



An ISO 9001
Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

R & D and COAL RESEARCH

Supply of Vertical Split Tube Furnace System	Phone: +91 431 257 7558 Fax : +91 431 252 0696 / 252 0193 Email : mnthambi@bheltry.co.in Web : www.bhel.com
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Reference Number: 2821100013	Date: 03/10/2011	Due date for submission of quotation : 28/10/2011 by 14.00 Hours
You are requested to quote the Enquiry number date and due date in all your correspondences. <i>This is only a request for quotation and not an order.</i>		

BHEL/Trichy is looking for vendors for **Vertical Split Tube Furnace System consisting of control panel** as per the Annexure and terms & conditions attached.

Interested Manufacturers / Authorised dealers may send the offer on or before **28/10/2011, 14.00 Hours** in two parts as requested in the specification.

Note: The offer should reach this office on or before the due date & we are not responsible for any postal delay. Late tender will not be considered.

M.NALLATHAMBI
MANAGER/ R&D AND COAL RESARCH

**BHARAT HEAVY ELECTRICALS LIMITED**

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ENQUIRY
(INDIGENOUS)(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - FOSSIL BOILERS
THIRUCHIRAPALLI - 620014
TAMILNADU (INDIA)PHONE : 2577383
GRAMS : BHARATELEC
FAX NO: 2520696
E-mail :
Web :

429-002/A

OFFICE COPY	Collective No.	Enquiry Date	Due Date For Quotation
	2821100013	03.10.2011	28.10.2011
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	PIR NO: 7-398-115-027 Vertical split tube furnace system Consisting of a)3 nos of isothermal vertical split tube furnace b)Control panel with individual control system for each furnace c)Thermocouples d)Accessories for mounting Detailed technical specification has been enclosed. Vertical Split tube Furnace System	AU	1.000	1.00	28.11.11

General Note:

- 1) OFFERS WILL BE INVITED IN TWO PART BID ONLY.
- 2) IF REGRETTED MAKE MENTION ON THE TOP OF THE REPLY COVER AS"REGRETTED"
- 3) LD CLAUSE HAS TO BE CONFIRMED WITHOUT FAIL,OTHERWISE WE WOULD ASSUME THAT YOU HAVE ACCEPTED OUR LD CLAUSE.
- 4) REQUIRED:a)TEST CERTIFICATE.b)GUARANTEE CERTIFICATE
- 5) THE PREFERRED PAYMENT TERM IS 100% PAYMENT AFTER RECEIPT AND ACCEPTANCE OF MATERIALS.
- 6) ADVANCE OR PROFORMA INVOICE PAYMENT IS NOT ACCEPTED.
- 7) TRANSPORT AND DELIVERY AT BHEL / SHALL BE VENDOR'S SCOPE.
- 8) DETAILED SPECIFICATION REF NO:BHE:CRC:1 DT:01.09.2011.
(14 pages)+ QUALIFYING CRITERIA REF.BHEL:CRC:1 DT:11.09.2011
(1 page) ENCLOSED

Enclosures:

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

PR Links

Material.	PR.No	PR.Item.	Quantity	Acc. Assign	Customer Number
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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**

S. Subburaj
 Deputy Manager / R&D and CR,
 Bharat Heavy Electricals Limited
 MANAGER / PURCHASE

Bharat Heavy Electricals Limited – Tiruchirapalli
COAL RESEARCH CENTRE

Technical Specifications For Isothermal Vertical Split Tube Furnaces

Ref : BHE: CRC:1

Dt : 01-09-2011

Description :

Three individual vertical split tube furnaces, each maintained at a temperature as specified, is to be placed as indicated in the sketch (Annexure -1) below. A continuous process tube (High alumina) of 57.15 mm OD will be placed inside, which runs along the length of the three furnaces. Coal at the rate of about 1 to 5 g/ min and air at the rate of 10 to 25 LPM flows through the process tube continuously.

The desired heating length for each furnace has been mentioned in the specification for the respective furnace. The non heating length should be made as minimum as possible. The outer diameter of each furnace should be restricted within 650 mm.

The ID of the furnaces should be such a way that a 57.15 mm OD process tube can be inserted inside and removed with ease. Suitable support is to be provided for holding the process tube firmly inside the furnace without blocking the top and bottom openings of the process tube as coal may continuously flow from top and will be collected as ash at the bottom.

The selection of heating elements and its arrangement within the furnace interior wall should be such a way that the temperature gradient between the furnace interior wall and the process tube should be very minimum. The physical clearance between the furnace ID and the process tube OD should also be kept minimum to minimize heat loss.

It may be noted the requirement is three numbers of furnaces and not a furnace with three zones of heating. The sketch (Annexure 1) is attached for reference.

Scope of work :

- 1.Design, manufacture and supply of
 - a) 3 numbers of isothermal vertical split tube furnaces as per the specification
 - b) Control panel with individual control system for each furnace
 - c) Thermocouples
 - d) Accessories for mounting
 - e) Spares
- 2.Installation and commissioning of the furnace system as per the requirement
- 3.Demonstration of the performance as per the guaranteed parameters.
- 4.Provide training on operation and maintenance

Exclusions :

1. Power supply (3phase, 415V, 50 Hz) to the individual furnaces & control panel.
(However, if any transformers are required, it will be under vendor's scope.
2. Supporting columns for furnaces.
3. Data Acquisition System (Only signal provision to be provided by the vendor)
4. Process tube (to be placed inside the furnace)
5. Pyrometer

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Note :

The “Technical Bid” shall have vendor’s responses along with Product Catalogue, Data Sheets in ORIGINAL and complete technical details.

All Technical terms can be here. **NO PRICE DETAIL IS ENTERTAINED HERE.**

Any deviation from the specifications may be brought-out clearly by the supplier in the technical bid

Technical Specification for Furnace – 1

Sl. No	Description	BHEL’s Specification/requirement	Bidder’s Offer (With complete details)
1.	Item	Isothermal vertical split tube furnace	
2.	Desired design features	<ul style="list-style-type: none">• Heavy duty hinge assembly with handle and latches• Shell made of stainless steel	
3.	Maximum continuous temperature as measured by the thermocouple	800 °C	
4.	Normal operating range	400-800 °C	
5.	Effective heating length	400 mm	
6.	OD of the process tube which will be inserted	57.15 mm	
7.	Heating element	Silicon carbide based or equivalent heating element with low specific electrical resistivity, longer element life, resistance to oxidation and thermal shock.	
8.	Heating arrangement	The heating elements shall be placed such that the process tube is heated circumferentially.	
9.	Heat duty	To be specified by the supplier	
10.	Heating rate	Provision for varying the heating rate from 5 °C/min to 20 °C/min is required	

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Technical Specifications For Isothermal Vertical Split Tube Furnaces

11.	Permissible variation in temperature along the heating length	+/- 10 °C	
12.	Thermocouples	2 duplex thermocouples of suitable type for measuring temperatures in the range of 400-800 °C is to be provided on the fixed half of the furnace in the opposite directions as shown in the sketch.(Annexure-1)	
13	Refractory and Insulation lining	High temperature ceramic fibre insulation (RATH or equivalent) with refractory lining to withstand 1650 °C.	
14.	Skin temperature	When operated at the maximum furnace temperature, the skin/outside surface temperature should not be more than 50°C.	
15.	Furnace temperature control system	<ul style="list-style-type: none"> • Microprocessor based, auto tuning, programmable, digital PID controller. • RS 485 / RS 232 communication ports • LED/LCD display of temperature in °C • Alarm and trip for temperature overshoot from set point 	
16.	Temperature Control accuracy	+/- 3 °C	
17.	Power supply	3 phase, 415 V, 50 Hz	

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Technical Specifications For Isothermal Vertical Split Tube Furnaces

Technical Specification for Furnace – 2

Sl. No	Description	BHEL's Specification/requirement	Bidder's Offer (With complete details)
1.	Item	Isothermal vertical split tube furnace	
2.	Desired design features	<ul style="list-style-type: none"> • Heavy duty hinge assembly with handle and latches • Shell made of stainless steel 	
3.	Maximum continuous temperature as measured by the thermocouple	1650 °C	
4.	Normal operating range	1000-1600 °C	
5.	Effective heating length	600 mm	
6.	OD of the process tube which will be inserted	57.15 mm (2.25")	
7.	Heating element	Molybdenum disilicide (MoSi ₂) based or equivalent heating element with low specific electrical resistivity, longer element life, resistance to oxidation and thermal shock.	
8.	Heating arrangement	The heating elements shall be placed such that the process tube is heated circumferentially.	
9.	Heat duty	To be specified by the supplier	
10.	Heating rate	Provision for varying the heating rate from 5 °C/min to 25 °C/min is required.	
11.	Permissible variation in temperature along the heating length	+/- 10 °C	
12.	Thermocouples	4 duplex thermocouples of suitable type for measuring temperatures in the	

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Technical Specifications For Isothermal Vertical Split Tube Furnaces

		range of 1000-1650°C is to be provided on the fixed half of the furnace in the opposite directions as shown in the sketch.(Annexure -1)	
13.	Refractory and Insulation lining	High temperature ceramic fibre insulation (RATH or equivalent) with refractory lining to withstand 1650 °C.	
14.	Skin temperature	When operated at the maximum furnace temperature, the skin/outside surface temperature should not be more than 50°C.	
15.	Furnace temperature control system	<ul style="list-style-type: none"> • Microprocessor based, auto tuning, programmable, digital PID controller. • RS 485 / RS 232 communication ports • LED/LCD display of temperature in °C • Alarm and trip for temperature overshoot from set point 	
16.	Temperature Control accuracy	+/- 3 °C	
17.	Port for pyrometer	Port of standard dimensions is to be provided at the middle of the furnace as shown in the sketch (Annexure-1) for insertion of pyrometer.	
18.	Power supply	3 phase, 415 V, 50 Hz	

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Technical Specifications For Isothermal Vertical Split Tube Furnaces

Technical Specification for Furnace – 3

Sl. No	Description	BHEL's Specification/requirement	Bidder's Offer (With complete details)
1.	Item	Isothermal vertical split tube furnace	
2.	Desired design features	<ul style="list-style-type: none"> • Heavy duty hinge assembly with handle and latches • Shell made of stainless steel 	
3.	Maximum continuous temperature as measured by the thermocouple	1650 °C	
4.	Normal operating range	1000-1600 °C	
5.	Effective heating length	600 mm	
6.	OD of the process tube which will be inserted	57.15 mm (2.25")	
7.	Heating element	Molybdenum disilicide (MoSi ₂) based or equivalent heating element with low specific electrical resistivity, longer element life, resistance to oxidation and thermal shock.	
8.	Heating arrangement	The heating elements shall be placed such that the process tube is heated circumferentially.	
9.	Heat duty	To be specified by the supplier	
10.	Heating rate	Provision for varying the heating rate from 5 °C/min to 25 °C/min is required.	
11.	Permissible variation in temperature along the heating length	+/- 10 °C	
12.	Thermocouples	4 duplex thermocouples of suitable type for measuring temperatures in the	

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Technical Specifications For Isothermal Vertical Split Tube Furnaces

		range of 1000-1650 °C is to be provided on the fixed half of the furnace in the opposite directions as shown in the sketch. (Annexure -1)	
13	Refractory and Insulation lining	High temperature ceramic fibre insulation (RATH or equivalent) with refractory lining to withstand 1650 °C.	
14.	Skin temperature	When operated at the maximum furnace temperature, the skin/outside surface temperature should not be more than 50°C.	
15.	Furnace temperature control system	<ul style="list-style-type: none"> • Microprocessor based, auto tuning, programmable, digital PID controller. • RS 485 / RS 232 communication ports • LED/LCD display of temperature in °C • Alarm and trip for temperature overshoot from set point 	
16.	Temperature Control accuracy	+/- 3 °C	
17.	Power supply	3 phase, 415 V, 50 Hz	

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Technical Specifications For Isothermal Vertical Split Tube Furnaces

Specifications/ Requirements common to all three furnaces

Sl.No	Description	BHEL's Specification/requirement	Bidder's Offer (With complete details)
1.	Dimensions & weight	Supplier to clearly indicate the dimensions and weight of the individual furnaces as well as the entire system.	
2.	Power supply	<ul style="list-style-type: none"> • 3 phase, 415 V, 50 Hz supply will be made available at the installation site. • No of electrical sockets and MCB(if any) along with the ratings to be clearly indicated. • If any transformers are required, it will be under vendor's scope of supply. 	
3.	Provision for interfacing with Data Acquisition system	Provision for data logging is to be provided for all temperature measurements.	
4.	Support assembly	<ul style="list-style-type: none"> • The furnaces should have brackets with extended arms on one half such that they can be supported on columns and the other half can be opened freely. • Suitable support is to be provided for holding the process tube firmly inside the furnace without blocking the top and bottom openings of the process tube as coal may continuously flow from top and will be collected as ash at the bottom. 	
5.	Accessories required for all 3 furnaces individually	As the tube furnace is to be mounted on vertical support column, other essential accessories, if any, are to be supplied by the vendor.	

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Technical Specifications For Isothermal Vertical Split Tube Furnaces

6.	Thermocouples	<ul style="list-style-type: none"> • 2 for furnace1 and 4 each for furnaces 2 and 3. • To be positioned on the fixed half of the furnace in the opposite directions as shown in the sketch. (Annexure -1) • Selection of thermocouple type to be in accordance with the temperature range mentioned under the specification for each furnace. • Duplex connectors • Connection head with terminal block • Should withstand oxidizing, reducing and corrosive atmosphere • Ceramic protection tube and ceramic insulation • Temperature calibration certificate to be provided for all the thermocouples. 	
7.	Spares required	<ul style="list-style-type: none"> • Itemised break-up of recommended spares to be quoted with unit price separately. 	
8.	Control panel	<ul style="list-style-type: none"> • Control systems for three furnaces should be independent and mounted on a single panel. • The control panel should be floor supported type. • The temperature from all the thermocouples must be displayed on the control panel. 	
9.	Inspection at vendor works	<ul style="list-style-type: none"> • BHEL's inspection is applicable. Physical inspection of the equipment and associated accessories will be carried out at vendor works. • All the features and guaranteed parameters of the equipment and associated accessories are to be 	

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		demonstrated by the vendor during inspection .	
10.	Installation and commissioning	The furnaces with all accessories is to be installed & commissioned at BHEL works by the supplier.	
11.	Training	After successful installation and commissioning of the furnaces, complete training on operation of the furnaces, associated software (if any) , mechanical and electrical maintenance to be given to BHEL personnel at the installation site free of cost.	
12.	Performance prove-out at BHEL	Vendor to demonstrate the performance as per the specification at BHEL's works.	
13.	Manuals	Hard and soft copies of complete set of installation and O&M manuals in English language	
14.	Documents to be furnished to BHEL along with the offer.	<ul style="list-style-type: none"> • Scope of supply -2 copies. • Catalogs of models quoted-2 copies. • Lay out of the furnace with all dimensions clearly specified • Mandatory spares with Unit price. (only the name of spare in the technical bid and its cost in the price bid) • Application notes , hard copy of literature with photos and drawings explaining the technical features 	
14.	Documents to be furnished to BHEL after the offer acceptance	<ul style="list-style-type: none"> • Lay out of the furnace system with all dimensions clearly specified • Electrical wiring diagram indicating power supply requirement and cable 	

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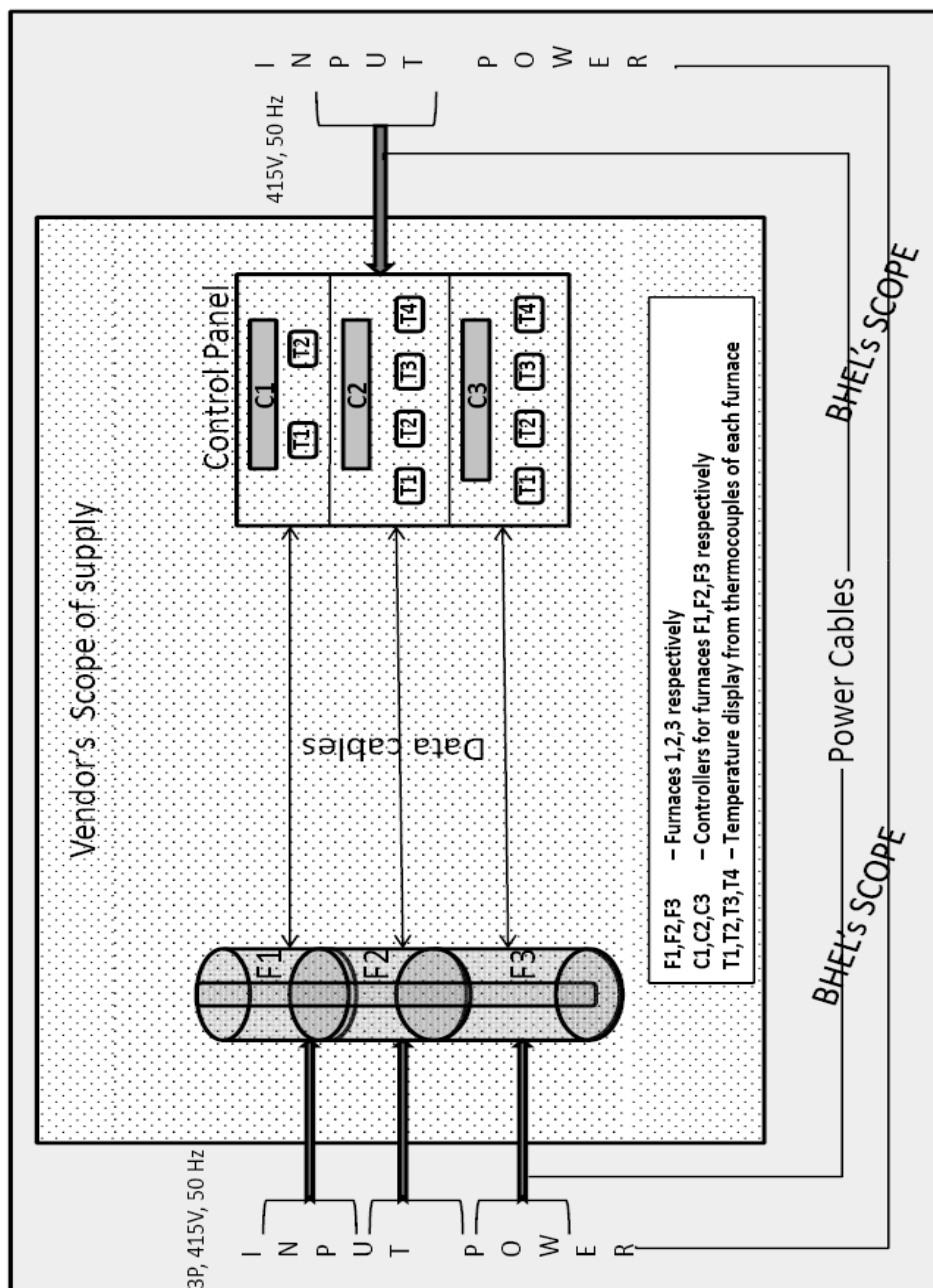
Technical Specifications For Isothermal Vertical Split Tube Furnaces

		<p>specifications.</p> <ul style="list-style-type: none"> • Temperature versus resistivity graph and material composition certificate for the heating elements • Quality certificates, internal test reports for each furnace components (heating elements, refractory,etc) and calibration reports. (to be submitted after placing order) 	
15.	Onsite performance guarantee	The furnaces and accessories are to be guaranteed for its performance for a minimum period of 1 year from the date of performance acceptance at BHEL works.	
16.	After sales service	Service support and spares for the model offered should be assured for a minimum of five years	
	<p>The total cost should be inclusive of</p> <ul style="list-style-type: none"> • Furnaces • Integrated control panel with furnace control systems • All essential accessories required for mounting and support the furnaces and control panel. • Software for interfacing and controlling through PC • Installation and commissioning <p>The itemized list of spares with unit price is to be quoted separately and not to be included in the total landed cost.</p>		

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Technical Specifications For Isothermal Vertical Split Tube Furnaces

Scope Diagram

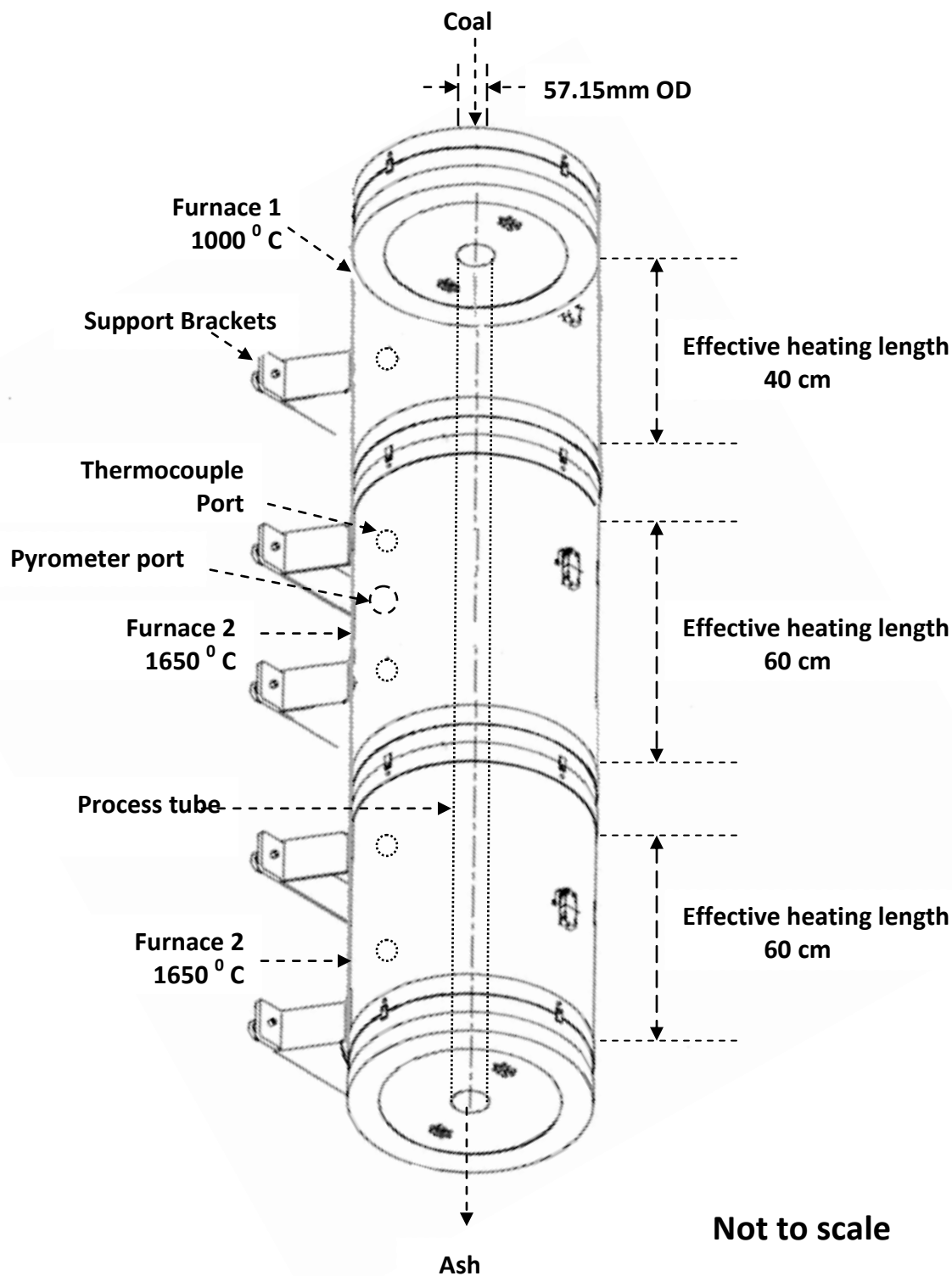


Note :

- The panel will be located at a distance of 5 metres away from the furnace. Suitable cable length for proper routing will be under vendor's scope.
- If any transformers are required, it will be under vendor's scope of supply.

Technical Specifications For Isothermal Vertical Split Tube Furnaces

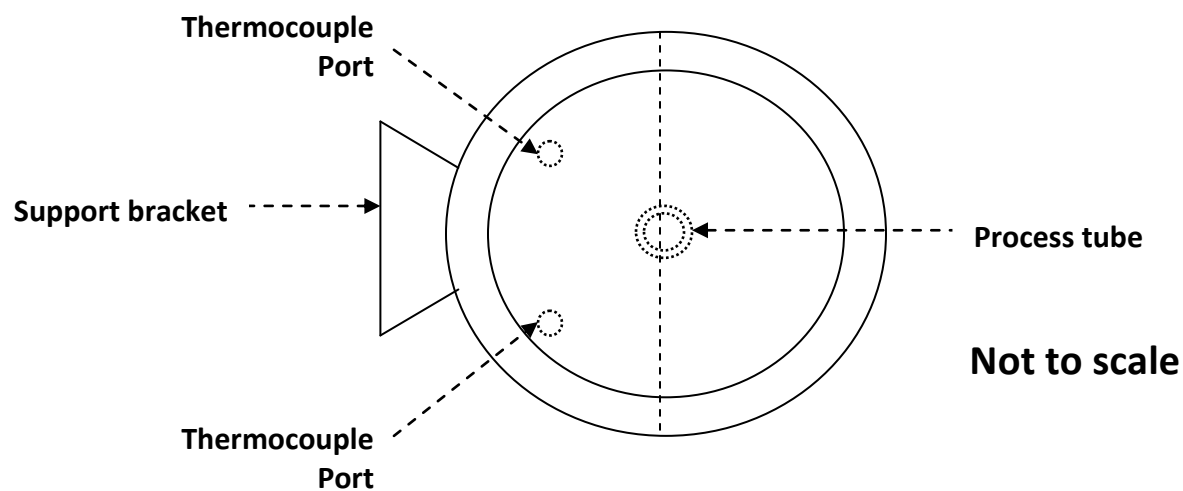
Annexure – 1



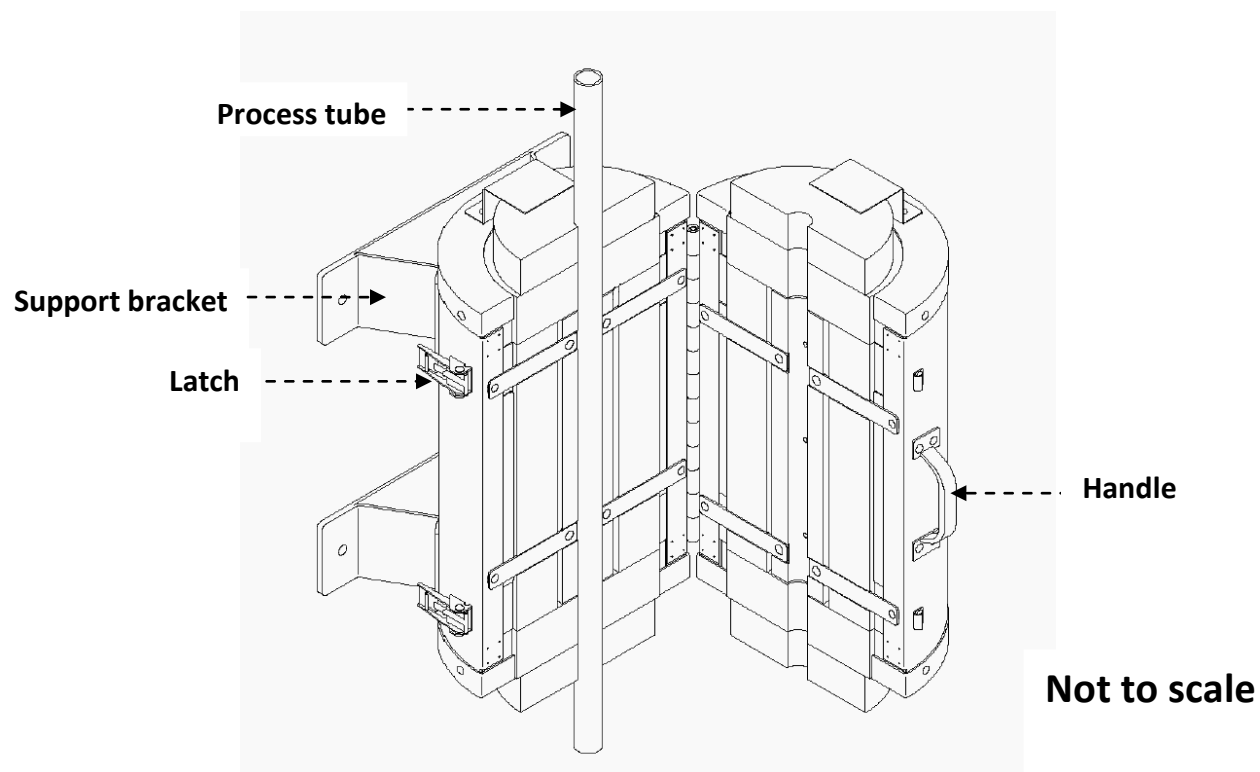
Technical Specifications For Isothermal Vertical Split Tube Furnaces

Annexure – 1

Plan view



Side view(with the furnace open)



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Qualifying criteria for supply of Isothermal Vertical Split Tube Furnaces

Ref : BHE: CRC:1

Dt : 11-09-2011

QUALIFYING CRITERIA

The BIDDER / VENDOR have to necessarily provide the following details, for making an assessment of the firm's capability and competency.

The bid consists of 2 parts namely Technical and Price bid. Vendor shall submit Technical and Price bid separately. BHEL will study both the Qualifying Criteria and Response for Technical Specifications. The Price bid can be studied only if both the Qualifying Criteria and Response for Technical Specifications are found acceptable.

[The BIDDER is expected to give complete details against each clause in the table given below and wherever necessary an additional sheet may be attached giving clear reference number to cover the required details]

Name of the product: Isothermal vertical split tube furnaces

Please refer Technical Specification for further details.

S. No.	PARTICULARS	VENDOR's RESPONSE
1.0	The BIDDER / VENDOR or their Principal shall have a minimum of FIVE Years of Continuous Experience in the Design, Manufacture & Supply of Vertical Split Tube Furnaces . Please indicate the actual experience.	
2.0	Number of “ Vertical Split tube furnaces ” supplied, installed and commissioned till date in India. Please furnish contact person name, address, phone number, fax number and mail id.	
3.0	Number of “ Vertical Split tube furnaces ” supplied, installed and commissioned till date outside India. Please furnish contact person name, address, phone number, fax number and mail id.	
4.0	Please enclose Performance Certificate from atleast one Indian or Foreign customer for this type of furnace.	
5.0	Details of Technical Back-Up assured from the PRINCIPAL Equipment Maker.	
6.0	The BIDDER / VENDOR shall assure a continuous support for SPARES and SERVICE for Five Years, from the date of commissioning of the equipment at BHEL Works.	