall be able to cope up for frequent forward / reverse rotation – continuing for a longer period of time for more number of expansion cycles.	Vendor to confirm& specify.	
3.2.4	The drive units shall be compatible with the Torque Controller Unit specified vide point No. 3.1.0	Vendor to confirm	

ElectricTube Expansion system for Titanium Tubes– Qty : 2 Sets.Page 3of8

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDERS OFFER With Technical Details
3.2.5	In addition to the handles for holding the drive unit manually, hook shall be provided at proper location to hold the Drive unit using the 'Spring balancer' in such a way to keep the axis of expander in horizontal position.	Vendor to confirm	
3.3.0	<u>Contact Rolling Tube Expanders:</u>		
3.3.1	Before welding the Tube end with the Tube sheet, expansion of Tube will be carried out to a length of $9^{+/-1}$ mm from the Tube sheet face, as shown in "Expn. Opn 1 in Annexure II – Sheet 2, for which these expanders are to be designed.	Vendor to confirm	
3.3.2	Contact length of rollers shall not exceed 9.0 mm.	Vendor to confirm	
3.3.3	Percentage Thinning required after contact rolling is 2% to 4%. Entry diameter for these expanders is $11.0^{+0.07/+0.0}$ mm.	Vendor to confirm	
3.3.4	Required percentage thinning should be achieved uniformly in single set of expansion stages. Repetition of stages (Re-rolling) is not permissible.	Vendor to confirm	
3.3.5	Tube expanders shall be made up of high quality materials to work with Titanium tubes, for durability, surface finish and life. The tube expanders should not create any scratches or scoring marks inside the tube surface. Flaking of rollers / mandrels is not permissible.	Vendor to confirm	
3.3.6	<u>Life of Expanders</u> : Desired number of expansion cycles that each of the tube expander can be used in the prove out component safely, to avoid any damage to the job / expander.	Vendor to specify	
3.4.0	<u>Stage I, Stage II and Stage III Tube Expanders:</u>		
3.4.1	After welding the Tube end with the Tube sheet, expansion of Tube will be carried out to a length of 80 mm at a distance of 7 mm from the Tube sheet face, as shown in "Expn. Opn 2 in Annexure II – Sheet 2, for which these expanders are to be designed. Expansion length of 80mm shall be achieved in three stages, as mentioned below: <u>Opn.2 – Stage I</u> : 7 to 39 mm from Tube sheet face <u>Opn.2 – Stage II</u> : 33 to 65 mm from Tube sheet face <u>Opn.2 – Stage III</u> : 57 to 89 mm from Tube sheet face	Vendor to Note & confirm	
3.4.2	For each stage, separate expanders are to be supplied as specified vide Cl. 3.0	Vendor to confirm	
3.4.3	Percentage thinning required after the completion of Opn. 2 = 3% to 5%. Required percentage thinning should be achieved uniformly in single set of expansion stages. Repetition of stages (Re-rolling) is not permissible.	Vendor to confirm	

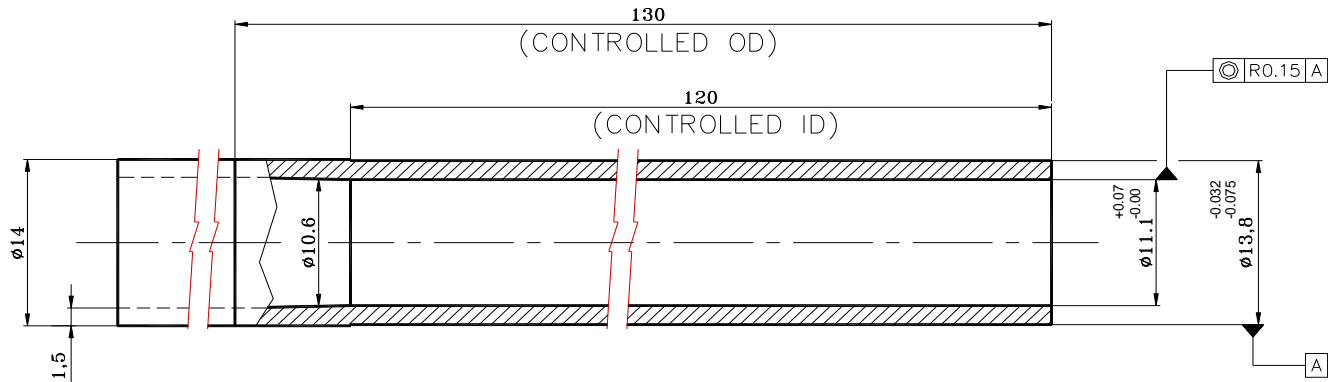
ElectricTube Expansion system for Titanium Tubes– Qty : 2 Sets.Page 4of8

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDERS OFFER With Technical Details
3.4.4	Minimum entry diameter available for the expander is 10.4 mm due to weld projection.	Vendor to confirm	
3.4.5	Tube expanders shall be made up of high quality materials to work with Titanium tubes, for durability, surface finish and life. The tube expanders should not create any scratches or scoring marks inside the tube surface. Flaking of rollers / mandrels is not permissible.	Vendor to confirm	
3.4.6	<u>Life of Expanders</u> : Desired number of expansion cycles that each of the tube expander can be used in the prove out component safely, to avoid any damage to the job / expander.	Vendor to specify	
3.5.0	<u>Voltage Stabilizers</u> should be suitable for the Control Unit being supplied.	Vendor to confirm	
3.6.0	<u>Movable Trolley</u> : Suitable Trolley with good quality caster wheels shall be provide to accommodate the Torque Control system with the Drive unit and it should have free movement in any direction along the shop floor.	Vendor to confirm	
3.7.0	<u>Spring Balancer</u> : Suitable Spring balancer is to be supplied to mount and hang the Drive Unit in horizontal position at required elevation and shall permit the alignment of the gun in any of the tube in the Tube sheet with ease.	Vendor to confirm	
3.8.0	<u>Adopters</u> : Adopters shall be suitable to use with the drive unit to transmit the drive to the Tube Expanders.	Vendor to confirm	
3.9.0	<u>Tool Kit</u> : Tool Kit should contain the tools required for maintenance and operation of the system and expanders, in sufficient numbers.	Vendor to confirm	
3.9.10	All spares specified vide Annexure –II for two years trouble free operation of the control system and its accessories should be supplied. Spares for telescopic shaft and any other spares required are also to be included in the Annexure II and un-priced list to be submitted with this offer. All types of spares for the 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 & Vendors to enable BHEL to procure these in advance, if required.	Vendor to confirm, fill up Annexure II& submit	
4.0	<u>Electrical</u> :		
4.1	230 V \pm 10%, 50HZ \pm 3 HZ, AC Power Supply will be provided by BHEL.	Vendor to confirm	
4.2	Suitable protection system should be provided to prevent the operator from electric shock.	Vendor to confirm	

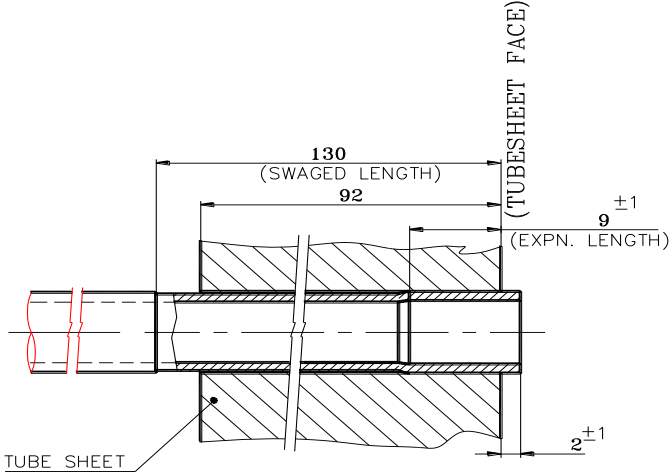
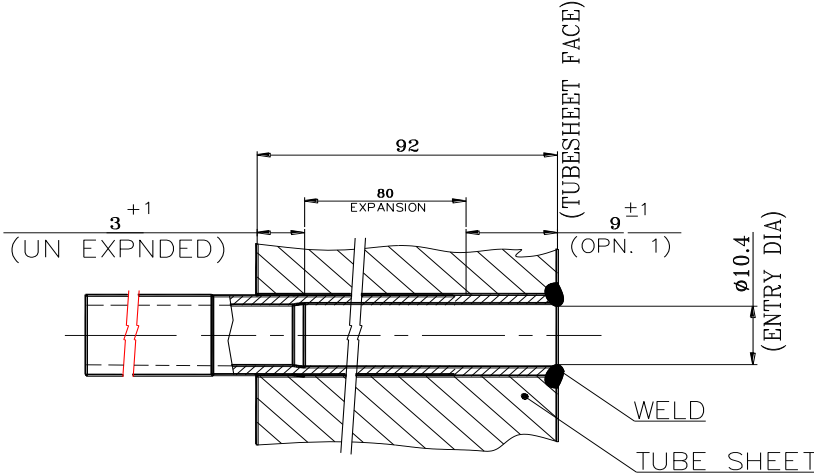
Electric Tube Expansion system for Titanium Tubes– Qty : 2 Sets.Page 5 of 8

Clause	PARTICULARS AND BHEL SPECIFICATION		BIDDERS OFFER With Technical Details
4.3	Motors shall conform to IEC or Indian Standards	Vendor to confirm	
4.4	The KW rating of the motors to be specified and the make of the motor should be acceptable to BHEL.	Vendor to specify	
4.5	All adapters / receptacles should have compatibility with Indian equivalents.	Vendor to confirm	
5.0	Delivery Period : Supplier to specify the best possible delivery period	Vendor to specify	
6.0	Installation and commissioning at BHEL : Installation and commissioning of the “Tube Expansion system” at BHEL shall be in the scope of vendor	Vendor to confirm	
7.0	Commissioning & Acceptance at BHEL Works : Installation and commissioning of the “Tube Expansion system” at BHEL shall be in the scope of vendor. All equipment / accessories being supplied are to be demonstrated at BHEL for their proper performance in the prove out job as specified in 2.0. Tube sheet block and Tubes will be provided by BHEL for the demonstration.	Vendor to confirm	
8.0	Painting : All non-working surfaces and control panels shall be given a primer coat & two coats of paint as specified in Vendor’s Painting scheme. All unpainted surfaces shall be protected from rust during transit.	Vendor to confirm	
9.0	Packing : The “Tube Expansion system” and other accessories, expanders etc shall be packed rigidly to avoid any transit damage and dispatched	Vendor to confirm	
10.0	GUARANTEE : 12 months from the date of acceptance of the “Tube Expansion system” at BHEL or 18 months from dispatch whichever is earlier	Vendor to confirm	
11.0	Documentation : 3 sets of the following documents shall be furnished during inspection and supply:	Vendor to confirm	
11.1	GA drawing: Exploded view & Cross section assembly of gearing unit to be given. Make of Bought out items with Part no/Specification	Vendor to confirm	
11.2	The operator instruction manual	Vendor to confirm	
11.3	Maintenance instruction manual	Vendor to confirm	
11.4	Guarantee / warranty cards of all bought-outs	Vendor to confirm	
12.0	Check List : Please ensure that the following documents are submitted along with this “ Technical offer ”	Vendor to furnish	
12.1	Filled Up “ Part-A ” of Technical specification	Vendor to furnish	
12.2	“ Performance Certificate ” as specified in Section IV of Part-A	Vendor to furnish	
12.3	Filled up “ Annexure I ” – Scope of supply (Ref: Cl. 3.0)	Vendor to furnish	
12.4	Filled up “ Annexure II ”	Vendor to furnish	

Electric Tube Expansion system for Titanium Tubes– Qty : 2 Sets.Page 6of8

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDERS OFFER With Technical Details
	<p style="text-align: center;"><u>ANNEXURE–I</u> (SHEET 1 of 2)</p>  <p style="text-align: center;"><u>TUBE DETAILS</u></p> <p>TUBE HOLE DIAMETER : $\phi 13.9^{+0.043}_{+0.0}$</p> <p>PERCENTAGE THINNING REQUIRED : 3 TO 6%</p> <p>(FORMULA) PERCENTAGE THINNING = $\frac{(\text{TUBE OD} - \text{TUBE ID BEFORE EXPN}) - (\text{HOLE ID} - \text{TUBE ID AFTER EXPN})}{(\text{TUBE OD} - \text{TUBE ID BEFORE EXPN})} \times 100$</p> <p>MATERIAL : TITANIUM</p> <p style="text-align: center;"><u>TUBE EXPANSION DETAILS</u></p>	

ElectricTube Expansion system for Titanium Tubes– Qty : 2 Sets.Page 7 of 8

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDERS OFFER With Technical Details
	<p style="text-align: center;"><u>ANNEXURE–I</u> (SHEET 2 of 2)</p>  <p style="text-align: center;"><u>EXPANSION OPN. 01</u> CONTACT ROLLING (BEFORE WELDING) ROLLING LENGTH = 8 to 10 mm PERCENTAGE THINNING = 2 TO 4 PERCENT.</p>	 <p style="text-align: center;"><u>EXPANSION OPN. 02</u> (AFTER WELDING)</p> <p>STAGE–I EXPANDER : EXPN. 7 TO 39 MM STAGE–II EXPANDER : EXPN. 33 TO 65 MM STAGE–III EXPANDER : EXPN. 57 TO 88 MM PERCENTAGE THINNING = 3 TO 6 PERCENT.</p> <p style="text-align: right;">(FROM TUBESHEET FACE)</p>

Electric Tube Expansion system for Titanium Tubes– Qty : 2 Sets.Page 8 of 8

Clause	PARTICULARS AND BHEL SPECIFICATION	BIDDERS OFFER With Technical Details
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Annexure II**List of Spares for 2 years trouble free O&M (for 2 sets)**

Sl. No	Item Description	Qty	Sl. No	Item Description	Qty
	<u>Spares for TCW controller</u>			<u>Spares for Expansion Drive</u>	
01	MCB		01	Armature	
02	Line Filter		02	Field Coil	
03	Transformer T1		03	Trigger Switch	
04	Transformer T2		04	Armature Bearing (bottom)	
05	Transformer CT		05	Armature Bearing (top)	
06	Calibration PCB		06	Gear Box bearing assembly	
07	Drive Card		07	Bearing Bracket	
08	Main PCB		08	Helical Gear	
09	Display card		09	Spindle Bearing	
10	Front Panel		10	Brush Plate	
11	Memory IC		11	8 Core Cable with 12 pin Plug	
12	Program IC		12	Carbon Brushes	

Note: Addition / Deletion of items is permitted to suit the equipment being supplied.

ATP/MCTD/TES

Tube Cone rolling equipment: Qty-1 Set

PART-A (Qualifying Criteria)

Page 1 of 4

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.

Sl. No.	PARTICULARS	BIDDER's RESPONSE
1	BIDDER to provide the Profile of their Company	
2	The Bidder (OEM) shall have a minimum of Three Years of Continuous Experience in the field of Design, Manufacture and Supply of Tube Cone Rolling Equipment.	
3	List of customers to whom Tube Cone Rolling Equipment were supplied, installed and commissioned till date.	
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.	

ATP/MCTD/TES

Tube Cone rolling equipment: Qty-1 Set

PART-A (Qualifying Criteria)

Page 2 of 4

SECTION – II: The BIDDER has to compulsorily meet the following requirements to get qualified for submitting an offer for the "**Tube Cone Rolling Equipment**".

Sl. No.	REQUIREMENTS	BIDDER's RESPONSE
1	Only those Bidders (OEMs) should quote, who have supplied and commissioned at least three numbers of Tube Cone Rolling Equipment, in the past three years (on the date of opening of Tender) and such equipment should presently be working satisfactorily for more than one year after commissioning (on the date of opening of Tender).	
	The Bidder should submit following information where the Tube Cone Rolling Equipment have 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 Bidder should submit the <u>Performance certificates from any one of the customers for the satisfactory performance of the equipment supplied as per clause 1.0 above</u> (For obtaining the Performance certificate, a suggestive format is provided in SECTION – IV).	
3	Offers of only those Bidders who meet the above Qualifying Criteria will be considered for further evaluation.	
4	BHEL reserves the right to verify the information provided by Bidder. In case the information provided by Bidder is found to be false/ incorrect, the offer shall be rejected.	

ATP/MCTD/TES

Tube Cone rolling equipment: Qty-1 Set

PART-A (Qualifying Criteria)

Page 3 of 4

SECTION – III

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

S. No.	REQUIREMENTS	BIDDER's COMPLIANCE
1	The BIDDER 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 'Bidder 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, tooling's, 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.	

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Tube Cone rolling equipment: Qty-1 Set

PART-A (Qualifying Criteria)

Page 4 of 4

SECTION – IV**PERFORMANCE CERTIFICATE****(On Customer's Letter Head)**

1. Supplier of the "Tube Cone Rolling Equipment" :
2. Make & Model of the "Tube Cone Rolling Equipment" :
3. Month & Year of Commissioning :
4. Application for which the "Tube Cone Rolling Equipment" is used :
5. Size of the tube and length / Angle of cone rolling for which the "Tube Cone Rolling Equipment" is used:
6. Performance of the equipment : Satisfactory / Good / Average /
(Strike off whichever is not applicable) Not Satisfactory
7. After Sales Service : Satisfactory / Good / Average /
Not Satisfactory
8. Any other remarks :

Date:

Signature & Seal of the Authority
issuing the Performance Certificate

ATP/MCTD/TES Tube Cone rolling equipment: Qty-1 Set

PART-B (Technical) Page 1 of 6

Clause	BHEL SPECIFICATION	BIDDERS OFFER
1.0	Purpose: Tube Cone Rolling Equipment, also generally known as “Torque Controlled electric Tube Expansion system” operatable with 230 V AC power supply - is for conical rolling of Incoloy Tubes at the front face in the Alloy Steel (cladded with Inconel) Tube sheet Holes. This rolling is done to close the gap between the hole and the tube. After this rolling, edge preparation and welding will be carried out. Job details are explained in Cl. 2.0. The control system should work on “ Torque Control ” principle. All the accessories being supplied along with this shall be compatible with each other to perform the required expansion operation.	Vendor to note
2.0	Job profile: Incoloy Tubes of size OD : 19.0^{+0.12 / -0.03} mm X Thk: 1.1^{+/- 0.11} mm. Hole Size : Dia 19.22^{+0.13 / -0.0} Tube Sheet Thickness : 426 mm. For Further details on materials and expansion requirements, please refer Detail A in the enclosed Sketch No. 30-T-33- 35900/A .	Vendor to note & confirm
3.0	Scope of Supply: The Torque Controlled electric Tube expansion system suitable for the purpose and Job profile specified vide Cl. 1.0 and 2.0, shall consist of : 1. Electric Torque control unit with foot Switch - 1 No. 2. Electric Drive Unit to use with the above Torque Controller - 1 No. 3. Adapters suitable between the Torque controller and Drive Unit - 10 No. 4. Spares for two years of trouble free operation & maintenance as per Annexure-I - 1 Set. 5. Tool Kit for Operation & Maintenance - 1 Set. 6. Conical (Tube) Expander - 25 No. 7. Spare Mandrel for Conical Tube Expander - 25 No. 8. Spare Rollers (Set of three) - 50 Sets.	Vendor to provide offer with model No. / Ordering code for the items, wherever applicable.
3.1.0	Electric Torque Control Unit with Foot Switch:	
3.1.1	Should be able to take care of the load requirements for the product requirement specified vide Cl: 1.0 and 2.0	Vendor to confirm
3.1.2	The Controller Unit shall be of “Torque control system”.	Vendor to confirm
3.1.3	Shall be provided with soft start for all drives	Vendor to confirm

ATP/MCTD/TES Tube Cone rolling equipment: Qty-1 Set

PART-B (Technical) Page 2 of 6

Clause	BHEL SPECIFICATION	BIDDERS OFFER
3.1.4	Provision shall be made for the display of actual drive current / voltage / torque value during expansion and also display shall be available to see the set values.	Vendor to confirm
3.1.5	The Torque Control Unit shall have a facility for operating the drive “Forward / Reverse / Stop” by manual mode with the use of push buttons.	Vendor to confirm
3.1.6	The Torque Control Unit shall also be provided with a “foot Switch” with sufficient length of cable for forward, stop and reverse controls.	Vendor to confirm
3.1.7	Adjustable range for “Reverse time”	Vendor to specify
3.1.8	Adjustable range for “Trip time”	Vendor to specify
3.1.9	Adjustable range for “Pause time”	Vendor to specify
3.1.10	Suitable provisions shall be made to protect the Unit against Over current, Short Circuits, Voltage fluctuations, etc.	Vendor to confirm
3.1.11	Foot Switches shall be robust, safe and should have switches (pedals) for “Forward, Stop & Reverse” operations.	Vendor to confirm
3.2.0	Electric Drive Unit :	
3.2.1	Electric Drive Unit shall be suitable for the job requirement specified vide Cl. 2.0 and shall be compatible and operatable with the Controller specified vide 3.1.0.	Vendor to confirm
3.2.2	Construction of the Drive units shall be rigid and robust and should be of light weight.	Vendor to confirm
3.2.3	It should consist of a suitable Motor shall be able to cope up for frequent forward / reverse rotation – continuing for a longer period of time for more number of expansion cycles.	Vendor to confirm
3.2.4	Drive Unit shall have the manually operated switch for “Forward / Reverse / Off”.	Vendor to confirm
3.2.5	In addition to the handles for holding the drive unit manually, hook shall be provided at proper location to hold the Drive unit using a “Spring Balancer / Counter balance system, in such a way to keep the axis of drive unit in horizontal position.	Vendor to confirm
3.3.0	Adapters should be suitable to use between the Drive Unit and the expanders	Vendor to confirm
3.4.0	All spares (electrical and mechanical) for two years trouble free operation of the control system and its accessories should be supplied. Un priced list of all items shall be submitted as “Annexure I” with this technical bid. All types of spares for the total equipment and accessories shall be available for at least ten years after	Vendor to confirm & submit Annexure I

Clause	BHEL SPECIFICATION	BIDDERS OFFER
	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 & Vendors to enable BHEL to procure these in advance, if required.	
3.5.0	Tool Kit : Tool Kit should contain the tools required for maintenance and operation of the system and expanders, in sufficient numbers.	Vendor to confirm
3.6.0	Conical(Tube) Expanders shall be suitable for the conical expansion with included angle of 4 degree (Half angle 2 degree) at the entry side of the Tube sheet (Refer Detail A of Skt. 30-T-33-35900). None of the part should get broken / damaged inside the tube and should not produce any scratch mark in the tube surface.	Vendor to confirm
3.7.0	Spare mandrel for Conical Expanders shall be suitable for the expander with the specifications described in Cl. 3.6.0	Vendor to confirm
3.8.0	Spare Rollers shall be suitable for the Conical expanders with the specifications described in Cl. 3.6.0	Vendor to confirm
4.0	Commissioning & Acceptance at BHEL Works: Installation and commissioning of the "Cone Rolling Equipment" at BHEL shall be in the scope of vendor. All equipment / accessories being supplied are to be demonstrated at BHEL, Trichy for their proper performance in the job as specified in 2.0. Tube sheet block and Tubes will be provided by BHEL for the demonstration.	Vendor to confirm
5.0	Delivery Period : Supplier to specify the best possible delivery period	Vendor to specify
6.0	Electrical:	
6.1	230 V \pm 10%, 50HZ \pm 3 HZ, AC Power Supply will be provided by BHEL.	Vendor to confirm
6.2	Suitable protection system should be provided to prevent the operator from electric shock.	Vendor to confirm
6.3	Motors shall conform to IEC or Indian Standards	Vendor to confirm
6.4	The KW rating of the motors to be specified and the make of the motor should be acceptable to BHEL.	Vendor to Specify
6.5	All adapters / receptacles should have compatibility with Indian equivalents.	Vendor to confirm
7.0	Painting : All non-working surfaces and control panels shall be given a primer coat & two coats of paint as specified in Vendor's Painting scheme. All unpainted surfaces shall be protected from rust during	Vendor to confirm

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PART-B (Technical) Page 4 of 6

Clause	BHEL SPECIFICATION	BIDDERS OFFER
	transit.	
8.0	Documentation: 3 sets of the following documents shall be furnished during inspection and supply:	Vendor to confirm
8.1.1	GA drawing: Exploded view & Cross section assembly of gearing unit to be given. Make of Bought out items with Part no/Specification	Vendor to confirm
8.1.2	The operator instruction manual	Vendor to confirm
8.1.3	Maintenance instruction manual	Vendor to confirm
8.1.4	Guarantee / warranty cards of all bought-outs	Vendor to confirm
9.0	Packing : The “Tube Cone Rolling Equipment”, other accessories, expanders etc shall be packed rigidly to avoid any transit damage and dispatched	Vendor to confirm
10.0	GUARANTEE: 12 months from the date of commissioning of the equipment at BHEL or 18 months from dispatch whichever is earlier	Vendor to confirm
11.0	Qualifying Criteria: Only vendors having a minimum of three years of experience in Design, manufacturing and commissioning of such equipment only will be qualified. Vendors have to provide necessary documentary support for their experience in this field.	Vendor to furnish
12.0	Check List : Please ensure that the following documents are submitted along with this “ Technical offer ”	Vendor to furnish
12.1	Filled Up “ Part-A ” of Technical specification	Vendor to furnish
12.2	“ Performance Certificate ” as specified in Section IV of Part-A	Vendor to furnish
12.3	Filled up– Scope of supply (Ref: Cl. 3.0)	Vendor to furnish
12.4	List of spares “ Annexure I ”(Refer 3.4.0)	Vendor to furnish
12.5	GA drawing / detailed catalogue of the offered “Tube Expansion system” with details & dimensions.	Vendor to furnish
12.6	List and Makes of the bought-outs	Vendor to furnish
12.7	Documents for qualifying criteria (Refer 11.0)	Vendor to furnish

ATP/MCTD/TES Tube Cone rolling equipment: Qty-1 Set
PART-B (Technical) Page 5 of 6

Clause	BHEL SPECIFICATION	BIDDERS OFFER
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Annexure I

List of Essential Spares for 2 years trouble free operation - 1 set

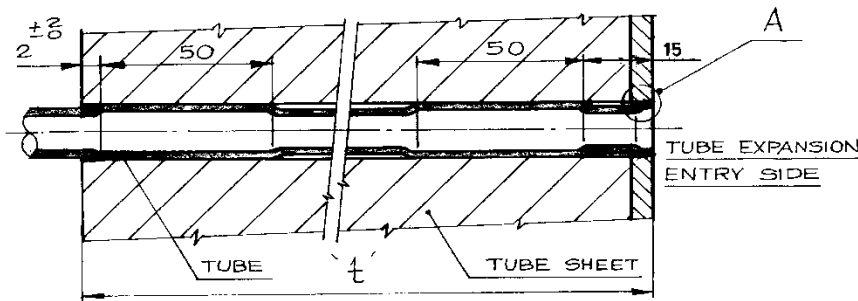
Sl. No	Item Description	Quantity
	<u>Spares for Controller</u>	
01	MCB	
02	Line Filter	
03	Transformer T1	
04	Transformer T2	
05	Transformer CT	
06	Calibration PCB	
07	Drive Card	
08	Main PCB	
09	Display card	
10	Front Panel	
11	Memory IC	
12	Program IC	

Sl. No	Item Description	Quantity
	<u>Spares for Expansion Drive</u>	
01	Armature	
02	Field Coil	
03	Trigger Switch	
04	Armature Bearing (bottom)	
05	Armature Bearing (top)	
06	Gear Box bearing assembly	
07	Bearing Bracket	
08	Helical Gear	
09	Spindle Bearing	
10	Brush Plate	
11	8 Core Cable with 12 pin Plug	
12	Carbon Brushes	

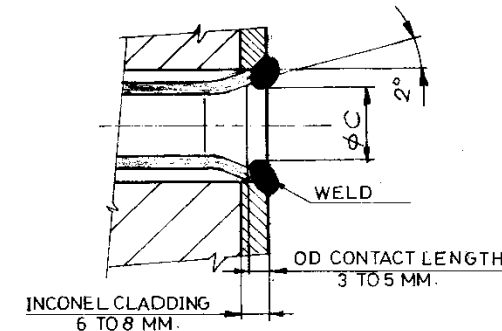
ATP/MCTD/TES Tube Cone rolling equipment: Qty-1 Set
PART-B (Technical) Page 6 of 6

Clause	BHEL SPECIFICATION	BIDDERS OFFER
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EXPANSION DETAILS



SL NO	't'	MIN. ϕ FOR EXP. ENTRY ϕ C	TUBE OD IN mm	TUBE THICKNESS IN mm	HOLE SIZE ON TUBE PLATE IN mm
1	4.06	ϕ 13	ϕ 16 $^{+0.1}_{-0.03}$	1 $^{+0.1}_{-0.03}$	ϕ 15.22 $^{+0.13}_{-0.03}$
1	4.26	ϕ 16.2	ϕ 19 $^{+0.12}_{-0.03}$	1.1 $^{+0.11}_{-0.03}$	ϕ 19.22 $^{+0.13}_{-0.03}$



DETAIL-A

	TUBE	TUBE PLATE
MATERIAL	INCOLOY 800	20MnMoNi 55
STRENGTH(YIELD)	334 N/mm ²	390 N/mm ²
HARDNESS	180 BHN	200 BHN
COMPOSITION	%	%
CARBON	0.03	0.17 - 0.23
NICKEL	32 - 35	0.5 - 0.8
CHROMIUM	20 - 23	0.2
MANGANESE	0.4 - 1.0	1.2 - 1.5
ALUMINIUM	0.15 - 0.45	0.01 - 0.04
PHOSPHOROUS	0.02	0.012
SILICON	0.3 - 0.7	0.15 - 0.3
MOLYBDENUM	—	0.4 - 0.55

NO. OF PIECES	DESCRIPTION	SER. PRO. SEQ. NO.	INT. MAT. / DES. NO.	FINAL MATERIAL	PCRP DWT	NET WT (kg)	GROSS WT (kg)	DRAWING NO.	ITEM NO.
	COMP. DRG. No	0.93.150.01518/00							
	COMP. DES.	SUB ASSY. 32							
	TYPE & GROUP	93.150	W.C: D165						

REF. No. 00.00604-00

BHARAT HEAVY ELECTRICALS LTD.,
BOILER PLANT UNIT, TIRUCHIRAPALLI-14

FIRST ANGLE	SCALE	DRAWN	TOTAL NET WT. (kg)
CHECKED			TYPE
APPROVED			NEW/OLD DRG. NO.
ALL DIMENSIONS IN MILLIMETRES	DATE	TITLE	

CAUTION
 THE INFORMATION CONTAINED IN THIS
 DRAWING IS THE PROPERTY OF
 BHARAT HEAVY ELECTRICALS LTD.,
 BOILER PLANT UNIT, TIRUCHIRAPALLI-14
 AND SHALL NOT BE USED WITHOUT THEIR
 EXPRESS WRITTEN PERMISSION IN ANY
 FORM OR PART THEREOF FOR ANY
 OTHER PURPOSE THAN FOR WHICH
 IT IS SENT TO YOU.

EXPANSPECN									
DRAWING NO.	30.T.33.35900	REVISION	A						

A	DATE	ALTERED	KVV
11.08.00	CHECKED		
TUBESHEET 't'			
ADDED IN THIS TABLE			