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 79 38 Fax : +91 431 252 07 19 Email : tvenkat@bheltry.co.in Web : www.bhel.com

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620700072	**11.08.2007**	**15.09.2007**
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**	**Quantity**	**Delivery (Item required at BHEL on)**
10	40 Ton Gas Fired Heating Furnace (40 Ton LPG Fired Heating Furnace) as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	1 No.	30.03.2008

BHEL commercial terms & conditions with Price Bid and Bank Guarantee formats along with technical specifications 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 "2620700072".

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 Manager / Capital Purchase / MM / Manufacturing

PART - A

SECTION-I :

QUALIFYING CRITERIA FOR THE SUPPLY OF 40 TON LPG FIRED HEATING FURNACE

S. No.	PARTICULARS	VENDOR'S RESPONSE
1.0	Only those vendors, who have supplied and commissioned at least one 40T or higher size Gas (LPG) Fired Furnace for similar applications 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 following information should be submitted by the vendor 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 Nos. and E-Mail address of the contact person of the customer	
	g. Performance certificate from the customers regarding satisfactory performance of Furnace 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 with the configuration given in this tender	
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 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 note the following :

S.No.	REQUIREMENTS	VENDOR's COMPLIANCE
10.0	The BIDDER shall submit the offer in TWO PARTS - Technical **[with PART A** and **PART B]** & Commercial and Price Bid.	
11.0	Un-Priced 'Price Bid' shall be given separately for **OPTION No.1** and **OPTION No.2**, along with the TECHNICAL OFFER.	
12.0	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 "ACCEPTED" or similar words in the technical comparative statement may lead to disqualification of the Technical Offer.	
13.0	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.	
14.0	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	
15.0	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	
16.0	BIDDER has to indicate the Country of Origin for the supply of Bought-Out Items.	
17.0	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

TECHNICAL SPECIFICATIONS for 40 Ton LPG FIRED HEATING FURNACE

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
1.0.0	**PURPOSE & WORKPIECE MATERIAL:**			
1.1.0	**Purpose:** To heat raw materials in the shape of pipes, plates and sections for hot forging applications.			
1.2.0	**Job Details:** Material: Configuration: Diameter Range: Wall Thickness: Job Length: Loose Job Weight: Weight of Job Lot:	 Mild Steel & Alloy Steel Plates or Straight/ Bend Pipes 219 to 1000 mm OD 12 to 150 mm Up to 2000 mm Not exceeding 10 Tons Not exceeding 40 Tons		
1.3.0	**Job loading details** Jobs to be heat treated will be loaded on to the furnace hearth and unloaded for hot working by Fork lift			

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
2.0.0	**SPECIFICATIONS :**			
2.1.0	**FURNACE OPERATIONS :**			
2.1.1	**Operating Parameters:**			
2.1.1.1	Charge Capacity	40 Tons		
2.1.1.2	Heat Treatment Cycles to be carried out [in addition to raw material heating cycle for hot-forging operations]	Stress Relieving, Annealing, Normalizing & Tempering		
2.1.1.3	Maximum Furnace Temperature	Vendor to specify		
2.1.1.4	Maximum Charge Temperature	1150^{o}C +/- 10^{o}C		
2.1.1.5	Rate of Heating	35 °C to 200 °C/Hr		
2.1.1.6	Job Temperature Uniformity at soaking	± 10^{o}C		
2.1.1.7	Fuel	LPG		
2.1.2	**Furnace Configuration**			
2.1.2.1	Firing system	Vendor to specify		
2.1.2.2	Mode of operation control system	Automatic and provision for manual operation		
2.1.2.3	Automatic Zone Temperature Control with Programming of Heat Treatment Cycle	Vendor to confirm		
2.1.2.4	Ceramic Fiber block module Lining	Vendor to confirm		
2.1.2.5	Recuperator System for Energy Conservation	Vendor to confirm		
2.1.3	**OPTION No. 1 - BOX TYPE CHAMBER & TOP LIFTING DOOR ON ONE SIDE**			
2.1.3.1	**Furnace effective Inside Dimensions:**			
2.1.3.2	Wall to Wall width	5000 mm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
2.1.3.3	Inside length (door to Back wall) - depth	4000 mm		
2.1.3.4	Inside height	2000 mm		
2.1.4	**OPTION No. 2 - SINGLE BOGIE CAR BOTTOM TYPE & TOP LIFTING DOOR**			
2.1.4.1	**Furnace Chamber / Bogie Dimensions [usable area]**			
2.1.4.2	Number of Bogies	One		
2.1.4.3	Bogie Width	5000 mm		
2.1.4.4	Bogie Length (Door to Back Wall Effective Clearance)	4000 mm		
2.1.4.5	Chamber Inside Height (above Bogie Hearth)	2000 mm		
2.1.4.6	Bogie Height From Floor	Around 600 mm		
2.2.0	**FURNACE BOGIES CONSTRUCTION :**			
2.2.1	The bogies 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		
2.2.2	The bogie should be able to be moved out sufficiently for carrying out the maintenance work.	Vendor to Confirm		
2.2.3	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		
2.2.4	Around the periphery, special shaped bricks of IS 8 quality has to be positioned	Vendor to Confirm		
2.2.5	Heat resisting gray iron castings has to be positioned around the periphery of the bogie to support the refractory.	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
2.2.6	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		
2.2.7	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		
2.2.8	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		
2.2.9	The bogies 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		
2.2.10	The Bogie structure has to be designed to give minimum deflection under different load conditions.	Vendor to confirm		
2.2.11	The complete bogie with refractory to be supported on the set of cast wheels through trolley arrangement	Vendor to confirm		
2.2.12	It should be ensured that all the wheels share the load to the maximum extent.	Vendor to confirm		
2.2.13	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		
2.2.14	Power Rating of Bogie Drive in kW	Vendor to Furnish		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
3.0.0	**JOB SUPPORT PEDESTAL:**			
3.1.0	Number of job support pedestals to be placed on **each** bogie	12 Nos (Total 24 Nos. for the two bogies)		
3.2.0	Material	Heat resistant cast iron		
3.3.0	Size	350 **x** 300 **x** 3750 in mm (Height x Width x Length)		
3.4.0	Max weight of each pedestal	1200 Kgs		
4.0.0	**Furnace Door:**			
4.1.0	Number of Doors	One		
4.2.0	Operation	Vertical lifting by push button operation with inching mode.		
4.3.0	Drive (Vendor to furnish kW rating of motor)	Motorized Winch		
4.4.0	Pneumatic door locking arrangement along with mechanical lock arrangement has to be provided to press the door against door opening in its closed position. (Better locking mechanism other than pneumatic locking system if any shall be described in the offer Complete details should be furnished with the offer)	Vendor to confirm		
4.5.0	Sand sealing for the door shall be provided at suitable places to avoid the leakage from the furnace in closed position of the door. (Complete details should be furnished with the offer)	Vendor to confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
4.6.0	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 provide details		
4.7.0	In the unlocked position, and while lifting the door, it should move away from the furnace opening and move up with out fouling on any furnace structure.	Vendor to confirm		
4.8.0	All the pneumatic equipments and interlock elements are to be suitably protected from failure due to heat from the furnace	Vendor to confirm		
5.0.0	**Combustion System**			
5.1.1	Furnace has to be provided with required number of nozzle-mix burners suitably designed for firing LPG. 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		
5.1.2	Fuel	LPG		
5.1.3	LPG Pressure	Vendor to specify		
5.1.4	Max required flow rate of LPG	Vendor to Specify		
5.1.5	Burners Type (Vendor to furnish make, model no. and technical details of burners.)	High velocity burners.		
5.1.6	Number of rows and arrangement of Burners (Schematic drawing should be furnished along with the offer)	Vendor to specify		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
5.1.7	Number of Burners (Calculation details shall be submitted with the offer)	Vendor to Specify		
5.1.8	Burner Rating	Vendor to Specify		
5.1.9	Flame Length	Vendor to Specify		
5.1.10	Type of Temperature Control	PID		
5.1.11	No. Of Temperature control Zone	Vendor to specify		
5.1.12	Furnace Efficiency minimum 60%	Vendor to Specify		
5.2.0	**Forced Draught (FD) Fan:**			
5.2.1	FD Fan of suitable capacity **(including excess air)** has to be provided to ensure proper combustion	Vendor to Confirm		
5.2.2	Air flow	Vendor to Specify		
5.2.3	Air Pressure	Vendor to Specify		
5.2.4	Power Rating (kW)	Vendor to Specify		
5.2.5	Type of blower	Vendor to Specify		
5.2.6	Make of Blower	Vendor to Specify		
5.3.0	**Induced Draught (ID) Fan:**			
5.3.1	ID Fan of suitable capacity has to be provided before the stack to ensure proper combustion	Vendor to Confirm		
5.3.2	Air flow	Vendor to Specify		
5.3.3	Air Pressure	Vendor to Specify		
5.3.4	Power Rating (kW)	Vendor to Specify		
5.3.5	Type of blower	Vendor to Specify		
5.3.6	Make of Blower	Vendor to Specify		
5.4.0	The FD Fan and ID Fan have to be suitably sized to ensure a Balanced Draught System	Vendor to confirm		
5.5.0	A standby fan each for both FD and ID system has to be provided with suitable valve arrangement.	Vendor to confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
5.6.0	**Dampers:**			
5.6.1	Damper has to be provided after the furnace hearth and before the stack in the flue gas path to regulate draught	Vendor to Confirm		
5.6.2	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		
5.6.3	Provision should be there to operate the damper in manual mode also.	Vendor to Confirm		
6.0.0	**Refractory Lining:** (For Side walls, roof, door) Ceramic fiber block modules of suitable density and thickness with back up layer to ensure skin temperature of the furnace does not exceed $80^{o}C$ (Vendor to furnish calculations for choice of density and thickness of insulation material to show that skin temperature will not exceed $80^{o}C$ at the maximum furnace operating temperature. Details of the type of modules to be installed inside the furnace to be furnished in the offer)	Vendor to Confirm		
6.1.0	Size of Ceramic Fiber Block Modules	Vendor to Specify		
6.2.0	Density	Vendor to Specify		
6.3.0	Insulation thickness	Vendor to Specify		
6.4.0	High emissive ceramic coating has to be applied over the furnace wall insulation surface	Vendor to specify		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
7.0.0	**Furnace Hearth:**			
7.1.0	Inside the Fixed hearth shell all the walls and door are to be lined with ceramic fiber block module of suitable density and thickness with back up layer and high emissive ceramic coating	Vendor to Confirm		
7.2.0	The furnace bed shall be provided with hard refractory insulation comprising Cold face, Hot face insulation and IS 8 Quality Standard fire bricks of suitable thickness to contain the temperature inside the furnace. Necessary expansion gaps shall be provided. The supports for the brick structure should suitably be given to avoid disturbance of the brick construction. (Complete details of construction have to be submitted along with the offer).	Vendor to confirm		
7.3.0	Insulation pattern to ensure perfect sealing between the furnace hearth and the door.(Details to be submitted along with the offer)	Vendor to confirm		
7.4.0	The peripheral refractory has to be held and supported by a set of heat resisting castings, confirming to **IS 4522, Grade 9.**	Vendor to Confirm		
8.0.0	**Burner Blocks:**	Vendor to specify.		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
9.0.0	**FURNACE CONSTRUCTION (GENERAL):**			
9.1.0	The complete furnace structure including the sidewalls and roof are to be manufactured from rolled steel sections and plates of suitable thickness (Minimum 10mm) (Complete details should be furnished with the offer)	Vendor to confirm		
9.2.0	The various load bearing members are to be designed conservatively to ensure rigidity of the complete shell.	Vendor to Confirm		
9.3.0	A schematic diagram showing the layout of the furnace & associated systems with salient dimensions should be furnished along with the offer	Vendor to Confirm		
.9.4.0	The operating sequence of the furnace with broad outline of various operations involved should be furnished with the offer	Vendor to Confirm		
10.0.0	**RECUPERATOR:**			
10.1.0	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		
10.2.0	Recuperator has to pre-heat the air to 250 - 300 deg.C.	Vendor to confirm		
10.3.0	The recuperator has to be located suitably in the flue gas path above the ground itself.	Vendor to confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
11.0.0	**FLUE DUCT:**			
11.1.0	Flue duct shall be Rear all fitted	Vendor to Confirm		
12.0.0	**STACK:**			
12.1.0	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		
12.2.0	Chimney 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) . The guidelines to calculate the chimney height is as follows : $H = 14 (Q)^{0.3}$. Q – SOx emission rate in Kg/hr; H – height of stack in meters from ground level. However the height of the chimney shall be maximum of : 1. Height calculated by the above formula **OR** 2. 5 Mtrs above the roof the building**.** [The building height is to be considered as 20 mtrs.]	Vendor to confirm		
12.3.0	Emission of CO (% by volume) and Particulate Matter (mg/NM^3) through flue gas shall be indicated in the tender document.	Vendor to confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
12.4.0	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 during commissioning of the furnace.	Vendor to confirm		
12.5.0	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 of 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, with toe guard 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. Hand rails should be provided all round the platform. Staircase shall be provided for both traverse point planes.	Vendor to confirm		
12.6.0	The stack shall be provided with a weather cowl	Vendor to confirm		
12.7.0	The stack shall be provided with complete lightning arrester system including lightning arrester spike, aluminum conductor tape from spike to test link, connection to the nearest available earth pit as per Indian standards	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
13.0.0	**PIPELINES & VALVES:**			
13.1.0	BHEL will provide LPG at one point near the furnace. All piping for LPG to the furnace gas control valves and to other points is in the scope of the vendor	Vendor to confirm		
13.2.0	All air piping from the fans to the control valves and to other points is in the scope of the vendor	Vendor to confirm		
13.3.0	Required valve for control of gas and air is in scope of the vendor	Vendor to confirm		
14.0.0	**ELECTRICAL DETAILS :**			
14.1.0	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. 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. 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		
14.2.0	**Tropicalization:** All electrical / electronic equipment shall be tropicalized.	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
14.3.0	All Electric enclosures shall have IP 54 protection	Vendor to Confirm		
14.4.0	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to Confirm		
14.5.0	Separate electrical control panel for ID Fan, FD Fan and Door Drive.	Vendor to Confirm		
14.6.0	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		
14.7.0	All electrical and electronic components shall be of SIEMENS, L&T, TELE MECHANIC, or any other reputed make acceptable to BHEL.	Vendor to Confirm		
14.8.0	Motors & other electrical components shall confirm to IEC or Indian Standards. All motors should be of energy efficient one. Make of motors ABB, SIEMENS, KEC, or any other reputed make acceptable to BHEL.	Vendor to Confirm		
14.9.0	All the cable trays required for lying of cables should be included in the offer. All cables should be of copper.	Vendor to Confirm		
14.10.0	Vendor should ensure the proper earthing for the furnace and its peripherals.	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
15.0.0	**SAFETY ARRANGEMENTS:**			
15.1.0	Following safety features in addition to other standard safety features should be provided on the machine:			
15.2.0	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 screen display and panels) should be available. On-line monitoring facility of furnace operation PLC ladder shall be provided.	Vendor to specify		
15.3.0	A detailed list of all alarms / indications provided should be submitted by the Vendor.	Vendor to specify		
15.4.0	All the pipes, cables etc. should be well supported and protected.	Vendor to Confirm		
15.5.0	All the rotating parts should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm		
15.6.0	Emergency Switches should be provided at suitable locations	Vendor to Confirm		
16.0.0	**INSTRUMENTATION & CONTROL SYSTEM:**			
16.1.0	All controls will be 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		
16.2.0	Furnace temperature control Zones	Vendor to specify		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
16.3.0	PLC-PC based instrumentation with SCADA software system**.** (Complete details should be provided along with the offer)	Vendor to confirm		
16.4.0	Furnace over temperature control	Vendor to specify		
16.5.0	Recuperator protection loop	Vendor to specify		
16.6.0	Number of Thermocouples for required in each zones for temperature controller and recorder.	Vendor to specify		
16.7.0	Suitable rated modulating motors / Control elements for required number of Zones	Vendor to confirm		
16.8.0	Mass flow based zonal ratio control system for temperature controls.	Vendor to confirm		
16.9.0	6 Point Micro processor based temperature recorder make: Chino / Honeywell /Yogohawa, ABB	Vendor to confirm		
16.10.0	Pressure, flow transmitters for gas and Air - control elements	Vendor to confirm		
16.11.0	Furnace pressure transmitters and control elements	Vendor to confirm		
16.12.0	Pressure switches, regulators	Vendor to confirm		
16.13.0	Instruments cables and compensating cables	Vendor to confirm		
16.14.0	Pipings	Vendor to confirm		
16.15.0	Junction boxes	Vendor to confirm		
16.16.0	Isolation Transformer of suitable capacity to be provided for the complete instrumentation system.			
16.17.0	Any other requirement to complete the system	Vendor to specify		
16.18.0	The PID Control loop to be constituted within the PLC through intelligent software PID block.	Vendor to confirm		
16.19.0	It should be possible to view the value and status of zone temperatures on the screen of the furnace workstation	Vendor to confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
16.20.0	For excess temperature control of respective zone, it should be possible to set the limit value of each zone in the PC Work station. 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 PC.	Vendor to Confirm		
16.21.0	PLC should be complete with CPU, power supply module, I/O module, Digital input/Output cards, analog cards, load process facility and PLC panel (Make ABB, Yogohawa, Honeywell)	Vendor to Confirm		
16.22.0	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		
	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 zonel temperature furnace pressure and gas leak.	Vendor to Confirm		
16.23.0	Separate panels should be provided for Instruments, PLC-PC System	Vendor to Confirm		
16.24.0	PI Diagram, schematic circuit diagram for instruments control system to be submitted for final approval	Vendor to Confirm		

Sl.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
16.25.0	**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 bumpless transfer. Alternatively the master CPU should take over in case of the failure of slave CPU	Vendor to Confirm		
16.26.0	Required Motor Control Centers shall be provided for control of all fans and blowers	Vendor to Confirm		
16.27.0	Gas Train consisting of filter, pressure regulator, pressure gauge with isolation, "minimum pressure" switch, slam-shut safety shut-off valves, vent line, digital gas flow meter with totalizer, and other valves as required for safe operation shall be provided (Complete details of the gas train including make, models of valves etc shall be provided along with the offer)	Vendor to Confirm		
16.28.0	Burner purge cycles with adequate purging time for safe operation shall be provided	Vendor to Confirm		
16.29.0	Manual Gas Shut Off Valve shall be provided apart from the safety shutoff valve in the gas train	Vendor to confirm		
16.30.0	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	Vendor to Confirm		
16.31.0	Furnace control schematic shall be submitted along with the offer	Vendor to confirm		

Sl.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
17.0.0	**LEVELING & ANCHORING SYSTEM**			
17.1.0	Complete anchoring system including foundation bolts, anchoring materials, leveling shoes etc should be supplied	Vendor to confirm		
18.0.0	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE:**			
18.1.0	Vendor shall bring special tools required for erection of the Furnace. Tools like Torque Wrench, Keys, Spanners, Grease Guns etc. for Furnace operation & maintenance, shall be supplied & list shall be submitted with offer	Vendor to confirm		
19.0.0	**SPARES:**			
19.1.0	Itemized breakup of mechanical, pneumatic, combustion system, refractory , 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)**			
19.2 0	**a) Mechanical & Pneumatic Spares:** All types of Valves, Pressure Switches, Transducers, Flow Switches, actuators etc.	Vendor to Specify		
19.3.0	**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 , Field Sensors etc.	Vendor to Specify		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
19.4.0	Vendor to confirm that complete list of spares for furnace 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		
20.0.0	**DOCUMENTATION** Five sets of following documents (5 Hard copies,) in English shall be supplied along with Furnace Materials			
20.1.0	Operating & Maintenance Manuals of Furnace	Vendor to confirm		
20.2.0	The O&M Manual should contain the following	Vendor to confirm		
20.2.1	Drawing of the Furnace.			
20.2.2	GA Drawing of Individual Mechanisms.			
20.2.3	Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose			
20.2.4	Electrical Wiring Drawings – Power & Control Circuits			
20.2.5	Pneumatic Circuit Diagram			
20.2.6	PLC Ladder Diagrams with Flash Memory Card.			
20.2.7	PLC Ladder Diagrams (Hard Copy)			
20.2.8	Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls			
20.2.9	Alarm Log, Error Code, Error Messages & Remedies and On-Line Fault Diagnostics to be provided.			
20.2.10	Trouble Shooting Chart for Main & for all Sub- Systems			
20.3.0	One Hard Copy of O & M Manual , material test certificates for refractory, castings , Job support pedestals Calibration certificates for the instrumentation etc ., hall be submitted at the time of inspection of the furnace by BHEL Officials	Vendor to confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
20.4.0	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm		
20.5.0	The vendor shall submit complete Master List of parts used in the machine.	Vendor to confirm		
20.6.0	Three additional set of all the above documentation on CD (Compact Disc)	Vendor to confirm		
20.7.0	Furnace operation related PC Details – Furnace Operating Software, Parameters Selection Software, File Handling software uploading & downloading procedure, etc.,	Vendor to confirm		
21.0.0	**TRAINING:**			
21.1.0	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		
21.2.0	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		
22.0.0	**FOUNDATION:**			
22.1.0	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 3 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		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
23.0.0	**ERECTION & COMMISSIONING**			
23.0.0	Vendor to take full responsibility for carrying out the erection, start up, testing & commissioning of the furnace & its controls & all types of other supplied equipment. The vendor shall arrange manpower & tools for the same.	Vendor to Confirm		
23.1.0	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		
23.2.0	Successful proving of BHEL components by the Vendor shall be considered as part of commissioning. All tests, as mentioned in clause 12.0 (Furnace Acceptance) shall form part of the commissioning activity.	Vendor to Confirm		
23.3.0	The Vendor should bring tools, Tackles, and other necessary equipment required to carry out all above activities.	Vendor to Confirm		
23.4.0	The Vendor shall bring commissioning spares on returnable basis required for commissioning of the machine within stipulated time.	Vendor to Confirm		
23.5.0	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to Confirm		
23.6.0	Vendor should furnish charges, duration, terms & conditions for E&C in detail separately along with offer.	Vendor to Confirm		
24.0.0	**FURNACE INSPECTION & ACCEPTANCE**			
24.1.0	The furnace (in total or in modules) shall be offered for inspection to BHEL for completeness of supply at supplier's works prior to dispatch	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
24.2.0	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 plate heating stress relieving, normalizing, tempering shall be tested and proved utilizing 2 cycles in each category	Vendor to confirm		
25.0.0	**PAINTING**			
25.1.0	**For Furnace, Recuperator & Stack**			
25.1.1	Primer painting:	One coat of primer painting at vendor's works and one of primer after erection		
25.1.2	Final painting:	Two coats of heat resistant aluminum paint		
25.2.0	For Fans, Control Panel	RAL 6011 Apple Green Colour –		
25.3.0	Air & Gas Pipelines	Blue and Yellow or as per the Instructions of BHEL and with indication of direction of flow marked at suitable intervals		
26.0.0	**PACKING:**			
26.1.0	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		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER [with Complete Technical Details]	DEVIATION / REMARKS
27.0.0	**GUARANTEE:**			
27.1.0	24 months from the date of commissioning and acceptance at BHEL Works	Vendor to confirm		
28.0.0	**GENERAL POINTS :**			
28.1.0	Furnace Model No.	Vendor to specify		
28.2.0	Total connected load (KVA):	Vendor to specify		
28.3.0	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify		
28.4.0	Total weight of the furnace components and materials	Vendor to specify		