



Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

An ISO 9001
Company

ENQUIRY	Phone: +91 431 257 79 38 Fax : +91 431 252 00 31 Email : tvenkat@bheltry.co.in Web : www.bhel.com
NOTICE INVITING TENDER	

TWO PART BID	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
Tender to be submitted in two Parts	2621400026	08.05.2014	09.06.2014

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

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

Item	Description	Quantity
10	4 Torch Panel Gantry Welding Machine as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	1.00 No.

Important points to be taken care during submission of offer

1. Delivery required 6 months from the date of purchase order.
2. Erection & Commissioning period required 4 Weeks from the date of intimation by BHEL to vendor for deputation of their Engineers for E&C.
3. EMD for this Tender will be (INR) : 2,00,000.00
4. Checklist 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.
5. 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**) including bank guarantee formats and list of consortium banks, commercial terms check-list can be downloaded from BHEL web site <http://www.bhel.com> or from the Government tender website <http://tenders.gov.in> (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "**2621400026**".

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

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

Sr. Manager / Capital Equipment / MM

PART – A

4 Torch Panel Gantry Welding Machine

SECTION- 1: Qualifying Criteria

The BIDDER has to compulsorily meet the Qualifying Criteria indicated in **Section 1** to get qualified. Otherwise the technical offer will not be considered.

S NO.	REQUIREMENTS	VENDOR'S RESPONSE
1.1	The BIDDER / VENDOR (OEM) shall have a minimum TEN Years of Continuous Experience in Design, Manufacture & Supply of “Boiler Membrane wall Panel Gantry Welding Machine OR Boiler Membrane wall Panel Welding Machine”. Vendor shall indicate the actual number of years of experience in the field.	
1.2	Only those vendors (OEMs) should quote, who have supplied and commissioned in the last 10 years (as on the original date of tender opening) at least ONE “Minimum 4 Torch Boiler Membrane Wall Panel Gantry Welding Machine OR Minimum 4 Torch Boiler Membrane Wall Panel Welding Machine” welding by FLUX CORED ARC WELDING/GMAW process with PLC based controller. EITHER (i) In at least 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 from the date of commissioning (as on the original date of tender opening). The name and contact addresses of the customers to whom the above said machines were supplied to be furnished with details.	
1.3	Vendor has to submit at least ONE PERFORMANCE CERTIFICATE for satisfactory performance of Boiler Membrane Wall Panel Gantry Welding machine OR Boiler Membrane Wall Panel Welding Machine as referred under clause 1.2 above, for a minimum period of one year from the date of commissioning (as on the original date of tender opening) from their customers in India or in any other country outside the country of origin, supplied and commissioned in the last 10 years. Performance certificate as Original Certificate or E-mail directly from the customer may be submitted. The original certificate may be returned after verification by BHEL, if required. For obtaining the Performance certificate, a suggestive format is provided at the end of Part A.	
1.4	BHEL reserves the right to verify the information provided by the Vendor for the referred Machine at their referred customer's works. It shall be the responsibility of the vendor to facilitate the visit of BHEL's team at their referred customer works. The Travel, Board and Lodging expenses for BHEL Personnel shall be borne by BHEL. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected. BHEL reserves the right to accept or reject the OEMs based on the assessment of their technical and financial capability.	

SECTION - 2:

The BIDDER / VENDOR are requested to provide the following information:-

S NO.	REQUIREMENTS	VENDOR'S RESPONSE
2.1	The BIDDER / VENDOR to furnish Reference List of Customers, with complete address, details of contact person, where Boiler Membrane Wall Panel Gantry Welding machine OR Boiler Membrane Wall Panel Welding Machine has been supplied in the past.	
2.2	Specify details of Boiler Membrane Wall Panel Gantry Welding machine OR Boiler Membrane Wall Panel Welding Machine supplied to other units of BHEL, if any (Year of commissioning with details etc.	
2.3	Details on SERVICE-AFTER-SALES Set-up in India including the Address of Agents / Service Centres in India.	
2.4	Any Additional data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – 3:

The BIDDER to note:

S NO.	REQUIREMENTS	VENDOR'S RESPONSE
3.1	The BIDDER / VENDOR shall submit the offer in TWO parts. 1. Technical Offer [with PART A & PART B] 2. Commercial Offer and Price bid.	
3.2	The Technical Offer shall contain complete details against all clauses of Technical Specifications given by BHEL.	
3.3	The Technical Offer shall be supported by copies of product Catalogues, DataSheets 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.	

Suggestive Format of Performance Certificate:

The Performance should be certified by the customer on **Customer's Letter Head** and submitted along with the offer.

PERFORMANCE CERTIFICATE

1.0	Name of the Machine:	
2.0	Suppliers name	
3.0	Make & Model number of the Machine	
4.0	Month & Year of Commissioning	
5.0	Application for which the Machine is used	
6.0	Machine Details	
6.1	Sizes of the jobs performed in the machine.	
6.2	No of Torches	
6.3	Welding Process	
6.4	Welding Speed	
7.0	Performance of the Machine (Please tick the appropriate option)	Satisfactory
		Not Satisfactory
8.0	Service after sales (Please tick the appropriate option)	Satisfactory
		Not Satisfactory
9.0	Other remarks (if any)	
Date:		Signature & Seal of the Authority Issuing the Performance Certificate

Part-B

4 TORCH PANEL GANTRY WELDING MACHINE

SI.No	BHEL Specification/Description	Bidder's offer
1.0	<p>Purpose</p> <p>Continuous welding of Tubes to Fin for Panel formation of Supercritical / Subcritical Power Boiler panels by keeping the job stationary and clamped by a side locking fixture and welding by movable Gantry with torches and related auxiliaries (wire spool, feeder, cables and hoses etc) mounted on the gantry.</p> <p>Rough sketch of the machine is provided for understanding.</p>	
2.0	<p>Description</p> <p>The equipment is intended to use for welding of high pressure boiler panels having straight / panel opening bent tubes and also joining of sub-panels. Following is the procedure for welding boiler panels with straight/bent tubes:</p> <ul style="list-style-type: none"> • Placing the panel of tubes and fins (tack welded at regular intervals) over job support stands • Side clamping of the panel by using pneumatic clamping fixtures • Welding the tubes to fins by using all or any of the four torches • Panel opening bends where the welding has to be skipped, the operator shall lift the corresponding torch prior to the bend portion by using the individual controls provided in the control panel, while gantry is in motion. • The operator shall move the torches down to the appropriate height to restart and continue the welding after the bend zone. • After finishing the weld on one side of the panel, the panel shall be flipped with the help of crane. • The gantry shall be moved either to the starting point of the panel and the welding shall be continued or welding shall be done in the reverse direction in the same procedure as explained above. 	

SI.No	BHEL Specification/Description	Bidder's offer
3.0	JOB Specification	
3.1	Tubes:	
3.1.1	Tube outside diameter	28.6mm to 76.1mm (28.6/38.1/41.3/42.4/44.5/51/57/63.5/76.1)
3.1.2	Tube wall thickness	4mm to 12.7mm
3.1.3	Tube length	4000mm to 25000mm
3.1.4	Tube material	Carbon steel: SA192, SA210 Gr.A1, SA 210 Gr.C Alloy steel: SA 209 Gr.T1 ; SA 213 Gr.T11 ; SA 213 Gr.T12 SA 213 Gr. T22 ; SA 213 Gr. T23 SA 213 Gr. T91
3.1.5	Tube configuration	Straight tubes and tubes with panel opening bends, to be formed as a membrane panel
3.2	Fins:	
3.2.1	Fin width	9 mm to 110mm
3.2.2	Fin thickness	5mm to 12.7mm
3.2.3	Fin length	4000mm to 25000mm
3.2.4	Fin material	Carbon steel: ASTM A576 Gr 1015 Alloy steel: ASTM A 387 Gr.12 Cl 2 ASTM A 387 Gr.22 Cl 2
3.3	Panels:	
3.3.1	Panel length	4000mm to 25000mm
3.3.2	Panel width	Min. 800mm to Max. 2500mm
3.3.3	Tolerance on width	(+) 0.0 mm/ (-) 3 mm
3.3.4	Panel opening bends height	150mm to 500mm
3.3.5	Max. no.of tubes/panel	Max. 46 tubes in a panel
3.3.6	Max. weight of panel	8 Tons

SI.No	BH&L Specification/Description		Bidder's offer																				
3.3.7	Tube pitches	<table border="1"> <thead> <tr> <th data-bbox="1347 645 1385 790">OD (mm)</th> <th data-bbox="1347 790 1385 936">Pitch(mm)</th> </tr> </thead> <tbody> <tr> <td data-bbox="1310 645 1347 790">28.6</td> <td data-bbox="1310 790 1347 936">41.3</td> </tr> <tr> <td data-bbox="1273 645 1310 790">38.1</td> <td data-bbox="1273 790 1310 936">50.8/52/53/54/55</td> </tr> <tr> <td data-bbox="1236 645 1273 790">41.3</td> <td data-bbox="1236 790 1273 936">54</td> </tr> <tr> <td data-bbox="1200 645 1236 790">42.4</td> <td data-bbox="1200 790 1236 936">54</td> </tr> <tr> <td data-bbox="1163 645 1200 790">44.5</td> <td data-bbox="1163 790 1200 936">101.6/110/112/113.88/114.3/115.48/127/135.15/139.7</td> </tr> <tr> <td data-bbox="1126 645 1163 790">51</td> <td data-bbox="1126 790 1163 936">63.7/76.2/101.6/102/103/127/136/137/139.7/152.4</td> </tr> <tr> <td data-bbox="1090 645 1126 790">57</td> <td data-bbox="1090 790 1126 936">80/104/106/107/110.78/125</td> </tr> <tr> <td data-bbox="1053 645 1090 790">63.5</td> <td data-bbox="1053 790 1090 936">76.2/104/127/152.4</td> </tr> <tr> <td data-bbox="1016 645 1053 790">76.1</td> <td data-bbox="1016 790 1053 936">101.6</td> </tr> </tbody> </table>	OD (mm)	Pitch(mm)	28.6	41.3	38.1	50.8/52/53/54/55	41.3	54	42.4	54	44.5	101.6/110/112/113.88/114.3/115.48/127/135.15/139.7	51	63.7/76.2/101.6/102/103/127/136/137/139.7/ 152.4	57	80/104/106/107/110.78/125	63.5	76.2/104/127/ 152.4	76.1	101.6	
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76.1	101.6																						
4.0	Main parts /sub assemblies	<p>The 4 torch panel welding machine should have the following main parts.</p> <ul style="list-style-type: none"> a) Welding Gantry with rails and rail supports b) Welding carriage and torch movement configuration c) Job support stand and Side locking arrangement d) Operator stand e) Preheating arrangement f) Welding power sources g) Wire feeder units h) Welding torches i) Torch coolant chilling unit j) Shielding gas system k) Gas Mixing unit l) Operator and control panels 																					
5.0	Welding Gantry																						
5.1	Gantry design	Welding gantry shall be of rigid construction to carry all the welding equipment as mentioned in the following clauses. Vendor to provide a drawing showing the arrangement of the above equipment along with the offer																					

SI.No	BHEL Specification/Description		Bidder's offer
5.1.1	Construction	All welding components/equipment arranged are to be of rigid and solid design, self-guiding/ holding type and user friendly to avoid welding related problems (due to fragile arrangement of wire feeders, guides & controllers, torch assembly & positioning etc).	
5.1.2	Gantry design	Gantry to be designed to carry four 100kg to 200kg jumbo coils for future requirement, two operator stands and control panels.	
5.1.3	Carriages	Two carriages with two welding torches & one pre-heating burner per carriage.(Totaling to four welding torches & two burners). Motors and pneumatic cylinders for movement of carriage and welding torches , interconnecting accessories/hoses/cables etc.	
5.1.4	Power sources ,wire feeder location	All power sources, wire feeders and spools shall be kept on the gantry. Vendor to provide all the cables and accessories accordingly. Vendor to provide details of arrangement along with offer.	
5.1.5	Rail supports	Rigid rail supports for the gantry to move on the rails to be provided. Vendor to provide the details of supports and designation, length of rails.	
5.1.6	Dimensions of the gantry	Span and height of the gantry to be provided by vendor based on the jobs provided above. Panel to be at a height of 800mm (as per clause 7.1.1) Vendor to provide the dimensions of the gantry considering the jobs.	
5.1.7	Ladder	Suitable ladder to be provided to approach the welding wire feeders, spools etc on the gantry.	
5.2	Gantry Movement		
5.2.1	Drive for Gantry	Machine gantry frame driven through inverted rack and pinion gear drive guided by LM guide ways/rail for movement. Vendor to specify. The movement shall be smooth without jerks.	
5.2.2	Longitudinal travel speed of Gantry	Adjustable Welding speed: 500mm/min to 1500mm/min Adjustable Idle speed: Upto 5000mm/min	

SI.No	BHEL Specification/Description	Bidder's offer
6.0	<p>Weld carriage and Torch Movement</p> <p>The following movements have to be provided by the vendor for the torches and torch carriages:</p>	
	a) Individual Motorized horizontal movement of each torch carriages along the total length of the gantry. Vendor to confirm and provide the details (make, model no etc) of the motors used.	
	b) Individual Pneumatic vertical movement for the torch carriages for fast retraction when there is an opening bend in the tube- 150mm to 500mm (Up/Down) movement with reed switches. Vendor to confirm and provide the details (make, model no etc) of pneumatic cylinders used	
	c) Individual Motorized Vertical movement for the four torches for fine adjustment of it (from panel top to around 150mm) with selector and joystick arrangement. Vendor to confirm and provide the details (make, model no etc) of the motors used	
	d) Individual Motorized Horizontal movement for the four torches for fine adjustment around 150mm with selector and joystick arrangement. Vendor to confirm and provide the details (make, model no etc) of the motors used	
6.1	Torch arrangement	
6.2	Torch angle adjustment - Manual	<p>a) Adjustment for 0 to 30 deg for welding advance angle scale</p> <p>b) Adjustment for 0 to 30 deg for welding torch target angle scale</p>
7.0	Job support Stand	
7.1	Description	Job support stand is required to keep the panel over it before welding.
7.1.1	Height of job support stand	Around 800mm.vendor to specify exact height
7.1.2	Length of job support stand	Minimum 25mts.vendor to specify exact length

Sl.No	BHEL Specification/Description		Bidder's offer
7.1.3	Width of job support stand	Minimum 2500mm. vendor to specify the exact width considering side locking arrangement.	
7.2	Fixed Job supports	Fixed supports at a pitch of 2m to be provided along the length of the job support stand.	
7.2.1	No. of fixed job supports	12 Nos. vendor to confirm	
7.2.2	Details of fixed job supports	Vendor to provide the dimensions of the fixed job supports	
7.3	Movable job supports	These will be slid along the length of the job support stand /removed from the stand to accommodate panel opening bends of the tubes in the panel	
7.3.1	No. of Movable job supports	12 nos. vendor to confirm	
7.3.2	Details of Movable job supports	Vendor to provide the dimensions of the job supports	
7.4	Mesh/grill	A suitable mesh/grill along the length of the job support stand to be provided at the bottom of the job supports for safety.	
8.0	SIDE Locking arrangement-Pneumatic type		
8.1	Design Considerations	Side locking arrangement by clamp fixtures using pneumatic cylinders to be provided by the vendor.	
8.2	No. of pneumatic cylinders	Minimum 12 nos at a pitch of 2m along the length of job support stand	
8.3	Side locking mechanism	Vendor to provide the detailed side locking mechanism for the panels of width varying from 800mm to 2500mm	
8.4	Stroke of cylinder	Vendor to specify	
8.5	Make and model	Make and model of the pneumatic cylinder to be specified	

Sl.No	BHEL Specification/Description	Bidder's offer
9.0	Operator stand location	
9.1	Operator stands	Two Operator stands to be provided at around 400mm from the top of the job on either side of the torch carriages. Vendor to confirm
9.2	Movement-manual	Operator stands can be horizontally moved manually along the length of the gantry and can be locked at any desired position. Vendor to confirm and provide details
9.3	Ladder to reach operator stand	Proper ladder to be provided on both sides of the job support stand to reach the operator stand easily. Vendor to confirm and provide the details accordingly.
10.0	Pre Heating	
10.1	Pre heating	Vendor to provide preheating provision by movable burners- two burners (one burner for each torch carriage) ahead of torch OR Other side of gantry with up/down and horizontal movement (electrical/pneumatic actuators only) facility LPG is used for preheating. Bidder to specify The suggested process is provided below: a) Preheating of the tubes by the movable burners b) It should be followed by welding of the panel. All hoses and cables to be provided accordingly.
10.2	Burner movement	Burners should be moved vertically along the carriage such that burner will be lifted automatically whenever the carriage is lifted.
11.0	Welding power sources	
11.1	Type	IGBT based Inverter controlled Welding Power Source for Synergic Pulsed GMAW/FCAW welding with Digital Control
11.2	Welding power sources	4 Nos
11.3	Make	OTC DAIHEN / KEMPI / PANASONIC makes only
11.4	Model	Vendor to specify

Sl.No	BHEL Specification/Description	Bidder's offer
11.5	Power source Rating Current: 500Amps @ 60% Duty cycle	
11.6	Welding process Suitable for pulsed GMAW / FCAW with mixed gas shielding [Argon (80-98%)+CO2 (20-2%)]	
11.7	Other Features of Powersource Capable to produce defect free Weld in the Panel welding Process [with Spatter Free Welding, Smooth Arc Initiation, Crater Filling, Good Penetration, Uniform Weld Bead Formation, etc.]	
12.0	Wire feeder Units	
12.1	Wire feeding roller mechanism Wire feeding roller mechanism shall be FOUR roll wire feeding system with EURO adaptor. Bidder to confirm	
12.2	Make and model Make and model of the wire feeder to be provided by the bidder.	
12.3	Wire feed motor rating Vendor to provide motor rating.	
12.4	Welding wire 1.2 mm solid wire & 1.6mm flux cored wire	
12.5	Welding wire coil holders Capacity to hold and feed 15/25kg spools. Vendor to confirm.	
12.6	Wire feed speed Vendor to specify	
12.7	Wire feeding conduits The wire feed conduits for feeding of the wire from the spools to wire feeder inlet shall have a suspending/ support arrangement that ensures the conduits are routed in smooth curves aiding uninterrupted wire flow.	
13.0	Welding torches	
13.1	Rating Continuous heavy duty application of 500Amps @ 100% Duty cycle. vendor to confirm	
13.2	Type Water cooled	
13.3	Preferable makes BERNARD / ABICOR BINZEL / ESAB	
13.4	Model Vendor to specify	
13.5	No.of torches 4 Nos - Two torches on each torch carriage	
13.6	Welding wire 1.2 mm solid wire & 1.6mm flux cored wire	

Sl.No	BHEL Specification/Description	Bidder's offer
13.7	Euro adapter for the torches to be provided	
13.8	Torch design The gas nozzles of the torches (Threaded preferred), torch body and torch slides shall be of design and construction to allow satisfactory aiming of the 1.20mm solid wire & 1.6mm flux cored wire to the particular point in the tube fin interface (for all combinations of tube fin sizes) with appropriate stick out distance (10 to12mm)-appropriate torch angles- to result in deposition of a defect free bead of satisfactory shape & size in all torches. Vendor to confirm	
14.0	Torch coolant chilling unit	
14.1	Chilling unit A common tank containing the coolant having separate piping and control arrangement for four torches shall be provided. The coolant shall be cooled by refrigerant type water chiller of suitable capacity.	
14.2	Preferable makes Werner Finley / Rittal. Bidder to specify the make and model no	
14.3	Tank capacity Vendor to specify	
14.4	Flow rate and pressure Vendor to specify	
14.5	Distribution system Distribution system for all the torches from the chiller to be provided. Vendor to confirm and provide details	
14.6	Coolant Flow - Interlock Suitable flow sensors are to be provided to have an interlock with welding circuit, to avoid failure of flow of cooling medium. Digital indication to be provided on the return line of coolant flow. Vendor to confirm.	

SI.No	BHEL Specification/Description		Bidder's offer
14.7	Cooling temp	Cooling system of sufficient capacity to maintain complete System at a temperature not exceeding 50 deg C irrespective of the ambient conditions. Vendor to confirm & Furnish details.	
15.0	Shielding gas system		
15.1	Location of gas cylinder bank	Gas supply from cylinder bank (Argon Cylinders: 6nos;CO2 Cylinders:3 nos) and suitable manifold connecting the cylinders in the cylinder bank. Two cylinder banks to be provided such that the empty cylinders can be changed in one bank while the other bank is under use. The cylinder banks to be located centrally along the length of machine on one side.	
15.2	Weld Arc Shielding Glass	Machine mounted arc shield for Pulsed GMAW	
15.3	Mixed Gas Flow Rate	20 – 40 litres / min / torch	
15.4	Inlet Pressure	1.5 to 5 Bar	
15.5	Gas circuit accessories	Gas manifold, Gas solenoid valves, gas flow meters & gas flow sensors for each torch , gas regulators with hoses and the end connections are to be provided with machine tripping logics arranged.	
15.6	Gas flow sensors	Gas flow sensors to be provided for each torch and to be interfaced with PLC for porosity control IFM make gas sensors preferred.	
15.7	Gas connection	Proper festoon arrangement for the shield gas / compressed air hoses. Vendor to confirm.	
16.0	GAS MIXING UNIT		
16.1	Make and Model	Make: Preferably Gentec. Any other make acceptable to BHEL. Bidder to Specify the make and model quoted. Digital gas mixer is preferable.	
16.2	Gases to be mixed	Argon and CO ₂	
16.3	Mixing Ratio	Argon : 95 - 98% CO ₂ : 5 - 2%	

Sl.No	BHEL Specification/Description		Bidder's offer
16.4	Operating Features	Bidder to Specify : a) Type of Mixing Unit & its Accuracy b) Flow Rate (adjustable) for Argon & CO ₂ c) Mixed Gas Flow Rate d) Inlet Pressure e) Outlet Pressure	
16.5	Scope of Supply	Scope of Supply shall include the following: a) Gas Mixing Unit b) Gas Flow Meters c) Regulators d) CO ₂ Heaters with 220 V power supply. e) Gas Solenoid Valves	
17.0	Operator and control panel	2 Nos - one for each torch carriage	
17.1	Selection of torches	Independent controls for each carriage to be provided such that each of the two carriages can be operated independently by two different operators. Operators should have the flexibility to move any/all the torches vertically or horizontally based on the configuration of the job. Vendor to provide the details of the controls.	

SI.No	BHEL Specification/Description		Bidder's offer
17.2	Operator and control panel switches or controls	<p>Following controls to be provided and should be easily accessible by the operator in the control panel:</p> <ul style="list-style-type: none"> a) Individual horizontal movement, vertical movement, angular movement of torches b) Start, stop and speed selection for the gantry c) Individual weld start and stop controls for the torches d) Gas flow and water flow controls. e) Cycle start, stop & programming f) Wire feed speed and inching controls. g) Preheating controls h) Power source panel programming, weld speed etc i) Emergency stop. <p>Machine frame shall be designed in such a manner to have easy access for the operators to view the weld bead in all 4 torches and make adjustments. All the cables, accessories etc are to be routed accordingly</p>	
17.3	Approachability	<p>All switches/controls should be within the reach of the operator. All displays/indications should also be conveniently placed on the welding gantry.</p>	
17.4	Remote control	<p>Remote control for welding torch operations:</p> <ul style="list-style-type: none"> a) Torch carriage left/Right b) Torch carriage up/down c) Torches-up/down –fine adjustment d) Wire feed inching e) Gantry movement 	
17.5	Interlocks	<p>All necessary interlocks such as burn through, welding wire feed indication and alarm for change over, etc to be provided. Bidder to list down all the interlocks provided in the machine</p>	

Sl.No	BHEL Specification/Description		Bidder's offer
18.0	Controls	Controls shall be industrial PC based PLC system	
18.1	Make	Fanuc/Siemens/Mitsubishi preferred	
18.2	Model	Vendor to specify	
18.3	Standard features	Vendor to specify	
18.4	System features	The system should have full alphanumeric keyboard , Suitable display,RS232C serial interfaces, parallel interface for printer, compact disc drive unit for data input/output, hard disk of sufficient capacity, pre-installed system software and the other associated/ required softwares etc (Details shall be furnished by the vendor in the TECHNICAL OFFER)	
18.5	Monitors	TFT monitors/touch screens to be provided for display. Bidder to specify the size of monitors.	
18.6	Display	Controller shall be provided with digital ammeters & voltmeters for display of preset & real time weld parameters, digital display of welding speed & gantry speed (actual and programmed), wire feed rate(actual and programmed), gas flow etc Bidder to enlist all displays on the control panel.	
18.7	Parameter locking	Provision for setting and locking of welding parameters	
18.8	Data logger	Data logger PC/laptop to be provided	
19.0	Fault diagnostic system		
19.1	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. Vendor to confirm		
19.2	Help guide should be provided to use both diagnostic systems		
20.0	Lubrication		
20.1	Machine lubrication: Automatic centralized lubrication system with timer control and suitable metering cartridges to be supplied. Vendor to confirm		
20.2	All greasing points to be provided at convenient location for the operators to fill grease periodically. Vendor to confirm		

Sl.No	BHEL Specification/Description	Bidder's offer
20.3	First filling of Lubrication Oil to be supplied by the supplier. Indian equivalent shall be mentioned. Vendor to specify	
20.4	First filling of Grease should be supplied by vendor. Indian equivalent shall be mentioned. Vendor to specify	
21.0	PNEUMATIC SYSTEM:	
21.1	The pneumatic operated elements of the machine shall work efficiently with BHEL compressed air supply at a pressure of 4.5 to 5 kg/sq.cm in 1 inch line. Vendor to confirm	
21.2	Bidder to specify the total air volume required for efficient operation of the complete machine.	
21.3	Refrigerated Air Drier to be provided to eliminate moisture content from the compressed air at the designed flow and pressure rating. Vendor to confirm	
21.4	BHEL will provide compressed air at only one point near the machine. Vendor shall provide suitable filter-regulator-lubrication (FRL) unit and in addition a hand wheel valve at this point. Vendor to confirm	
21.5	Hydraulic, Pneumatic & Lubricating oil piping should be preferably metallic except places where flexible piping is essential. All the pipes required for the same shall be included in the standard scope of the machine. Vendor to confirm	
21.6	Pneumatic components shall be of FESTO / NORGREN / SMC / PARKER/ REXROTH_make. Vendor to specify	
22.0	Electrical & Electronics systems	
22.1	415V with a voltage fluctuation of +/- 10%, 50HZ with a fluctuation of +/-3%, 3 Phase AC (3 wire system without neutral) power supply will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All cables, connections, circuit breakers etc. required for connecting BHEL's power supply to the machine shall be in the scope of vendor. Vendor to confirm	
22.2	Tropicalization: All electrical / electronic equipment shall be tropicalized. Vendor to confirm	
22.3	Control circuit voltage shall not exceed 24V DC Vendor to confirm	
22.4	All electrical components in the cabinets should be mounted on DIN Rail. Vendor to confirm	

Sl.No	BHEL Specification/Description	Bidder's offer
22.5	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. Vendor to confirm	
22.6	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all the cable trays required for laying of cables should be included in the offer. Vendor to confirm	
22.7	Vendor should ensure the proper earthing for all the electrical equipments, machine and its peripherals. Vendor to confirm and should provide the details	
22.8	Cables shall be routed through totally enclosed cable trays. There shall not be cable trenches. Vendor to confirm	
22.9	All electrical & electronic control cabinets & panels should be vermin and dust proof. All Electric enclosures shall have IP 54 protection. Vendor to confirm	
22.10	Motors and drives shall be of Fanuc / Siemens / Allen Bradley / ABB / Indramat / SEW conforming to IS / IEC Standards (Vendor should indicate make and type in the offer). Vendor to confirm	
22.11	All electrical items shall be of from Siemens/ABB/AB/L&T /SEW / ROCKWELL / Allen Bradley / Telemecanique / Delta. Vendor to confirm	
22.12	All the motor control variable frequency drives should have input and out put chokes with brake resistor. Vendor to confirm	
22.13	All indication lamps should be provided with LED Indication Lamp. Vendor to confirm	
22.14	All components/devices/terminals are to be incorporated with numbered ferrules. Vendor to confirm	
22.15	External wiring from / to control panel, control desk, external motors etc shall be by means of screened multi-core cables. Vendor to Confirm	
22.16	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. Vendor to Confirm	

SI.No	BHEL Specification/Description	Bidder's offer
22.17	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. Vendor to Confirm	
22.18	Air Conditioners with Dehumidifiers of suitable capacity to be provided for all Electrical / Electronic Panels / Cabinets including Operator's Panel considering specified ambient conditions (ambient temperature of +50 deg C and relative humidity of 93 %) Make: Rittal / Werner Finley. Detailed specifications to be submitted. Vendor to specify	
22.19	Vendor to specify total power consumption in KW at Maximum load.	
23.0	Machine Lights	
23.1	Machine Spot Lights and suitable fluorescent light or metal halide lamps to be provided for sufficient illumination in the welding zone. Vendor to confirm	
23.2	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents. Vendor to confirm	
24.0	Machine foundation	
24.1	Vendor shall submit the preliminary foundation drawing having complete details like static and dynamic loads, etc required for foundation design for getting BHEL's approval within 30 days.	
24.2	BHEL shall design and construct complete foundation for the machine as per the Vendor's recommendation.	
24.3	Complete anchoring system including fixators, levelling shoes required for anchoring system should be supplied by vendor. Vendor to specify.	

SI.No	BHEL Specification/Description	Bidder's offer
25.0	Machine Spares	
25.1	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 Vendor for 2 years of trouble free operation on three shifts continuous running basis shall be furnished by vendor along with offer. The list is to include following, in addition to other recommended spares: Vendor to confirm	
25.2	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. Vendor to confirm.	
25.3	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. Vendor to confirm	
25.4	Welding Consumable spares such as Contact tips (Threaded Preferred), Gas nozzles (Threaded Preferred), Tip adapters (Threaded Preferred), Other torch spares for at least 6 months continuous operation shall be provided. Vendor to clearly specify the quantity of the consumables quoted.	
25.5	Spare Torches, Torch cables and Wire feed conduits, Wire feed rollers may also be offered. vendor to specify	
25.6	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 vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required. Vendor to confirm	
25.7	Vendor 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. Vendor to confirm	

Sl.No	BHEL Specification/Description	Bidder's offer
25.8	A set of Service Tools for dismantling and assembling of machine components may be quoted. Vendor to confirm	
25.9	A set of maintenance tools kit for operation and maintenance of the machine components such as ratchet spanners sets, Bosch Rexroth Tool kit (Pneumatic), Allen Keys set, grease guns, etc. to be included in the scope of supply. Vendor to confirm and provide the details. The following spares must be included in the scope of supply by the vendor <ul style="list-style-type: none"> • LM Guide with LM Bearings- 1 set in each type • Solenoid Valve for Air -1 No in each type • Regulator for Air - 1 No in each type • Speed Controller for Air - 1 No in each type • Pneumatic Seal Kit for Air - 1 No in each type • Welding Power Supply-1 set • Welding Torch - 4 nos • Welding Torch – Liner for 1.6 mm-30 nos • Welding Torch – Feed Roller for 1.2 mm- 16 nos • Welding Torch – Feed Roller for 1.6 mm- 10 nos • Hydraulic Valves & Accessories - 1 No in each type (if applicable) 	
26.0	Documentation	
26.1	The following drawings are to be provided along with the offer <ol style="list-style-type: none"> 1. GA Drawing of the complete Panel Welding station. 2. GA Drawing of Individual Mechanisms 	
26.2	GA drawings, Machine detailed constructional drawings with dimensions, Civil Foundation layout drawings, Pneumatic / Electrical / Electronic circuits with BOM, are to be submitted within 30 days from the date of ordering (in case of an order) for approval by BHEL. Vendor to confirm	

SI.No	BHEL Specification/Description	Bidder's offer
26.3	<p>The following documents in English language should be supplied along with the machine: Hard Copies-hard binded - 3 Sets Vendor to confirm In CD form - 1 Set</p> <ol style="list-style-type: none"> 1. GA Drawing of the complete Panel Welding 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 and spare part 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 / hydraulic / 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 vendor. 20. Complete list of spares for machine, along with item part no /specification / type / model and make & address of the sub-vendor. 21. Part drawings of sub systems installed in machine 	

Sl.No	BHEL Specification/Description	Bidder's offer
27.0	MACHINE INSPECTION & ACCEPTANCE:	
27.1	PRE-DISPATCH INSPECTION AT SUPPLIER'S WORKS:	
27.1.1	Complete Panel Welding station with all sub-systems and accessories shall be assembled and offered for inspection by BHEL at supplier's works. Vendor to confirm	
27.1.2	All systems of the machine have to be operated and demonstrated to the BHEL Engineers in proper working condition.	
27.1.3	Two full panels of 12m length / 2.5m width to be welded and shown. The Tubes and fins will be arranged by BHEL. All the other consumables have to be arranged by supplier. Welding wire shall be in 15kg/25kg spools. Vendor to confirm	
27.1.4	The Weld quality shall be tested as per Annexure-I. Vendor to confirm	
27.2	PROVE-OUT AND ACCEPTANCE AT BHEL WORKS:	
27.2.1	After the machine erection and energizing at BHEL works, all systems of the machine have to be operated and demonstrated in proper working condition. Vendor to confirm	
27.2.2	25m long and 2.5m wide panels shall be welded and proved out with 25 Kg spools with wires of 1.2mm Solid wire as well as 1.6mm flux cored wire. Vendor to confirm	
27.2.3	For the first prove out trail -All welding consumables, tubes and fins will be supplied by BHEL. Vendor to confirm	
27.2.4	The welding shall be smooth and without interruptions. Vendor to confirm	
27.2.5	The machine shall be accepted after trouble free welding of panels for SIX consecutive shifts. Weld quality test shall be done as per Annexure-I. Vendor to confirm	
28.0	Training	
28.1	The supplier shall train TWO BHEL Engineers in Operation and Maintenance (Mechanical, Electrical/ Electronics and Programming) of the Machine for FIVE working days at supplier's works after the pre-dispatch inspection. Vendor to confirm	
28.2	Airfare, board & lodging for the BHEL Engineers who will be visiting supplier's works for pre-dispatch inspection and training, shall be borne by BHEL. Vendor to note	

Sl.No	BHEL Specification/Description	Bidder's offer
28.3	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. Vendor to confirm	
28.4	Vendor to clearly mention whether the training is offered free of cost or chargeable. If chargeable, the vendor has to quote on manday basis. vendor to specify.	
28.4	The training shall include specialized coaching in i) Safety ii) Operation of the machine iii) PC based System & Operation, iv) Trouble-Shooting, v) Software/PLC-training from respective OEM for this bought out PLC vi) All special features of the machine vii) Electrical / Mechanical / Electronics systems Vendor to confirm	
28.5	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel. Vendor to confirm	
29.0	Erection & Commissioning	
29.1	Supplier to take full responsibility for Supervision of the erection and for start up, testing and commissioning of machine, its controls and accessories. Supplier shall send suitable qualified Engineers for supervision of Erection and Commissioning of the machine at BHEL works. Commissioning Engineers who will be deputed to BHEL shall be English speaking or English interpreters have to be arranged by the supplier for the entire duration from start of erection till the machines are commissioned and handed over to BHEL with complete training. Vendor to confirm	
29.2	Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by Vendor in their foundation/layout drawings. Other requirements like crane and personnel shall also be provided by BHEL. Vendor to confirm	
29.3	All tests, as mentioned (Machine Acceptance) shall form part of the commissioning activity. Vendor to confirm	

Sl.No	BHEL Specification/Description	Bidder's offer
29.4	Commissioning spares, required for commissioning of the machine shall be supplied by vendor. Vendor to confirm	
29.5	Straight Edges, dial indicators, Test Mandrels, Instruments and other necessary equipment including Laser equipment, if required, to carry out all above activities should be brought by the Vendor on returnable basis. Vendor to confirm	
29.6	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the Vendor should supply sufficient quantity of touch-up paint of various colours of paint used. Vendor to confirm	
30.0	IN-BUILT SAFETY ARRANGEMENTS	
30.1	Following safety features in addition to other standard safety features should be provided on the machine:	
30.2	shielding glass to be provided between the torch and operator. Bidder to submit details on this arrangement offered. Vendor to specify	
30.3	A detailed list of all alarms / indications provided on machine should be submitted by the Vendor. Vendor to specify	
30.4	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine. Vendor to confirm	
30.5	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. Vendor to specify	
30.6	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. Vendor to confirm	
30.7	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations and suitably guarded. Vendor to confirm	
30.8	Emergency Switches should be provided at suitable locations as per International Norms. Vendor to confirm	

Sl.No	BHEL Specification/Description	Bidder's offer
30.9	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. Vendor to confirm	
31.0	THERMAL STABILITY FOR AMBIENT CONDITIONS & ENVIRONMENTAL PERFORMANCE OF THE MACHINE:	
31.1	The machine shall be suitable for an ambient temperature of +50 deg C and relative humidity of 93% respectively, but both do not occur simultaneously. Vendor to confirm	
31.2	The vendor should ensure trouble free operation of the machine with Thermal Stability of the complete machine and accuracy requirements of BHEL components, keeping in view of ambient conditions and pre heating as mentioned above. Vendor to confirm	
31.3	The machine, including attachments and accessories, should be suitable for continuous operation on three shifts a day. Vendor to confirm	
31.4	If any safety / environmental protection enclosure is required it shall be built in the machine by the vendor. Vendor to confirm	
31.5	Paint of the machine should be oil / coolant resistant and should not peel off. Vendor to confirm	
32.0	PAINTING:	
32.1	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. Vendor to confirm	
33.0	MACHINE PACKING:	
33.1	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. Vendor to confirm	
34.0	Guarantee	
34.1	Performance Guarantee to be given for 12 months from the date of commissioning OR 18 months from the date of dispatch whichever is earlier. vendor to confirm	

Sl.No	BHEL Specification/Description	Bidder's offer
35.0	General	
35.1	Machine Model No. Vendor to specify	
35.2	Total connected load (KVA): Vendor to specify	
35.3	Total air volume in cu.m/min. Vendor to specify	
35.4	Floor area required (Length, Width, Height) for complete machine & accessories. Vendor to specify	
35.5	Total weight of the machine (approx). Vendor to specify	
35.6	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. Vendor to specify	
36	MAKE OF THE BOUGHT OUT ITEMS	
	Makes of all the applicable bought out items shall be as follows unless otherwise specified in the above spec	Vendor to specify
	BELTS (V - BELT, TIMING BELT& OTHER BELTS)	FENNER/SKF/GATES/DUNLOP/GOODYEAR
	HYDRAULIC HOSES	GATES/PARKER/AEROQUIP
	HYDRAULIC VALVES &PUMPS	REXROTH/EATON VICKERS/PARKER
	POLYURETHENE TUBES & ONE TOUCH FITTINGS	FESTO/SMC /PARKER
	CHAINS, CONNECTING LINK&SPROCKETS	DIAMOND/ ROLLON/ SKF/ TUSABAKI
	PNEUMATIC VALVES &PUMPS, SYSTEM	FESTO/SMC/PARKER
	HYDRAULICS SEALS, SPRING LOADED OIL SEAL& ORINGS	PARKER/ MARKEL/ SIMRIT/ FREDUNBERG/ BUSHAK & SHABAN/HUNGER/ HALLITE/ JAMIES WALKER
	REDUCTION GEAR BOX	ELECON/BONFIGLIOLI/MAKISHINKO/ SUMITOMO/ SEW
	GEARED MOTOR	BONFIGLIOLI / SEW /ELECON /MAKISHINKO/SUMITOMO
	COOLANT PUMP	BE / SUGUNA / SEAPUMP / KSB / RAJAMONI
	HYDRAULIC JACKS	LARZEP / ENERPAC / POWER TEAM /HI- FORCE
	ALL HYDRAULIC SYSTEM	BOSCH REXROTH/EATON VICKERS/PARKER
	PRESSURE GAUGE	REXROTH/WIKA/WAREE/PARKER

S.NO	BHEL Specification/Description	Bidder's offer
	ALL COUPLINGS WITH GUARDS	SKF/FENNER/HYDAX
	HYDRAULIC FITTINGS	ARKER/SWAGELOC/HYLOC
	MOTORS	ENERGY EFFICIENT EFF II ABB/ SIEMENS/SUMITOMO
	CONTACTORS	SIEMENS/L&T/SCHENIEDER/TELEMECHANIC
	PUSH BUTTONS AND SELECTOR SWITCHES	SIEMENS/TELEMECHANIC
	TEMPERATURE GAUGE	WIKA/WARRE/REXROTH/EATON VICKERS
	LM GUIDE WAYS, BALL SCREW UNIT & SCREW ROD	THK/HIWIN/IKO/NB/THOMPSON
	BEARINGS/PILLOW BLOCKS/PLUMMER BLOCKS	SKF/FAG/NTN/TIMKEN/IKO/ASAHI
	GEARED COUPLINGS	WMI / FENNER / ALFEX / SKF
	BREAK LINING	FERRODA / COMPAQ
	FASTNERS (GRADE: 10.8/12.9 AS PER IS.2269/IS 1367)	TVS/UNBROKO
	DRIVES	SCHNEIDER/SIEMENS/MISTIBUSHI
	SERVO MOTOR	SCHNEIDER /SIEMENS/ MISTIBUSHI
	Any other makes recommended by the supplier may be approved by BHEL during technical devaluation. Bidder to confirm	
37	Standards for Design and Manufacture: Standards for design and manufacture of the welding station shall be in accordance with ISO or JIS or DIN. Any other standards shall be approved by BHEL before manufacturing. Anything unspecified but necessary for welding station function shall be indicated by the supplier. vendor to specify	
38	Accessories: Supplier shall quote SEPARATELY the required tools, spares sleeves, spacers, any accessories required. Quantity - Bidder shall propose besides standard tooling wherever required (1 set for prove out as per mutual agreement while technical discussion). Bidder to specify	

S.NO	BHEL Specification/Description	Bidder's offer
39.0	SCOPE OF SUPPLY	
39.1	SUPPLIER'S SCOPE	
	<ol style="list-style-type: none"> 1. Design, Manufacture, Supply, Erection, Commissioning and prove out of 2. 4 Torch gantry welding machine as per clause 1.0 3. Tooling's 4. Accessories 5. Hydraulic Oil, grease, tooling during pre-dispatch inspection 6. All anchoring & foundation bolts, levelling plates for the complete machine. 7. Levelling Instruments, Power Tools / Hand Tools / Special tools for erection of the machine. 8. Crane required for handling outside shop, if any. 9. Commissioning Engineers for supervision of erection and commissioning 10. First Fill of Hydraulic Oil and grease 11. Job Quality and Productivity Prove-out 	Bidder to Confirm
39.2	BHEL SCOPE	
	<ol style="list-style-type: none"> 1. Drawings approval 2. Civil foundation work as per manufacturer's drawing 3. EOT crane facility inside shop 4. Tubes for trials and prove out 5. Single Compressed air point at the location indicated in the drawing 6. Single Electrical Supply point at the location indicated in the drawing 7. Welding machines and consumables required for erection if any 8. Manpower for machine erection 	Bidder to Confirm

Enclosures:

1. Rough sketch of 4 torch Gantry welding machine
2. Annexure-1-Weld quality criteria
3. Annexure-2-Panel Schematic
4. Annexure-3-Typical panel with panel opening bends
5. Annexure-4-Fillet weld detail

VISUAL INSPECTION OF TUBULAR PANELS

The tubular products shall be visually inspected at appropriate stages and accepted based on the Acceptance standards detailed in below:

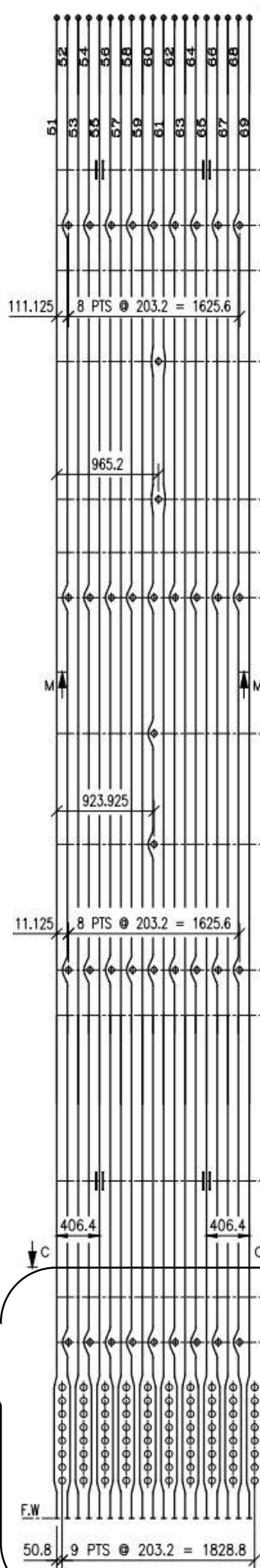
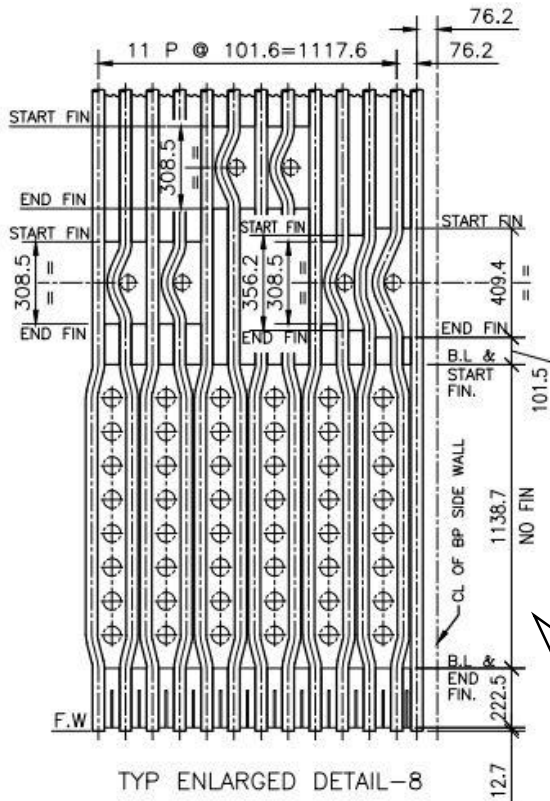
ACCEPTANCE CRITERIA

Characteristics	Acceptance norms
a) Cracks, Voids & Skips	} Not permitted
b) Burnthrough	
c) Lack of Fusion	
d) Lack of penetration	
e) Oxide/metallic inclusions	
f) Overlaps	
g) Underflushing	
h) Root porosity	
i) Wrinkles & Deformities	
j) Poor restart	
1. Surface mismatch	Not to exceed $1/4 t$ where "t" is the tube thickness
2. Undercut (on pressure retaining materials)	Not to exceed 0.4mm
3. Porosity (for fillet welds)	Pores up to & including 1.6 mm diameter, provided it does not occur at a start or stop. 4 or more pores (cluster or inline) are not permitted if they are separated by less than 1.6mm or less than the major dimension of the largest indication in that group. For other pores, acceptance shall be as per TABLE 1.
4. Reinforcement	Not to exceed 3 mm
5. Tool marks	Not permitted. To be ground to have a smooth transition
6. Concavity of the fillet weld	Permissible, provided it does not encroach on the required weld thickness
7. Arc strikes	Not permitted. Stray arc areas shall be examined with LPI or MPI after grinding followed by thickness measurement
8. Spatter	To be removed. Isolated spatter may be permitted
9. Bore passage	Freedom from foreign materials

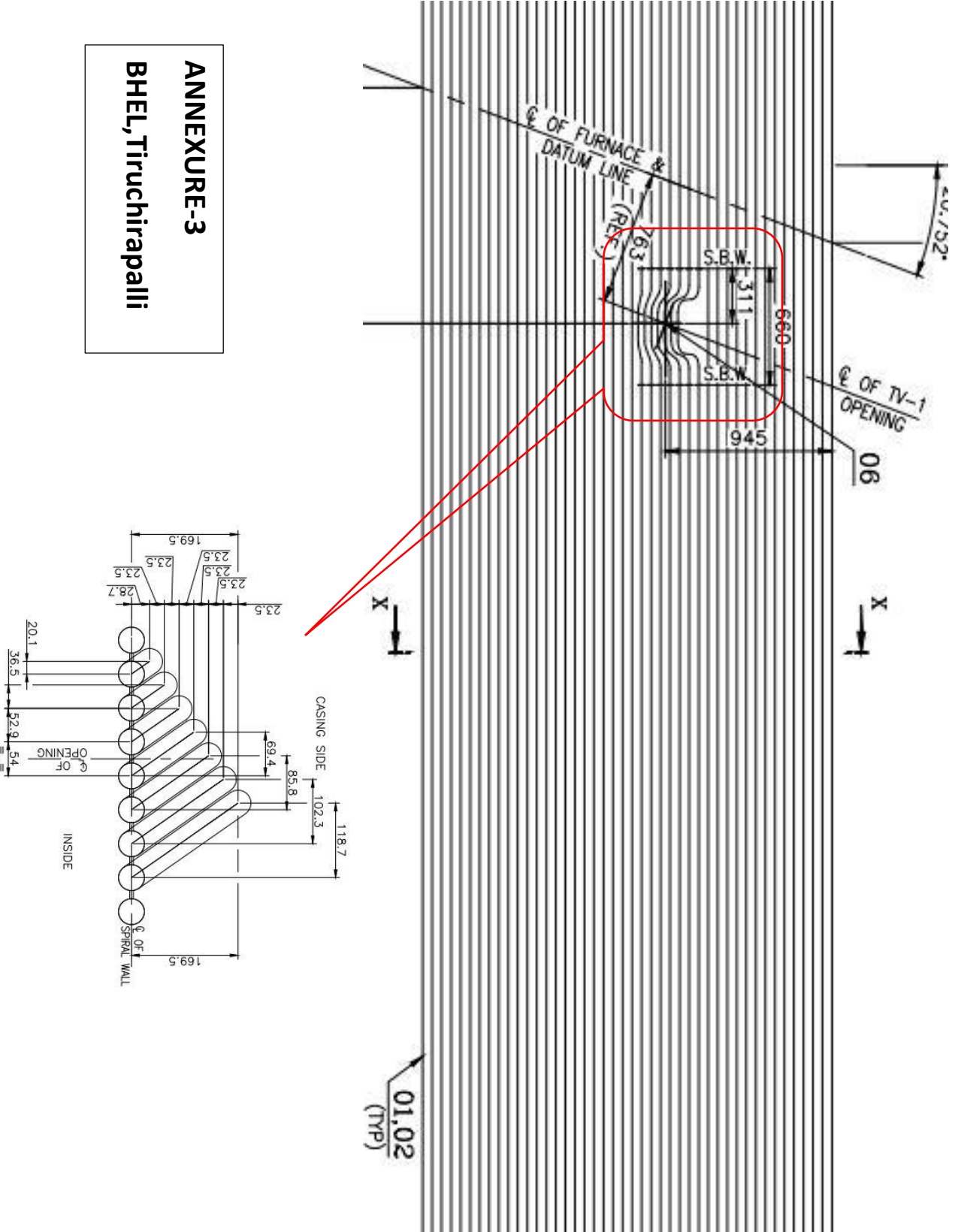
TABLE 1 - Porosity acceptance level

TYPE	SIZE in mm	No. of pores permitted in 150 mm length
SMALL	0.8	10
MEDIUM	1.2	5
LARGE	1.6	3
ASSORTED	-	LARGE – 1No.) MEDIUM – 2 Nos.) TOTAL – 7 Nos. SMALL – 4 Nos.)

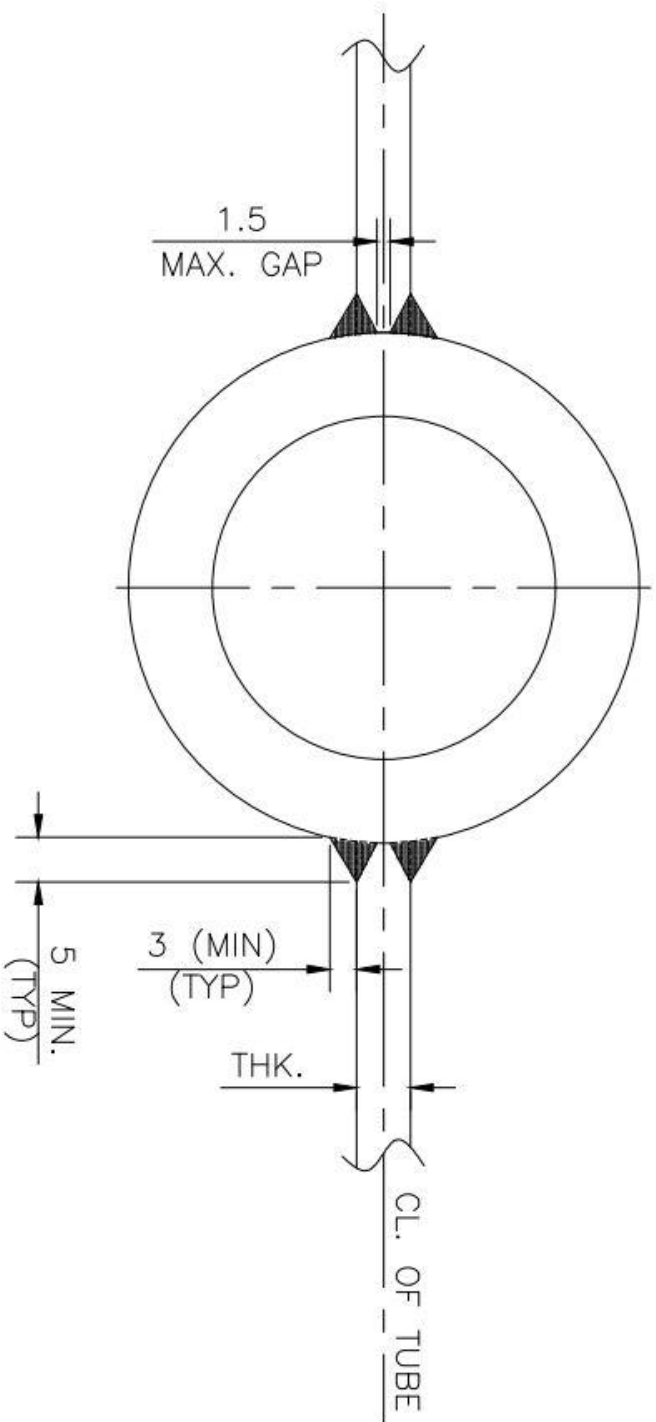
ANNEXURE-2
BHEL, Tiruchirapalli



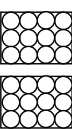
ANNEXURE-3
BHEL, Tiruchirappalli



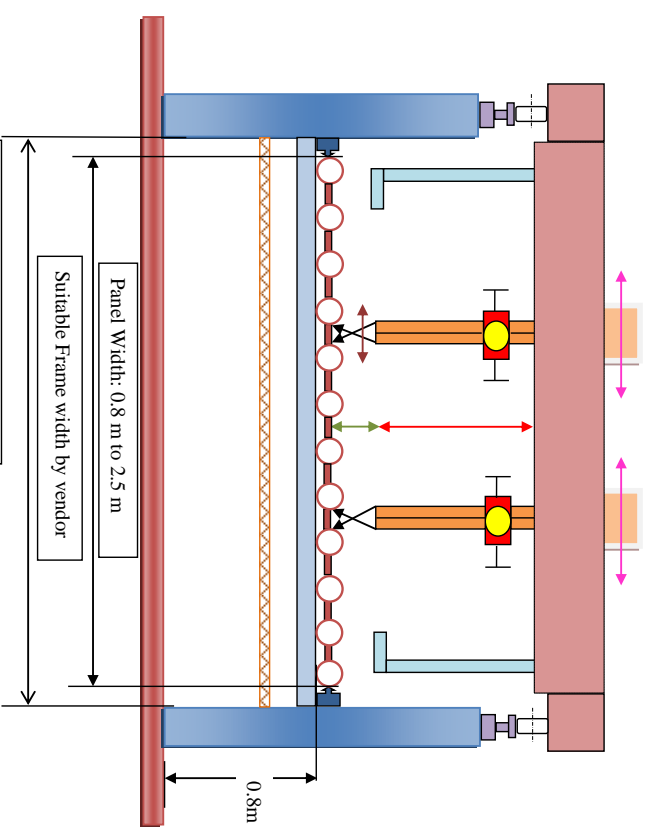
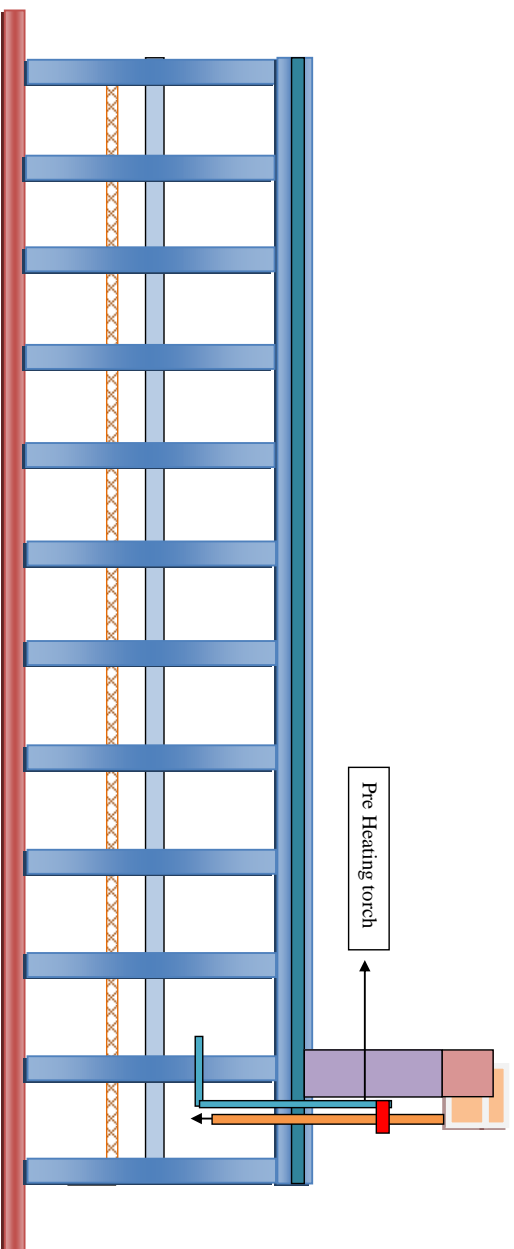
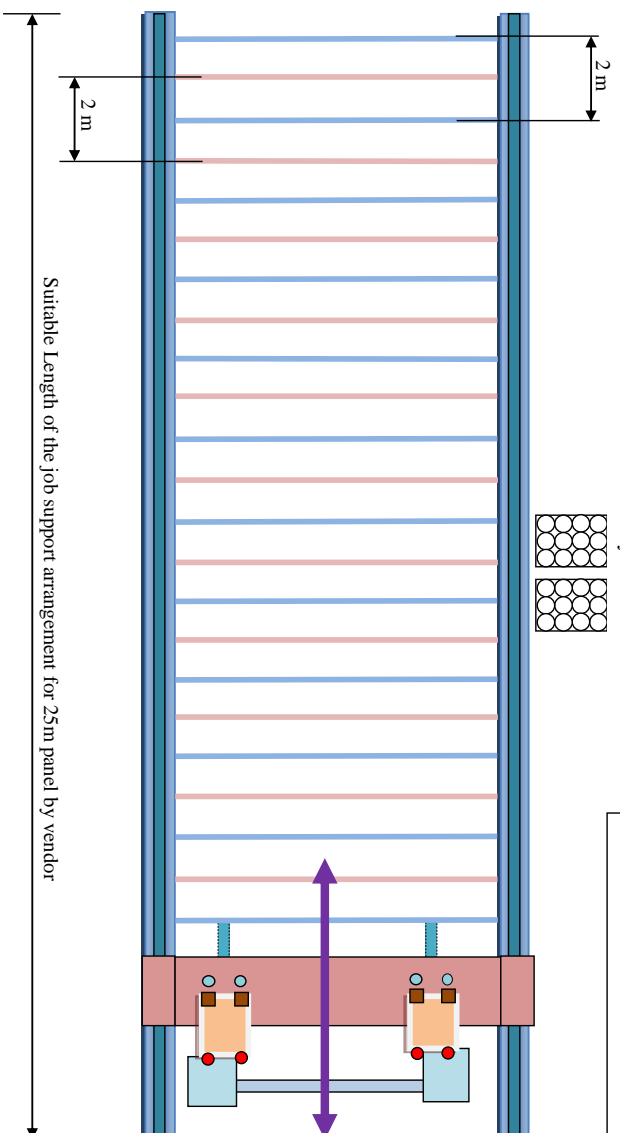
FILLET WELD DETAIL FOR PANEL WELDING



Gas Cylinder Banks



ROUGH SCHEMATIC OF 4 TORCH PANEL GANTRY



VFD for Gantry movement - 1 No

VFD for Torch carriage movement - 2 Nos

VFD for Torch fine vertical movement - 4 Nos

VFD for Torch fine Horizontal movement - 4 Nos

Pneumatic drive for fast vertical movement of torch - 2 Nos

Permanent Supports - Minimum 12 Nos

Removable Supports - Minimum 12 Nos

Note: Vendor to provide

- a. Shield Glass in between torch & operator - 2Nos
- b. Suitable Ladder for
 - a. Approaching the operator stand
 - b. Approaching the gantry top