



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 7740 / 7653

Email : skaruna@bheltry.co.in,

ajay@bheltry.co.in, prince@bheltry.co.in

Web : www.bhel.com

TWO PART BID

Enquiry Number:

Enquiry Date:

Due date for submission of
quotation:

Tender to be submitted in two Parts

2601700025

23.06.2017

24.07.2017

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	(Indigenous Vendors) Matl. Will be delivered to
10	Retrofitting of existing straight tube butt welding station as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	01 no.	FOR, BHEL, stores, High Pressure Boiler Plant, Tiruchirappalli - 620014

Important points to be taken care during submission of offer

1. Material shall be delivered to (by Indigenous vendors): as stated above.
2. By Foreign vendors: CFR Chennai Seaport / Airport
3. Delivery period required is 5 months from the date of P.O.
4. Commissioning and performance prove out shall be done at BHEL Trichy by the supplier
5. Time period required for commissioning and performance prove out shall be 1 month from the date of intimation by BHEL
6. EMD for this tender Rs. 2,00,000/-
7. Compliance Form No: TRY/IMP/02 & TRY/IND/02A to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.
8. All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.

BHEL's General guidelines / instructions (refer MM/CE/GENL/001- EMD), compliance form and technical specification can be downloaded from BHEL web site <http://www.bhel.com> or from the Government tender website <http://tenders.gov.in> (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference.

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

Devasi
PRINCE DEVASI

Engineer / Capital Equipment / MM

PART– A**QUALIFYING CONDITIONS FOR THE PARTS SUPPLY AND RETROFITTING OF EXISTING STRAIGHT TUBES BUTT WELDING STATION****SCOPE OF WORK:**

The Power Plant Boiler Manufacturing Plant of Bharat Heavy Electricals Limited – (BHEL – A Government of India Undertaking) located in TIRUCHIRAPPALLI in the State of TAMIL NADU, intends to modify the existing Straight Tube Butt Welding Station (STBW) using Pulsed TIG/MIG Welding Process, involving the following works :

1. Installation of a New Tube Holding and Rotating Equipment (where the butt welding of tube joints takes place) by replacing the existing equipment.
2. Installation of a New GTAW/TIG Welding System involving Pulsed TIG Welding process including the PULSATING/OSCILLATING Filler Wire Feeder.
3. Installation of a New MIG/MAG Welding System involving Pulsed MIG/MAG Welding process, replacing the existing welding systems.
4. Integration of the above three systems through a Centralized Control Panel for effecting the welding operation as per the pre-defined weld program, including manual over riding facility for the operating parameters.
5. Interfacing the above mentioned new welding system with the existing raw tube storage and handling system (for a systematic feeding of tubes to the STBW Station).
6. Performance prove-out of the whole welding station as per the Technical Specifications given under PART-B (forming part of this tender).

NOTE: For assessing the work content and inspection of the existing welding stations, a pre-bid technical meeting is possible at BHEL/Tiruchirappalli Works with the Vendors / Bidders during the period **10th JULY, 2017 to 20th JULY, 2017** with prior appointment.

SECTION- 1:

The VENDOR / OEM (Original Equipment Manufacturer) has to compulsorily meet the following Qualifying Criteria to get qualified, for submitting the Technical Bid. Otherwise the technical bid will not be considered.

S.No.	TENDER REQUIREMENTS	VENDOR'S RESPONSE
1.1	The BIDDER / VENDOR (OEM) shall have a minimum of FIVE Years of Continuous Experience in the field of Design, Manufacture & Supply of Custom Built Welding Stations involving Pulsed TIG and/or Pulsed MIG/MAG Welding Processes to Heavy Industries / Manufacturers of Heat Exchangers / High Pressure Boilers / Pressure Vessels. Vendor to indicate the actual number of years of experience in the field.	[Bidders have to submit documentary proof for the claim]

S.No.	TENDER REQUIREMENTS	VENDOR'S RESPONSE
1.2	Only those VENDOR / OEM fulfilling the following conditions are expected to submit offers : Those, who have commissioned in the last 10 years (as on the date of this tender opening) at least THREE Mechanised Welding Stations where Pulsed GTAW or Pulsed MIG/MAG Welding processes are deployed EITHER (i) in at least any one country other than the country of origin to establish vendor's global business activity OR (ii) in India and the referred machines are presently working satisfactorily for more than one year after commissioning (as on the date of this tender opening). The name and contact addresses of the customers of the VENDOR/OEM to whom the above mentioned machines were supplied, to be positively furnished with details.	
1.3	VENDOR / OEM has to submit a PERFORMANCE CERTIFICATE from their Customers in India or from the Customers to whom the machine(s) were supplied outside the Country of Origin, for satisfactory performance of the machine, referred under the above Clause 1.2 above, for a minimum period of one year from the date of commissioning (as on the date of this tender opening). Performance Certificate in Original need to be submitted or the Certificate Scanned Copy may be sent through E-mail directly to BHEL, by the VENDOR's Customer. For obtaining the Performance Certificate, a suggestive format is provided in the ANNEXURE - A.	
1.4	BHEL reserves the right to verify the information provided by the VENDOR /OEM for the referred WELDING STATIONS at their referred Customer's Works. It shall be the responsibility of the VENDOR /OEM to facilitate the visit of BHEL's team at their referred Customer Works. The Travel, Board and Lodging expenses for BHEL Team shall be borne by BHEL. In case the information provided by VENDOR /OEM is found to be false/ incorrect, the offer will get rejected.	

SECTION - 2:

The BIDDERS / VENDORS are expected to provide the following information positively:-

S.No.	TENDER REQUIREMENTS	VENDOR'S RESPONSE
2.1	The BIDDER / VENDOR has to furnish details on the ventures where the VENDOR/OEM has/had working experience with the internationally reputed welding power source suppliers like LINCOLN/USA, MILLER/USA, KEMPPI/FINLAND, FRONIUS/AUSTRIA, OTC/JAPAN, EWM/GERMANY, LORCH/GERMANY, etc., for the technological partnership in the welding systems already supplied & working presently . Reference List of Customers, with complete address, details of contact person, where such mechanised welding systems have been supplied in the past.	
2.2	The VENDOR/OEM shall have the capability for system integration by way of design and technical expertise for the erection and commissioning of the offered system at BHEL, including performance prove-out. Supporting documents need be submitted for scrutiny	
2.3	Details on SERVICE-AFTER-SALES Set-up in India including the Address of Agents / Service Centres in India with associated infrastructure, to be submitted.	
2.4	VENDOR/OEM has to specify the details on the list of Mechanised Welding Stations or any other Type of Automation Equipment supplied to any Division(s) of BHEL (including the Year of Supply & Commissioning). Any adverse remarks or suppression of details might lead to disqualification of the VENDOR/OEM.	
2.5	Any Additional data to supplement the design / manufacturing / system integration capability of the VENDOR/OEM for the subject equipment.	

SECTION – 3:

The BIDDER has to note the following and has to comply with the requirements:

S.No.	TENDER REQUIREMENTS	VENDOR'S COMPLIANCE
3.1	The BIDDER / OEM shall submit the bid in TWO parts. 1. Technical Offer [with filled in PART - A and PART - B] with Commercial Terms and the UNPRICED Portion for the Scope of Supply (item-wise with quantity) 2. Price bid covering the entire Scope of Supply and the charges for Erection & Commissioning .	

S.No.	TENDER REQUIREMENTS	VENDOR'S COMPLIANCE
3.2	The Technical Offer shall contain a comparative statement with Technical Specifications given by BHEL i.e., the Technical Offer shall contain details submitted by the VENDOR/OEM, against each clause of the Technical Specifications. A just 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical offer may lead to disqualification of the Technical Offer.	
3.3	The Technical Offer shall be supported by copies of product Catalogues, Data Sheets and technical details of Bought- Out Items.	
3.4	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.	
3.5	Vendor to note the delivery period required by BHEL as specified in the Commercial terms and conditions.	
3.6	Vendor to note and accept the RISK PURCHASE clause as specified in the Commercial terms and conditions.	
3.7	The VENDOR / OEM shall assure a continuous support for SPARES and SERVICE for TEN Years, from the date of commissioning of the welding system / equipment at BHEL Works. This will be an undertaking by the OEM at the time of release of Purchase Order on the successful bidder.	

ANNEXURE - A**Suggestive Format of PERFORMANCE CERTIFICATE:**

The Performance of the VENDOR's EQUIPMENT should be certified by the customer on **Customer's Letter Head** and submitted along with the TECHNICAL OFFER.

PERFORMANCE CERTIFICATE

1.0	Brief Description of the MECHANISED WELDING STATION / AUTOMATED WELDING WORK CENTRE for which the Performance Certificate is sought / furnished (with Manufacturer's name)	
2.0	Make & Model Number of the Machine	
3.0	Month & Year of Commissioning	
4.0	Application for which The Machine is used	
5.0	Machine Details	
5.1	Number of MIG/TIG Welding Heads	
5.2	Size of jobs handled in the Welding Station.	
5.3	Specification of Materials welded in the subject work-station	
5.4	Details on the Welding Power sources used	
5.5	Details on the PLC / Control Units employed.	
6.0	Performance of the Machine by way of Productivity and Availability (Please tick the appropriate option)	Satisfactory
		Not Satisfactory
7.0	Service After Sales support rendered by the VENDOR / OEM (Please tick the appropriate option)	Satisfactory
		Not Satisfactory
8.0	Other Remarks (if any)	
Date:		Signature & Seal of the Authority Issuing the Performance Certificate

PART - B

TECHNICAL SPECIFICATIONS FOR THE PARTS SUPPLY AND RETROFITTING OF EXISTING STRAIGHT TUBES BUTT WELDING STATION

IMPORTANT NOTES:-

- AA.** The Column **“Vendor’s Offer with Technical Details & Remarks”** in the format given in the following pages shall be filled in by the Vendor and submitted along with the TECHNICAL BID. Inadequate / incomplete, ambiguous or unsustainable information against any of the clauses of the specifications / requirements shall be treated as non-compliance.
- BB. Scope of Work:** - Design, Manufacture, Supply of New Mechanised Welding System and Integration with the Existing Welding Station inclusive of the Erection & Commissioning of supplied Welding Systems – consisting of the following:
1. Installation of a New Tube Holding and Rotating Equipment (where the butt welding of tube joints takes place) by replacing the existing equipment
 2. Installation of a New GTAW/TIG Welding System involving Pulsed TIG Welding process including the PULSATING/OSCILLATING Filler Wire Feeder - Including a Fume Extraction Unit, as welding of exotic metals is planned in the new work station.
 3. Installation of a New MIG/MAG Welding System involving Pulsed MIG/MAG Welding process, replacing the existing welding systems - Including an LPG Pre-Heating Unit for the tube ends being subjected to welding in the new work station.
 4. Integration of the above three systems through a Centralized Control Panel for effecting the welding operation as per the pre-defined weld program, including manual over riding facility for the operating parameters
 5. Interfacing the above mentioned new welding system with the existing raw tube storage and handling system (for a systematic feeding of tubes to the STBW Station)
 6. Performance prove-out of the whole welding station as per the Technical Specifications given under PART-B (forming part of this tender).

S. No.	PARTICULARS	SPECIFICATIONS/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
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 with Hot wire, fed through a Filler Wire Pulsating/Oscillating Unit to minimize the process heat input when taking the butt welding of Alloy 617 Tubes. IMPORTANT NOTE: b) The machine is intended for Tube Build-up to 24 meters with ONE GTAW Head consisting of ONE TIG Torch with ONE Hot Wire Feeders and ONE GMAW Head consisting of TWO MIG Torches with TWO Cold Wire Feeders. c) Scope includes STBW station as described under the Clause BB on Page No. 1 of this specification. d) Welding of tubes of similar or dissimilar materials in steel (like carbon steel to alloy steel, alloy steel to stainless steel, Inconel etc.) e) Welding of tubes of various outer diameters and thicknesses. f) Torch has to be employed, exclusive for TIG/MIG/combination of TIG & MIG welding process and using two/three types of filler wire respectively for different material combination butt-welds. g) The welds produced using the above system should pass Radiography Test (RT) / Ultrasonic Test (UT) as stipulated in ASME Sec. IX, ANSI B31.1, and B31.3 for welding high- pressure tube butt joints of ultra-super critical coal fired thermal power plants.	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION			VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
2.0	JOB DETAILS				
2.1	Nature of Job	Butt welding of only Seamless alloy Steel Tubes / High Nickel Alloy Tubes (All are Outer Diameter controlled tubes with a tolerance of maximum 12% on tube wall thickness)			
2.2	Tube Outer Diameters				
		S.No	OD, in mm	THICKNESS, in mm	Max/Min. ID, in mm
		1	28.0	3 / 5.6	21.60/ 16.80
		2	31.8	4.0 / 4.57	25.40/22.60
		3	33.4	5.59 / 7.11	22.22/19.18
		4	38.1	4.57/5.59/7.11 / 9.65/ 10.67 / 11.0	28.96/16.10
		5	41.3	7.4 / 8.2	26.50/24.90
		6	42.4	4.57 / 5.59 / 6.6 / 7.11 / 7.62 / 8.6 / 9.1	33.26/24.20
		7	44.5	4.19 / 5.59 / 6.1 / 7.11 / 8.1 / 8.7/ 10.92	36.12/22.66
		8	47.63	5 / 6.3 / 8 / 10	37.63/27.63
		9	48.3	6.6 / 8.1	35.10/32.10
		10	51.0	4.19 / 5.59 / 6.6 / 7.62 / 8.64 / 9.6/ 10.0	42.62/31.00
		11	54.0	9.14 / 13.49	35.72/27.02
		12	57.0	4.19 / 7.62 / 8.64 / 9.4/ 12.7/ 14.3/ 15.1	48.62/26.82
		13	63.5	3.81 / 4.19 / 4.57 / 5.59 / 8.64 / 12.7	55.88/38.10
		14	69.85	4.57 / 15.09 / 16.5	60.71/39.67
		15	76.1	4.57 / 5.08 / 5.5	67.06/65.20
2.3	Tube Wall Thickness	Minimum : 3mm Maximum : 16.5mm			

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
2.4	Raw Tube Length	Tubes ends are edge prepared suitable for welding (as given under clause 2.7) before loading on the tube In-feed stands Minimum - 2 meters Maximum - 15 meters	
2.5	Raw tubes – Important Note	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 2 meters will be loaded manually.	
2.6	Tube Material	a) Carbon Steel: SA192, SA210Gr.A1, SA210 Gr.C b) Alloy Steel : SA213 T11, SA213 T22, SA213 T23, SA213 T91, SA213 T92 c) Stainless Steel: Super 304H, SA 213TP321H, SA 213 TP347H d) Inconel: Alloy 617	
2.7	Tube End Edge Preparation Style and Weld Groove Design	a) SA210 Gr.C, SA213 T11, T22 b) SA213 T91 and Stainless Steel / Alloy 617 c) Combination of T91/SS with T22; Super 304H with Alloy 617 45.0Deg for Tube wall thickness up to 5.6 mm 37.5Deg for Tube wall thickness above 5.6 mm [Refer to ANNEXURE for Edge Preparation details]	
2.8	Weld Joint Root Gap	Tube butt joints to be welded WITHOUT ROOT GAP in GTAW and GMAW process.	
2.9	Weld Consumables	a) Grade C, SA213 T11, T22 ER80S-B2 Wire sizes 0.8,1.0,1.2 mm by Pulsed GMAW process b) SA213 T91,T92 ER 90S-B9 Wire sizes 0.8,1.0,1.2 mm by TIG process c) Inconel Alloy ER Ni Fe-7A,ER Ni Cr-3 Wire Sizes 0.8,1.0,1.2 mm by Pulsed GTAW process in Wire Oscillation/Pulsating Mode	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
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 15m length. Bidder has to confirm and to be proved out including tube loading & handling. 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 24m. 60 joints/shift of OD 47.63mm x Th 6.0mm SA 213 T91 with 1.2 mm ER 90S-B9 wire by Pulsed Hot wire GTAW process to build a length of 24 m.	
4.0	QUALITY OF WELD JOINTS		
4.1	Quality testing	The welds produced using the above system should pass Radiography Test (RT) / Ultrasonic Test (UT) as stipulated in ASME sec. IX, ANSI B31.1, and B31.3 for welding high- pressure tube butt joints of power plant. The tube weld joints are tested by online Real Time Radiography or Film radiography.	
5.0	WELDING MACHINE CONFIGURATION		
5.1	Dual headstock	Welding lathe with dual headstocks driven by one AC servo motors with variable chuck rotation speed of 0.6 to 6 rpm to ensure synchronised rotation of both tubes clamped between chucks.	
5.2	Three Jaw Chuck	Both headstocks fitted with three jaw self-centring chucks equipped with actuating pneumatic cylinder to hold and rotate the tubes having diameter range from 28 to 76.1 mm. BHEL will supply 4.5 to 5 kg/sq.cm air pressure in ¾ inch Tube for pneumatic system. Vendor to specify a suitable Booster, if required.	
5.3	Tube Rotation speed	Variable Tube rotation speed for Butt Welding Operation 0.6 RPM to 6.0 RPM (Synchronized rotation of the two tube clamping chucks are to be ensured)	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
5.4	Movable Headstock	One headstock shall be fixed and the other headstock shall be movable along the bed. This horizontal movement of the movable headstock should be pneumatically operated and its action should be programmable through PLC. The distance between chucks shall be adjustable from 350 to 400 mm	
5.5	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 as mentioned under clause 2.5.	
5.6	Speed of Rotation Accuracy 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)	
5.7	Tube Rotation drive	AC Servo Drive. Motor rating and controller rating greater than 1.5 Nm. Bidder to Specify the make and rating.	
5.8	Tube Clamping	a) Bidder to Specify the type of tube clamping in chuck (Hydraulic / Pneumatic / Electrical) b) 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.	
5.9	Machine Lifting Stroke	Vertical stroke of 30 mm or more for aligning the tube centre of various diameters on roller stand. Bidder to Specify the stroke.	
5.10	Machine Lifting Mechanism	By motorized gear box with stay foot. Bidder to Confirm.	
5.11	Welding Return Current Collector	Bidder to give Technical Details on the weld current return rings on each chuck. Bidder to provide a sketch.	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
5.12	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.	
5.13	Machine Mounted Arc Shield	The Weld zone shielding door has to protect the air flow with large size Welding shield glass. 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.	
6.0	WELDING HEADS IN GTAW AND GMAW PROCESS		
6.1	Number of Weld Head	GTAW – Hot Wire Welding Process GMAW – MIG/MAG Solid Wire Welding Process	
6.2	Number Torches / Wire Feeders	GTAW Process: ONE GTAW Torch with ONE HOT WIRE Feeders GMAW Process: TWO GMAW Torches with TWO Wire Feeders [Preferably all the wire Feeder sheath to be positioned in a single line with PLC controls]	
6.3	Positioning of Weld Head/wire Feeder sheath head.	a. The Weld head has to be preferably in the centre such that the time taken for moving the selected wire Feeder sheath horizontally will be minimum. b. Quick positioning of wire Feeder sheath head for the selected wire to be engaged. c. By Pneumatic and AC Servo System for quick up-down movement with creep speed. d. The time taken by the wire Feeder sheath head to move to home position and back to the weld position shall not exceed 5 seconds	
7.0	VERTICAL SLIDE UNIT FOR GTAW AND GMAW PROCESS		
7.1	Type	AC Servo Motorized / Pneumatic. Motor rating and controller rating not less than 1 Nm– Bidder to Specify	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
7.2	Vertical Stroke	AC servo motor controlled vertical slide assembly unit for moving the torch and entire wire Feeder sheath head vertically in Z -axis with inbuilt sensors for end position sensing. [Stroke length 300mm / Max Speed: 1000 mm/min). Bidder to Specify the stroke of the Torch and entire wire Feeder sheath head.	
7.3	Stroke of each wire Feeder sheath head	Up/Down stroke of the torch to be Pneumatically operated. Fine adjustment shall be Motorized.	
7.4	Fine Adjustment	Fine adjustment to be provided by Joystick Bidder to Specify the fine adjustment stroke.	
7.5	Height Adjustment	The position of the TIG torch tip for different diameters to be adjustable such that the torch will not collide with the tube.	
7.6	Interlock for collision	Fool proof arrangement to be provided such that the torch shall not descend over the chuck and collide.	
7.7	Vertical guide ways	Vertical individual wire Feeder sheath head sliding guide-ways shall be of steel or LM guide-ways. It should be provided with slim and compact head. Aluminium or any other metal is not acceptable.	
8.0	HORIZONTAL SLIDE UNIT FOR GTAW AND GMAW PROCESS		
8.1	Type	AC Servo Motorized / Pneumatic. Motor rating and controller rating not less than 1 Nm – Bidder to Specify	
8.2	Movement of Torch and Positioning of wire Feeder sheath head.	AC Servo Motor controlled horizontal slide assembly unit for moving the torch and wire Feeder sheath head with selected wire along the tube axis with inbuilt sensors for end position sensing. [Stroke length 300mm / Max Speed: 2500 mm/min].	
8.3	Horizontal Stroke	Bidder to Specify the stroke of the entire head mounted with Torch and of wire Feeder sheath heads.	
8.4	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	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
8.5	Horizontal guide ways	Horizontal Torch and wire Feeder sheath head sliding guide-ways shall be of steel or LM guide-ways. It should be provided with slim and compact head. Aluminium or any other metal is not acceptable. Ball screws to be used in case of motorized movement.	
8.6	Oscillation Function	Bidder to give Technical Details	
8.6.1	Oscillation frequency	6 to 200 cycles / minute	
8.6.2	Oscillation Width	0 to 40 mm (20 mm on either side of the centre of joint)	
8.6.3	Dwell Time at Both Ends	0 to 9.9 sec (Separately Adjustable)	
9.0	POWER SOURCE FOR PULSED GTAW WITH ACCESSORIES		
9.1	Type	Inverter Controlled (IGBT Based) - DC Welding Power Source with CC/CV characteristics and with high frequency start.	
9.2	Make	M/s. EWM – Germany or M/s TIP TIG International - Switzerland	
9.3	Model	Bidder to Specify	
9.4	Current Rating	360 A @ 100% duty cycle; 450 A@ 60% duty cycle.	
9.5	H F Unit for TIG Welding	Bidder to give Technical Details	
9.6	GTAW Torch Make	Binzel / Bernard	
9.7	Tungsten Electrode Size	Diameter : 2.0 / 2.4 / 3.2 mm	
9.8	Cooling system	Water Cooled-Chiller refrigerant type	
9.9	AVC Function for TIG Welding	Bidder to furnish Technical Details	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
9.10	Operating Features	a) Standard and Pulsing current mode selection facility.	
		b) Straight DC current.	
		c) Pulsing current.	
		d) Adjustable base and peak current.	
		e) Adjustable upslope and down slope	
		f) Current pulse frequency range	
		g) Digital display of current and voltage as well as Hot wire feed rate, hot wire current.	
9.11	Interlocks required in this System should stop and give alarm in the event of stoppage of	a) Shielding gas flow	
		b) Cooling water supply- Chiller refrigerant type	
		c) Hot wire feed	
		d) Chuck rotation	
		e) Oscillation	
		f) AVC function	
10.0	POWER SOURCE FOR HOT WIRE AND FEEDER		
10.1	Power Source Type	Inverter Controlled (IGBT Based) Welding Power Source for continuous and Pulsed feeding of Hot wire.	
10.2	Make	M/s. EWM – Germany or M/s TIP TIG International - Switzerland	
10.3	Model	Bidder to Specify	
10.4	Rating	a. Current : 140 A or more b. Voltage : 15-36 V	
10.5	Duty Cycle	100% or more	
10.6	Hot Wire Feeder	Continuous feeding and Pulsed feeding. 0 to 10 m/min and 150 Hz(Variable)	
10.7	Guide assembly	Hot wire guide assembly attached to GTAW torch. GTAW torch equipped with hot wire guide with pneumatic positioning mechanism.	
10.8	Feeder Motor Capacity	Bidder to Specify	
10.9	Weight of Wire Spool	Suitable for loading 25kg Wire Spools. Bidder to Confirm	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
10.10	Tilting adjustment	Tilting adjustment to be provided to complete torch unit including hot wire assembly.	
10.11	Offset adjustment	Offset adjustment provided to complete Torch unit including hot wire assembly.	
10.12	Wire size	Wire diameters to be accommodated: 0.8,1.0 and 1.2 mm.	
10.13	Wire material	Wire material to be accommodated: carbon steel, stainless steel and Inconel. [Wire Spool diameter: 300 mm as per AWS 5.18.]	
10.14	Connections	Set of wire sheaths and sheath connections.	
10.15	Scope of Supply	Complete cable bundle with Power cable, Water hose, AVC, oscillation, wire and gas.	
11.0	POWER SOURCE FOR SYNERGIC PULSED GMAW		
11.1	Type	Inverter Controlled (IGBT Based) Welding Power Source for Synergic Pulsed GMAW	
11.2	Make	OTC DAIHEN CORPORATION, Japan	
11.3	Process	Synergic Pulsed GMAW preprogramed for 0.80, 1.0, 1.2 mm Wire of CS, AS & SS with gas shielding [Argon (95-98%) +CO ₂ (5-2%) Mix]. Gas mixture unit digital type is preferable.	
11.4	Model	Bidder to Specify	
11.5	Rating	a. Current : 350 A or more b. Voltage : 15-36 V	
11.6	Duty Cycle	100%	
12.0	GTAW WELDING TORCH		
12.1	Type	Water Cooled	
12.2	Make	Binzel /Bernard	
12.3	Model	Bidder to Specify	
12.4	Rating	400 A or more @ 100% Duty Cycle	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
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	
12.7	Electrode type	Ceriated	
12.8	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	
13.0	GMAW WELDING TORCH		
13.1	Type	Water Cooled	
13.2	Make	Binzel / Bernard	
13.3	Model	Bidder to Specify	
13.4	Rating	450 A or more @ 100% Duty Cycle	
13.5	Wire size	Torch fitted with Accessories for 0.8, 1.0, 1.2 mm steel wire.	
13.6	Wire feed speed	0 to 8m/min (variable from 0 to maximum)	
14.0	GTAW WIRE (HOT WIRE) FEEDER -1 No.		
14.1	Type	Bidder to Specify type & rating	
14.2	Make	M/s. EWM – Germany or M/s TIP TIG International - Switzerland	
14.3	Model	Bidder to Specify	
14.4	Wire size	0.8, 1.0 and 1.2 mm.	
14.5	Wire Feed Speed	0 to 15 m/min (Variable)	
14.6	Feeder Motor Capacity	Bidder to Specify	
14.7	Drive	4-Roll Drive (Rollers to be suitable for Dia 0.8mm/1.0mm/1.2mm wires)	
14.8	Weight of Wire Spool	Suitable for loading 25kg Wire Spools. Bidder to Confirm	
14.9	Scope of Supply	Bidder to Confirm supply of complete unit with cables, gas hoses, end connectors & protective sheath	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
15.0	GMAW WIRE FEEDER – 2 Nos.		
15.1	Type	Bidder to Specify type & rating	
15.2	Make	Bidder to Specify	
15.3	Model	Bidder to Specify	
15.4	Wire size	0.8,1.0,1.2 mm	
15.5	Drive	4-Roll Drive (Rollers to be suitable for 0.8mm wire)	
15.6	Wire Feed Speed	8 m/min or more (variable from 0 to maximum)	
15.7	Feeder Motor Capacity	Bidder to Specify	
15.8	Weight of Wire Spool	Suitable for loading 25kg Wire Spools. Bidder to Confirm	
15.9	Scope of Supply	Bidder to Confirm supply of complete unit with cables, gas hoses, end connectors & protective sheath and Feed Rolls for 0.8,1.0,1.2 mm wire.	
16.0	TORCH ACCESSORIES		
16.1	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	
17.0	WATER CHILLER UNIT FOR GTAW & GMAW TORCHES		
17.1	Bidder to Specify the Design Parameters	a) Type – Refrigerant type water chiller	
		b) Water Chiller Cooling Capacity (in Tons of refrigeration)	
		c) Tank Capacity – more than 10 litres preferred	
		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	
		g) Chiller cooling system should be direct type with inbuilt safety measures to be incorporated with indication lamp.	
17.2	Operating Features	Cooling water flow sensor & interlocks to ensure fool-proof flow of water. Welding should stop automatically in case there is any interruption in cooling water flow.	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
18.0	GAS MIXING UNIT		
18.1	Make and Model	Make: Preferably Gentec. Any other make acceptable to BHEL. Bidder to Specify the make and model quoted. Digital gas mixer is preferable.	
18.2	Gases to be mixed	Argon and CO ₂	
18.3	Mixing Ratio	Argon : 95 - 98% CO ₂ : 5 - 2%	
18.4	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	
18.5	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 0.8,1.0 and 1.2 mm wire, j) Tip Adapters & Ferrules	
19.0	PRE-HEATING ARRANGEMENT		
19.1	Requirement	Tube joints of SA213 T 91 / T92 / T23 require pre-heating upto 200 deg C	
19.2	Method of heating	Heating shall be through LPG from industrial cylinder or pipeline supply (under BHEL Scope).	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
19.3	Arrangement	Suitable nozzle for heating tube joint prior to welding to be provided. The nozzle to be suitably located such that the nozzle moves up and down vertically OR front and back horizontally from behind. The nozzle to be positioned between chucks to heat the tube at the joint location. The movement may be achieved by electric motor (rack and pinion). Bidder to explain the arrangement.	
19.4	Interlock	The gas nozzle shall retract back as soon as the welding torch starts to advance for welding.	
19.5	Ignition	The gas shall be manually ignited. The regulator may be provided separately. Handheld gas ignitor may be provided. 5m Hose and regulator to be provided with the machine.	
20.0	CONTROL SYSTEM		
20.1	Type	Industrial PC based PLC. Bidder to Confirm.	
20.2	Make	Bidder to Specify the Make of the PLC Control System. Preferred make – Fanuc / Siemens / Mitsubishi or Any other reputed makes acceptable to BHEL	
20.3	Model	Model (suitable and latest version, as available at the time of purchase order placement, shall be supplied).	
20.4	HMI / MDI	Touch Screen Panel. Bidder to Specify the Make and Model with 15 inch or more of panel size.	
20.5	Communication	Bidder to Specify.	
20.6	Memory	Sufficient Memory to store and recall programmed data of minimum 500 programs.	
20.7	Technical Features	Control should include all interlocks, manual, semi auto and auto.	
20.8	Controls / Meters	All ammeters, voltmeters, gas flow meters shall be located near the operator control station	
20.9	All controls	All controls for the In-Feed & Out-Feed conveyors, hydraulic/pneumatic unit & other peripheral units should be available the operator control station.	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
20.10	Laptop	Latest version Laptop with pre-loaded software for PLC for maintenance to be supplied with the machine – 1 No	
20.11	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.	
20.12	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 10 joints or more in a row to build up one tube length of up to 24 metres. 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.	

S. No	PARTICULARS	SPECIFICATION/DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
20.13	Pre-heating cycle / To observe weld	Provision for rotating the tube before welding for pre-heating by LPG and one rotation after welding for visual check of welding. This may be programmable.	
20.14	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 LPG and subsequent welding by MIG/TIG process to be possible.	
21.0	FAULT DIAGNOSTIC SYSTEM		
21.1	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.	
21.2	Help guide	Help guide should be provided to use both diagnostic systems. Bidder to Confirm	
22.0	GTAW - WELDING PROGRAMMABLE DATA (COMMON TO ALL PASSES)		
22.1	TIG Welding facility will be used for welding and also for pre-heating.	Bidder to Confirm	
22.2	Program Number	Bidder to furnish range	
22.3	Gas Pre-Flow & Post-Flow Time	Bidder to Specify	
22.4	Initial Current	Bidder to Specify	
22.5	Initial Current Time	Bidder to Specify	
22.6	Current Up-Slope & Down-Slope Time	Bidder to Specify	
22.7	Tube Revolution Start & Stop Delay Time	Bidder to Specify	
22.8	Wire Feed Start & Stop Delay Time	Bidder to Specify	
22.9	AVC Delay Time	Bidder to Specify	
22.10	Oscillation Delay/Dwell Time at both ends independently adjustable.	Bidder to Specify	
22.11	Crater Current	Bidder to Specify	
22.12	Crater Current Time	Bidder to Specify	

S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
23.0	GTAW WELDING PROGRAMMABLE DATA (FOR EACH PASS)	
23.1	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 i) Filler Wire Pulsating Frequency	Bidder to furnish details
23.2	Tube Revolution Speed	Bidder to Specify
23.3	Weld Bead Oscillation Width	Bidder to Specify
23.4	Weld Bead Oscillation Speed	Bidder to Specify
23.5	Weld Bead Oscillation Dwell Time on both ends (Independently adjustable)	Bidder to Specify
23.6	Overlap Angle – Variable and programmable	Bidder to Specify
23.7	Overlap Speed – Variable and programmable	Bidder to Specify
23.8	Torch Shift per revolution of weld	Bidder to Specify
23.9	Torch shift speed	Bidder to Specify
24.0	GTAW FINE ADJUSTMENT OF WELDING PARAMETERS (DURING WELDING)	
24.1	Fine Adjustment of Torch centering /Vertical position / Parameters while welding is in progress	Bidder to Confirm
24.2	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
24.3	Fine adjustment must be only by knob or joy stick not by numerical inputs.	Bidder to Confirm
24.4	TIG Welding parameters	Bidder to furnish range
24.5	Pulse Current	Bidder to Specify

S. No	SPECIFICATIONS / DESCRIPTION		VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
24.6	Base Current	Bidder to Specify	
24.7	Tube Revolution Speed	Bidder to Specify	
24.8	Torch Oscillation Width	Bidder to Specify	
24.9	Torch Oscillation Speed	Bidder to Specify	
24.10	Provision of display of wire feed rate	Bidder to Confirm	
24.11	Filler Wire Feed Speed	Bidder to Specify	
24.12	Filler Wire Pulsating Frequency : 1 Hz to 15 Hz	Bidder to Specify	
25.0	GMAW WELDING PROGRAMMABLE DATA (COMMON FOR ALL PASSES)		
25.1	Program Number	Bidder to furnish range	
25.2	Gas Pre-Flow & Post-Flow Time	Bidder to Specify	
25.3	Initial Current	Bidder to Specify	
25.4	Initial Current Time	Bidder to Specify	
25.5	Current Up-Slope & Down-Slope Time	Bidder to Specify	
25.6	Initial Voltage	Bidder to Specify	
25.7	Arc Start Delay Time	Bidder to Specify	
25.8	Tube Revolution Start Delay Time	Bidder to Specify	
25.9	Oscillation start Delay Time	Bidder to Specify	
25.10	Crater Current	Bidder to Specify	
25.11	Crater Current Time	Bidder to Specify	
25.12	Crater Voltage	Bidder to Specify	
25.13	Burn-Back Control to avoid globule formation on wire tip	Bidder to provide details	
25.14	Synergic MIG welding Program based on wire diameters 0.8 mm for CS/AS/SS.	Bidder to Specify	
25.15	Any other feature required to result in a defect free weld joint as seen in Real Time Radiography test.	Bidder to Specify.	

S. No	SPECIFICATIONS / DESCRIPTION		VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
26.0	GMAW WELDING PROGRAMMABLE DATA (FOR EACH PASS)		
26.1	Pass Number	Bidder to furnish range	
26.2	Welding Pulse Current	Bidder to Specify	
26.3	Welding Voltage	Bidder to Specify	
26.4	Tube Revolution Speed	Bidder to Specify	
26.5	Overlap Angle for each pass –Variable and programmable	Bidder to Specify	
26.6	Overlap speed for each pass –Variable and programmable	Bidder to Specify	
26.7	Oscillation Width	Bidder to Specify	
26.8	Oscillation Speed	Bidder to Specify	
26.9	Oscillation Dwell Time on both ends (Independently adjustable)	Bidder to Specify	
26.10	Torch shift for each pass – Variable and adjustable. Provision for Torch centre shifting during welding in progress.	Bidder to Specify	
26.11	Torch shift speed	Bidder to Specify	
26.12	Crater Pulse Current	Bidder to Specify	
27.0	GMAW FINE ADJUSTMENT OF WELDING PARAMETERS (DURING WELDING)		
27.1	Welding Current	Bidder to Specify	
27.2	Welding Voltage	Bidder to Specify	
27.3	Tube Revolution speed	Bidder to Specify	
27.4	Torch Oscillation Width	Bidder to Specify	
27.5	Torch Oscillation Speed	Bidder to Specify	
28.0	WELDING FUME EXTRACTION UNIT – 1 No.		
28.1	Purpose : Removal of Welding Fumes generated during the welding operation and Release to Shopfloor after total filtration of toxic elements and undesired gases	Bidder to Confirm	
28.2	Make of Fume Extractors : Only of LINCOLN ELECTRIC/USA, KEMPER/GERMANY, ESAB/SWEDEN, NEDERMAN/SWEDEN, MILLER/USA, MECHON/UK, FUMEX AB/SWEDEN	Bidder to Specify	

S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
28.3	Filter Method : TWO stage	Bidder to Confirm
28.4	Type of Filter : Disposable Filter	Bidder to Confirm
28.5	Filter Surface : Minimum 15 sq. mtrs	Bidder to Specify
28.6	Filter Efficiency : Minimum 99%	Bidder to Specify
28.7	Filter Material : Non-Woven Fibre	Bidder to Confirm
28.8	Additional Filters : Pre=filters desired	Bidder to Confirm
28.9	Welding Fume Separation Class : W3	Bidder to Confirm
28.10	Performance Testing Code : DIN EN ISO 15012-1 (2005)	Bidder to Confirm
28.11	Electric Motor Power	Bidder to Specify
28.12	Noise Level : Less than 75 dB (A)	Bidder to Specify
28.13	Extraction Capacity : Around 1000 cubic metre/hour	Bidder to Specify
28.14	Position : Suitably fitted in the Workstation without affecting the Operators' function	Bidder to Specify
28.15	Power Supply : To be taken from the centralised supply unit with ON/OFF control on the Panel	Bidder to Confirm
29.0	PNEUMATIC SYSTEM:	
29.1	The pneumatic operated elements of the machine shall work efficiently with BHEL compressed air supply at a pressure of 4.5 to 5.0 kg/cm ² in ¾ inch line.	Bidder to Confirm
29.2	If higher air pressure is required for efficient operation of the machine, Bidder shall furnish the information for Air Compressor/Booster of suitable capacity.	Bidder to Specify
29.3	Bidder to Specify the total air volume required for efficient operation of the complete machine.	Bidder to Confirm
29.4	Refrigerated Air Drier to be provided to eliminate moisture content from the compressed air at the designed flow and pressure rating.	Bidder to Confirm
29.5	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

S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
29.6	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
29.7	Pneumatic components shall be of FESTO/SMC/PARKER.	Bidder to Specify
30.0	ELECTRICAL & ELECTRONICS SYSTEMS	
30.1	415 V 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
30.2	Tropicalization: All electrical / electronic equipment shall be tropicalized.	Bidder to Confirm
30.3	Control circuit voltage shall not exceed 24V DC	Bidder to Confirm
30.4	All electrical components in the cabinets should be mounted on DIN Rail	Bidder to Confirm
30.5	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
30.6	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
30.7	Bidder should ensure the proper earthing for the machine and its peripherals.	Bidder to Confirm
30.8	Cables shall be routed through totally enclosed cable trays. There shall not be cable trenches.	Bidder to Confirm
30.9	All electrical & electronic control cabinets & panels should be vermin and dust proof. All Electric enclosures shall have IP 54 protection	Bidder to Confirm

S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
30.10	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- Energy Efficient Motor)	Bidder to Confirm
30.11	All electrical items shall be of from SEW / ROCKWELL Allen Bradley/ Telemecanique/Siemens/L&T/ABB or reputed makes acceptable to BHEL.	Bidder to Confirm
30.12	All the motor control variable frequency drives should have input and output chokes with brake resistor.	Bidder to Confirm
30.13	All indication lamps should be provided with LED Indication Lamp.	Bidder to Confirm
30.14	All components/devices/terminals are to be incorporated with numbered ferrules.	Bidder to Confirm
30.15	External wiring from / to control panel, control desk, external motors etc shall be by means of screened multi-core cables.	Bidder to Confirm
30.16	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
30.17	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
30.18	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 are to be submitted with the offer.	Bidder to Specify

S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
30.19	Suitable Servo Voltage stabilizer for Butt Welding Machine & Ultra isolation transformer for programmable controls shall be quoted for each machine separately.	Bidder to Confirm
31.0	MACHINE LIGHTS	
31.1	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
31.2	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Bidder to Confirm
32.0	MACHINE FOUNDATION& DRAWING APPROVAL:	
32.1	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
32.2	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
32.3	BHEL shall design and construct complete foundation for the machine as per the Bidder's recommendation	Bidder to Confirm
32.4	Complete anchoring system including foundation bolts, anchoring materials, fixators, levelling shoes, chemical for anchoring etc should be supplied	Bidder to Specify

S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]	
33.0	MACHINE SPARES:		
33.1	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	
33.2	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	
33.3	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	
33.4	Welding Accessories spares such as Contact tips, Gas nozzles, Tip adapters, other spares for at least 12 months continuous operation shall be provided.	Bidder to Confirm	
33.5	Spare Torches, Torch cables/ Wire feed conduits, rollers might be offered.	Bidder to Confirm	
33.6	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	
33.7	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	
33.8	A set of Service Tools for dismantling and assembling of machine components such as roller sets etc. may be quoted.	Bidder to Confirm	

S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
34.0	DOCUMENTATION:	
34.1	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 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. Pneumatic circuit diagrams with bill of materials 9. Maintenance & Interface manuals for Machine Control System 10. Preventive Maintenance check list for Electrical and Mechanical System 11. Trouble shooting chart for Main and all sub systems 12. Complete PCB Schematics indicating check points for Electronic controls. 13. Catalogues, O&M manuals for all bought out items used in the machine. 14. Operating Manuals, Maintenance Manuals & Catalogues for all supplied Accessories. 15. Detailed specification of all rubber items /pneumatic / lubrication fittings 16. PLC program print-outs with comments in English 17. PLC program and data on CD, Flash Memory Card. 18. 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. 19. Complete list of Alarm log, Error code, error messages & remedies and on line fault diagnostics to be provided by the Bidder. Complete list of spares for machine, along with item part no /specification / type / model and make & address of the sub-Bidder.	

S. No	SPECIFICATIONS / DESCRIPTION		VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
35.0	MACHINE PRE-DISPATCH INSPECTION & ACCEPTANCE AT SUPPLIER'S WORKS:		
35.1	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	
35.2	All systems of the machine have to be operated and demonstrated to the BHEL Engineers in proper working condition.	Bidder to Confirm	
35.3	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	
35.4	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	
35.5	Supplier has to arrange for conducting Radiography test on joints and will be evaluated as per BHEL quality standards given in Annexure-1. All the joints should pass the test.	Bidder to Confirm	
35.6	The welded tubes are to be returned back to BHEL along with the machine consignment.	Bidder to Confirm	
36.0	PROVE-OUT AND ACCEPTANCE AT BHEL WORKS:		
36.1	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	Quality test: The following joints have to be produced without defects as per the quality standards in Annexure-1: a) OD 44.5mm x Th. 8.0mm / SA210 Gr. C with 0.8mm ER70S-A1 wire by Pulsed GMAW process-10 Joints	Bidder to Confirm	

S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
36.2	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 d) Inconel Alloy tubes if available during commissioning may be welded with ER Ni Fe-7A, ER Ni cr-3 with wire sizes 0.8,1.0,1.2 mm by GTAW process-10 joints for establishing the process.	
36.3	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 24 Mts.	Bidder to Confirm
36.4	All consumables and tubes will be supplied by BHEL.	Bidder to Confirm
36.5	Edge prepared tubes, welding consumables, gas etc will be supplied by BHEL.	Bidder to Confirm
36.6	Radiography test will be conducted on joints in RTR station online with the STBW machine, and will be evaluated as per BHEL quality standards.	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, will be borne by BHEL.	Bidder to note

S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with 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 startup, testing and commissioning of machine, its controls and accessories. Supplier shall send suitable qualified Engineers and Erection crew for supervision of Erection and Commissioning at BHEL/TRICHY. 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
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

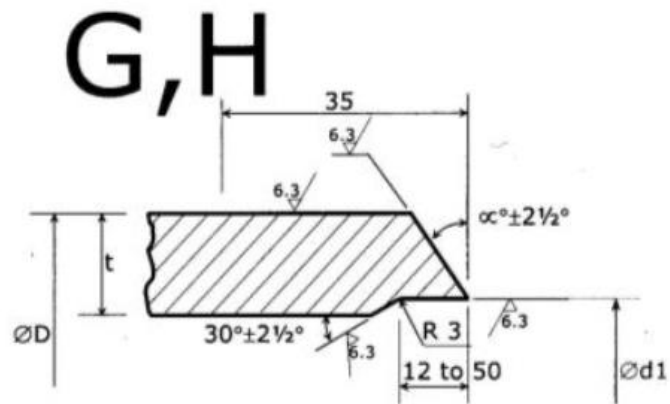
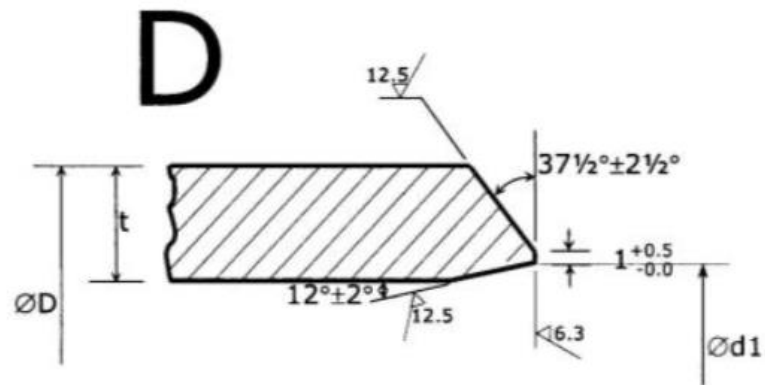
S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
38.3	Successful proving of BHEL components by the Bidder shall be considered as part of commissioning. All tests, as mentioned (Machine Acceptance) shall form part of the commissioning activity.	Bidder to Confirm
38.4	Commissioning spares, required for commissioning of the machine shall be supplied free of cost	Bidder to Confirm
39.0	IN-BUILT SAFETY ARRANGEMENTS	
39.1	Following safety features in addition to other standard safety features should be provided on the machine:	
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

S. No	SPECIFICATIONS / DESCRIPTION		VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]
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	
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	
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	

S. No	SPECIFICATIONS / DESCRIPTION	VENDOR'S OFFER / CONFIRMATION [with Complete Technical Details]	
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	

ENCLOSURES: ANNEXURE - 1 and 2

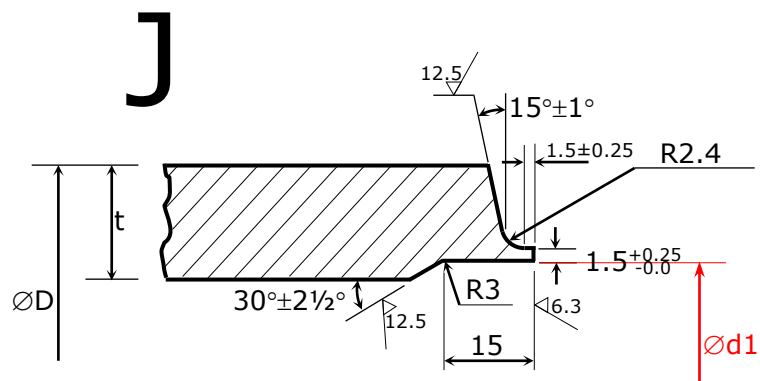
ANNEXURE - 1



$\alpha = 45^\circ$ for $t \leq 5.6\text{mm}$ - G Style
 $\alpha = 37\frac{1}{2}^\circ$ for $t > 5.6\text{mm}$ - H Style

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

'J' STYLE EDGE PREPARATION DETAIL



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

All dimensions are in mm
BHEL, TIRUCHIRAPPALLI