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 70 49 Fax : +91 431 252 07 19 Email : csguna@bheltry.co.in Web : www.bhel.com

TWO PART BID Tender to be submitted in two parts.	**Enquiry Number:** **2620900244**	**Enquiry Date:** **17.11.2009**	**Due date for submission of quotation:** **21.12.2009**

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.

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	**Straight Tube Butt Welding Station with Tube Storage Water Fall Rack and 108m Tube Handling System** as per the technical specification, general guidelines instructions & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**01 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. **Checklist to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.**
4. **Subsequent to the hosting of this Enquiry, any corrigendum to the Enquiry that may be hosted in the BHEL Web-site as well as Government Tenders-portal shall be viewed by the vendors regularly to know the details of corrigendum. In case if any vendor without seeing the corrigendum quoted as per original Enquiry and intimate that they have wrongly quoted will not be considered and rejected. However as per the appropriate Policy of BHEL action will be taken on them in this regard.**

BHEL's General guidelines / instructions (refer MM/CE/GT/001) 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 referred above.

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 / MM / Capital Equipment

PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF
Straight Tube Butt Welding Station with Tube Storage Water Fall Rack and 108m Tube Handling system

SECTION – I

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

S. No.	PARTICULARS	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 STBW machines.	
3	List of customers to whom STBW 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 has to compulsorily meet the following requirements to get qualified for submitting an offer for the Straight Tube Butt Welding Station:

S. No.	REQUIREMENTS	BIDDER's RESPONSE
1	Only those Bidder (OEM) should quote, who have supplied and commissioned at least **Straight Tube Butt Welding Machine** in the past Ten years (on the date of opening of Tender) and such machine should presently be working satisfactorily for more than one year after commissioning (on the date of opening of Tender),. However, if such equipment has been supplied to BHEL, then the same must be currently working satisfactorily for not less than six months (as on date of Tender Opening) from the date of commissioning and acceptance.	
	The Bidder 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 Bidder 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 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.	
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 Bidder works.	

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, 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

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

TECHNICAL SPECIFICATION - PART B

Straight Tube Butt Welding Station with Tube Storage Water Fall Rack and 108m Tube Handling system

QUANTITY : 1 No

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S CONFIRMATION
1.0	APPLICATION	a) This machine is meant for butt-welding of straight tubes with edge prepared ends (without tack welding) using • Entirely by Pulsed GMAW Welding-(The predominant method) • Pulsed GTAW root welding followed by Pulsed GMAW Welding, • Entirely by Pulsed GTAW. **IMPORTANT NOTE:** b) The machine is intended for Tube Build-up to 108 metres with 1No. of GTAW and 4Nos. of GMAW welding station. Scope includes Water Fall Rack, In Feed stand, 108m Tube Out Feed Stand, Pinch rollers etc. c) Welding of tubes of similar or dissimilar materials in steel (like carbon steel to alloy steel, alloy steel to stainless steel etc) d) Welding of tubes of various outer diameters and thicknesses. e) Torches have to be employed, one exclusive for TIG, the other three/four for MIG welding process using three/four types of filler wire for different material combination butt-welds. f) The weld Joints shall meet the quality requirements for soundness in Real time Radiography Tests as per BHEL Standard – Annexure-1	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
2.0	**JOB DETAILS**		
2.1	Nature of Job	Only Seamless Steel Tubes (All are Outer Diameter controlled tubes with a tolerance of **maximum** 12% on tube wall thickness)	
2.2	Tube Outer Diameters	28.6mm / 31.8mm / 38.1mm / 44.5mm / 51mm / 57mm / 63.5mm / 76.1mm	
2.3	Tube Wall Thickness	3mm to 12.5mm	
2.4	Tube Length (Raw tubes that are to be joined - In-feed Material)	Minimum - 4 metres Maximum - 15 metres Note: a) Small tubes known as inserts of length 80mm / 110mm with straight gripping length of 30mm have to be welded to the longer tubes. The machine to be suitable for gripping these inserts in the chucks and weld them to the longer tubes. b) Tube lengths less than 4 metres will be loaded manually. Tube lengths greater than 4 metres have to be fed automatically into the machine.	
2.5	Tube Material	a. Carbon Steel : SA192, SA210Gr. A1, SA210 Gr.C b. Alloy Steel : SA209 T1, SA213 T11, SA213 T22, SA213 T91, SA213 T23, SA213 T92 c. Stainless Steel: SA 213 TP304H, SA 213 TP321H, SA 213 TP347H	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
2.6	Tube End Edge Preparation Style and Weld Groove Design	a. Grade C, SA213 T11, T22 - 45 degree chamfer b. SA213 T91and Stainless Steel - 37.5 degree chamfer c. Combination of T91/SS with T22 -37.5 degree chamfer [Refer to ANNEXURE – 2 for Edge Preparation details]	
2.7	No root gap	Tubes to be welded without root gap for GTAW & GMAW. GMAW process will be adopted pre-dominantly from root pass to final pass.	
3.0	**PRODUCTIVITY**		
3.1	No.of Joints / Shift of 8 Hours	Number of radiography quality weld joints expected per shift of 8 hours, for following tubes of 10 or 12m length is Bidder has to confirm and to be proved out. 80 joints / shift of OD 47.63mm x Th. 6.0mm / SA213 T11 with 0.8mm ER80S-B2 wire by Pulsed GMAW process to build a length of 108m.	
4.0	**WELDING MACHINE CONFIGURATION**		
4.1	Tube Revolution during Butt Welding Operation	0.1 RPM to 6.0 RPM (Synchronized rotation of the two tube clamping chucks are to be ensured)	
4.2	Accuracy of speed of rotation of Job Holding Chuck	Bidder to Specify the accuracy with minimum and maximum error (in terms of percentage of the set speed with reference to actual)	
4.3	Tube Rotation drive	AC Servo Drive. Bidder to Specify the make and rating.	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
4.4	Tube Clamping	a. Two sets of 3-Jaw Self Centering Chucks with actuating cylinders. Bidder to Specify the no.of sets of jaws for the range of tube diameters mentioned above.	
		b. Jaw clamping area must be serrated surface, for better electrical contact and grip over tubes coated with Rust preventive oil.	
		c. One Chuck shall be of fixed type and other shall be movable, to suit the tube lengths with respect weld joint location.	
		d. Bidder to Specify the type of clamping (Hydraulic / Pneumatic / Electrical)	
		e. The movable chuck shall exert a constant pressure on the joint during welding in order to get uniform root fusion and penetration to the tune of 1.50 mm in height all around the circumference that merges without any start-stop gap or irregularity.	
4.6	Machine Lifting Stroke	30 mm or more. Bidder to Specify the stroke.	
4.7	Machine Lifting Mechanism	By motorized gear box with stay foot. Bidder to Confirm.	
4.8	Welding Return Current Collector	Bidder to give Technical Details on the weld current return rings on each chuck. Bidder to provide a sketch.	
4.9	Stopper	Bidder to give Technical Details for stopping the tubes for joint alignment with torch. The stopper to be sturdy enough to take the impact load of the tubes hitting it. The stopper to be positioned behind the chuck and preferably lift upwards so that the bottom side is free for arranging a burner for preheating the joint.	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
4.10	Horizontal Travel of Chucks	Bidder to give Technical Details with stroke length (in mm) for movable chuck, after clamping the tube, to butt against the tube in the fixed jaw. The stroke shall be long enough to butt against the tube inserts of 80mm length.	
4.11	Machine Mounted Arc Shield	Large Welding shield glass to form part of the machine fitted on sliding door. The inner side of the welding shield glass facing the welding to be protected against spatter with a plain glass that can be replaced at frequent intervals. Bidder to provide 10 spare plain glasses.	
5.0	**WELDING HEAD**		
5.1	Number of Weld Head	ONE	
5.2	Number of Torches	a. For GTAW Process - 1 No AND b. For Synergic Pulsed GMAW Process - 4 Nos [Preferably all the Torches to be positioned in a single line]	
5.3	Positioning of Weld Head/Torches	a. The Weld head has to be preferably in the centre such that the time taken for moving the selected torch horizontally will be minimum. b. Quick positioning of head for the selected torch to be engaged. c. By Pneumatic or AC Servo System for quick up-down movement with creep speed. d. The time taken by the weld head to move to home position and back to the weld position shall not exceed 5 seconds	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
6.0	**VERTICAL SLIDE UNIT**		
6.1	Type	AC Servo Motorized / Pneumatic – Bidder to Specify	
6.2	Vertical Stroke	Bidder to Specify the stroke of the entire head mounted with all torches.	
6.3	Stroke of each torch	Up/Down stroke of each torch to be Pneumatically operated. Fine adjustment shall be Motorized.	
6.4	Fine Adjustment	Fine adjustment to be provided by Joystick Bidder to Specify the fine adjustment stroke.	
6.5	Height Adjustment	The position of the torch tip for different diameters to be adjustable such that the torch will not collide with the tube.	
6.6	Interlock for collision	Fool proof arrangement to be provided such that the torch shall not descend over the chuck and collide.	
6.7	Vertical guide ways	Vertical individual Torch sliding guide-ways shall be of steel or LM guide-ways. Aluminium or any other metal is not acceptable.	
7.0	**HORIZONTAL SLIDE UNIT**		
7.1	Type	AC Servo Motorized / Pneumatic – Bidder to Specify	
7.2	Movement of Torches	Quick positioning of head for the selected torch to be engaged.	
7.3	Horizontal Stroke	Bidder to Specify the stroke of the entire head mounted with all torches.	
7.4	Fine Adjustment	Horizontal Fine adjustment (Left/Right) to be provided in the same Joystick provided for Vertical fine adjustment. Bidder to Specify the fine adjustment stroke.	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
7.5	Horizontal guide ways	Horizontal Torch sliding guide-ways shall be of steel or LM guide-ways . Aluminium or any other metal is not acceptable. Ball screws to be used in case of motorized movement.	
7.6	Oscillation Function	Bidder to give Technical Details	
7.6.1	(i) Oscillation frequency	6 to 200 cycles / minute	
7.6.2	(ii) Oscillation Width	0 to 40 mm (20 mm on either side of the centre of joint)	
7.6.3	(iii) Dwell Time at Both Ends (Separately Adjustable)	0 to 9.9 sec	
8.0	**POWER SUPPLY for PULSED GTAW**		
8.1	Type	Inverter Controlled (IGBT Based) - DC Welding Power Supply for Pulsed TIG	
8.2	Make	OTC / DAIHEN CORPORATION, Japan	
8.3	Model	Bidder to Specify	
8.4	Current Rating	350 A or more	
8.5	Duty Cycle	60% or more	
8.6	H F Unit for TIG Welding	Bidder to give Technical Details	
9.0	**POWER SUPPLY for SYNERGIC PULSED GMAW**		
9.1	Type	Inverter Controlled (IGBT Based) Welding Power Source for Synergic Pulsed GMAW	
9.2	Make	OTC / DAIHEN CORPORATION, Japan	
9.3	Process	Synergic Pulsed GMAW preprogrammed for 0.80 mm Wire of CS, AS & SS with gas shielding [Argon(95-98%) + CO_2 (5-2%) Mix]	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
9.4	Model	Bidder to Specify	
9.5	Rating	a. Current : 350 A or more b. Voltage : 15-36 V	
9.6	Duty Cycle	60% or more	
10.0	**GTAW WIRE (COLD WIRE) FEEDER**		
10.1	Type	Bidder to Specify type & rating	
10.2	Make	Bidder to Specify	
10.3	Model	Bidder to Specify	
10.4	Wire size	0.8 mm	
10.5	Wire Feed Speed	0 to 2 m/min (Variable)	
10.6	Feeder Motor Capacity	Bidder to Specify	
10.7	Weight of Wire Spool	Suitable for loading 25kg Wire Spools. Bidder to Confirm	
10.8	Scope of Supply	Bidder to Confirm supply of complete unit with cables, gas hoses, end connectors & protective sheath	
11.0	**GMAW WIRE FEEDER**		
11.1	Type	Bidder to Specify type & rating	
11.2	Make	Bidder to Specify	
11.3	Model	Bidder to Specify	
11.4	Wire size	0.8 mm	
11.5	Drive	4-Roll Drive (Rollers to be suitable for 0.8mm wire)	
11.6	Wire Feed Speed	8 m/min or more (variable from 0 to maximum)	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
11.7	Feeder Motor Capacity	Bidder to Specify	
11.8	Weight of Wire Spool	Suitable for loading 25kg Wire Spools. Bidder to Confirm	
11.9	Scope of Supply	Bidder to Confirm supply of complete unit with cables, gas hoses, end connectors & protective sheath and Feed Rolls for 0.80 mm.	
12.0	**GTAW WELDING TORCH**		
12.1	Type	Water Cooled	
12.2	Make	Binzel / Weldcraft / Tokin	
12.3	Model	Bidder to Specify	
12.4	Rating	400 A or more @ 100% Duty Cycle	
12.5	AVC Function for TIG Welding	Bidder to furnish Technical Details	
12.6	Tungsten Electrode Size	Diameter : 2.0 / 2.4 / 3.2 mm	
13.0	**GMAW WELDING TORCH**		
13.1	Type	Water Cooled	
13.2	Make	Binzel / Bernard / Tokin	
13.3	Model	Bidder to Specify	
13.4	Rating	450 A or more @ 100% Duty Cycle	
13.5	Wire size	0.8 mm - Fitted with Accessories for 0.80 mm steel wire.	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
14.0	**TORCH ACCESSORIES**		
14.1	Torch cable Length	Welding cable size and length to be carefully selected in order to avoid any problem of wire feeding during, before or after the welding process and to nullify problems like early failure of wire liner, wire getting struck inside liners etc. Bidder to Confirm	
15.0	**WATER CHILLER UNIT FOR GTAW & GMAW TORCHES**		
15.1	Bidder to Specify the Design Parameters	a. Type – Refrigerant type water chiller	
		b. Water Chiller Cooling Capacity (in Tons of refrigeration)	
		c. Tank Capacity – 5 Litres or more	
		d. Flow rate and pressure (in litres/min and psi or kg/cm_2)	
		e. Type of Coolant – to ensure no scale/sediment formation	
		f. Bidder to Specify the number of Water chillers provided	
15.2	Operating Features	Cooling water flow sensor & interlocks to ensure fool-proof flow of water. Welding should stop automatically incase there is any interruption in cooling water flow.	
16.0	**GAS MIXING UNIT**		
16.1	Make and Model	Make: Preferably Gentec. Any other make acceptable to BHEL. Bidder to Specify the make and model quoted.	
16.2	Gases to be mixed	Argon and CO_2	
16.3	Mixing Ratio	Argon : 95 - 98% CO_2 : 5 - 2%	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
16.4	Operating Features	Bidder to Specify : a) Type of Mixing Unit & its Accuracy b) Flow Rate (adjustable) for Argon & CO_2 c) Mixed Gas Flow Rate d) Inlet Pressure e) Outlet Pressure	
16.5	Scope of Supply	Scope of Supply shall include the following: a) Gas Mixing Unit, b) Gas Flow Meters, c) Regulators, d) CO_2 Heaters, e) Gas Solenoid Valves, f) Gas Flow Sensors and g) Interlocks to ensure fool-proof flow of gas. h) Gas Cups/Nozzles, i) Contact tips for 0.80 mm wire, j) Tip Adapters & Ferrules	
17.0	**CONTROL SYSTEM**		
17.1	Type	Industrial PC based PLC. Bidder to Confirm.	
17.2	Make	Bidder to Specify the Make of the PLC Control System. Preferred make – Fanuc / Siemens / Mitsubishi or Any other reputed makes acceptable to BHEL	
17.3	Model	Model (suitable and latest version, as available at the time of purchase order placement, shall be supplied).	
17.4	HMI / MDI	Touch Screen Panel. Bidder to Specify the Make and Model with the standard size of panel.	
17.5	Communication	Preferably through Profibus. Bidder to Specify.	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
17.6	Memory	Sufficient Memory to store and recall programmed data of minimum 200 programs.	
17.7	Technical Features	Control should include all interlocks, manual, semi auto and auto.	
17.8	Controls / Meters	All ammeters, voltmeters, gas flow meters shall be located near the operator control station	
17.9	All controls	All controls for the In-Feed & Out-Feed conveyors, hydraulic/pneumatic unit & other peripheral units should be available the operator control station.	
17.10	Laptop	Latest version Laptop with pre-loaded software for PLC for maintenance to be supplied with the machine – 1 No	
17.11	Conveyor controls	In-feed and out-feed conveyors, Tube kick off from storage rack / Water fall rack controls shall be delinked from welding program controls. Operator must be able to independently control the movements with separate set of switches on the operator control panel / separate controller in case of water fall rack.	
17.12	Programming design	a) A database to be provided to store programs identifiable by unique number for each weld joint of different combinations of materials / tube sizes. b) Operator has to select only the program number, which he chooses to activate and recall the program from the database, for welding a particular joint and the torch number with which the operator intends to weld, for a particular sequence of welding to build up the tube length. c) The program should be capable of welding a sequence of more than 15 joints or more in a row to build up one tube length of upto 108 metres.	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
17.12	Programming design Contd…	d) For welding a joint with new combination, programming of the parameters shall be done with a unique number and stored in the database. e) Provision to correct the original program whenever fine tuning of parameters are done to improve the quality of the joint. f) Display of all critical weld parameters – programmed and actual real time data on the screen is essential. g) Fine tuning of critical weld parameters during welding is under progress to be made possible.	
17.13	Pre-heating cycle / To observe weld	Provision for rotating the tube before welding for pre-heating and one rotation after welding for visual check of welding. This may be programmable.	
17.14	Programming features	a) Torch Selection – Programmable Same torch may be selected for different joints with different programs. Similarly different torches may be selected for different joints. b) Switch over from TIG to MIG should be possible c) Pre-heating by TIG and subsequent welding by MIG to be possible	
18.0	**FAULT DIAGNOSTIC SYSTEM**		
18.1	Fault diagnostic system	Fault diagnostic system should be provided to show the faults on the display and detailed cause, and remedy for the faults related to mechanical and electrical maintenance.	
18.2	Help guide	Help guide should be provided to use both diagnostic systems. Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
19.0	**GTAW - Welding Programmable Data (COMMON to All passes)**		
19.1	TIG Welding facility will be used for welding and also for pre-heating.	Bidder to Confirm	
19.2	Program Number	Bidder to furnish range	
19.3	Gas Pre-Flow & Post-Flow Time	Bidder to Specify	
19.4	Initial Current	Bidder to Specify	
19.5	Initial Current Time	Bidder to Specify	
19.6	Current Up-Slope & Down-Slope Time	Bidder to Specify	
19.7	Tube Revolution Start & Stop Delay Time	Bidder to Specify	
19.8	Wire Feed Start & Stop Delay Time	Bidder to Specify	
19.9	AVC Delay Time	Bidder to Specify	
19.10	Oscillation Delay/Dwell Time at both ends independently adjustable.	Bidder to Specify	
19.11	Crater Current	Bidder to Specify	
19.12	Crater Current Time	Bidder to Specify	
20.0	**GTAW Welding Programmable Data (For EACH PASS)**		
20.1	Technical Details a) Pass Number range b) Pulse Current c) Pulse Duration d) Base Current e) Base Duration f) AVC g) Wire Feed Pulse Speed h) Wire Feed Base Speed	Bidder to furnish details	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
20.2	Tube Revolution Speed	Bidder to Specify	
20.3	Oscillation Width	Bidder to Specify	
20.4	Oscillation Speed	Bidder to Specify	
20.5	Oscillation Dwell Time on both ends (Independently adjustable)	Bidder to Specify	
20.6	Overlap Angle - Variable and programmable	Bidder to Specify	
20.7	Overlap Speed – Variable and programmable	Bidder to Specify	
20.8	Torch Shift per revolution of weld	Bidder to Specify	
20.9	Torch shift speed	Bidder to Specify	
21.0	**GTAW Fine Adjustment of Welding Parameters (DURING WELDING)**		
21.1	Fine Adjustment of Torch centering /Vertical position / Parameters while welding is in progress	Bidder to Confirm	
21.2	The changes through fine adjustment made during welding may or may not be used to modify programmed data at end of welding cycle.	Bidder to Confirm	
21.3	Fine adjustment must be only by knob or joy stick not by numerical inputs.	Bidder to Confirm	
21.4	TIG Welding parameters	Bidder to furnish range	
21.5	Pulse Current	Bidder to Specify	
21.6	Base Current	Bidder to Specify	
21.7	Tube Revolution Speed	Bidder to Specify	
21.8	Torch Oscillation Width	Bidder to Specify	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
21.9	Torch Oscillation Speed	Bidder to Specify	
21.10	Provision of display of wire feed rate	Bidder to Confirm	
21.11	Filler Wire Feed Speed	Bidder to Specify	
22.0	**GMAW Welding Programmable data (COMMON for all passes)**		
22.1	Program Number	Bidder to furnish range	
22.2	Gas Pre-Flow & Post-Flow Time	Bidder to Specify	
22.3	Initial Current	Bidder to Specify	
22.4	Initial Current Time	Bidder to Specify	
22.5	Current Up-Slope & Down-Slope Time	Bidder to Specify	
22.6	Initial Voltage	Bidder to Specify	
22.7	Arc Start Delay Time	Bidder to Specify	
22.8	Tube Revolution Start Delay Time	Bidder to Specify	
22.9	Oscillation start Delay Time	Bidder to Specify	
22.10	Crater Current	Bidder to Specify	
22.11	Crater Current Time	Bidder to Specify	
22.12	Crater Voltage	Bidder to Specify	
22.13	Burn-Back Control to avoid globule formation on wire tip	Bidder to provide details	
22.14	Synergic MIG welding Program based on wire diameters 0.8 mm for CS/AS/SS.	Bidder to Specify	
22.15	Any other feature required to result in a defect free weld joint as seen in Real Time Radiography test.	Bidder to Specify.	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
23.0	**GMAW Welding Programmable Data (For each Pass)**		
23.1	Pass Number	Bidder to furnish range	
23.4	Welding Pulse Current	Bidder to Specify	
23.5	Welding Voltage	Bidder to Specify	
23.6	Tube Revolution Speed	Bidder to Specify	
23.7	Overlap Angle for each pass –Variable and programmable	Bidder to Specify	
23.8	Overlap speed for each pass –Variable and programmable	Bidder to Specify	
23.9	Oscillation Width	Bidder to Specify	
23.10	Oscillation Speed	Bidder to Specify	
23.11	Oscillation Dwell Time on both ends (Independently adjustable)	Bidder to Specify	
23.12	Torch shift for each pass – Variable and adjustable	Bidder to Specify	
23.13	Torch shift speed	Bidder to Specify	
23.14	Crater Pulse Current	Bidder to Specify	
24.0	**GMAW Fine Adjustment of Welding Parameters (DURING WELDING)**		
24.1	Welding Current	Bidder to Specify	
24.2	Welding Voltage	Bidder to Specify	
24.3	Tube Revolution speed	Bidder to Specify	
24.4	Torch Oscillation Width	Bidder to Specify	
24.5	Torch Oscillation Speed	Bidder to Specify	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
TUBE HANDLING SYSTEM			
25.0	**In-feed & Out-feed tube conveyors for 108m**		
25.1	Bidder to provide General Arrangement drawing	Bidder to provide	
25.2	In-feed tube conveyor to be suitable for transporting tubes of 4m to 15m lengths.	Bidder to Confirm	
25.3	Out-feed tube conveyor to be suitable for transporting built up tubes of 20m to 108m lengths	Bidder to Confirm	
25.4	Both Infeed and Outfeed conveyors shall have row of idle rollers for transporting tubes. The diameter of rollers shall be 150mm or more. The bearings used shall be of reputed make.	Bidder to Confirm	
25.5	Approximate of working height of tube from shop floor level to be furnished	Bidder to Confirm	
25.6	The structures carrying rollers shall be anchored to the floor with the help of anchoring bolts, secured to the floor by drilling and pouring quick setting cement. No separate foundation is acceptable.	Bidder to Confirm	
25.7	**Pinch Roller drive**		
25.7.1	Pinch Roller driving mechanism to be deployed for transporting the tube. The structure shall be rigid to handle the loads.	Bidder to Confirm	
25.7.2	The pinch roller drive to be either hydraulically or electrically operated	Bidder to Specify	
25.7.3	The pinch roller drive unit adjacent to the welding machine on either sides must have four rollers	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
25.7.4	The pinch roller drive farther away from the welding machine may have two rollers. Bidder to choose two or four roller depending on their design	Bidder to Specify	
25.7.5	The axes of pinch rollers shall be vertical to the floor	Bidder to Confirm	
25.7.6	The pinch rollers shall be Teflon lined rollers	Bidder to Confirm	
25.7.7	Adjustable to accommodate the range of tube diameters	Bidder to Specify	
25.7.8	The pinch roller diameter shall be 175mm or more and having width of 80mm or more.	Bidder to Confirm	
25.7.9	The maximum speed of transporting tube shall be 60m/min. The speed shall be adjustable	Bidder to Confirm	
25.7.10	The speed of tube shall be reduced (creep speed) while approaching the stopper, at the centre, to avoid impact loading on the stopper.	Bidder to Confirm	
25.7.11	Bidder to Specify total number of Pinch roller drive units on the in-feed side and out-feed side.	Bidder to Specify	
25.7.12	Pinch roller drive unit shall be anchored to the shop floor as explained under Clause 25.6.	Bidder to Confirm	
26.0	**Water fall type tube storing rack**		
26.1	Raw tubes have to be stacked in water-fall type tube storing racks. The structure shall be rigid to hold tubes in all the six decks.	Bidder to Confirm	
26.2	The water-fall rack shall have SIX Decks (one above the other) for storing tubes of SIX different tube sizes / specifications.	Bidder to Confirm	
26.3	The minimum length of tube shall be : 4m (for this STBW) The maximum length of tube shall be : 15m	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
26.4	Each deck shall have the capacity to hold around 50 tubes of OD 63.5mm spread in a single ros. The width of each deck shall be 3500mm. Supporting members in each storage deck shall be lined with Nylon or Teflon for reducing the noise level.	Bidder to Confirm	
26.5	The clear gap between the decks for the tubes to stack in a row shall be 175mm or more.	Bidder to Confirm	
26.6	The water fall rack shall have a suitable tube bundle loading system – to transfer the bundle of tubes placed on the platform to various tube storage decks, as desired by the Machine Operator. The platform shall be capable of transferring tube bundle weighing FOUR Tons. The width of the platform shall be 2000mm. All the tubes shall be quickly loaded on to the selected deck.	Bidder to Confirm	
26.7	The tube from each rack shall be transferred from the deck on to the In-feed conveyor by means of Chain conveyor. The speed of Chain conveyor shall be variable.	Bidder to Confirm	
26.8	The controls should enable operator to choose different tubes each from different decks to be loaded on to the chain conveyor simultaneously. The chain conveyor then transfers each tube one after the other on to the in-feed conveyor.	Bidder to Confirm	
26.9	A centralized Operator Control Desk shall be provided to operate the water fall tube storage rack. Controls to be provided for loading the tube bundles on to the selected deck and also to select the tube from the racks.	Bidder to Confirm	
26.10	The water fall rack shall be in line with the tube butt welding machine.	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
26.11	The ratings of various motors used on Water Fall rack shall be specified. Bidder to Specify whether the system used for loading and unloading of tubes is electric / pneumatic / hydraulic.	Bidder to Specify	
26.12	The water fall rack shall have provisions for easy access (for the maintenance staff) to various mechanisms (hydraulic /electric /pneumatic) mounted in the system for maintenance.	Bidder to Confirm	
26.13	Safety guards and safety interlocks shall be provided.	Bidder to Confirm	
26.14	Foundation required for Water fall rack shall be mentioned.	Bidder to Specify	
27.0	**HYDRAULICS**		
27.1	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.	Bidder to Furnish Details	
27.2	Pumps, valves, accessories etc shall be of Bosch-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.	Bidder to Confirm & furnish details	
27.3	Each pump should have an independent motor. Tandem pumps shall be avoided.	Bidder to Confirm	
27.4	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).	Bidder to Confirm & furnish details	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
27.5	The flexible hoses used in the system shall be of Gates / Aeroquip / Parker or any other reputed make acceptable to BHEL.	Bidder to Specify	
27.6	Failure indication for oil level, temperature, pressure, filter clogging should be provided	Bidder to Confirm & furnish details	
27.7	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.	Bidder to Specify	
27.8	Cooling system of sufficient capacity to maintain complete Hydraulic System at a temperature not exceeding 50 deg C irrespective of the ambient conditions.	Bidder to Confirm & furnish details	
27.9	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	Bidder to furnish details	
27.10	Maximum Operating Pressure of hydraulic system	Bidder to Specify	
27.11	Main Pump flow in lpm and Motor Power in kW	Bidder to Specify	
27.12	Reservoir capacity (in litres)	Bidder to Specify	
27.13	All oil pipelines shall be of seamless steel and should undergo pickling process.	Bidder to Confirm	
27.14	One hand held minimess pressure gauge of suitable range with minimess hose (1.0 to 1.5m length) to be supplied along with the power pack. Check points to be provided in the system.	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
27.15	All cylinders used in the machine should have standard bore and rod sizes. The piston rod shall be hard chrome plated.	Bidder to furnish details	
27.16	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.	Bidder to furnish details	
27.17	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.	Bidder to Confirm	
27.18	The oil to be used shall be of standard ISO Viscosity Grades – 32 / 46 / 68	Bidder to Specify	
27.19	The maximum pressure of the system should preferably not to exceed 310 bar	Bidder to Specify	
27.20	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.	Bidder to Specify	
27.21	The pipelines to be painted with standard colours as per the colour coding accepted internationally for hydraulic systems.	Bidder to furnish details	
27.22	All hydraulic pipelines, hoses and electrical control cables to be neatly laid out with proper clamps and flexible hose conveyors wherever required.	Bidder to Confirm	
27.23	Suitable leakage oil collection metallic tray to be provided wherever required.	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
27.24	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.	Bidder to Confirm	
27.25	Hydraulic oil will be supplied by BHEL during commissioning at BHEL works. Bidder to provide the oil during pre-dispatch inspection.	Bidder to Confirm	
28.0	**COOLING SYSTEM**		
28.1	Chiller Unit for Cooling of Sub-Systems: Suitable Capacity Refrigerant / Radiator type Chilling Units are to be provided for the cooling of Hydraulic Power Pack Oil etc. Bidder to give Complete Technical Details on these Chilling Units	Bidder to Specify	
28.2	Interlock System for Chilling Units Coolant Flow Suitable flow sensors are to be provided to have an interlock with welding circuit, to avoid failure of flow of cooling medium	Bidder to Confirm	
29.0	**LUBRICATION :**		
29.1	Machine lubrication: Bidder to furnish details of the type of lubrication provided for all the movable parts in the machine.	Bidder to Confirm	
29.2	All greasing points to be provided at convenient location for the operators to fill grease periodically.	Bidder to Confirm	
29.3	First filling of Lubrication Oil to be supplied by the supplier. Indian equivalent shall be mentioned.	Bidder to Specify	
29.4	First filling of Grease should be supplied by Bidder. Indian equivalent shall be mentioned.	Bidder to Specify	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
30.0	**PNEUMATIC SYSTEM:**		
30.1	The pneumatic operated elements of the machine shall work efficiently with BHEL compressed air supply at a pressure of 3.5 to 4.5 kg/cm2.	Bidder to Confirm	
30.2	If higher air pressure is required for efficient operation of the machine, Bidder shall furnish the information for Air Compressor of suitable capacity.	Bidder to Specify	
30.3	Bidder to Specify the total air volume required for efficient operation of the complete machine.	Bidder to Confirm	
30.4	Refrigerated Air Drier to be provided to eliminate moisture content from the compressed air at the designed flow and pressure rating.	Bidder to Confirm	
30.5	BHEL will provide compressed air at only one point near / on the machine. Bidder shall provide suitable filter-regulator-lubrication (FRL) unit and in addition a hand wheel valve at this point	Bidder to Confirm	
30.6	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.	Bidder to Confirm	
30.7	Pneumatic components shall be of FESTO / NORGREN make or equivalent reputed make acceptable to BHEL.	Bidder to Specify	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
31.0	**ELECTRICAL & ELECTRONICS SYSTEMS**		
31.1	415V with a voltage fluctuation of +/- 10%, 50HZ with a fluctuation of +/-3%, 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 Bidder. All cables, connections, circuit breakers etc. required for connecting BHEL's power supply to the machine shall be in the scope of Bidder.	**Bidder to Confirm**	
31.2	Tropicalization**:** All electrical / electronic equipment shall be tropicalized.	Bidder to Confirm	
31.3	Control circuit voltage shall not exceed 24V DC	Bidder to Confirm	
31.4	All electrical components in the cabinets should be mounted on DIN Rail	Bidder to Confirm	
31.5	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. All adapters /receptacles should have compatibility with Indian equivalents.	Bidder to Confirm	
31.6	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.	Bidder to Confirm	
31.7	Bidder should ensure the proper earthing for the machine and its peripherals.	Bidder to Confirm	
31.8	Cables shall be routed through totally enclosed cable trays. There shall not be cable trenches.	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
31.9	All electrical & electronic control cabinets & panels should be vermin and dust proof. All Electric enclosures shall have IP 54 protection	Bidder to Confirm	
31.10	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 (Bidder should indicate make and type in the offer)	Bidder to Confirm	
31.11	All electrical items shall be of from SEW / ROCKWELL Allen Bradley/ Telemechanique / Delta or reputed makes acceptable to BHEL.	Bidder to Confirm	
31.12	All the motor control variable frequency drives should have input and out put chokes with brake resistor.	Bidder to Confirm	
31.13	All indication lamps should be provided with LED Indication Lamp.	Bidder to Confirm	
31.14	All components/devices/terminals are to be incorporated with numbered ferrules.	Bidder to Confirm	
31.15	External wiring from / to control panel, control desk, external motors etc shall be by means of screened multi-core cables.	Bidder to Confirm	
31.16	All electrical motors, limit switches etc, on the machine shall be wired using PVC sheathed cable running in conduits and converging to common terminal block.	Bidder to Confirm	
31.17	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.	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
31.18	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.	Bidder to Specify	
31.19	Suitable Servo Voltage stabilizer for Butt Welding Machine & Ultra isolation transformer for programmable controls shall be quoted for each machine separately.	Bidder to Confirm	
32.0	**MACHINE LIGHTS**		
32.1	Machine Spot Lights and suitable fluorescent light or metal halide lamps to be provided for sufficient illumination in the welding zone and in the pit where bottom torches are mounted.	Bidder to Confirm	
32.2	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Bidder to Confirm	
33.0	**MACHINE FOUNDATION:**		
33.1	Bidder shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI). Complete details like static and dynamic loads etc required for foundation design shall be submitted by the Bidder within three months after getting BHEL's approval.	Bidder to Confirm	
33.2	BHEL shall design and construct complete foundation for the machine as per the Bidder's recommendation	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
33.3	Complete anchoring system including foundation bolts, anchoring materials, fixators, levelling shoes, chemical for anchoring etc should be supplied	Bidder to Specify	
34.0	**MACHINE SPARES:**		
34.1	List of spares with itemized break-up of mechanical, hydraulic, pneumatic, electrical and electronic spares used in the machine in sufficient quantity as per recommendation of Bidder for 2 years of trouble free operation on three shifts continuous running basis shall be furnished by Bidder along with offer. The list is to include following, in addition to other recommended spares: **(Unit Price for each item of spare shall be offered)**	Bidder to Confirm	
34.2	**Mechanical, Hydraulic, Pneumatic Spares:** All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses, hoses, bearings, sprockets, chains etc.	Bidder to Confirm	
34.3	**Electrical / Electronic / PLC Spares:** All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, Spares for PLC, Servo Motors for Feed Drives, Power Module & Control Cards for Main Drive as well as Feed Drives etc.	Bidder to Confirm	
34.4	Welding Consumable spares such as Contact tips, Gas nozzles, Tip adapters, Other torch spares for atleast 3 months continuous operation shall be provided.	Bidder to Confirm	
34.5	Spare Torches, Torch cables and Wire feed conduits, Wire feed rollers may also be offered..	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
34.6	All types of spares for total machine and accessories shall be available for at least ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the Bidder 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	Bidder to Confirm	
34.7	Bidder to Confirm that complete list of spares for machine and accessories, along with item part no / specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Bidder to Confirm	
34.8	A set of Service Tools for dismantling and assembling of machine components such as roller sets etc. may be quoted.	Bidder to Confirm	
35.0	**DOCUMENTATION:**		
35.1	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.	Bidder to Confirm	

S.No	PARTICULARS	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
35.2	The following documents in English language should be supplied along with the machine: **Hard Copies - 3 Sets** **Bidder to Confirm** **In CD form - 1 Set** 1. GA Drawing of the complete STBW station with conveyor/tube handling system. 2. GA Drawing of Individual Mechanisms 3. GA & Sub-Assembly Drawings for sub-systems for maintenance purpose. 4. Operating manuals of Machine & its PLC System 5. Programming manuals of Machine & its PLC System 6. Maintenance manuals with all drawings of machine assemblies / sub-assemblies with parts list 7. All Electrical circuit diagrams with bill of materials 8. Hydraulic circuit diagrams with bill of materials 9. Pneumatic circuit diagrams with bill of materials 10. Maintenance & Interface manuals for Machine Control System 11. Preventive Maintenance check list for Electrical and Mechanical System 12. Trouble shooting chart for Main and all sub systems 13. Complete PCB Schematics indicating check points for Electronic controls. 14. Catalogues, O&M manuals for all bought out items used in the machine. 15. Operating Manuals, Maintenance Manuals & Catalogues for all supplied Accessories. 16. Detailed specification of all rubber items / hydraulic / lubrication fittings 17. PLC program print-outs with comments in English 18. PLC program and data on CD, Flash Memory Card. 19. 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. 20. Complete list of Alarm log, Error code, error messages & remedies and on line fault diagnostics to be provided by the Bidder. 21. Complete list of spares for machine, along with item part no /specification / type / model and make & address of the sub-Bidder.	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
36.0	**MACHINE INSPECTION & ACCEPTANCE:**		
36.1	**PRE-DISPATCH INSPECTION AT SUPPLIER'S WORKS:**		
36.1.1	Complete STBW stations with all sub-systems and accessories shall be assembled and offered for inspection by BHEL Engineers at supplier's works.	Bidder to Confirm	
36.1.2	All systems of the machine have to be operated and demonstrated to the BHEL Engineers in proper working condition.	Bidder to Confirm	
36.1.3	Supplier has to establish parameters for radiographic quality weld joints with the following tube specifications: a) OD 47.63mm x Th. 6.0mm / SA213 T11 with 0.8mm ER80S-B2 wire by Pulsed GMAW process. 10 Joints b) OD 63.5mm x Th. 12mm / SA213 347H (110mm insert) + OD 63.5mm x Th. 12mm / SA213 T22 with 0.8mm ER Ni Cr3 wire by Pulsed GMAW process – 10 Joints	Bidder to Confirm	
36.1.4	Edge prepared tubes will be supplied by BHEL. The welding consumables have to be arranged by the supplier. All the other consumables have to be arranged by supplier.	Bidder to Confirm	
36.1.5	Supplier has to arrange for conducting Radiography test on joints and will be evaluated as per BHEL quality standards given in Annexure-I. All the joints should pass the test.	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
36.1.6	The welded tubes are to be returned back to BHEL along with the machine consignment.	Bidder to Confirm	
36.2	**PROVE-OUT AND ACCEPTANCE AT BHEL WORKS:**		
36.2.1	After the machine Erection is completed and Energizing the machine at BHEL works, all systems of the machine have to be operated and demonstrated in proper working condition.	Bidder to Confirm	
36.2.2	**Quality test:** The following joints have to be produced without defects as per the quality standards in Annexure-I: a) OD 44.5mm x Th. 8.0mm / SA210 Gr. C with 0.8mm ER70S-A1 wire by Pulsed GMAW process- 10 Joints b) OD 47.63mm x Th. 6.0mm / SA213 T11 with 0.8mm ER80S-B2 wire by Pulsed GMAW process- 10 Joints c) OD 63.5mm x Th. 12mm / SA213-347H (110mm insert) + OD 63.5mm x Th. 12mm / SA213 T22 with 0.8mm ER Ni Cr3 wire by Pulsed GMAW process- 10 Joints	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
36.2.3	**Productivity prove out:** Supplier to prove out the productivity with defect free Radiography quality weld joints, for following tubes of 10 or 12m length for one shift of 8 hours as per clause 3.1: 80 joints / shift of OD 47.63mm x Th. 6.0mm / SA213 T11 with 0.8mm ER80S-B2 wire by Pulsed GMAW process to build a length of 108m.	Bidder to Confirm	
36.2.4	All consumables and tubes will be supplied by BHEL.	Bidder to Confirm	
36.2.5	Edge prepared tubes, welding consumables, gas etc will be supplied by BHEL.	Bidder to Confirm	
36.2.6	Radiography test will be conducted on joints in RTR station online with the STBW machine, and will be evaluated as per BHEL quality standards given in Annexure-I. All the joints should pass the test.	Bidder to Confirm	
37.0	**TRAINING:**		
37.1	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.	Bidder to Confirm	
37.2	Bidder to clearly mention whether the training is offered free of cost or chargeable. If chargeable, the Bidder has to quote on manday basis.	Bidder to Specify	
37.3	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.	Bidder to note	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
37.4	The Supplier shall impart training to BHEL's Machine Operators and Maintenance crew in Operation and Maintenance (Mechanical, Electrical/ Electronics and PLC System) during commissioning of the Machine at BHEL works for TEN working days.	Bidder to Confirm	
37.5	**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	Bidder to Confirm	
37.6	Competent, English speaking experts shall be arranged by the Bidder during training for satisfactory & effective training of BHEL personnel	Bidder to Confirm	
38.0	**ERECTION & COMMISSIONING**		
38.1	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. Commissioning Engineers who will be deputed to BHEL shall be English speaking or English interpreters have to be arranged by the supplier for the entire duration from start of erection till the machines are commissioned and handed over to BHEL with complete training.	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
38.2	Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by Bidder in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL.	Bidder to Confirm	
38.3	Successful proving of BHEL components by the Bidder shall be considered as part of commissioning. All tests, as mentioned (Machine Acceptance) shall form part of the commissioning activity.	Bidder to Confirm	
38.4	Commissioning spares, required for commissioning of the machine shall be supplied free of cost	Bidder to Confirm	
38.5	Test Mandrels, Instruments and other necessary equipment including Laser equipment, if required, to carry out all above activities should be brought by the Bidder.	Bidder to Confirm	
38.6	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 Bidder. For this purpose, the Bidder should supply sufficient quantity of touch-up paint of various colours of paint used.	Bidder to Confirm	
39.0	**IN-BUILT SAFETY ARRANGEMENTS**		
39.1	Following safety features in addition to other standard safety features should be provided on the machine:		

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
39.2	STBW Machine shall have Safety Guards / Sliding Doors for protection against the welding arc / splash / flashing for the Machine Operators. Safety Doors to have visible glasses for clear vision also. Bidder to submit details on this arrangement offered.	Bidder to Specify	
39.3	A detailed list of all alarms / indications provided on machine should be submitted by the Bidder.	Bidder to Specify	
39.4	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.	Bidder to Confirm	
39.5	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.	Bidder to Specify	
39.6	Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on the display and operator panels) should be available.	Bidder to Confirm	
39.7	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Bidder to Confirm	
39.8	Emergency Switches should be provided at suitable locations as per International Norms.	Bidder to Confirm	
39.9	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.	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
40.0	**THERMAL STABILITY FOR AMBIENT CONDITIONS & ENVIRONMENTAL PERFORMANCE OF THE MACHINE:**		
40.1	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.	Bidder to Confirm	
40.2	The Bidder 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.	Bidder to Confirm	
40.3	The machine, including sub-systems, attachments and accessories, should be suitable for continuous operation on three shifts a day.	Bidder to Confirm	
40.4	If any safety / environmental protection enclosure is required it shall be built in the machine by the Bidder.	Bidder to Confirm	
40.5	Paint of the machine should be oil / coolant resistant and should not peel off	Bidder to Confirm	
40.6	Maximum noise level shall be 85 dB(A) at normal load condition..	Bidder to Confirm	
41.0	**PAINTING:**		
41.1	Painting of entire Machine / Electrical Panels: **RAL 6011 Apple Green** (Polyurethane Paint) **Heat resistant paint** on the inside of the machine in the welding zone.	Bidder to Confirm	

S.No	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH CONFIRMATION & COMPLETE TECHNICAL DETAILS
42.0	**MACHINE PACKING:**		
42.1	Sea worthy & rigid packing for all items of complete machine, PLC 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	Bidder to Confirm	
43.0	**GUARANTEE:**		
43.1	Performance Guarantee to be given for 12 months from the date of commissioning OR 18 months from the date of dispatch whichever is earlier.	Bidder to Confirm	
44.0	**GENERAL:**		
44.1	Machine Model No.	Bidder to Specify	
44.2	Total connected load (KVA):	Bidder to Specify	
44.3	Total air volume in cu.m/min	Bidder to Specify	
44.4	Floor area required (Length, Width, Height) for complete machine & accessories	Bidder to Specify	
44.5	Total weight of the machine (approx)	Bidder to Specify	
44.6	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	Bidder to provide compulsorily	

ANNEXURE - 1

REAL TIME RADIOSCOPIC EXAMINATION OF WELDS DONE IN STBW

BHEL, TRICHY - ACCEPTANCE STANDARD

1. SCOPE:

1.1. All joints welded in Straight Tube Butt Welding Machines are subject to Real Time Radiographic Examination through a state of art Radiography and Image processing equipment positioned in the out feed side of STBW Machine.

1.2. Radioscopic Images of Joints welded in the machine are to be free from defects as outlined in the clauses below.

2. ACCEPTANCE CRITERIA:

2.1. INTERNAL DEFECTS

2.1.1. Cracks, incomplete penetration, incomplete fusion and burn-through, are not acceptable.

2.1.2. Pin holes and Porosity (entrapped Gas holes) are not acceptable.

2.2. SURFACE DEFECTS

The following weld conditions as revealed in the radioscopic images are not acceptable.

2.2.1. Undercuts exceeding 0.4 mm.

2.2.2. Mismatch/ misalignment in excess of 1.5 mm.

2.2.3. Weld outside reinforcement, less than 1.5 mm and exceeding 3.2 mm.

2.2.4. Weld Inside reinforcement (Excess penetration) exceeding 1.5mm . (See Note below)

2.2.5. Depressions on the weld surface, entrapping non metallic inclusions.

2.2.6. A crater at the termination of the weld.

2.2.7. Abrupt weld surface ridges and valleys.

2.2.8. Non melted electrode wire on the inside of the weld (Wire Stub).

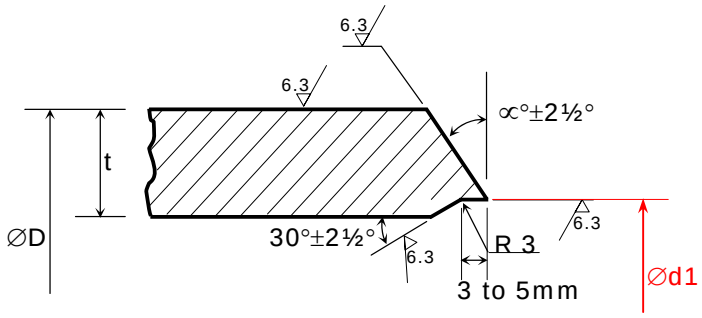
Note:

It is desirable to have a uniform inside reinforcement/penetration at the root not exceeding 1.50 mm in height all around the circumference that merges without any start-stop gap or irregularity.

ANNEXURE - 2

TUBE EDGE PREPARATION DETAIL FOR STBW

D : Tube OD
t : Tube thickness
d1 : Bore ID



a. Grade C, SA213 T11, T22 - ∝ - 45^0
b. SA213 T91 and Stainless Steel - ∝ - 37.5^0
c. Combination of T91/SS with T22 - ∝ - 37.5^0

All dimensions are in mm
BHEL, TIRUCHIRAPPALLI