Bharat Heavy Electricals Limited

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

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

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620600062	**21.09.2006**	**28.10.2006**
Your are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order			

Item	**Description**	**Quantity**	**Delivery Schedule**
10	Straight Tube Welding Machine with TIG-MIG Welding as per the technical specification & commercial conditions applicable (to be downloaded from web site **www.bhel.com**)	2 Nos.	31.08.2007

Note:

(1) The detailed Technical Specification along with technical point-by-point confirmation, Commercial Terms & Conditions applicable for this Enquiry, Confirmation of acceptance for BHEL commercial terms & conditions and Price Bid formats have been posted in BHEL Corporate web site www.bhel.com under Enquiry reference "2620600062". Your offer should be based on all the above documents.

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

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

PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF *STRAIGHT TUBE BUTT WELDING M/c. for TUBE BUILD-UP*

SECTION – I

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

S. No.	PARTICULARS	VENDOR's RESPONSE
1.0	Profile of the Company bringing-out the years of Experience of the BIDDER in the field of machine design , manufacture and supply of CUSTOM BUILT STEEL TUBE BUTT WELDING STATION involving tube handling, setting for weld joint formation, pre-heating (process option), welding and data recording operations.	
2.0	Number of AUTOMATIC STRAIGHT TUBE BUTT WELDING STATIONS supplied, installed and commissioned till date (with details on machine type / model, configuration, customer and quantity)	
3.0	YEAR of supply of latest AUTOMATIC TUBE BUTT WELDING STATION and the Technical Specifications of the Machine supplied [Details to be furnished]	
4.0	Number of AUTOMATIC STRAIGHT TUBE BUTT WELDING STATIONS supplied, installed and commissioned till date for the CUSTOMERS who are mainly the manufacturers of Power Utility Boilers (of High Pressure Ratings), with brief technical specifications of the supplied machines.	
5.0	Details on the Firm's Registration and the FINANCIAL STRENGTH of the COMPANY (Balance Sheet for the last **3** years) shall be submitted with the TECHNICAL OFFER	
6.0	Details of Design Set-Up and Technology Back-Up assured for the PRINCIPAL Equipment Manufacturer & Supplier [Details on Experience of Design Personnel, Technology Tie-Up, R & D Facilities, etc. have to be furnished]	

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

SECTION – II

The BIDDER has to meet the following requirements, in general, to get qualified for submitting an offer for STRAIGHT TUBE BUTT WELDING STATION

S. No.	REQUIREMENTS	VENDOR's COMMENTS
12.0	The BIDDER shall have a minimum of TEN Years of Continuous Experience in the field of Design, Manufacture and Supply of AUTOMATIC STRAIGHT TUBE BUTT WELDING STATIONS.	
13.0	The BIDDER shall have supplied at least one number of AUTOMATIC STRAIGHT TUBE BUTT WELDING STATION (having similar capacity and basic specifications given under PART B) in the recent past, say in the last five to six years.	

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

SECTION – III

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

S.No.	REQUIREMENTS	VENDOR's COMPLIANCE
17.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS - Technical **[with PART A & PART B]** & Commercial and Price Bid.	
18.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' preferably with the copies of Product Catalogue, are to be enclosed.	

S.No.	REQUIREMENTS	VENDOR's COMPLIANCE
19.0	The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. A mere 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement [without any supporting technical write-ups, photos and datasheets] may lead to outright disqualification of the Technical Offer.	
20.0	The BIDDER / VENDOR shall assure a continuous support for the supply of SPARES and SERVICE for TEN Years, from the date of commissioning of the equipment at BHEL Works.	
21.0	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation of the inclusion of all the accessories, toolings, attachments, auxiliary parts, spares, consumables, etc. with the main and basic equipment, to meet the technical specification requirements.	
22.0	Any soft copy, giving the salient features of the proposed machine or equipment with all sub-systems and auxiliaries, and /or showing live-demo of an existing and working machine of similar configuration and capacity will be highly appreciated by BHEL.	
23.0	BIDDER has to indicate the Country of Origin for the supply of equipment .	
24.0	The reference List of Customers shall be accompanied with (Phone Number and E-Mail ID) of the CONTACT PERSON for cross reference by BHEL	
25.0	In case of preliminary qualification of the offer, on technical grounds, the BIDDER may be called for a detailed technical discussion on the original technical offer at BHEL Works, with a notice period of not less than 2 weeks.	

PART B

TECHNICAL SPECIFICATIONS for

STRAIGHT TUBE BUTT WELDING STATION for TUBE BUILD-UP

IMPORTANT NOTE :

AA. The requirement is for two number of Welding Stations as per the Technical Specifications

BB. One Welding Station is meant for building tubes upto a length of 72 Metres by joining tubes of various lengths, by means of butt welding one tube end to another and so on.

CC. The second Welding Station is also meant for building tubes, but to a length of 24 metres only by joining tubes of various lengths, by means of butt welding one tube end to another and so on.

DD. The material handling system for handling raw tubes and butt welded tubes will have to be different for these two welding stations – the technical details given under the Specification Clause No. 5.0.0 / CASE – I and CASE-II shall be taken into account for the quotation. Except for the material handling unit, all other technical requirements are identical for these two welding stations.

EE. Two separate (individual) offers – both TECHNICAL and COMMERCIAL OFFERS - are to be submitted for these two welding stations.

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
1.0.0	**APPLICATION**	a. This machine is meant for butt-welding of ends (edge prepared) of straight tubes using TIG root welding (without tack welding) and followed by Pulsed MIG Welding, or only with Pulsed MIG Welding or Pulsed TIG Welding for full weld fill-up. b. Welding of tubes of dissimilar materials (like carbon steel to alloy steel, alloy steel to stainless steel and on, but only steel materials) is involved. c. Welding of tubes of various outer diameters is also involved, but at the weld joint, the tube outer diameter will be made uniform, by using the upset or swaged tube ends for a distance of 300 mm (maximum). d. Four torches have to be employed, one exclusive for TIG, the other three for MIG welding process using three types of filler wire for material combination butt-welds. e. An integral facility for pre-heating of tubes (of special alloy material), prior to welding, shall also form part of the supply.	**[BIDDER is expected to give technical write up on machine design, construction and operational features to bring out the capability of the proposed equipment, to meet the BHEL specification requirements]**
2.0.0	**PRODUCTIVITY**	a. Number of quality weld joints expected per hour of machine working, for the job configuration of two tubes of 14 meters length (tube O.D. - 76.1 mm, tube wall thickness - 12 mm) and one tube to tube butt joint, is 20 to 24 Nos. [Tube Material: SA 213T91 and SA 213TP347H, in combination] b. Machine has to work for 3 shifts in a day	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
3.0.0	**JOB DETAILS**		
3.1.0	Nature of Job	Only Seamless Steel Tubes	
3.2.0	Tube Outer Diameter	Tube Sizes: 25.4 mm to 76.1 mm	
3.3.0	Tube Wall Thickness	Thickness Range: 2.0 mm to 12.5 mm	
3.4.0	Tube Length (In-feed Material)	Minimum - 2.0 Metres.; Maximum – 15 Metres.	
3.5.0	Tube Material	a. Carbon Steel : SA192, SA210A1, SA210C b. Alloy Steel : SA209T1, SA213T11, SA213T22, SA213T91, T-23, T-93 c. Stainless Steel SA 213 TP304H, SA 213 TP321H, SA 213 TP347H	
3.6.0	Tube End Edge Preparation Style and Weld Groove Design	a. Grade C,T11,T12,T22 - angle 45 degree b. T91/SS - with groove angle 37.5 degree c. Combination of T91 with T22 - with groove angle 37.5 degree d. 'V' and 'J' Style Weld Grooves **[Refer to ANNEXURE – 1 for DETAILS]**	
4.0.0	**MACHINE CONFIGURATION**		
4.1.1	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)	
4.1.2	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)	
4.1.3	Drive for Tube Revolution	AC Servo Drive	
4.1.4	Tube Rotation Drive Rating	Bidder to Specify	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
4.1.5	Tube Clamping	a. Two sets of hydraulically operated 3-Jaw Self Centering Chucks with actuating cylinders. b. Jaw clamping area must be serrated surface, for better contact and grip of tubes. c. One Chuck shall be of fixed type and other shall be movable, to suit the tube lengths with respect weld joint location.	
4.1.6	Machine Lifting Stroke	Minimum 30 mm	
4.1.7	Machine Lifting Mechanism	By motorized gear box with stay foot	
4.1.8	Welding Return Current Collector	Bidder to give Technical Details on the weld current return rings on each chuck	
4.1.9	Hydraulically Operated Stopper	Bidder to give Technical Details for stopping the tubes for joint alignment with torch	
4.1.10	Horizontal Travel of Chucks	Bidder to give Technical Details with stroke length (in mm) for one chuck, after tube clamping, for butting of the tubes	
4.1.11	Machine Mounted Arc Shield	To form part of the machine and to have provision for more area coverage with spatter protection on the welding viewing glass	
4.1.12	Tube Pre-Heating Facility	a. Built-in / Integrated tube pre-heating facility up to 300 deg. Centigrade b. Temperature Sensor and Display Unit for the set value and the actual value attained.	
4.1.13	Tube feeding and loading elevator unit.	Water fall racks for 8 grades of material, storage and feeding at a length of 15 meters for 50 tubes per rack	
4.1.14	Tube Feeding System	Bidder to give Technical Details on the Tube Feeding System which is to be interlocked with machine in feed pinch roller control.	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
4.2.0	**WELDING HEAD**		
4.2.1	Number of Weld Heads	ONE	
4.2.3	Number of Torches	a. 1 No for TIG Welding Process b. 3 Nos. for Synergic Pulsed MIG/MAG Welding Process [It is preferred to have all the Torches to be positioned in a line.]	
4.2.2	Positioning of Weld Head	a. Quick positioning of head for each welding torch independently b. By Pneumatic or AC Servo System for quick movement with creep speed	
4.3.0	**VERTICAL SLIDE UNIT**		
4.3.1	Type	AC Servo Motorized - 1 No	
4.3.2	Vertical Stroke	Not less than 10 mm (with Fine Adjustment)	
4.3.3	AVC Function for TIG Welding	Bidder to give Technical Details	
4.4.0	**HORIZONTAL SLIDE UNIT**		
4.4.1	Type	AC Servo Motorized - 1 No	
4.4.2	Horizontal Stroke	Not less than 50 mm (with Fine Adjustment)	
4.4.3	Oscillation Function	Bidder to give Technical Details	
4.4.4	(i) Oscillation frequency	6 to 200 cycles / minute	
4.4.5	(ii) Oscillation Width	0 to 40 mm	
4.4.6	(iii) Dwell Time at Both Ends (Separately Adjustable)	0 to 9.9 sec	
4.5.0	**POWER SUPPLY for PULSED TIG**		
4.5.1	Type	Inverter Controlled (IGBT/MOSFET Based) - DC Welding Power Supply for Pulsed TIG	
4.5.2	Make	Bidder to Specify [Reputed makes like Fronius/Austria, ESAB/Sweden, OTC/Japan, LINCOLN/USA]	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
4.5.3	Model	Bidder to Specify	
4.5.4	Current Rating	Minimum - 350 Amps [Range: 5 to 350 amps.]	
4.5.5	Duty Cycle	Bidder to specify to suit the welding load proposed (preferably 100%)	
4.6.0	H F Unit for TIG Welding	Bidder to give Technical Details	
4.7.0	**POWER SUPPLY for PULSED MIG / MAG**		
4.71	Type	Inverter Controlled (IGBT /MOSFET Based) Welding Power Source for Synergic Pulsed MIG/MAG	
4.7.2	Make	Bidder to Specify [Reouted makes like Fronius/Austria, ESAB/Sweden, OTC/Japan, LINCOLN/USA]	
4.7.3	Model	Bidder to Specify	
4.7.4	Rating	a. Current : 50-350 Amps. b. Voltage : 15-36 Volts	
4.7.5	Duty Cycle	Bidder to specify to suit the welding load proposed, but not less than 60%	
4.7.6	Burn-Back Control	Bidder to provide the Technical Details, to avoid globule formation on wire tip	
4.7.7	Automatic Torch Selection Device	a. Electro-Pneumatic type. b. Bidder to provide the Technical Details	
4.7.8	Hot Start Facility [HSF]	HSF with adjustment of current & time required	
4.8.0	**TIG WIRE (COLD WIRE) FEEDER**		
4.8.1	Type	Bidder to specify type & rating	
4.8.2	Make	Bidder to Specify	
4.8.3	Model	Bidder to Specify	
4.8.4	Wire size	0.8 mm to 1.6 mm	
4.8.5	Wire Feed Speed	0.0 to 2.0 mtr. / minute	
4.8.6	Feeder Motor Capacity	Bidder to specify (for pulling max. dia. of wire)	
4.8.7	Weight of Wire Spool	Bidder to specify	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
4.8.8	Scope of Supply	Bidder to confirm supply of complete unit with cables, gas hoses, end connectors & protective sheath	
4.9.0	**MIG/MAG WIRE FEEDER**		
4.9.1	Type	Bidder to specify type & rating	
4.9.2	Make	Bidder to Specify	
4.9.3	Model	Bidder to Specify	
4.9.4	Wire size	0.8 mm to 1.6 mm	
4.9.5	Drive	4-Roll Drive	
4.9.6	Wire Feed Speed	0 to 15 mtr. / minute	
4.9.7	Feeder Motor Capacity	Bidder to specify (for pulling max. dia of wire)	
4.9.8	Weight of Wire Spool	Bidder to specify	
4.9.9	Scope of Supply	Bidder to confirm supply of complete unit with cables, gas hoses, end connectors & protective sheath	
4.9.10	Display	Bidder to confirm the provision of display of wire feed rate	
4.10.0	**TIG WELDING TORCH**		
4.10.1	Type	Water Cooled	
4.10.2	Make	Bidder to Specify	
4.10.3	Model	Bidder to Specify	
4.10.4	Rating	Minimum 300 Amps. @ 60% Duty Cycle	
4.10.5	Tungsten Electrode Size	Diameter : 2.0 / 2.4 / 3.2 mm	
4.11.0	**MIG/MAG WELDING TORCH**		
4.11.1	Type	Water Cooled	
4.11.2	Make	Bidder to Specify	
4.11.3	Model	Bidder to Specify	
4.11.4	Rating	Minimum 350 Amps. @ 60% Duty Cycle	
4.11.5	Wire size	0.8 mm to 1.6 mm	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
4.12.0	**TORCH ACCESSORIES**		
4.12.1	Torch Length	Design to take care of welding cable size and length 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.	
4.12.2	Scope of Supply	To include Gas Mixing Unit, Gas Flow Meters, Regulators, Gas Solenoid Valves, Gas Flow Sensor and interlocks to ensure fool-proof flow of gas	
4.13.0	**WATER COOLING UNIT FOR TIG & MIG/MAG TORCHES**		
4.13.1	Design Parameters	Bidder to specify : a. Type & Cooling Capacity (in Tonnes) b. Tank Capacity to meet the productivity level mentioned under **Clause No.2.0.0** c. Flow rate d. Type of Coolant	
4.13.2	Operating Features	Bidder to give details on : a. Water Chiller Arrangement b. Cooling water flow sensor & interlocks to ensure fool-proof flow of water	
4.13.3	Maintenance Features	Bidder to provide details like Servicing of Heat Exchanger, Elimination of Scale Formation in Heat Exchanger, etc.	
4.14.0	**GAS MIXING UNIT**		
4.14.1	Gases to be mixed	Argon and CO_2	
4.14.2	Mixing Ratio	Argon : 80 to 100% CO_2 : 0 to 20%	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
4.14.3	Operating Features	Bidder to specify : a. Type o Mixing Unit & its Accuracy b. Flow Rate (adjustable) for Argon & CO_2 c. Mixed Gas Flow Rate d. Inlet Pressure e. Outlet Pressure	
4.14.4	Functional Features	Bidder to confirm supply and provide technical details on : a. Built-in heating element for CO_2 with temperature controller and temperature indicator b. Ratio controller of gas flow with pressure correction & flow indicator	
4.15.0	**IN-FEED & OUT-FEED WORK CONVEYOR**		
4.15.1	Basic Design	Bidder to specify type & rating	
4.15.2	Pinch Roll type transport rollers on roller bearings	Bidder to specify	
4.15.3	Adjustable to accommodate the range of tube diameters	Bidder to specify	
4.15.4	Pinch-Roll assembly mounted on necessary substructures at the in-feed and out-feed sides of the machine.	Bidder to specify	
4.15.5	Pinch-roll Drive. Must work from side to side.	Bidder to specify	
4.15.6	Speed: Maximum speed 60 meters per minute with variable speed drive - Bidder to Specify	Bidder to specify	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
4.16.0	**CONTROL SYSTEM**		
4.16.1	Type	Industrial PC based Programmable Logic Controller . Bidder to specify	
4.16.2	Input device for data input (MDI)	Bidder to specify	
4.16.3	Facility to edit data	Bidder to specify	
4.16.4	Memory to store and recall programmed data	Bidder to specify	
4.16.5	Flash Memory Card	99 Programs Memory for back up of machine operation, to be provided.	
4.16.6	TIG Welding Programmable Data (Common for All passes)	Bidder to specify	
4.16.7	Program Number	Bidder to furnish range	
4.16.8	Gas Pre-Flow & Post-Flow Time	Bidder to specify	
4.16.9	Initial Current	Bidder to specify	
4.16.10	Initial Current Time	Bidder to specify	
4.16.11	Current Up-Slope & Down-Slope Time	Bidder to specify	
4.16.12	Tube Revolution Start & Stop Delay Time	Bidder to specify	
4.16.13	Wire Feed Start & Stop Delay Time	Bidder to specify	
4.16.14	AVC Delay Time	Bidder to specify	
4.16.15	Oscillation Delay/Dwell Time at both ends independently and adjustable.	Bidder to specify	
4.16.16	Torch Shift per revolution of weld	Bidder to specify	
4.16.17	Overlap Angle	Shall be Variable	
4.16.18	Crater Current	Bidder to specify	
4.16.19	Crater Current Time	Bidder to specify	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
4.17.0	**TIG WELDING PROGRAMMABLE DATA (FOR EACH PASS)**		
4.17.1	Technical Details	Bidder to furnish details on 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	
4.17.2	Tube Revolution Speed	Bidder to specify	
4.17.3	Oscillation Width	Bidder to specify	
4.17.4	Oscillation Speed	Bidder to specify	
4.17.5	Oscillation Dwell Time on both ends (Independently adjustable)	Bidder to specify	
4.17.6	Torch Shift per revolution of weld	Bidder to specify	
4.18.0	**MIG WELDING PROGRAMMABLE DATA (COMMON FOR ALL PASSES)**		
4.18.1	Program Number	Bidder to furnish range	
4.18.2	Gas Pre-Flow & Post-Flow Time	Bidder to specify	
4.18.3	Initial Current	Bidder to specify	
4.18.4	Initial Current Time	Bidder to specify	
4.18.5	Current Up-Slope & Down-Slope Time	Bidder to specify	
4.18.6	Initial Voltage	Bidder to specify	
4.18.7	Arc Start Delay Time	Bidder to specify	
4.18.8	Tube Revolution Start & Stop Delay Time	Bidder to specify	
4.18.9	Oscillation Delay Time	Bidder to specify	
4.18.10	Overlap Time	Bidder to specify	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
4.18.11	Hot Start Programming	Bidder to specify	
4.18.12	Synergic MIG welding Programme based on wire diameters 0.8, 1.0 and 1.2 mm	Bidder to specify	
4.18.13	Crater Current	Bidder to specify	
4.18.14	Crater Current Time	Bidder to specify	
4.18.15	Crater Voltage	Bidder to specify	
4.19.0	**MIG WELDING PROGRAMMABLE DATA (FOR EACH PASS)**		
4.19.1	Pass Number	Bidder to furnish range	
4.19.2	Welding Pulse Current	Bidder to specify	
4.19.3	Welding Voltage	Bidder to specify	
4.19.4	Tube Revolution Speed	Bidder to specify	
4.19.5	Oscillation Width	Bidder to specify	
4.19.6	Oscillation Speed	Bidder to specify	
4.19.7	Oscillation Dwell Time on both ends (Independently adjustable)	Bidder to specify	
4.19.8	Crater Pulse Current	Bidder to specify	
4.19.9	Torch Shift	Bidder to specify	
4.20.0	**FINE ADJUSTMENT OF WELDING PARAMETERS (DURING WELDING)**		
4.20.1	Basic Requirements	Bidder to confirm a. Fine Adjustment of the parameters when welding is in progress b. Can be processed to change or not to change programmed data at end of welding cycle c. Fine adjustment must be only by knob or joy stick not by numerical inputs.	
4.20.2	TIG Welding parameters	Bidder to furnish range	
4.20.3	Pulse Current	Bidder to specify	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
4.20.4	Base Current	Bidder to specify	
4.20.5	Tube Revolution Speed	Bidder to specify	
4.20.6	Torch Oscillation Width	Bidder to specify	
4.20.7	Torch Oscillation Speed	Bidder to specify	
4.20.8	Filler Wire Feed Speed	Bidder to specify	
4.21.0	**MIG WELDING PARAMETERS**		
4.21.1	Welding Current	Bidder to specify	
4.21.2	Welding Voltage	Bidder to specify	
4.21.3	Tube Revolution speed	Bidder to specify	
4.21.4	Torch Oscillation Width	Bidder to specify	
4.21.5	Torch Oscillation Speed	Bidder to specify	
4.22.0	**PROCESS CONTROL UNIT**		
4.22.1	Technical Features	a. Control should include all interlocks, manual, semi auto and auto. b. All controls for the In-Feed & Out-Feed conveyors, hydraulic unit & other peripheral units should be available the operator control station c. All ammeters, voltmeters, gas flow meters, and wire feed speed meters shall be located near the operator control station d. Voltage stabilizer & ultra isolation transformer for programmable controls e. Air Conditioner for Electrical Control Panel to form part of the supply, to meet tropicalised working conditions.	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
5.0.0	**TUBE HANDLING SYSTEM**		
5.1.0	**CASE – I** for Building Tubes upto a length of 72 metres	a. Raw tubes have to be stacked in water-fall type tube storing racks. b. The water-fall rack shall have EIGHT Decks (one above the other) for storing tubes of EIGHT materials of different grades. c. Each deck shall have the capacity to hold a minimum of 50 tubes (of O.D. – 76.1 mm). d. A centralized Operator Control Desk shall be provided to select the tube from the racks and then to feed into the tube butt welding machine, with provisions for varying speeds for tube feeding. e. The water fall rack shall be in line with the tube butt welding machine. f. The water fall rack shall have a suitable tube bundle loading system – to transfer the bundle of tubes placed on the receiver (inlet) platform to various tube storage decks, as desired by the Machine Operator. g. 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. h. The out-feed tube handling system shall be capable of handling but welded tubes with length varying from 24 to 72 metres.	**[BIDDER is expected to give technical details and the schematics with operational features to with the TECHNICAL OFFER]**

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
5.2.0	**CASE – II** for Building Tubes upto a length of 24 metres	a. Raw tubes have to be stacked in normal tube storing racks with free-rolling and kick-off facility. b. The tube handling mechanism and tube transfer methods shall not generate noise level beyond 85 dB. c. The tube storage deck shall have the capacity to hold a minimum of 100 tubes (of O.D. – 76.1 mm). d. The Centralized Operator Control Desk shall be have the buttons/switches to feed tubes from the Storage Rack. e. The tube storage rack and tube in-feed shall be in line with the tube butt welding machine. f. The out-feed tube handling system shall be capable of handling but welded tubes with length varying from 10 to 25 metres.	**[BIDDER is expected to give technical details and the schematics with operational features to with the TECHNICAL OFFER]**
6.0.0	**MACHINE CONSTRUCTION**		
6.1.0	Ambient Atmospheric Conditions	a. The STBW Machine with all Sub-Systems shall be suitable for operation in an ambient temperature of 25 to 50°C and with a Relative Humidity of 90% (both higher values do not occur simultaneously). b. The ENTIRE EQUIPMENT shall be TROPICALISED in Design and CONSTRUCTION.	
6.2.0	Interlock System for Gas Supply (to avoid process failure)	An air/gas pressure switch to be provided to have an interlock with welding circuit.	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
6.3.0	Electrical Design Aspects	a. The equipment shall be suitable for operation on an input power supply of 415V±10%, 50Hz±3%, 3 Phase, 3 wire (no neutral conductor) system. b. BHEL will provide electrical power supply at one point only and at the above specified potential. Bidder has to include in the scope of supply all the tappings required to meet the machine requirements using control transformers, step-up or step-down transformers , wherever required. c. All electrical motors, limit switches etc, on the machine shall be wired using PVC sheathed screened cable running in conduits and converging to common terminal block . d. External wiring from / to control panel, control desk, external motors etc shall be by means of screened multi-core cables e. Control circuit voltage shall not exceed 110 V. f. All motors shall be of any of the following makes : M/S Siemens / Asea Brown Boveri / GE or other makes conforming to IEC standards g. BIDDER has to mention the total electrical power requirement in kVA, for the complete welding station offered.	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
6.4.0	Pneumatic Circuits	a. Pneumatics forming part of the machine and associated equipment shall be connected by nylon reinforced synthetic rubber and / or steel tubes. b. Pneumatic Circuit to originate from a common point on the Machine and provided with a suitable Filter / Regulator /Lubricator Unit and in addition a hand wheel valve. c. Bidder to give details on the Air Compressor, Refrigerant Air Dryer and Elements forming part of the pneumatic circuitry. d. All pneumatic components shall be of FESTO make. e. The compressed air supplied by BHEL will be at a pressure of 60 PSI to 70 PSI . All pneumatic systems on the machine, dust collector etc shall be designed to operate efficiently at this air pressure. Bidder shall also provide an air booster to maintain the air pressure (if required).	
6.5.0	Machine Operation	The Basic Machine with all the Sub-Systems, Accessories and Attachments are to be designed for user friendly operation in three shifts (8 hour shift) a day and all the 365 Days in a year, with the SUPPLIER recommended PREVENTIVE MAINTENANCNE MEASURES.	
6.7.0	Machine Lighting	Bidder to specify for adjustable type metal halide lamp	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
6.8.0	Hydraulic Circuits & Power Pack - Selection Criteria	Bidder has to comply with the BHEL Terms given in the **ANNEXURE -2** and shall provide Complete Technical Details /Specifications with the TECHNICAL OFFER.	
6.9.0	Chillier 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, . Bidder to give Complete Technical Details of Chilling Units	
6.10.0	Interlock System for Chilling Units – Coolant Flow	Suitable flow censors are to be provided to have an interlock with welding circuit, to avoid failure of flow of cooling medium.	
6.11.0	Safety Guards	STBW Machine to have Safety Guards / Sliding Doors for protection against the arc for the Machine Operators. Safety Doors to have visible glasses for clear vision during welding. Bidder to submit details on this arrangement.	
6.12.0	Machine Maintenance	a. The machine configuration and element arrangement should have easy accessibility, higher rigidity, self-aligning / fitting, locking & piloting arrangement of machine components and modules with easy trouble shooting features, to ensure a 'maintenance free' (little / almost nil maintenance) concept. b. Programming Tool for on line Trouble Shooting in Machine PLC - Bidder to specify	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
6.13.0	Painting	a. The heavier machine parts are to be heat-treated after fabrication (including castings and forgings) and shot blasted or chemically cleaned for surface preparation prior to painting. b. One coat of Primer with 25 microns of DFT (Dry Film Thickness) and 48 hours of compulsory curing after painting. c. Two coats of Poly-Urethane /Enamel Paint (Colour – Apple Green – RAL 6011) each with 25 microns of DFT and intermittent curing of minimum 16 hours d. All unpainted surfaces shall be protected from rust during transit	
7.0.0	**OPTIONAL ITEMS / ACCESSORIES**		
7.1.0	**Pre-Heating Unit**	A suitable tube pre-heating unit to be offered with modular type induction coil heating arrangement, so as to reach a temperature of 200 Deg. C. Associated temperature setting and display units are to form part of the supply. Technical Details are to be provided.	
7.2.0	**Buffing Unit**	A suitable buffing unit to do buffing on the outer surface of the tube, so that the edge-chamfered tubes will have better earthing (for better earth contact), just before welding.	
7.3.0	**Set of Service Tools**	Bidder to list and quote for Set of Service Tools for maintenance and day-to-day operation.	
7.4.0	**Tungsten Grinding Machine**	Bidder to specify the make and technical details with price offer for the Tungsten Electrode Grinding Machine (including consumables and spares)	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
8.0.0	**MACHINE SPARES**		
8.1.0	COMMISSIONING SPARE PARTS	a. The Supplier shall LIST DOWN with the OFFER, the complete set of replaceable parts / items / components coming in the STBW Machine and other Sub-Systems / Accessories / Attachments and shall QUOTE the Unit Price for each item. b. BHEL will procure almost all parts listed under the above category [which will be required to be used during the machine commissioning] with the STBW Machine.	
8.2.0	OPERATING SPARES	Bidder has to COMPULSORILY quote for the following items with the OFFER : a. Mechanical wearing components due to linear movement and rotation, etc. [Each 4 Nos.] b. Spares for Hydraulics Power-Pack viz., 'O' rings, Sealing Rings, Hydraulic Valve 'O' rings, etc.. [Each 4 Nos.] c. Electrical & Electronic Items:- PCB & PLC I/O Card, Digital to Analogue Card, CPU Card, HMI, Field Sensors (such as Encoders, Optical Sensors, Proximity Switch, Limit Switch), Display Unit, etc. [Each 4 Nos.]	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
9.0.0	**MACHINE INSPECTION & ACCEPTANCE**		
9.1.0	Machine Performance Testing and Acceptance	1. The STBW and Accessories shall be tested for its performance prove-out as per BHEL Specifications, at the Supplier's Works prior to despatch. 2. Welding trials have to be done with a minimum of 15 tube samples (each with Carbon Steel and Alloy Steel, SS material) – tube sizes selected will be based on a mutually agreeable criterion. These tube joints shall also be subjected to post weld heat treatment in the machine itself. 3. The sample welded joints should pass through the Radio-graphic Test and satisfy the requirements of BHEL. 4. Monitoring of Process Parameters by the Computer in the STBW Machine for 10 consecutive weld joints, shall not deviate by 5 %. 5. Bidder to provide the facility for printing out the FORMAT containing the Weld Monitoring Data like Date, Job No., Part No., Parameters, etc.	
10.0.0	**ERECTION & COMMISSIONING**		
10.1.0	Mechanical Erection	Erection of the Equipment will be done by BHEL under the supervision of Supplier's SERVICE ENGINEERS and as per the guidelines furnished in the Erection Manual. Erection Schedule is to be given by the Supplier	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
10.2.0	Commissioning	Commissioning of the Equipment and Smooth Functioning of all the Sub-Systems (at BHEL Works) shall be the RESPONSIBILITY of the Supplier.	
10.3.0	Performance Prove-Out	After the successful commissioning of the welding station including all sub-systems, the COMMISSIONING ENGINEER and the APPLICATION ENGINEER of the Supplier have to establish the Performance Prove – Out for the Machine's Capability and the Production Rate expected from the Machine, as given under the **Specification Clause Sl.No. 2.0.0**	
11.0.0	**MACHINE DOCUMENTATION**		
11.1.0	O & M Manuals	a. Six Copies of the Operation & Maintenance Manual to be given in Hard Bound Paper Copies with three copies in CD form (SOFT COPY) b. One Hard Copy of O & M Manual shall be submitted at the time of INSPECTION of the STBW Machine by BHEL Officials, at the Supplier's Works. c. The following documents and details [given under the **Clause Sl. No. 11.2.0**] shall form part of the Operation & Maintenance Manual	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
11.2.0	Documents and Technical Details	a. GA (General Arrangement) Drawing of the STBW Station. b. GA Drawing of Individual Mechanisms. c. Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose.. d. Electrical Wiring Drawings – Power & Control Circuits e. Pneumatic/Hydraulic Circuit Diagram in hard & soft copy. f. PLC Ladder Diagrams (Soft Copy) with Flash Memory Card for machine operation logic backup. g. PLC Ladder Diagrams (Hard Copy) h. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls in CD. i. Alarm Log, Error Code, Error Messages & Remedies and On-Line Fault Diagnostics to be provided. j. PLC Programming Tool: On-Line Troubleshooting, Software Modification, Upload and Down-load of Programs. k. PLC of Allen Bradley, Siemens, Fanuc is only required. l. Fault diagnostics and remedies and on line sequence of operations should be displayed in HMI unit. m. Flash memory card for CPU of PLC to be ensured.	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
11.2.0	Documents and Technical Details [….contd..]	n. Specifications/Ratings of All Bought-Out-Items. p. Warranty / Guarantee Card for all Bought-Out-Items. q. Trouble Shooting Chart for Main and all Sub-Systems. r. Machine related PC Details – Machine Operating Softwares, Parameters Selection Software, File Handling, and Display Recording. CD Read and Write unit, Serial and USB Ports to be ensured. s. UPS (Uninterrupted Power Supply) is required for 1 hour back up time for PC and PLC datas. t. Total weight of the Machine & Sub-Systems.	
12.0.0	**TRAINING**	a) The Supplier shall train three of BHEL Engineers in the Operation, Trouble Shooting and Maintenance of the STBW Machine at the Supplier's Works for a minimum period of 10 Working Days, after the INSPECTION of the Equipment. b) The Supplier's Service Engineer / Application Engineer shall train of BHEL Engineers in the Operation, Trouble Shooting and Maintenance of the STBW Machine at BHEL Works for a minimum period of 15 Working Days, after the SUCCESSFUL COMMISSIONING of the Equipment, at BHEL Works.	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER [with technical details]
13.0.0	**TECHNICAL OFFER**	The Technical Offer shall contain the following : a. Complete Scope of Supply, including Main Equipment, Job Handling Unit, All Accessories and Attachments, etc. b. List of Operating Spares, Commissioning Spares, Foundation / Anchoring Materials c. Erection, Commissioning and Performance Prove-Out Details. d. Complete description of all systems & sub-systems forming part of the Straight Tube Butt Welding Station. e. A schematic diagram showing the layout of the machine & associated systems with salient dimensions. f. The operating sequence of the machine with broad outline of various operations involved.	
14.0.0	**PERFORMANCE GUARANTEE**	The Performance of the Total Equipment and/or the Components / Sub-Assemblies / Bought-Out-Items shall be guaranteed for a minimum period of twenty- four months from the date of performance acceptance at BHEL Works.	

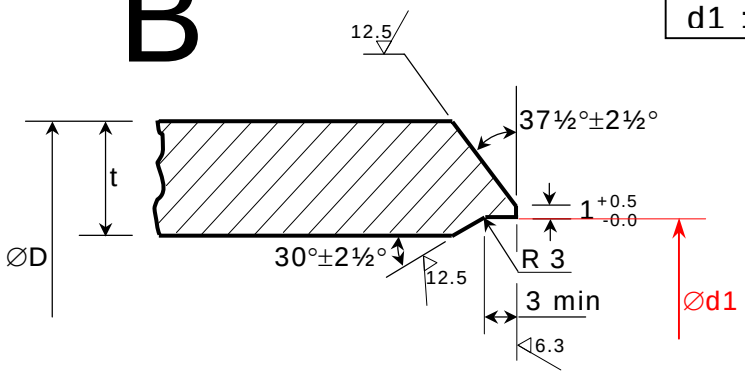
ENCLOSURES :

ANNEXURE – 1 : Edge Preapration Styles
ANNEXURE – 2 : Hydraulic Circuitry Details.

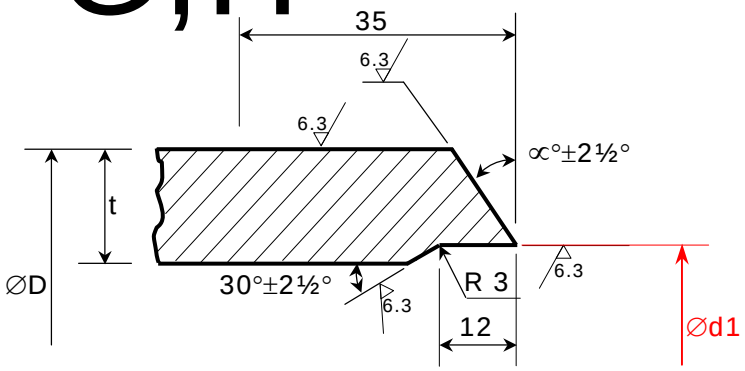
TUBE EDGE PREPARATION DETAILS

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

B

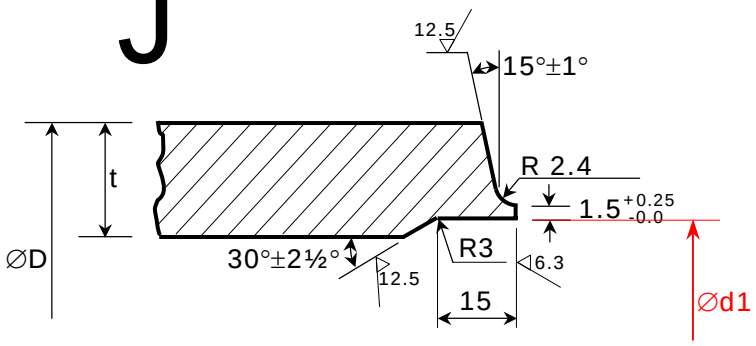


G,H



∝ = 37½° for t≤ 5.6mm
∝ = 45° for t>5.6mm

J



ANNEXURE - 2

HYDRAULICS DESIGN and CONSTRUCTION *: -*

1. All the power packs, manifold/valve cartridges, pressure & flow regulation stations are to be separately kept away from the machine. The cylinders, hydraulic heavy pressure joints are to be ensured with welded nipple joints.

2. Provisions and suitable clamping are to be made properly for dampening and arresting the vibrations induced and transmitted to the hydraulic joints.

3. The proposed hydraulic hoses and the joints are to be of metric size with male swivel nut and female adaptor on the cylinder ends with leak proof fittings. No ferrule joints are to be proposed in the hydraulic system.

4. All hydraulic pumps for the power packs should be loaded only during the times of machine operational requirement and to be in the unloaded condition, during ideal running conditions. All hydraulic pumps should have 100% standby provisions.

5. All hydraulic power pack return oil from cylinders, relief valves, hydro motors and other hydraulic valves are to be routed through a common return line to the oil tank. For oil cooling arrangement, the return oil to the tank can be routed through a suitable cooler/chiller unit to maintain the oil temperature below 40/45 °C, as the machine has to work in a TROPICALISED CONDITION throughout the year.

6. The hydraulic valves input oil viscosity and micron level cleanliness has to be clearly mentioned in the offer.

7. As an option, a centrifuge unit for oil, dust and moisture separation has to be offered.

8. All hydraulic components of the power pack such as pump, cylinders, valves, pressure regulators, flow regulators, hydro motors, etc. are to be only of Rexroth, Vickers or Denesion.

9. The details of bought-out items, coming as the internal components of hydraulic unit, have to be given item wise for the procurement of spares [such as oil seals, 'O' rings, all rubber items, cylinders, piston and piston rings, bearings, bushes, etc.] with the main equipment.

10. The hydraulic power pack and other associated elements are to be adequately designed and selected, to enable a smoother operation of the hydraulic cylinders during linear movements and to ensure leak proof working arrangements for a nil failure or a safe sealing, during the machine operation.

11. Since the machine is intended to work in three shifts a day and for all the 365 days in an year, the BIDDER shall give complete details [including detailed schematics] on the hydraulics, with the TECHNICAL OFFER.

[M B] [S R] [W J] [G S] [R Su] [K A] [H R]