An ISO 9001 Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)
Tiruchirappalli – 620014, TAMIL NADU, INDIA
CAPITAL EQUIPMENT/ MATERIALS MANAGEMENT

ENQUIRY **NOTICE INVITING TENDER**	Phone: +91 431 257 70 49 Fax : +91 431 252 07 19 Email : csguna@bheltry.co.in Web : www.bhel.com

TWO PART BID Tender to be submitted in two parts.	**Enquiry Number:** **2620900206**	**Enquiry Date:** **25.09.2009**	**Due date for submission of quotation:** **03.11.2009**

You are requested to quote the Enquiry number date and due date in all your correspondence. This is only a request for quotation and not an order.
Please note that under any circumstances both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of tender opening.

Item	Description	Quantity
10	**Bogie Hearth Furnace for Drums and Headers – LPG Fired Bogie Hearth Furnace** as per the technical specification, general guidelines instructions & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**1 No**

Important points to be taken care during submission of offer

1. **Delivery required 10 months from the date of purchase order.**
2. **Grace period of 2 months beyond the above delivery period will be considered.**
3. **Checklist to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.**

BHEL's General guidelines / instructions (refer MM/CE/GT/001) including bank guarantee formats and list of consortium banks, commercial terms check-list can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2620900206".

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

PART A
BOGIE HEARTH FURNACE-100 TONS

SECTION – I : QUALIFYING CRITERIA

The BIDDER has to compulsorily meet the following requirements to get qualified for considering the technical offer:

S. No.	REQUIREMENTS	VENDOR's RESPONSE
1	Only those vendors (**OEMs**), who have Designed, supplied and commissioned at least **ONE BOGIE HEARTH FURNACE** with minimum capacity of 100Tons for furnace temperature of 1000 °C or higher in the past ten years (on the date of opening of Tender) 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 had already been supplied to BHEL, then that furnace should be presently working satisfactorily for more than six months after it's commissioning and acceptance (on the date of opening of Tender).	
	The vendor should submit following information where similar machine has been supplied for qualification of their offer.	
1.1	Name and postal address of the customer or company where similar machine is installed.	
1.2	Name and designation of the contact person of the customer.	
1.3	Phone, FAX no and email address of the contact person of the customer.	
1.4	Month and Year of commissioning of the furnace	
1.5	Application for which the furnace is supplied	
1.6	Along with the Technical offer, the Vendor should submit one Performance certificate from the customer for the satisfactory performance of the furnace supplied to them. For obtaining the Performance certificate, a suggestive format is provided in **SECTION – IV.**	
1.7	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.	
2.0	**DELIVERY** - The bidder shall quote the best possible delivery. However the delivery shall not exceed 10 months with an additional grace period of 2 months. The additional grace period will attract a penalty which is explained in the commercial terms of the enquiry. The delivery period shall be reckoned from date of purchase order to despatch from the vendor works.	

SECTION – I I

The BIDDER / VENDOR is requested to provide the following information:

S. No.	REQUIREMENTS	VENDOR's RESPONSE
3.0	The BIDDER/VENDOR to furnish Reference List of Customers, with full address, details of contact person, where Bogie Hearth furnace have been supplied in the past.	
4.0	Details of Bogie Hearth furnace supplied to other BHEL units, if any. (Year of commissioning, Length, Width and Operating temperature)	
5.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Address of Agents / Service Centers in South India.	
6.0	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – III

The BIDDER to note:

S. No.	PARTICULARS	VENDOR'S RESPONSE
7.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS. 1. Technical Offer [with PART A & PART B] & commercial offer 2. Price Bid.	
8.0	The Technical Offer shall contain a comparative statement of Technical **Specifications demanded by BHEL** and **Offer Details submitted by the Bidder**, against each clause. A just 'CONFIRMED' or 'COMPLIED' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement where specific details are required may lead to disqualification of the Technical Offer.	
9.0	The Technical Offer shall be supported by product Catalogues & Data Sheets and also technical details of Bought-Out-Items with copies of Product Catalogue to the extent possible.	
10.0	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.	

SECTION – IV

The performance certificate should be produced **on Customer's Letter Head.**

PERFORMANCE CERTIFICATE

1. Supplier of the machine		
2. Make & Model of the M/C		
3. Month & Year of Commissioning		
4. Application for which M/C is used		
5	a) Length b) Width c) Operating Temperature d) WT. Carrying Capacity	
6. Performance of the Machine (Strike off whichever is not applicable)		Satisfactory **/** Good **/** Average **/** Not Satisfactory
7. After sales service (Strike off whichever is not applicable)		Satisfactory **/** Good **/** Average **/** Not Satisfactory
8. Any Other remarks		
Date:		Signature & Seal of the Authority Issuing the Performance Certificate

PART B

100 TON CAR BOTTOM FURNACE
(Fuel: LPG)

TECHNICAL DATA & SPECIFICATIONS:

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
1.0	**PURPOSE & WORKPIECE MATERIAL :**			
1.1	**Purpose :** To Stress relive and normalizing of headers, Drums, shells, Dished ends, U Rods of Utility and industrial Boilers			
1.2	**Job Details:** Material: Mild Steel, Alloy Steel, Job Length: Up to 25000 mm Job Width: Up to 4000 mm. Weight of Job Lot: Not exceeding 100 Tons (The specific heat of material shall be considered as 0.14 Kcal/kg^0**C)**	Vendor to note		
2.0	**Furnace:**			
2.1	**Operating Parameters:**			
2.1.1	Charge Capacity –Excluding pedestals.	100 Tons		
2.1.2	Heat Treatment Cycles to be carried out	Stress Relieving		
2.1.3	Maximum Furnace Design Temperature	1000^0C		
2.1.4	Maximum Charge Temperature	890 ^{0}C +/- 10^0C		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.1.5	Rate of heating (selection has to be infinitely variable in the range specified) 1. Upto 400 Deg C at 200 ^{0}**C** /Hr 2. Above 400 deg C (i) For Load: (a) 0-60T- 110 ^{0}**C** /Hr (b) 60-100T- 75 ^{0}**C** /Hr (ii) For Wall Thickness: (a) < 50mm - 110 ^{0}**C** /Hr (b) 51-75mm - 75 ^{0}**C** /Hr	Vendor to specify		
2.1.6	Rate of cooling (cooling up to 400^{0}**C)** (selection has to be infinitely variable in the range specified)-	60 ^{0}C / Hr (min.)		
2.1.7	Job Temperature Uniformity: (i) During Heating and cooling cycle, the temperature uniformity along the length of the charge shall not exceed +/- 37 ^{0}**C** between any two thermocouples and shall not exceed +/- 10 ^{0}**C** at soaking temperature under following loading pattern in auto mode. a. The minimum load on the furnace shall be 40% of the capacity of furnace. b. The uniformity of loading along the length of the bogie to be maintained within 20%. (ii) If the loading pattern differs from the above, the temperature uniformity as stated in point (i) to be maintained with manual intervention.	Vendor to confirm		
2.2	**Furnace Configuration**			
2.2.1	Fuel – LP Gas Fired firing system	Vendor to confirm		
2.2.2	Single Bogie Configuration with Top Lifting Door	Vendor to confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.2.3	Car Bottom Bogie Traversing on embedded Rails, through a Rack & Pinion Drive with reduction gear box	Vendor to furnish details		
2.2.4	Automatic Zone Temperature Control with Programming of Heat Treatment Cycle	Vendor to confirm		
2.2.5	Ceramic Fiber module refractory for doors and shell.	Vendor to confirm		
2.2.6	Hard refractory construction for bogies	Vendor to confirm		
2.2.7	Recuperator System for Energy Conservation	Vendor to confirm		
2.2.8	Job supporting Heat resistant cast iron pedestals 16 nos.	Vendor to confirm		
2.3	**Furnace Inside Dimensions** :			
2.3.1	Wall to Wall width	5000 mm		
2.3.2	Inside length (door to Back wall)	27000 mm		
2.3.3	Inside height (above Bogie top)	4000 mm		
2.4	**Combustion System**:			
2.4.1	The furnace has to be provided with the required number of nozzle-mix high velocity burners suitably designed for firing LPG. The positioning of the burners inside the furnace should be designed to create high degree of turbulence in the furnace atmosphere, increased convection heat transfer co-efficient, resulting in better uniformity and thermal efficiency even at lower temperature.	Vendor to Confirm	.	

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.4.2	Fuel	LPG		
2.4.3	LPG Gas Pressure-BHEL can supply at 2.0 kg/cm2	Vendor to Specify		
2.4.4	Max required flow rate of LPG (Supporting heat calculation details to be enclosed)	Vendor to Specify		
2.4.5	Burners Type-**(High Velocity Burner of Reputed make acceptable to BHEL) (Vendor to furnish model no. and technical details of burners)**	Vendor to furnish details.		
2.4.6	Number of rows and arrangement of Burners (Schematic drawing should be furnished along with the offer)	Vendor to specify		
2.4.7	**Number of Burners** (Calculation details should be submitted with the offer)	Vendor to Specify		
2.4.8	Burner Rating	Vendor to Specify		
2.4.9	Burner turn - down ratio (higher ratio is preferred)	Vendor to specify		
2.4.10	Flame Length	Vendor to Specify		
2.4.11	Type of Temperature Control	PID		
2.4.12	No. of Temperature control Zones	Vendor to specify		
2.4.13	LPG gas burner material of construction shall be SS 310 inside portion.	Vendor to Confirm		
2.4.14	LPG gas igniter material of construction shall be SS 310.	Vendor to Confirm		
2.4.15	Two ways solenoid valve shall be brass material and should be flame proof as per IS: 2148 gas group class IIA, IIB.	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.4.16	Isolation valves shall be fire safe design as per IS: 2148	Vendor to Confirm		
2.4.17	Vent valves opening position to be indicated in the control panel	Vendor to Confirm		
2.4.18	All vent valves shall be routed above roof to better air mix up in atm.	Vendor to Confirm		
2.4.19	All valve flanges shall be raised face with serrations.	Vendor to Confirm		
2.4.20	Wherever electrical input is available with any instrument in the LPG line such as Igniter cables, scanner related items, junction boxes, transmitter, limit switches those shall be provided with flame proof enclosure with double compression cable gland provision for cable entry/exit.	Vendor to Confirm		
2.4.21	All cables should be Flame Retardant Low Smoke design only	Vendor to Confirm		
2.4.22	Copper cladded asbestos gasket to be used for flanges valves	Vendor to Confirm		
2.4.23	The complete piping system with all mechanical components should withstand minimum 5 bar pressure	Vendor to Confirm		
2.4.24	2 Nos. of "y" type / simplex filter with 4 Nos. of isolation valves to be provided.	Vendor to Confirm		
2.4.25	Instrument impulse line shall be SS 316, Sch 40.	Vendor to Confirm		
2.4.26	Copper washer shall be provided to all pressure gauges and switches	Vendor to Confirm		
2.4.27	All Flanges should be provided with copper earthing	Vendor to Confirm		
2.4.28	One spectacle blind shall be provided for each furnace near terminal point at gas train piping.	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.4.29	TIG root run welding shall be carried out for all welding joints in LPG pipe lines.	Vendor to Confirm		
2.4.30	Provide one isolation valve for all pressure gauge /pressure switch	Vendor to Confirm		
2.4.31	**Forced Draught (FD) Fan:**	Vendor to Confirm		
a)	FD Fan with VFD of suitable capacity **(including excess air)** has to be provided to ensure proper combustion	Vendor to Confirm		
b)	Air flow –Calculation details to be enclosed	Vendor to Specify		
c)	Air Pressure	Vendor to Specify		
d)	Power Rating (KW)	Vendor to Specify		
2.4.32	**Induced Draught (ID) Fan & Dilution Fan:**			
a)	ID Fan and Dilution fan of suitable capacity has to be provided before the stack	Vendor to Confirm		
b)	Air flow –Calculation details to be enclosed	Vendor to Specify		
c)	Air Pressure	Vendor to Specify		
d)	Power Rating (KW)	Vendor to Specify		
2.4.33	Type of all Blower/Fan	Centrifugal		
2.4.34	Make of all Blowers- **C-Doctor/ Patel / Flakt India.**	Vendor to Specify.		
2.4.35	The FD Fan and ID Fan have to be suitably sized to ensure a Balanced Draught System	Vendor to confirm		
2.4.36	A standby fan with motor each for the FD, ID & Dilution fan system has to be provided.	Vendor to confirm		
2.4.37	Bell mouth (Silencer) inlet to be provided on the suction side of FD, ID & Dilution fans.	Vendor to confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.4.38	Suitable filter to be provided on the suction side of FD fan. Vendor must provide suitable handling facility for cleaning the filter element by 1 person.	Vendor to confirm		
2.4.39	All the motors used for the fans shall be of Energy efficient motors.	Vendor to confirm		
2.4.40	All the Fans (FD, ID & Dilution) should comply with the following construction / performance 1. Full welding of impeller blades with the rotating base plate. 2. Availability of sufficient strengthening stiffeners in the body / support structure of the blower. 3. Noise level: Max. 85 ± 3 dBA @ 1.5 meter distance. 4. Vibration level: As per ISO-2372. Up to 2.8 mm/sec (RMS). 5. Dynamic balancing of impeller at rated speed.	Vendor to confirm		
2.4.41	**Dampers** :			
a)	Damper has to be provided 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).	Vendor to Confirm with details		
c)	Provision should be there to operate the damper in manual mode also.	Vendor to confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.5	**Refractory Lining:** (For Shell and doors) Ceramic fiber blocks modules with back up layer of suitable density and thickness (conforming to ASTM-892 C-1993) to ensure that the skin temperature of the furnace does not exceed 80^{o}C. The anchor material should be SS310. 1. (Vendor to furnish calculations for choice of insulation material and Data sheet of the insulating materials) 2. The supplier shall provide MSDS for all refractory material (including ceramic wool) – It shall cover "cradle to grave". 3. The supplier shall indicate the applicability of the ceramic material under **Hazardous Wastes (Management, Handling and Trans boundary Movement) Rules, 2008.**	Vendor to Specify		
2.5.1	Size of Ceramic Fiber Block Modules (Size should be under the standard manufacturing range of the supplier)	Vendor to Specify		
2.5.2	Density	Vendor to specify		
2.5.3	Thickness	Vendor to Specify		
2.5.4	Maximum .Service Temperature	Vendor to specify		
2.5.5	Make: M/s MMTCL or M/s Unifrax only	Vendor to confirm		
2.5.6	Size of Back up Blanket layer (Size should be under the standard manufacturing range of the supplier)	Vendor to Specify		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.5.7	Density	Vendor to specify		
2.5.8	Maximum .Service Temperature	Vendor to specify		
2.5.9	Thickness	Vendor to Specify		
2.5.10	Make: M/s MMTCL or M/s Unifrax only	Vendor to confirm		
2.6	**Furnace hearth :**			
2.6.1	Side walls are to be constructed with the combination of hard refractory & Insulation brick (Shaped bricks) with Calcium silicate board backup for suitable thickness and leveled equal to the top of bogie refractory. The shaped brick combination between the bogie and the hearth should ensure good thermal sealing between them.	Vendor to Confirm		
2.6.2	Make of Hard refractory materials: M/s ACE, M/s Maithan refractories, M/s TATA refractories, M/s Corborundam Universal only. (Relevant data sheets to be submitted in the offer)	Vendor to confirm		
2.6.3	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		
2.7	**Burner blocks:**	90% High Alumina or SIC material		
2.8	**Furnace Door:**			
2.8.1	Number of Doors	ONE		
2.8.2	Operation	**Vertical**		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.8.3	**Drive:** Electric drive with Speed reduction Gear Box, Electromagnetic Brake etc. for the door at ground level	Vendor to confirm		
2.8.4	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		
2.8.5	All Pneumatic elements used shall be of FESTO make only.	Vendor to confirm		
2.8.6	BHEL will provide air supply at a pressure of 60 - 70 psi only at one point near the furnace. Vendor to provide suitable air drier, filter, regulator, air booster etc for controlling the required air pressure for the pneumatic system.	Vendor to confirm and provide details.		
2.8.7	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		
2.8.8	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		
2.8.9	In the unlocked position, and while lifting the door, it should move away from the furnace opening and move up without interfering on any furnace structure.	Vendor to confirm		
2.8.10	Interlock should be provided so that bogie can be operated only when door is completely open.	Vendor to confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.8.11	All the pneumatic equipments and interlock elements are to be suitably protected from failure due to heat from the furnace	Vendor to confirm		
2.8.12	Steel construction with ceramic fiber modules lining inside and a set of heat resisting grey cast iron castings, conforming to IS 4522, Grade-9 around the periphery of the door and with suitable counter balance arrangement	Vendor to Confirm		
2.8.13	The counter weight arrangement should be provided on the sides of the door.	Vendor to Confirm		
2.8.14	Vendor to provide suitable interlock for low firing at door open condition and high fire only after closing the door			
2.9	**Furnace Construction (General) :**			
2.9.1	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		
2.9.2	The various load bearing members are to be designed conservatively to ensure rigidity of the complete casing.	Vendor to confirm		
2.9.3	A schematic diagram showing the layout of the furnace & associated systems with salient dimensions should be furnished along with the offer	Vendor to confirm		
2.10	**RECUPERATOR:**			

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.10.1	The recuperator shall be of multi tubular metallic construction with counter flow, convective heat transfer arrangement. MOC shall be SS310 hot face and SS304 cold face. **(Complete details of construction should be furnished with the offer)**	Vendor to confirm		
2.10.2	Recuperator has to pre-heat the air to 350 Deg.C. **Thermal calculation to be enclosed**. Recuperator bypass with suitable valves to be provided	Vendor to confirm		
2.10.3	The recuperator has to be located suitably in the flue gas path above the ground itself	Vendor to confirm		
2.10.4	On line indication of inlet, exit temp of air and flue gas to be available.	Vendor to confirm		
2.11	**FLUE DUCT:**			
2.11.1	Flue duct Position (Suitably insulated preferably with hard refractory)	Vendor to specify		
2.12	**STACK :**			
2.12.1	The stack for flue gas outlet has to be designed and constructed with refractory brick lining and venturi suitably to leave the waste gas at a lowest temperature.	Vendor to specify		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.12.2	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 the Height calculated by the above formula OR 20m(Bldg height 14M) whichever is higher	Vendor to confirm		
2.12.3	At two planes (one at 2.0 meters from the ground level and the other at 6 D height of the chimney. where D is the inner diameter the chimney), four portholes shall be provided at 90 deg each. Each porthole shall be of 100 mm inner diameter, welded with a standpipe 100 mm long fixed with a flange and bolted with a dummy plate.	Vendor to Confirm		
2.12.4	Platform, with toe guard, should be provided all around the chimney 1.0 m below each plane to house the sample collection equipment and for working clearance for crew. Handrail should be provided all round the platform. Ladder shall be provided for both traverse point planes.	Vendor to Confirm		
2.12.5	Suitable ladder with cage should be provided to reach platform at both sampling planes.	Vendor to Confirm		
2.12.6	Suitable monkey ladder with safety rungs shall be provided up to top of the chimney	Vendor to confirm		
2.12.7	The stack shall be provided with a weather cowl	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.12.8	The stack shall be provided with complete lightning arrester system including lightning arrester spike, copper conductor tape from spike to test link, test link, earth pit as per Indian standards	Vendor to Confirm		
2.12.9	Exit temperature, Oxygen, SPM (in mg/cu.m), SPM (Microns), Sox; NOx; CO; flue gas velocity at the outlet tip of the chimney	Vendor to Specify		
2.12.10	The demonstration (proving) of the parameters as per 2.12.9 is in the scope of vendor. Necessary calibrated measuring instruments used for this purpose is in the scope of the supplier.	Vendor to Confirm		
2.13	**FURNACE BOGIES**:			
2.13.1	Number of Bogies	One		
2.13.2.	Furnace Bogie Dimension a)	Length 26500 mm		
	b)	Width 4500 mm		
	c)	Height 800 mm		
2.13.3	The bogie to be driven by fabricated **Double rack** (Pin type) and pinion arrangement motorized with reduction units, couplings and electromagnetic brakes. BHEL prefers to have Double drive arrangement with synchronized speed. (Complete details should be furnished with the offer)	Vendor to specify		
2.13.4	The complete bogie with refractory to be supported on the set of cast wheels through trolley arrangement –one set of guided wheel and other three sets of plain wheels running on **four parallel rails (90 lbs rail by BHEL).**	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.13.5	The bogie should be able to be moved out sufficiently for carrying out the maintenance work.	Vendor to Confirm		
2.13.6	Bogie speed	Vendor to specify		
2.13.7	The Bogie refractory has to be constructed with the combination of IS 8 quality firebricks and Insulation bricks for suitable thickness backed by calcium silicate board and ensure that the skin temperature does not exceed 80 deg.C (Complete details with calculation should be furnished with the offer)	Vendor to Confirm		
2.13.8	Around the periphery, special shaped bricks of IS 8 quality have to be positioned. The combination of the shaped bricks in bogie and the hearth should ensure good thermal sealing between them.	Vendor to Confirm		
2.13.9	Heat resisting gray iron castings confirming to IS 4522 - Grade-9 has to be positioned around the periphery of the bogie to support the refractory.	Vendor to Confirm		
2.13.10	The bogie castings shall be of min. 20 mm thick at the base and 16 mm thick on the sides and the width of the base must be more than that of the side.	Vendor to Confirm		
2.13.11	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. Complete sand sealing castings shall confirm to IS 4522 - Grade-9	Vendor to Confirm		
2.13.12	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		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.13.13	The bogie is 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		
2.13.14	The Bogie structure has to be designed to give minimum deflection under different load conditions. 1. 98T , 14M Drum loaded on 3 nos pedestal of foot area 300mmx1200mm 2. 10T Dished end with convex surface touching the bogie and supports to prevent rolling	Vendor to Confirm	.	
2.13.15	It should be ensured that all the wheels share the load to the maximum extent.	Vendor to Confirm		
2.13.16	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		
2.13.17	KW Rating of Bogie Drives	Vendor to specify		
2.13.18	All the Castings in the furnace shall be fixed with respective structures using SS-304 bolts of min. M16 size.	Vendor to Confirm		
2.13.19	All the gear boxes used in the furnace shall be of standard size and of reputed makes of Greaves / Shanthi gears / Radicon / Elecon or any other make acceptable to BHEL.	Vendor to Specify		
2.14	**PIPELINES & VALES**			
2.14.1	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. 2Kg/cm2 Regulator to be provided at the start of the Gas train system for fine tuning.	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.14.2	All air piping from the fans to the control valves and to other points is in the scope of the vendor	Vendor to Confirm		
2.14.3	Required valve for control of gas and air is in scope of the vendor	Vendor to Confirm		
2.14.4	All hot air pipe lines to be insulated	Vendor to confirm		
2.14.5	All the pipe lines to be installed above ground level.	Vendor to confirm		
2.14.6	Make of Gas and Air valves used shall be of Kromschroder/Samson Mumbai/IL Palghat/MIL Chennai/ Fouress Bangalore/Fisher Xomas Chennai.	Vendor to Specify		
2.14.7	Gas valves, air valves & field instruments in gas line must be fire proof as per NFPA.	Vendor to confirm		
2.15	**ELECTRICAL :**			
2.15.1	**Tropicalization** : All electrical / electronic equipment shall be tropicalized.	Vendor to Confirm		
2.15.2	All Electric enclosures shall have IP 54 protection	Vendor to Confirm		
2.15.3	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to Confirm		
2.15.4	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.	Vendor to Confirm		
2.15.5	All cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the equipment/control cabinets, shall be the responsibility of vendor. All cables should be of copper only.	Vendor to Confirm		

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (With Complete Technical Details)	DEVIATION / REMARKS
2.15.6	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		
2.15.7	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220 Volts, 5/15 Amp AC. All adapters / receptacles should have compatibility with Indian equivalents.	Vendor to Confirm		
2.15.8	Motors & other electrical components shall conform to IEC or Indian Standards. Motors shall be of energy efficient and makes of ABB / Siemens / Kirloskar.	Vendor to Specify		
2.15.9	All the cable trays required for laying of cables should be included in the offer.	Vendor to Confirm		
2.15.10	Vendor should ensure the proper earthing for the furnace and its peripherals.	Vendor to Confirm		
2.15.11	All electrical components like contactors and OLRs etc., should be of Siemens, L&T or Telemechanique make and VVFD for FD fan shall be of ABB / Siemens / Eurotherm make.	Vendor to specify		
2.16	**JOB SUPPORT PEDESTAL**:			
2.16.1	Number of job support pedestals to be placed on bogie	Total 16 Nos.		
2.16.2	**Material:** Heat resistant cast iron as per **IS 4522 grade-11**	Vendor to Confirm		

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2.16.3	Size: **300 x 400 x 3750 in mm (Height x Width x Length) 'I' section with web thickness of 75mm and necessary stiffeners**	Vendor to submit drawing of pedestal along with offer.		
2.16.4	Max Weight of each pedestal	Vendor to specify		
3.0	**SAFETY ARRANGEMENTS:**			
3.1	Following safety features in addition to other standard safety features should be provided on the machine:			
3.2	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 panel should be available.	Vendor to specify		
3.3	A detailed list of all alarms / indications provided should be submitted by the Vendor.	Vendor to specify		
3.4	All the pipes, cables etc. should be well supported and protected.	Vendor to Confirm		
3.5	All the rotating parts should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm		
3.6	3 emergency switches to be provided to switch off the whole furnace for safety purpose. The locations are 1. In control Panel 2. Either side of the furnaces.	Vendor to Confirm		

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3.7	4 Nos Gas leak detector to be provided to cover critical gas leak zone. The system should have independent control with alarm. Vendor to provide the test certificate with LPG sample for LEL as per standard. Functional test with same sample to be done after commissioning of the instruments at site. Supply of standard sample gas is under vendor's scope	Vendor to Specify		
4.0	**INSTRUMENTATION & CONTROL SYSTEM :**			
4.1	All controls will be located in a Control Room (A.C) adjacent to the furnace. BHEL will construct the Control room based on inputs to be provided by the vendor	Vendor to Confirm		
4.2	**Furnace temperature control :** PLC-PC based instrumentation with SCADA software system shall be provided for Mass Flow control of the furnace. The PLC-PC based system shall be based on Redundant system with Master and Slave configuration. It operates through a Personal computer and suitable SCADA software. The PID control loop with auto tuning function to be constituted within the PLC through intelligent software. Suitable interface, required software, programming device to up load, down load for PLC programme changing in future or up gradation of PLC version. Upgrade software to be supplied by the Vendor. The system to monitor furnace parameters on the SCADA screen, enhanced interlocks for safety of furnaces and process level of furnace automation, continuous and efficient data logging and archiving etc to be provided. Preferable make of the PLC is ABB, Allen Bradley. PC with printer will be supplied by BHEL. Technical specifications of the PC should be submitted by vendor.	Vendor to specify		

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4.3	Furnace over temperature control to be made available at control panel only.	Vendor to confirm		
4.4	Recuparator protection for preheat temperature control.	Vendor to confirm		
4.5	The system shall comprise, but not be limited to the following:			
4.5.1	Zonal Thermocouples: 2 Nos. of Duplex thermocouples to be provided. One thermocouple for temperature controller, second for excess temperature controller 3rd for recorder and 4th as a spare. Thermocouple type-k with protective sheath to be of inconel with adjustable flange 1 meter long. Asbestos compensating cables to be provided for heat resisting	Vendor to confirm		
4.5.2	K- type Compensating cables of the Temperature recorder to be wired from the control panel to 6 location of each side wall of the furnace for material temperature measurements. Holes for thermocouples to be provided in between the burners at suitable locations approved by BHEL. Thermocouples will be provided by M/S. BHEL. Supply of suitable length of compensating cables is vendor's scope.	Vendor to confirm		
4.5.3	Suitable rated modulating motors / Control elements for all the Zones	Vendor to confirm		
4.5.4	Mass flow based zonal control system for temperature controls-This has been indicated in 4.2.	Vendor to confirm		
4.5.5	24 Point Micro Processor based temperature recorder with chart width 250 mm along with 50 nos.of chart paper packs. Make. Yokogawa, Eurotherm and Chino.	Vendor to confirm		

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4.5.6	Pressure switches with isolation valves, flow transmitters with manifold valves for gas, air and control elements with suitable markings for easy observation of position of the valves to be provided.	Vendor to confirm		
4.5.7	Furnace pressure transmitters and control elements with P&I diagram should be submitted.	Vendor to confirm		
4.5.8	Instruments cables and compensating cables are to be separated from power cables. Battery limit for panel location to be confirmed by the vendor. All cables should be of FRLS design only.	Vendor to confirm		
4.5.9	Piping lines for instruments to be provided with clamps and neatly routed	Vendor to confirm		
4.5.10	Metal Junction boxes with suitable terminal blocks and glands to be provided. All the wires should be with marked ferrules for easy identification both in the control panel and for the field instruments	Vendor to confirm		
4.5.11	Any other requirement to complete the system	Vendor to specify		
4.6	Possibility of over viewing the status in the control room.	Vendor to Confirm		
4.7	For excess temperature control of respective zone, it should be possible to set the limit value of each zone in the Control panel. In case of zonal temperature overshoots the maximum set value; it should control all safety systems along with raising audio visual alarm.	Vendor to Confirm		

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4.8	Other features required:			
	a) Alarm annunciation	Vendor to Confirm		
	b) Gas flow measuring system: Orifice type volumetric flow measurement with totalizer to be indicated in the control panel	Vendor to Confirm		
	c) Safety system and alarm indication required are to be indicated.	Vendor to Confirm		
4.12	Required Motor Control Centers shall be provided for control of all fans and blowers (This point should be separated from instrumentation and control)	Vendor to confirm		
4.13	Gas Train System details to be given for all the components with P and I diagram Suitable pressure gauge with isolation valve to be provided in the inlet and outlet of the gas train system. An additional pressure gauge in the gas train system after the main safety valve will be provided**.** All the field instruments in the gas line should be of flame proof enclosure	Vendor to Confirm		
4.14	Burner purge cycles with adequate purging time for safe operation shall be provided.	Vendor to Confirm		
4.15	Manual Gas Shut Off Valve shall be provided apart from the safety shutoff valve in the gas train.	Vendor to confirm		
4.16	Push button Control Station shall be provided near the furnace for all manual operations	Vendor to confirm		
4.17	Local push button stations shall also be provided for bogie drive, ID fans, FD fans, Dilution fans and door drives	Vendor to Confirm		

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4.18	Maintenance platform at suitable height for instrumentation to be provided	Vendor to confirm		
4.19	Instruments Calibration: Calibration certificates to be provided for process values measuring instruments, Transmitters, Thermocouples and compensating cables. Test certificates required for Pressure switches and modulating motors etc. are to be provided at the time of inspection of the furnace at vendor works. Vendor has to carry out re-calibration for all the above calibrated items at BHEL site during commissioning. After placement of order vendor has to provide the Calibration certificate and test certificate as per BHEL format.	Vendor to confirm		
4.20	Ignition & Flame Supervision: Spark igniter of high voltage type (H.V) to be used. The flame monitoring system to be with U.V. scanner for its reliability. In case of U.V Scanner, it must be provided with suitable air cooling. The flame supervision circuit is linked to the gas solenoid valve for each burner. This enables to monitor and control the flame of each burner continuously through PLC.	Vendor to confirm		
5.0	**LEVELLING & ANCHORING SYSTEM**			
5.1	Complete anchoring system including foundation bolts, anchoring materials, leveling shoes etc should be supplied	Vendor to Confirm		

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6.0	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE:**			
6.1	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		
7.0	**SPARES :**			
7.1	Itemized breakup of mechanical, pneumatic, electrical , electronic and Refractory 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)**	Vendor to Confirm		
7.2	**Mechanical & Pneumatic Spares :** All types of Valves, filters,Pressure Switches, Transducers, Flow Switches, actuators etc.	Vendor to Specify		
7.3	**Electrical / Electronic :** All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor fuses, Special Fuses, Circuit Breakers, Main Power Switch, spars for Field Sensors etc.	Vendor to Specify		
7.4	Following spares to be quoted compulsorily a. Burner 2 Nos. b. Burner Blocks 20 Nos. c. Gas Solenoid Valve for burners 5 Nos. d. UV Flame Detector 5 Nos. e. Thermocouple-duplex 4 Nos. **f.** Flow transmitter for gas 1 No.	Vendor to Confirm		

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7.4	**g.** Flow transmitter for air 1 No. h. Pressure switch for gas 1 No. i. Pressure switch for air 1 No. j. Furnace Pressure transmitter 1 No. k. Actuator for gas 2 No. l. Actuator for air 2 No. m. Seal kit for pneumatic cylinder 1 Set. n. PLC analog input module 1 No. o. PLC analog output module 1 No. p. PLC digital input module 1 No. q. PLC digital output module 1 No. r. PLC thermocouple module 1 No. 1. PLC power supply unit 1 No. s. Indication lamp 1 Set t. Limit switches 4 Nos. u. Ribbon cartridge 3 Nos. v. Excess temp controller- 1no. w. All type of Air valves – 10% of quantity used in the furnace x. All type of Castings – 20% of quantity used in the furnace y. All type of Gas valves – 10% of quantity used in the furnace z. Gas leak detector 1 No	Vendor to Confirm		
7.5	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		

S.No	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (with Complete Technical Details)	DEVIATION / REMARKS
8.0	**DOCUMENTATION**			
8.1	Documents to be submitted along with offer for technical Evaluation:			
8.1.1	**The vendor to submit the following drawings / details along with offer for technical evaluation:** 1. P&I Diagram with bill of materials 2. General Arrangement diagram 3. Schematic Instrument circuit diagram 4. Electrical circuit diagram 5. Heat load calculation 6. Furnace efficiency calculation 7. Complete list of components in Each Burner Assembly 8. Burner capacity selection method 9. LPG consumption in Nm3/hr under following conditions, which shall be verified at the time of commissioning: a) at No load after soaking for 3 hrs at maximum furnace temperature. b) at 50% load and operating the furnace for one complete cycle from start to end of soaking cycle. 10. Burner arrangement layout drawing. 11. Drive arrangement drawings for Bogie drive & door drive with bill of materials. 12. Counterbalance & door locking arrangement drawing 13. FD & ID Fan calculation 14. Refractory arrangement **15.** Casting arrangements.	Vendor to enclose		

S.No	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (with Complete Technical Details)	DEVIATION / REMARKS
8.1	16. Panel layout 17. Pneumatic Circuit with bill of materials. 18. Job support pedestal drawing.	Vendor to enclose		
8.2	**Documents to be submitted for BHEL approval before manufacturing:**			
8.2.1	The vendor to submit the following drawings / details for BHEL approval before manufacturing: 1. P&I Diagram with bill of materials 2. General Arrangement diagram 3. Schematic Instrument circuit diagram 4. Electrical circuit diagram 5. Heat load calculation 6. Furnace efficiency calculation 7. Skin temperature calculation 8. Complete list of components in Each Burner Assembly 9. Burner capacity selection method 10. LPG consumption in Nm3/hr under following conditions, which shall be verified at the time of commissioning: a) at No load after soaking for 3 hrs at maximum furnace temperature. b) at 50% load and operating the furnace for one complete cycle from start to end of soaking cycle. 11. Burner arrangement layout drawing. 12. Drive arrangement drawings for Bogie drive & door drive with bill of materials.	Vendor to confirm		

S.No	DESCRIPTION	PARAMETERS	BIDDER'S OFFER (with Complete Technical Details)	DEVIATION / REMARKS
8.2.1	13. Counterbalance & door locking arrangement drawing 14. FD & ID Fan calculation 15. Refractory arrangement 16. Casting arrangements and casting drawings. 17. Panel layout 18. Pneumatic Circuit with bill of materials. 19. Job support pedestal drawing. 20. Quality plan.	Vendor to confirm		
8.3	**Documents to be submitted along with Equipment:**			
8.3	Five sets of O&M manuals (5 Hard copies) in English language having the following documents should be supplied along with the machine. Apart from the hard copies, vendor to provide the entire documentation in a single PDF including the catalogues of all bought items and the same shall be provided in a 2GB pen drive. Note: One set of all the documents (hard copy and soft copy) to be shown to the BHEL inspector at the time of inspection at vendor's works to check the sufficiency of documents.	Vendor to confirm		
8.3.1	The O&M Manual should contain the following (A to S)	Vendor to confirm		
A	P&I Drawing of furnace			
B	Electrical Wiring Drawings – Power & Control Circuits			
C	Terminal drawings with check points shall be provided for Electronic Controls			
D	Trouble Shooting Chart for Main and all Sub-Systems			

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E	Specifications, Catalogues, O&M Manuals and Engineering manuals of all bought out items including drawings, wherever applicable.			
F	All Mechanical drawings for the items manufactured / covered under scope of vendor. Mechanical drawing includes GA & Sub-assembly drawings with major and critical dimensions, material and weight.			
G	Furnace Operation Procedure for start up, purging, shutdown, Power failure interruption, Gas fluctuation condition, etc. with all safety instructions. PLC ladder diagrams(both in hard and soft copy), Additional licensed software for SCADA should be provided.			
H	Complete refractory lay out and shaped brick drawings with dimensions, including specification of refractory materials used.			
I	Complete Casting lay out and individual casting drawings with dimensions, including specification of casting materials used.			
J	Drive arrangement drawings for Bogie drive & door drive with bill of materials including specification of materials used.			
K	Counterbalance and door locking arrangement drawings for door with bill of materials including specification of materials used.			
L	Bogie sealing, Door sealing arrangement drawings.			
M	Complete details of Combustion system- Operation and maintenance.			

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N	Complete Master List of spare parts used along with item part number/ specification/ type, name and address of the spare supplier			
O	Calibration certificates for all the Panel instruments, Transmitters, Flow meters, Thermocouples and test certificates for Pressure switches, modulating motors and regulators.			
P	Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls.			
Q	Complete calculations for heat load, skin temperature, burner selection, FD fan selection, refractory selection, efficiency, fuel consumption, etc.			
R	Panel layout with details for panel size, Painting, Cable entry, etc. Details and specification for contactor, MCB, Push buttons, OLR, Indication lamps, ON/OFF rotary switches, Isolators, selector switches, safety devices, etc to be provided.			
S	List of all alarms / indications / annunciator.			
T	The vendor shall submit complete Master List of parts used in the machine.			
8.4	One Hard Copy and one soft copy in pen drive of all the documents stated in clause 8.3 shall be submitted at the time of inspection of the furnace by BHEL Officials	Vendor to confirm		
9.0	**TRAINING:**			
9.1	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		

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10.0	**FOUNDATION:**			
10.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Purchase order. The layout should consist of all requirements pertaining to complete furnace including space requirement for Control Room, Blowers, and Stack, Rails etc. Vendor shall furnish the foundation layout and static and dynamic load details within 3 months of Purchase order. BHEL shall design and construct complete foundation for the furnace as per the Vendor's recommendation			
11.0	**ERECTION & COMMISSIONING**			
11.1	Vendor to take full responsibility for carrying out the erection, start up, testing & commissioning of the furnace & its control & all types of other supplied equipment. The Vendor shall arrange manpower & tools for the same	Vendor to Confirm		
11.2	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 free of cost. Fabrication requirements like gas, electrodes, mobile crane at site are in the scope of vendor	Vendor to Confirm		
11.3	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 from part of the commissioning activity.	Vendor to confirm		
11.4	The Vendor should bring tools, Tackles and other necessary equipment required to carry out all above activities.	Vendor to confirm		

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11.5	The Vendor shall bring commissioning spares required for commissioning of the machine within stipulated time	Vendor to Confirm		
11.6	Schedule of Erection and Commissioning shall be submitted with the offer	Vendor to Confirm		
11.7	Vendor should furnish charges, duration, terms & conditions for E & C in detail separately along with offer.	Vendor to Confirm		
12.0	**FURNACE INSPECTION & ACCEPTANCE**			
12.1	**Inspection at Vendor's works:** 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		
12.1.1	Complete sub-systems as per the contract - verification of functions to the extent possible.			
12.1.2	Blowers (FD & ID fans) to be offered for checking the performance. If required it shall be offered at blower supplier's works.			
12.1.3	Verification of Calibration certificates of instruments.			
12.1.4	Verification of Documents as per clause (**8.4**)			
12.2	The furnace shall be tested by the vendor for its performance prove-out as per BHEL Specifications, at BHEL after erection & commissioning. The furnace will be tested and proved utilizing 2 cycles in each of following category and as per condition stated in clause 12.2.1. 1. Normalizing (only rate of heating and soaking involved) at 890±10 deg C 2. Stress Reliving (Involves Rate of heating, soaking, and rate of cooling) at 610 ±15, 760±10 deg C			

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12.2.1	(i) During Heating and cooling cycle, the temperature uniformity along the length of the charge shall not exceed +/- 37 deg.C between any two thermocouples and shall not exceed +/- 10 deg.C at soaking temperature under following loading pattern in auto mode. a. The minimum load on the furnace shall be 40% of the capacity of furnace. b. The uniformity of loading along the length of the bogie to be maintained within 20%. (ii) If the loading pattern differs from the above, the temperature uniformity as stated in point (i) to be maintained with manual intervention.			
12.2.2	Verification of Calibration certificates of instruments.			
12.2.3	Control logic verification for all functions by simulation.			
12.2.4	Verification of Pollution control norms, skin temperature, etc.			
12.2.5	Verification of Documents as per clause (**8.3.1**)			
13.0	**PAINTING:**			
13.1	**For Furnace, Recuperator & Bogies & Stack**			
13.1.1	**Primer painting:** One coat of primer painting at vendor's works and one coat of primer after erection	Vendor to Confirm		
13.1.2	**Final painting:** Vendor to paint the complete furnace chamber with 2 coats of heat resistant Al paint (of grade 250 deg C) and the entire chimney, recuperator & flue path with 2 coats of heat resistant Al paint (of grade 600 deg C).	Vendor to Confirm		
13.2	**For Fans, Control Panel :** Two coats of Synthetic Enamel Apple Green Color Paint IS 5/1994. Shade :(ISC) NO-281.	Vendor to Confirm		

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13.3	**Air & Gas Pipelines** : White & Yellow or as per instructions of BHEL and with indication of direction of flow marked at suitable intervals	Vendor to Confirm		
13.4	Portion, if any, of the furnace, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the Vendor should supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to Confirm		
14.0	**PACKING :**			
14.1	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		
15.0	**GUARANTEE :**			
15.1	12 months from the date of commissioning and acceptance at BHEL works or 18 months from the date of supply whichever is earlier.	Vendor to confirm		
16.0	**GENERAL**			
16.1	Furnace Model No.	Vendor to specify		
16.2	Total Connected load (KVA)	Vendor to specify		
16.3	Floor area required Length, Width, Height) for complete machine & accessories.	Vendor to specify		
16.4	Total Connected Load (KVA) :	Vendor to specify		
16.5	Total weight of the furnace	Vendor to specify		