Bharat Heavy Electricals Limited

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

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

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620600065	**21.09.2006**	**01.11.2006**
Your are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order			

Item	**Description**	**Quantity**	**Delivery Schedule**
10	High Temperature (Solution Annealing) Furnace with Handling facility as per the technical specification & commercial conditions applicable (to be downloaded from web site **www.bhel.com**)	1 No.	31.08.2007

Note:

(1) The detailed Technical Specification along with technical point-by-point confirmation, Commercial Terms & Conditions applicable for this Enquiry, Confirmation of acceptance for BHEL commercial terms & conditions and Price Bid formats have been posted in BHEL Corporate web site www.bhel.com under Enquiry reference "2620600065". Your offer should be based on all the above documents.

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

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

PART A

HIGH TEMPERATURE (SOLUTION ANNEALING) FURNACE
(Fuel: Producer Gas)

SECTION-I:

QUALIFYING CRITERIA FOR THE SUPPLY OF HIGH TEMPERATURE (SOLUTION ANNEALING) FURNACE

S. No.	PARTICULARS	VENDOR'S RESPONSE
1.0	Only those vendors, who have supplied and commissioned at least one 10T or higher size Gas Fired Car Bottom Furnace for operating at 1200 deg C or higher in the past and such Furnace is presently working satisfactorily for more than one year after commissioning (on the date of opening of Tender), should quote. However, if such Furnace (s) has / had been supplied to BHEL, then it should be presently working satisfactorily for more than six months after its commissioning and acceptance (on the date of opening of Tender) in BHEL. **The vendor should submit the following information about the companies where similar machines have been supplied, for qualification of their offer.**	
	a. Name of the customer / company where similar furnace is installed.	
	b. Complete postal address of the customer	
	c. Month and Year of commissioning	
	d. Application for which the Furnace is supplied	
	e. Name and designation of the contact person of the Customer.	
	f. Phone, FAX no. and email address of the contact person of the Customer	
	g. Performance certificate from the customers regarding satisfactory performance of machine supplied to them	
2.0	Offers of only those vendors who meet the above Qualifying Criteria will be considered for further evaluation	
3.0	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	

SECTION – II

The vendors are requested to provide the following details

S. No.	PARTICULARS	VENDOR'S RESPONSE
4.0	Number of Years of Experience of the BIDDER/ VENDOR in the field of design, manufacture, supply, erection & commissioning of Heat Treatment Furnaces	
5.0	Number of FURNACES supplied, installed and commissioned till date	
6.0	Number of Heat Treatment Furnaces supplied, installed and commissioned till date in the QUOTED MODEL	
7.0	Number of Heat Treatment Furnaces supplied, installed and commissioned till date for the following category of CUSTOMERS a) Power Utility Boiler Manufacturer b) Equipment Supplier for Process Industries [Heavy Engineering Companies] c) Research Establishments	
8.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centre in India and Asia	
9.0	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – III

The vendor has to comply with the following:

S.No.	REQUIREMENTS	VENDOR'S RESPONSE
10.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS - Technical **[with PART A & PART B]** & Commercial and Price Bid.	
11.0	The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. Where details are required, a mere 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement may lead to disqualification of the Technical Offer.	

S.No.	REQUIREMENTS	VENDOR'S RESPONSE
12.0	The BIDDER / VENDOR shall assure a continuous support for SPARES and SERVICE for TEN Years, from the date of commissioning of the equipment at BHEL Works.	
13.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' with copies of Product Catalogue and Selection Criteria	
14.0	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation	
15.0	BIDDER has to indicate the Country of Origin for the supply of equipment.	
16.0	The reference List of Customers shall be accompanied with the details (Phone Number /E-Mail ID) of the CONTACT PERSON for cross reference by BHEL	

PART B

HIGH TEMPERATURE (SOLUTION ANNEALING) FURNACE

(Fuel: Producer Gas)

TECHNICAL DATA & SPECIFICATIONS: HIGH TEMPERATURE (SOLUTION ANNEALING) FURNACE

IMPORTANT NOTE : The proposed High Temperature Furnace has to be utilized in two modes of operation :-

MODE No. I :

In the normal way of loading the furnace bogie hearth (car bottom type) with the charge (jobs/components to be heat treated) and pushing the entire bogie inside the furnace, so that the furnace chamber is totally enclosed with the front door. Further firing of fuel is done to carry-out the heat treatment operation viz., solution annealing or normalizing or stress relieving.

MODE No. II :

In this mode, only the portions/segments of the job/components which have undergone cold working , have to be heat treated by way of solution annealing. For this only a segment of the furnace bogie is pushed into the furnace and an enclosed space is created by closing the front door and AN INTERMEDIATE PARTITION DOOR (movable in the vertical direction) and firing is carried out only in this enclosed portion.

So the furnace design shall be such that only 2.0 metre length of the bogie is pushed inside and the inside partition door makes a perfect sealing with the furnace bogie at the inner side. The Front Door will be resting on the job supports placed on the bogie (additional insulation / sealing will be provided to reduce the heat loss through this crevice opening.

The control system and the combustion system shall be suitable for operating the furnace exclusively for this small compartment as and when required.

The BIDDER has to give technical details on the provisions made in the furnace to achieve this objective of partial usage.

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
1.0	**PURPOSE & WORKPIECE MATERIAL:**			
1.1	**Purpose:** To heat treat all Pressure Parts like tubular coils etc of Utility and Industrial Boilers			
1.2	**Job Details:** Material: Mild Steel, Alloy Steel, Stainless Steel Configuration: Tubular Coil Assemblies and Loose Coils / Bends Tube Diameter Range: 31.8 to 76.1 mm OD Wall Thickness: 2.4 to 15 mm Job Length: Up to 8000 mm Job Width: Upto 3350 mm. Weight of Job Lot: Not exceeding 20 Tons			
2.0	**SPECIFICATION:**			
2.1	**FURNACE:**			
2.1.1	**Operating Parameters:**			
2.1.1.1	Charge Capacity	20 Tons		
2.1.1.2	Heat Treatment Cycles to be carried out	Solution Annealing, Stress Relieving, Annealing		
2.1.1.3	Operating Temperature			
a)	Maximum Furnace Temperature	1260^{o}C		
b)	Maximum Charge Temperature	Heating to 1060-1100 / 1160–1200^{o}C and soaking for 15 to 30 minutes		
c)	Rate of Heating (after attaining 400 °C)	Up to 200 °C / Hour		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.1.1.4	Job Temperature Uniformity at soaking	± 10^{o}C		
2.1.1.5	Fuel	Producer Gas		
2.1.2	**Furnace Configuration**			
2.1.2.1	Fuel - Gas Fired firing system	Vendor to confirm		
2.1.2.2	Single Bogie Configuration with Closed Furnace Chamber & Vertical Lifting Doors	Vendor to confirm		
2.1.2.3	Car Bottom Bogie Traversing on embedded Rails, thro' a Rack & Pinion Drive with reduction gear box	Vendor to confirm		
2.1.2.4	Automatic Zone Temperature Control with Programming of Heat Treatment Cycle	Vendor to confirm		
2.1.2.5	Ceramic Fiber block module Lining	Vendor to confirm		
2.1.2.6	Recuperator System for Energy Conservation	Vendor to confirm		
2.1.2.7	Job supporting Heat resistant cast iron pedestals 8 nos. for each bogie	Vendor to confirm		
2.1.3	**Furnace Inside Effective Dimensions:**			
2.1.3.1	Wall to Wall width	4000 mm		
2.1.3.2	Inside Length (Front Door to Back Wall)	8000 mm		
2.1.3.3	Inside Height (above Bogie top)	500 mm		
2.1.4	**Combustion System**			
2.1.4.1	Furnace has to be provided with required number of nozzle-mix burners suitably designed for firing Producer Gas. Positioning of the burners inside the furnace shall be designed to create high degree of turbulence inside the furnace, increased convection heat transfer co-efficient, for better uniformity and thermal efficiency even at lower temperature.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.1.4.2	Fuel	**Producer Gas** having calorific value 1250 Kcal/Nm^3 (CO = 20 to 25%, H2 = 10 to 12%, CH4 = 3 to 5%, CO2 = 5 to 7%, Nitrogen – balance)		
2.1.4.3	Producer Gas Pressure	150 to 250 mm Water Column		
2.1.4.4	Max required flow rate of Producer Gas	Vendor to Specify		
2.1.4.5	Burners Type	Vendor to Specify		
2.1.4.6	Number of rows and arrangement of Burners (Schematic drawing should be furnished along with the offer)	Vendor to specify		
2.1.4.7	Number of Burners (Calculation details should be submitted with the offer)	Vendor to Specify		
2.1.4.8	Burner Rating	Vendor to Specify		
2.1.4.9	Flame Length	Vendor to Specify		
2.1.4.10	Type of Temperature Control	PID		
2.1.4.11	No. of Temperature control Zone	Four		
2.1.4.12	Furnace Efficiency should be at least 70 %	Vendor to Specify		
2.1.4.13	Forced Draught (FD) Fan:			
a)	FD Fan of suitable capacity **(including excess air)** has to be provided to ensure proper combustion	Vendor to Confirm		
b)	Air flow	Vendor to Specify		
c)	Air Pressure	Vendor to Specify		
d)	Power Rating (KW)	Vendor to Specify		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.1.4.13	Forced Draught (FD) Fan:			
e)	Type of blower	Vendor to Specify		
f)	Make of Blower	Vendor to Specify		
2.1.4.14	Induced Draught (ID) Fan:			
a)	ID Fan of suitable capacity has to be provided before the stack to ensure proper combustion	Vendor to Confirm		
b)	Air flow	Vendor to Specify		
c)	Air Pressure	Vendor to Specify		
d)	Power Rating (KW)	Vendor to Specify		
e)	Type of blower	Vendor to Specify		
f)	Make of Blower	Vendor to Specify		
2.1.4.15	The FD Fan and ID Fan have to be suitably sized to ensure a Balanced Draft System	Vendor to confirm		
2.1.4.16	A standby fan each for both FD and ID system has to be provided	Vendor to confirm		
2.1.4.17	**Dampers:**			
a)	Damper has to be provided after the furnace hearth and before the stack in the flue gas path to regulate draught	Vendor to Confirm		
b)	The damper has to work on auto mode and its opening should get adjusted automatically depending upon the draught required in the furnace (positive). (Complete details should be furnished with the offer)	Vendor to Confirm		
c)	Provision should be there to operate the damper in manual mode also.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.1.5	**Refractory Lining:** (For Side walls, Back wall, roof, door) Ceramic fibre block modules of suitable density and thickness with back up layer and SS foil of 0.5mm thick to maintain the skin temperature of the furnace at 60^{o}C (Vendor to furnish calculations for choice of density and thickness of insulation material to show that skin temperature will not exceed 60^{o}C at the maximum furnace operating temperature**)**	Vendor to Confirm		
2.1.5.1	Size of Ceramic Fiber Block Modules	Vendor to Specify		
2.1.5.2	Density	Vendor to Specify		
2.1.5.3	Thickness	Vendor to Specify		
2.1.5.4	Thermal Conductivity	Vendor to Specify		
2.1.5.5	High emissive ceramic coating has to be applied over the furnace wall insulation surface	Vendor to Confirm		
2.1.6	**Furnace Hearth:**			
2.1.6.1	Inside the Fixed hearth all the walls are to be lined with ceramic fiber block module of suitable density and thickness with back up layer and SS foil of 0.5mm thick.	Vendor to Confirm		
2.1.6.2	The peripheral refractory has to be held and supported by a set of heat resisting gray cast iron castings.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.1.7	**Burner blocks:**	60% High alumina Fire Bricks		
2.1.8	**Furnace Door:**			
2.1.8.1	Number of Doors	One		
2.1.8.2	Operation	Vertical		
2.1.8.3	Drive (Vendor to furnish KW rating of motor)	Motorized Winch		
2.1.8.4	Pneumatic door locking arrangement along with mechanical lock arrangement has to be provided to press the door against door opening in its closed position. (Complete details should be furnished with the offer)	Vendor to confirm		
2.1.8.5	Provision should be made on the door for sand sealing at the roof and bottom in the bogie in closed position of the door. (Complete details should be furnished with the offer)	Vendor to confirm		
2.1.8.6	The Periphery of the door has to be designed suitably so that positive sealing is established with the furnace by the door in closed position.	Vendor to confirm		
2.1.8.7	In the unlocked position, and while lifting the door, it should moves away from the opening and moves up with out fouling on any furnace structure.	Vendor to confirm		
2.1.8.8	Interlock should be provided so that bogie can be operated only when door is completely open.	Vendor to confirm		
2.1.8.9	All the pneumatic equipments and interlock elements are to be suitably protected from failure due to heat from the furnace	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.1.9	**Furnace Construction (General):**			
2.1.9.1	The complete furnace structure including the sidewalls and roof are to be manufactured from rolled steel sections and plates of suitable thickness (Min 10mm) (Complete details should be furnished with the offer)	Vendor to confirm		
2.1.9.2	The various load bearing members are to be designed conservatively to ensure rigidity of the complete casing.	Vendor to Confirm		
2.1.9.3	A schematic diagram showing the layout of the furnace & associated systems with salient dimensions should be furnished along with the offer	Vendor to Confirm		
2.1.9.4	The operating sequence of the furnace with broad outline of various operations involved should be furnished with the offer	Vendor to Confirm		
2.2	**RECUPERATOR:**			
2.2.1	The recuperator shall be of metallic with counter flow Radiation heat transfer arrangement. (Complete details of construction should be furnished with the offer)	Vendor to confirm		
2.2.2	Recuperator has to pre-heat the air to a temperature around 400 Deg. C preferably .	Vendor to confirm		
2.2.3	The recuperator has to be located suitably in the flue gas path above the ground itself.	Vendor to confirm		
2.3	**FLUE DUCT:**			
2.3.1	Flue duct shall be fitted to the back wall (opposite to charging door)	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.4	**STACK:**			
2.4.1	The stack for flue gas outlet has to be designed and constructed with refractory brick lining suitably to leave the waste gas at a temperature of max. 100^0C	Vendor to confirm		
2.4.2	Chimney has to be provided with a hole at 18M levels for collecting the flue gas for analysis.	Vendor to confirm		
2.4.3	Suitable ladder and platform has to be provided to facilitate flue gas analysis	Vendor to confirm		
2.4.4	Total Stack height (Roof height is 14 m)	Vendor to Specify		
2.4.5	The stack shall be provided with a weather cowl	Vendor to Confirm		
2.4.6	The stack shall be provided with complete lightning arrester system including lightning arrester spike, aluminum conductor tape from spike to test link, test link, earth pit as per Indian standards			
82.5	**FURNACE BOGIE:**			
2.5.1	Number of Bogies	One		
2.5.2	Furnace Bogie Dimension a)	Length 8000 mm		
	b)	Width 4000 mm		
	c)	Height - Around 800 mm from the Floor		
2.5.3	The bogie to be driven by fabricated rack (Pin type) and pinion arrangement motorized with reduction units, couplings and electromagnetic brakes. (Complete details should b furnished with the offer)	Vendor to confirm		
2.5.4	The bogie should be able to be moved out sufficiently for carrying out the maintenance work.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.5.5	Top layer of Bogie has to be lined with IS 8 quality firebricks backed by lightweight firebricks of suitable thickness. (Complete details should be furnished with the offer)	Vendor to Confirm		
2.5.6	Around the periphery, special shaped bricks of IS 8 quality has to be positioned	Vendor to Confirm		
2.5.7	Heat resisting gray iron castings has to be positioned around the periphery of the bogie to support the refractory.	Vendor to Confirm		
2.5.8	Double Sand sealing has to be provided between bogie and the furnace hearth and it should be ensured that the alignment should not fail due to heat transfer.	Vendor to Confirm		
2.5.9	The peripheral bottom of the furnace hearth has to be lined with special shaped bricks to match with the shaped bricks on the bogie periphery.	Vendor to Confirm		
2.5.10	The sealing between bogie and the hearth has to be designed suitably to avoid heat transfer from furnace while furnace is under operation	Vendor to Confirm		
2.5.11	The bogies are to be manufactured from manufactured from rolled steel sections and plates of suitable thickness (Min 10mm). (Complete details should be furnished with the offer)	Vendor to confirm		
2.5.12	The Bogie structure has to be designed to give minimum deflection under different load conditions.	Vendor to confirm		
2.5.13	The complete bogie with refractory to be supported on the set of cast wheels through trolley arrangement	Vendor to confirm		
2.5.14	It should be ensured that all the wheels share the load to the maximum extent.	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.5.15	The wheels are to be mounted on antifriction bearings through non-rotating axles in such a way that heat transfer from bogie structure to the bearings is reduced to the minimum.	Vendor to confirm		
2.5.16	Power Rating of Bogie Drive in kW	Vendor to Furnish		
2.6	**PIPELINES & VALVES:**			
2.6.1	BHEL will provide Producer Gas at one point near the furnace. All piping for Producer Gas to the furnace gas control valves and to other points is in the scope of the vendor	Vendor to confirm		
2.6.2	All air piping from the fans to the control valves and to other points is in the scope of the vendor	Vendor to confirm		
2.6.3	Required valve for control of gas and air is in scope of the vendor	Vendor to confirm		
2.7	**LIGHTING:**			
2.7.1	Sufficient numbers of 2x40W fluorescent tube lamp fittings with tubes have to be provided at strategic locations around the furnace to provide adequate lighting [**atleast 65 lux at 91.4 cm from the floor]** for maintenance. Vendor to mention number of fittings in the offer	Vendor to Specify		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.8	**ELECTRICAL:**			
2.8.1	a. 415V +/- 10%, 50HZ +/-3 Hz, 3 Phase AC (3 wire system without neutral) power supply will be provided by BHEL at a single point near the furnace in the control room, as per layout recommended by Vendor. b. All cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine/control cabinets, shall be the responsibility of vendor. c. Requirement of grounding/earthing with required material details should be informed by vendor well in advance so that it could be incorporated during construction of foundation.	Vendor to Confirm		
2.8.2	**Tropicalization:** All electrical / electronic equipment shall be tropicalized.	Vendor to Confirm		
2.8.3	All Electric enclosures shall have IP 54 protection	Vendor to Confirm		
2.8.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to Confirm		
2.8.5	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		
2.8.6	Motors & other electrical components shall conform to IEC or Indian Standards	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.8.7	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		
2.8.8	Vendor should ensure the proper earthing for the furnace and its peripherals.	Vendor to Confirm		
2.9	**SAFETY ARRANGEMENTS:**			
2.9.1	Following safety features in addition to other standard safety features should be provided on the machine:			
2.9.2	Furnace should have adequate and reliable safety interlocks / devices to avoid damage to the furnace, work piece and the operator due to the malfunctioning or mistakes. Furnace functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on MMI display and panels) should be available.	Vendor to specify		
2.9.3	A detailed list of all alarms / indications provided should be submitted by the Vendor.	Vendor to specify		
2.9.4	All the pipes, cables etc. should be well supported and protected.	Vendor to Confirm		
2.9.5	All the rotating parts should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm		
2.9.6	Emergency Switches should be provided at suitable locations	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
3.0	**JOB SUPPORT PEDESTAL:**			
3.1	Number of job support pedestals to be placed on bogie	Minimum 16 Nos		
3.2	Material	Heat resistant cast iron		
3.3	Size	350mm x 300mm x 3750mm (Height x Width x Length)		
3.4	Max weight of each pedestal	1200 Kgs		
4.0	**INSTRUMENTATION & CONTROL SYSTEM:**			
4.1	All controls will b located in a Control Room adjacent to the furnace. BHEL will construct the Control room based on inputs to be provided by the vendor	Vendor to confirm		
4.2	PLC-PC based instrumentation with Scada software system for the following control loops: (Complete details should be provided along with the offer)	Vendor to confirm		
4.2.1	Furnace temperature control (4 Zones)	Vendor to confirm		
4.2.2	Furnace over temperature control (4 Zones)	Vendor to confirm		
4.2.3	Recuparator protection loop	Vendor to confirm		
4.3	The system shall comprise, but not be limited to the following:	Vendor to confirm		
4.3.1	Thermocouples for 4 Zones	Vendor to confirm		
4.3.2	Suitable rated modulating motors / Control elements for 4 Zones	Vendor to confirm		
4.3.3	Zonal ratio control system for temperature controls.	Vendor to confirm		
4.3.4	24 Point Micro processor based temperature recorder	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
4.3.5	Pressure, flow transmitters for gas and Air ~~fuel~~ and control elements	Vendor to confirm		
4.3.6	Furnace pressure transmitters and control elements	Vendor to confirm		
4.3.7	Pressure switches, regulators	Vendor to confirm		
4.3.8	Instruments cables and compensating cables	Vendor to confirm		
4.3.9	Pipings	Vendor to confirm		
4.3.10	Junction boxes	Vendor to confirm		
4.3.11	Any other requirement to complete the system	Vendor to specify		
4.4	The PID Control loop to be constituted within the PLC through intelligent software PID block.	Vendor to confirm		
4.5	It should be possible to view the value and status of zone temperature on the Man machine & interface (MMI) screen of the furnace workstation	Vendor to confirm		
4.6	For excess temperature control of respective zone, it should be possible to set the limit value of each zone in MMI. Incase of zonal temperature overshoots the maximum set value; it should control all safety systems along with raising audio visual alarm. The detail of alarm summary should be logged in MMI.	Vendor to Confirm		
4.7	PLC should be complete with CPU, power supply module, I/O module, Digital input/Output cards, analog cards, load process facility and PLC panel	Vendor to Confirm		
4.8	Other features required:			
	a) Temperature data logging	Vendor to Confirm		
	b) Over view of furnace	Vendor to Confirm		
	c) Fault annunciation page and alarm logging	Vendor to Confirm		
	d) Temperature Vs time programming profile generation	Vendor to Confirm		
	e) Reports	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
4.8	f) Gas flow measuring system: Additional flow indicator at site	Vendor to Confirm		
	g) Safety system and alarm indication for gas pressure low, air pressure low, excess zone temperature and furnace pressure	Vendor to Confirm		
4.9	Separate panels should be provided for Instruments, PLC-PC System, MMI	Vendor to Confirm		
4.10	PI Diagram, schematic circuit diagram for instruments control system to be submitted for final approval	Vendor to Confirm		
4.11	**WORK STATION PC & PRINTER:** Set of non – industrial grade PC with colour monitor, printer and UPS for taking print out **(Details should be furnished with the offer)**	Vendor to Specify		
4.12	UPS should be supplied for safe shut down of the PC and for recording temperature for max 1 Hour in case of power failure	Vendor to Confirm		
4.13	**Hot standby for PLC:** PLC Hot standby configuration to be with CPU with bi-directional changeover .In case master CPU fails, the slave CPU to take over as bump less transfer. Alternatively the master CPU should take over in case of the failure of slave CPU	Vendor to Confirm		
4.14	PLC Programming Unit: On-Line Troubleshooting, Software Modification, Upload and Down-load of Programs			
4.15	Required Motor Control Centers shall be provided for control of all fans and blowers	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
4.16	**Dimensional Sketches (plan, front and side view) of the entire control panel and detailed view of position and layout of controls, display and other man machine interface will be submitted for ergonomics evaluation and approval**			
5.0	**LEVELING & ANCHORING SYSTEM**			
5.1	Complete anchoring system including foundation bolts, anchoring materials, leveling shoes etc should be supplied	Vendor to confirm		
6.0	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE:**			
6.1	The Vendor shall bring special tools required for erection of the machine. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to confirm		
7.0	**STATUTORY REQUIREMENTS**			
7.1	Chimney shall height shall satisfy the requirements of Tamil Nadu Pollution Control Board (TNPCB) norms with respect to emission of SOx; NOx and Suspended Particulate Matter (SPM) but not less than 31 M.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
7.2	Emission of CO (% by volume) and Particulate Matter (mg/NM^3) through flue gas shall be indicated in the tender document.			
7.3	It is in the scope of the supplier to measure the velocity of the flue gas at 6D height traverse plan and satisfy the requirements of TNPCB Norms.			
7.4	a. Two traverse plans shall be provided in the chimney (stack) for periodic flue gas sample collection. The first plane shall be at 2.0 meters from the ground level and the other plane at 6 D height of the chimney. (where D is the inner diameter the chimney) b. At each plane, four port holes shall be provided at 90 deg each.. Each port hole shall measure 100 mm inner diameter welded with a stand pipe of 100 mm long. Fixed with a flange and bolted with a dummy flange. c. Platform around the chimney at 1.0 M below each plane shall be provided to house the sample collection equipment and for working clearance for crew. Plant form shall be fixed with hand rails all round the platform. Staircase shall be provided for both traverse point planes.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
8.0	**SPARES:**			
8.1	Itemized breakup of mechanical, pneumatic, electrical and electronic spares used on the furnace in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: **(Unit Price of each item of spare should be offered)**			
8.2	**a) Mechanical & Pneumatic Spares:** All types of Valves, Pressure Switches, Transducers, Flow Switches, actuators etc.	Vendor to Specify		
8.3	**b) Electrical /Electronic:** All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, spares for PLC controls and MMI, Field Sensors etc.	Vendor to Specify		
8.4	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 Specify		
9.0	**DOCUMENTATION:** Five sets of following documents (4 Hard copies,) in English language should be supplied along with the machine			
9.1	Operating & maintenance Manuals of Furnace	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
9.2	The O&M Manual should contain the following	Vendor to confirm		
	a. Drawing of the Furnace.			
	b. GA Drawing of Individual Mechanisms.			
	c. Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose			
	d. Electrical Wiring Drawings – Power & Control Circuits			
	e. Pneumatic Circuit Diagram			
	f. PLC Ladder Diagrams (Soft Copy) with Flash Memory Card.			
	g. PLC Ladder Diagrams (Hard Copy)			
	h. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls			
	i. Alarm Log, Error Code, Error Messages & Remedies and On-Line Fault Diagnostics to be provided.			
	j. Trouble Shooting Chart for Main and all Sub-Systems			
9.3	One Hard Copy of O & M Manual shall be submitted at the time of inspection of the furnace by BHEL	Vendor to confirm		
9.4	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm		
9.5	The vendor shall submit complete Master List of parts used in the machine.	Vendor to confirm		
9.6	Three additional set of all the above documentation on CD	Vendor to confirm		
9.7	Furnace operation related PC Details – Furnace Operating Software, Parameters Selection Software, File Handling	Vendor to confirm		

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10.0	**TRAINING:**			
10.1	The Supplier shall train four of BHEL Engineers in the Operation, Trouble Shooting and Maintenance of the Furnace & supporting systems at the Supplier's Works at free of cost.	Vendor to confirm		
10.2	The Vendor shall impart training to BHEL's Operators and Maintenance crew in Operation and Maintenance (Mechanical, Electrical/ Electronics and Control System) after the commissioning of the Machine at BHEL works for not less than 15 working days	Vendor to confirm		
11.0	**FOUNDATION:**			
11.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI). The layout should consist of all requirements pertaining to complete furnace including space requirement for Control Room, Blowers, and Stack etc. Vendor shall furnish the foundation layout and static and dynamic load details within 2 months of LOI. BHEL shall design and construct complete foundation for the furnace as per the Vendor's recommendation. The foundation work by BHEL will include supply & laying of rails for the bogies	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
12.0	**ERECTION & COMMISSIONING**			
12.1	Vendor to take full responsibility for carrying out the erection, start up, testing and commissioning of the furnace & it's controls & all types of other supplied equipment. The vendor shall arrange required manpower & tools for the same.	Vendor to Confirm		
12.2	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. BHEL will also provide crane for handling and lifting during erection at site free of cost	Vendor to Confirm		
12.3	Successful proving of BHEL components by the Vendor shall be considered as part of commissioning. All tests, as mentioned in Clause 13.0 (Furnace Acceptance) shall form part of the commissioning activity.	Vendor to Confirm		
12.4	The Vendor should bring tools, Tackles, and other necessary equipment required to carry out all above activities.	Vendor to Confirm		
12.5	The Vendor shall bring commissioning spares required for commissioning of the machine within stipulated time	Vendor to Confirm		
12.6	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to Confirm		
12.7	Vendor should furnish charges, duration, terms & conditions for E&C in detail separately along with offer.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
13.0	**FURNACE INSPECTION & ACCEPTANCE**			
13.1	The furnace materials and bought-out items shall be offered for inspection to BHEL for completeness of supply at supplier's works prior to dispatch	Vendor to Confirm		
13.2	The furnace shall be tested by the vendor for its performance prove-out as per BHEL Specifications, at BHEL after erection and commissioning The various cycles such as Solution Annealing, Stress Relieving, Annealing, Normalizing shall be tested and proved utilizing 2 cycles in each category. Prove-out for temperature uniformity shall be as per API 6A Standards.	Vendor to confirm		
14.0	**PAINTING**			
14.1	**For Furnace, Recuperator & Bogies & Stack**			
A	Primer Painting:	One coat of primer painting at vendor's works and one of primer after erection		
B	Final Painting:	Two coats of heat resistant aluminum paint		
14.2	**For Fans, control Panel**	Apple green colour paint		
14.3	**Air & Gas Pipelines**	Blue & Yellow or as per instructions of BHEL and with indication of direction of flow marked at suitable intervals"		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
15.0	**PACKING:**			
15.1	Rigid packing for items like fans, blowers, drives, electric / electronic panels and controls and such other items susceptible to damage during transit	Vendor to confirm		
16.0	**GUARANTEE:**			
16.1	24 months from the date of commissioning and acceptance at BHEL works	Vendor to confirm		
17.0	**GENERAL:**			
17.1	Furnace Model No.	Vendor to specify		
17.2	Total connected load (KVA):	Vendor to specify		
17.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify		
17.4	Total connected load (KVA):	Vendor to specify		
17.5	Total weight of the furnace	Vendor to specify		
17.6	Vendor to submit, along with offer, reference list of customers where similar furnaces have been supplied mentioning broad specifications of the supplied furnaces	Vendor to specify		