

**Bharat Heavy Electricals Limited**  
(High Pressure Boiler Plant) Tiruchirappalli – 620014,  
TAMIL NADU, INDIA

**CAPITAL PURCHASE /MATERIALS MANAGEMENT / MFG**

<b>Title:</b> Fully mechanized hot wire gas tungsten arc welding (HW-GTAW) system for welding of tube to tube butt joints.	Phone: +91 431 257 7331 Fax : +91 431 252 07 19 Email : srchandran@bheltry.co.in, gvijay@bheltry.co.in Web : <a href="http://www.bhel.com">www.bhel.com</a> / <a href="http://www.tenders.gov.in">www.tenders.gov.in</a>
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	<b>Enquiry Number:</b> 2691200057/41	<b>Enquiry Date:</b> 02.06.12	<b>Due date for submission of quotation :</b> 16.06.12
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You are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order.

**ITEM DESCRIPTION: Welding System**

**Confirmation of acceptance for BHEL commercial terms & conditions and Price Bid formats have been posted in BHEL Corporate web site [www.bhel.com](http://www.bhel.com) and on the Government tender website <http://tenders.gov.in> (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference “2691200057/41”.**

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  
DGM / MM / Capital Purchase



ENQUIRY  
(INDIGENOUS)

# BHARAT HEAVY ELECTRICALS LIMITED

( A Government of India Undertaking )  
HIGH PRESSURE BOILER PLANT  
PURCHASE DEPARTMENT - FOSSIL BOILERS  
THIRUCHIRAPALLI - 620014  
TAMILNADU (INDIA)

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429-002/A

Enquiry No	Enquiry Date	Due Date for Quotation
2691200057 - 41	02.06.2012	16.06.2012

Please quote Enquiry No, Date and due date in all correspondences.  
This is only a request for quotation and not an order

Item	Description	Unit	Quantity	Delivery Quantity	Schedule Date
10	Hot wire GTAW system for AUSC Boiler mat	NO	1.000	1.00	08.08.12

**General Note:**

PL QUOTE YR RATES FOR F.O.R-DESTINATION BHEL TRICHY-INDIA BASIS.  
PLEASE SUBMIT YOUR DETAILED OFFER IN TWO PART BID SYSTEM AS PER ANNEXURE ENCLOSED.  
WE MAY GO FOR R.A (REVERSE AUCTION ) - ON LINE BIDDING FOR THIS TENDER IF REQUIERD.

**Enclosures:**

"LD clause has to be confirmed without fail."  
"Payment to vendors will be made only thro E-Payment mode"

The offers should reach us 30 minutes before the time of opening of tenders.  
The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening.Late and delayed offers are liable to be rejected.

Yours faithfully,  
For **BHARAT HEAVY ELECTRICALS LIMITED**  
  
MANAGER / PURCHASE  
(FOSSIL BOILERS)  
Yours faithfully,

**FULLY MECHANIZED HOT WIRE GAS TUNGSTAN ARC WELDING (HW-GTAW) SYSTEM FOR WELDING OF TUBE TO TUBE BUTT JOINTS**

**PART-B (Technical Specifications)**

**S. No.                      Particulars and BHEL Specification**

**1.0 Purpose:** The mechanized hot wire gas tungsten arc welding (HW-GTAW) system is required for welding of tube to tube butt joints involving tube diameter ranging from 25 to 76 mm of material T91/92, Inconel, stainless steel and carbon steel.

- 1.1
- a) Tube diameter range : 25 to 76 mm.
  - b) Tube wall thickness range : 3 to 15 mm.
  - c) 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.
  - d) Materials to be welded: T91/92, Inconel alloys, stainless steel and carbon steel

**2.0 Scope of supply:**

- a) The mechanised hot wire gas tungsten arc welding system shall consist of the following items, but shall include all the sub system, components, accessories and tooling required for carrying out quality welds as mentioned in 1.0.
- b) Welding Lathe with dual headstock with synchronised rotation.
- c) Torch positioning/manipulation unit fitted with weaving unit to hold and oscillate the hot wire TIG torch with smooth control.
- d) Arc voltage control (AVC) system to maintain constant arc length during TIG welding.
- e) GTAW power source, external water cooling unit for cooling the TIG torch, water cooled TIG torch, argon gas flow meter, inter connection cables and accessories.
- f) Hot Wire Power Source with all cables and controls.
- g) Hot Wire Feeder with liner and hot wire guide device to fix it to GTAW torch.
- h) Welding & Earthing Cables
- i) Data Acquisition System

**2.1 Welding Lathe with dual headstock for synchronised rotation**

- 2.1.1
- a) Welding lathe with dual headstocks driven by two individual) AC servo motors with variable chuck rotation speed of 0.6 to 6 rpm to ensure synchronised rotation of both tubes clamped between chucks.
  - b) Both headstocks fitted with three jaw chucks equipped with pneumatic clamping to hold and rotate the tubes having diameter range from 25 to 76 mm.
  - c) 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.
  - d) Pneumatically operated stopper for repeatable tube end positioning.
  - e) Roller bed of 1.0 m length and suitable height on either side of welding lathe to mechanically support the tubes protruding beyond the lathe.
  - f) A central controller for programming & controlling various functions of the system including welding parameters.
  - g) A remote pendant for online adjustment of the position and process.

## **2.2 Torch positioning/manipulation unit equipped with weaving unit to hold and oscillate the hot wire TIG torch.**

- 2.2.1 a) DC Servo Motor controlled horizontal slide assembly unit for moving the torch along the tube axis with inbuilt sensors for end position sensing. [Stroke length 300mm / Max Speed : 2500 mm/min]
- b) DC servo motor controlled vertical slide assembly unit for moving the torch vertically in Z -axis with inbuilt sensors for end position sensing. Stroke length 300mm / Max Speed : 1000 mm/min)
- c) Independent pneumatic slide (to mount the hot wire TIG torch) with stroke length 100 mm.
- d) AVC slide :300 mm stroke / max speed :1000 mm/min
- e) Hot wire feeder with accessories for feeding 0.8, 1.2 and 1.6 mm diameter wires.
- f) Hot wire feeding nozzle arrangement.
- g) Hot wire feeder mounting frame, wire spool capacity:15kgs
- h) Angular movement slide (-5 deg to 10 deg) & Manual Transverse Slide (-10 to 20 mm)
- i) Oscillation unit to weave the torch during welding.
- j) Oscillation width adjustable range: 5 to 50 mm
- k) Left/Right dwell adjustable range: 0 to 2 sec independently adjustable (with 0.1s increments)
- l) Oscillation speed adjustable range:0 to 2500 mm/min
- m) Cross seam adjustment:  $\pm$  25 mm (25mm left & right of center)

## **2.3 GTAW Power Source with Accessories**

- a) Inverter type DC GTAW power source with CC characteristics and with high frequency start.
- b) Input Power Supply: 415V, 50 Hz, 3 phase, AC.
- c) Output rating: 450A @ 100% duty cycle; 600 A @ 60% duty Cycle
- d) Standard and Pulsing current mode selection facility.
  - 1. Straight DC current
  - 2. Pulsing current
- e) Adjustable base and peak current.
- f) Adjustable upslope and down slope
- g) Current pulse frequency range:
- h) Digital display of current and voltage as well as Hot wire feed rate, hot wire current.
- i) Interlocks required:
- j) System should stop and give alarm in the event of stoppage of
  - 1. Shielding gas flow
  - 2. Cooling water supply
  - 3. Hot wire feed
  - 4. Chuck rotation
  - 5. Oscillation
  - 6. AVC function

## **2.4 Water cooling unit**

- a. Water cooling unit for circulating cooling water to TIG torch and it may be attached or external to the TIG welding power source.
  - 1. Flow rate:Max 5L/min and Tank capacity:15Lit.

## **2.5 Hot Wire Power Source & Feeder**

- a) Hot Wire Power Source:
- b) Hot wire Power source of capacity: 140A @ 100% Duty cycle.
- c) Hot Wire Feeder:
- d) Hot wire feeding: continuous feeding and Pulsed feeding
- e) Hot wire guide assembly attached to TIG torch.
- f) Tilting adjustment to be provided to complete torch unit including hot wire assembly.
- g) Offset adjustment provided to complete Torch unit including hot wire assembly.

- h) GTAW torch equipped with hot wire guide with pneumatic positioning mechanism.
- i) Wire diameters to be accommodated: 0.8, 1.2 and 1.6 mm.
- j) Wire material to be accommodated: carbon steel, stainless steel and Inconel.  
[Wire Spool diameter: 300 mm as per AWS 5.18.]
- k) Set of wire sheaths and sheath connections.
- l) Complete cable bundle with Power cable, Water hose, AVC, oscillation, wire and gas.

## 2.6 Control Panel.

- a) The centralised control panel is required for controlling the various modules viz. welding lathe, Torch positioning unit, GTAW Power source, hot wire feeder and weaving unit etc., of the total system individually (for setting purposes) or in sequentially as per the programmed operation (for running the system).
- b) Welding lathe, Torch positioning unit, GTAW and HW-GTAW power sources, hot wire feeder shall all be fully interfaced with control cabinet of welding Lathe.
- c) The control panel should also include all interface circuitry and safety interlocks.
- d) Controls required for welding Lathe operations:
- e) Movement of movable headstock via pneumatic cylinders.
- f) Pneumatic chuck clamping/releasing..
- g) Stopper plate up /down movement.
- h) Chuck rotation speed for precise control.
- i) Controls required in respect of welding torch positioning unit:
- j) Horizontal, Vertical movements of the slides.
- k) AVC control of TIG arc length.
- l) Hot wire feed rate setting and control.
- m) Oscillation unit on/off control.
- n) Oscillation unit movement control (shifting of torch in groove, increase / decrease oscillation width)
- o) Weaving parameters setting and control.
- p) TIG welding parameters setting and control.
- q) Hot wire current setting and control.
- r) Display of all the welding parameters.
- s) Adjustable flow meter on front panel of controller.
- t) Display of all the welding parameters on remote pendant as well as on PC screen during welding.

Note: Setting of welding parameter / welding program created using software in PC.

## 2.7 Data Acquisition System

- a) The main purpose of the data acquisition system is to monitor, record all the welding parameters during welding viz. welding current, arc voltage, Travel Speed [chuck rotation] and hot Wire feed rate, hot wire current [AC current], pulsed current, pulsed wire feed rate.
- b) The data acquisition system should be fully integrated with Hot Wire Welding system.
- c) Storage of measured parameters with provision to print and export as EXCEL file format.
- d) The fully integrated data acquisition system amongst other things shall include:
  - 1) Non intrusive probes.
  - 2) High Voltage attenuator and noise rejection circuit.
  - 3) Protected from HF interference
  - 4) Welding Current: 0 - 1000A DC and up to 600A AC.
  - 5) Arc Voltage: 0 - 100 volts and AC up to 60 V.
  - 6) Wire Feed Speed: 0 to 15 meters per minute
  - 7) Chuck rotation speed: 0 .1 to 6.0 rpm.
  - 8) Temperature measurement (on the rotating tube surface): 100 to 400 deg C

- 9) Real time display of all parameters:  
graphical on common time base and/or  
digital. [Selectable ].
- 10) Storage unit to record and retrieve.
- 11) Output device for printing preferably  
Laser.

### **3.0 Safety features**

- a) Safety Interlocks
- b) The system should trip in the event of:
  - 1) Shielding gas flow
  - 2) Cooling water supply
  - 3) Hot wire feed
  - 4) Chuck rotation
  - 5) Oscillation
  - 6) AVC function

### **4.0 Other features**

- a) The system should be easy to assemble and disassemble.

### **5.0 Installation and Commissioning**

#### **5.1 Services at Vendor Works:**

- a) Pre-dispatch inspection:
- b) Inspection of the complete system by BHEL engineers and carrying out welding trials on mock-up jobs at vendors works before dispatch. The acceptance criteria for weld quality would be as indicated in section 1.1 this spec.
- c) The filler wire, shielding gas, base material (tubes) and other inputs required for carrying out the above welding trials would be under vendor scope.
- d) The expenses towards travel and accommodation of BHEL engineers to vendor works and back would be under BHEL scope.

#### **5.2 Services at BHEL, Trichy:**

- a) The vendor shall be responsible for-
  - 1) Installation, commissioning of the system at BHEL, Trichy and carrying out welding trials to prove out the system with respect to all functions of the system.
  - 2) Providing training to BHEL engineers, technicians on the operation and maintenance aspects of the system for a period of five days.
  - 3) Hand tools, fasteners, electrical fuses and other special items/tools required for installation and commissioning of the system shall be under the scope the vendor.
  - 4) The filler wire, shielding gas, tubes required for the above welding trials would be under BHEL scope.

### **6.0 Maintenance Spares**

**6.1 Spares for two years trouble free operation of the total system. Unit wise cost of all the items must be provided with the offer.**

### **7.0 Civil Foundation**

- a) Civil and foundation details for grouting the system, if required.
- b) Civil foundation drawings/details shall be provided by the vendor at least eight weeks in advance of installation date.

### **8.0 Power Supply**

8.1 All electronic controls that need stabilized supply shall be provided with suitable voltage stabilizer.

### **9.0 General Points:**

9.1 Make and Model of the machine to be mentioned. Detailed catalogs of the machine to be sent with the offer.

9.2 Complete description of all systems & sub-systems shall form part of the technical bid





**Bharat Heavy Electricals Limited, Trichirapalli - 620 014**

**MM : CAPITAL PURCHASE**

**(To be filled and submitted along with offer )**

<b>BHEL Commercial Terms and Conditions for Indigenous Supplies</b>	<b>Vendor's Confirmation / Comments</b>
Technical confirmation to BHEL's Specification as called for in BHEL Format shall be furnished. If needed additional sheets shall be used.	
Prices shall be quoted item wise only as per the model format enclosed.	
Prices shall be quoted on "FIRM PRICE" basis only. The prices should be only on F.O.R / Despatching station basis inclusive of Packing & Forwarding charges if any. Applicable % of ED & Sales Tax, Freight & Insurance, Installation & Commissioning Charges should be clearly indicated.	
Validity of offer shall be for a minimum period of 120 days from the date of Tender opening	
Delivery period from the date of Letter of Intent / Purchase order shall be clearly mentioned in the offer.	
Liquidated damages @ 1/3% per week subject to a maximum of 15% of the order value shall be applicable for delay in deliveries.	
Following Risk Purchase clause shall be applicable: The purchaser at his option will be entitled to terminate the contract and to purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or dispatch within the time stipulated or if the same were not available, the best and the nearest available substitute therefore. The supplier shall be liable for any loss which the Purchaser may sustain by reason of such risk purchases.	
Payment terms for supply portion: • 100% payment will be made within 45 to 90 days after receipt and acceptance / commissioning of goods at BHEL, against submission of PBG for 10% of Order value with required validity. (or) * 80% value of the goods will be paid within 45 to 90 days against dispatch documents, negotiated through bank. Balance 20% will be paid within 45 to 90 days from the date of acceptance / commissioning of goods against submission of supplementary invoice and also against submission of PBG for 10% of Order value with required validity. All bank charges are to vendor's account only.	
Erection / commissioning: Erection / commissioning shall be done at free of cost.	
The equipment shall be guaranteed for a period of 12 months from the date of commissioning.	
Equipment will be inspected and proved at vendor's works prior to dispatch. However final inspection and acceptance of equipment will be after installation at BHEL, Trichy.	
The vendor shall provide necessary drawings, Test Certificates and Operating Maintenance Manuals etc., as called for in the Technical Specification, in the required number of copies at no extra cost.	
Any warranty replacement during warranty period shall be supplied free of charge on FOR BHEL, Trichy basis.	
Offers should be submitted only in sealed cover super-scribing clearly the Enquiry reference and due date.	

**NOTE:-**

- It is confirmed that all the terms and conditions stipulated in the Enquiry have been fully understood by us and all clarifications & details have been obtained.
- Your offer should be indicating applicable if any P&F Charges, % of ED, Sales Tax -CST or VAT, Service Tax), Freight, Insurance and Installation and Commissioning Charges etc., as per our Price Format.
- Your specific acceptance to our Payment terms, LD, Risk Purchase Clause & Submission of PBG for 10% of the order value are essential for consideration of your offer. Other wise your offer is liable for rejection.

Signature & Office Seal of the vendor

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# MM : CAPITAL PURCHASE

**Bharat Heavy Electricals Limited, Trichirapalli – 620 014**  
(To be filled and submitted along with Offer)

**BHEL Enquiry No.**

**Date :**

<b>BHEL Commercial Terms and Conditions for IMPORT SUPPLIES</b>	<b>Vendor's Confirmation / Comments</b>
Technical confirmation to BHEL's Specification as called for in BHEL Format shall be furnished. If needed additional sheets shall be used.	To be furnished along with offer (or) Technical Bid – Part No. I
<b>Prices shall be quoted item wise only as per the model format enclosed.</b>	
Prices shall be quoted on " <b>FIRM PRICE</b> " basis only. The prices should be only on FOB/FCA basis inclusive of Packing & Forwarding charges if any.	
<b>Validity of offer shall be for a minimum period of 120 days from the date of Tender opening</b>	
<b>Delivery period</b> from the date of Letter of Intent shall be clearly mentioned in the offer.	
<b>Liquidated damages @ ½% per week</b> subject to a maximum of 15% of the order value shall be applicable for delay in deliveries.	
<b>Following Risk Purchase clause shall be applicable:</b> The Purchaser at his option will be entitled to terminate the contract and to purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or dispatch within the time stipulated or if the same were not available, the best and the nearest available substitute therefore. The supplier shall be liable for any loss which the Purchaser may sustain by reason of such risk purchases.	
<b>Payment terms for Foreign vendor (Principal):</b> 80% value of the goods will be paid through an irrevocable Letter of Credit established by our bankers. Balance 20% will be paid against acceptance / commissioning of goods for which supplementary invoice and PBG for 10% of total Purchase order value shall be submitted. <b>All bank charges outside India are to vendor's account only.</b>	
<b>Payment terms for Indian Agent:</b> Indian Agency commission, if any, shall be clearly specified in the offer and the same will be paid in Indian Rupees against acceptance / commissioning of the equipment.	
<b>Erection / commissioning:</b> Erection / commissioning shall be done at free of cost.	
<b>Submission of Performance Bank Guarantee (PBG):</b> Vendor should provide a performance bank guarantee(PBG) for 10% of the total Purchase order value valid for a period of 12 months from the date of commissioning (or) 18 months from the date of dispatch <b>whichever is later</b> with an additional claim period of 2 months. This PBG shall form part one of the documents for effecting the balance 20% payment.	
Part Shipment or Transshipment is not permissible	
In case of any short shipment in the main equipment / spares, where separate rates are not available in the contract, the customs duty levied on such supplies, shall be borne by the supplier / Indian agent.	
Any warranty replacement during warranty period shall be supplied free of charge on FOR BHEL, Trichy basis.	
Equipment will be inspected and proved at vendor's works prior to dispatch. However final inspection and acceptance of equipment will be after installation at BHEL, Trichy.	
The equipment shall be guaranteed for a period of 12 months from the date of commissioning.	
The vendor shall provide necessary drawings, Test Certificates and Operating Maintenance Manuals etc., as called for in the Technical Specification, in the required number of copies at no extra cost.	
<b>Offers should be submitted only in sealed coversuper-scribing clearly the Enquiry reference and due date.</b>	

**NOTE:-**

- It is confirmed that all the terms and conditions stipulated in the Enquiry have been fully understood by us and all clarifications & details have been obtained.
- The prices are to be offered only on FOB/FCA basis, inclusive of Packing & Forwarding charges if any.
- Your specific acceptance to BHEL Payment terms, LD, Risk Purchase Clause & Submission of PBG for 10% of the order value are essential for consideration of your offer. Other wise your offer is liable for rejection.

Signature & Office Seal of the vendor