



Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

An ISO 9001
Company

ENQUIRY

NOTICE INVITING TENDER

Phone: +91 431 257 79 80

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Email : lns@bheltry.co.in

Web : www.bhel.com

TWO PART BID

Enquiry
Number:

Enquiry
Date:

Due date for submission of
quotation:

Tender to be submitted in two Parts

2851400038

05.07.2014

12.08.2014

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	Delivery Schedule
10	50 Ton Stress Relieving Furnace as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	1.00 No	10 months from date of PO

Important points to be taken care during submission of offer

1. Compliance Form No. BND/IND/05 and Annexure II (Details of Company Performance) to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.
2. Material shall be delivered to FOR, BHEL Stores, POWER EQUIPMENT FABRICATION PLANT, BHARAT HEAVY ELECTRICALS LIMITED, Mundipar- 441804, Taluka: Sakoli, District: Bhandara, Maharashtra State.
3. Time period required for Erection & Commissioning shall be 2 Month from the date of intimation by BHEL requesting supplier to depute Service Engineers about site readiness.
4. EMD for this Tender will be (₹) : 2,00,000.00
5. Vendor should submit all Technical documents in duplicate.
6. All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.

BHEL's General guidelines / instructions (refer MM / CE / GENL / 001 - EMD) 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 "2851400038".

Tenders should reach us before 14:00 hours on the due date
Tenders will be opened at 14:30 hours on the due date
Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present

Yours faithfully,
For BHARAT HEAVY ELECTRICALS LIMITED


DGM / Capital Equipment / MM

PART A:50 TON STRESS RELIEVING FURNACE**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
1.0	<p>Only those vendors (OEMs), who have supplied and commissioned at least ONE LPG / NGfired Stress Relieving Bogie Hearth Furnace with a charge heating temperature of 850 deg C or higher, Charge weight carrying capacity of min. 50 Tons excluding pedestals in the past ten years (on the date of opening of this tender) and such furnace is presently working satisfactorily for a minimum period of one year after commissioning (on the date of opening of this tender) should quote.</p>	
1.1	<p>Vendor has to submit at least One Performance Certificate from their customers on customer's letter head, for satisfactory performance of STRESS RELIEVING FURNACE as said in 1.0 above which was supplied to them during the past ten years and is working satisfactorily for a minimum period of one year after commissioning (as on date of opening of this tender). For obtaining the Performance certificate, a suggestive format is provided.</p> <p>The vendor should submit the following information from whom the performance certificate was obtained:</p> <p>Name and postal address of the customer or company where the furnace is installed.</p> <p>Name and designation of the contact person of the customer.</p> <p>Phone, FAX no and email address of the contact person of the Customer.</p>	
1.2	<p>BHEL reserves the right to verify the information provided by vendor. In case the information provided is found to be false/ incorrect, the offer is liable to be rejected.</p>	

SECTION – II

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

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

SECTION – III

The performance certificate should be obtained on **Customer’s Letter Head.**

PERFORMANCE CERTIFICATE

1.0	Supplier of the Equipment	
2.0	Make & Model number	
3.0	Month & Year of Commissioning	
4.0	Application for which the equipment is used	
5.0	Fuel: LPG / NG	
6.0	Operating Temperature	
7.0	Furnace tonnage	
8.0	Burner type:	
9.0	Burner make:	
10.	Bogie hearth	
11	Performance of the Machine (Strike off whichever is not applicable)	Satisfactory Not Satisfactory
12	After sales service (Strike off whichever is not applicable)	Satisfactory Not Satisfactory
13	Feedback/ Comments/ Remarks from the customer if any.	
<p>Date: _____</p> <p style="text-align: right;">Signature & Seal of the Authority Issuing the Performance Certificate</p>		

PART B: 50 TON STRESS RELIEVING FURNACE- LPG FIRED

Bidders should provide detailed information against each clause and shall be supported by drawings and mathematical calculations.

S.No.	DESCRIPTION	PARAMETERS	BIDDER'S OFFER
1.0	PURPOSE & WORKPIECE MATERIAL :		
1.1	Purpose: For stress relief heat treatment of various MS and alloy steel fabricated jobs of power equipments.		
1.2	Job Details: 1. Job Material: Carbon Steel and Alloy Steel equipments 2. Job Size: a) The maximum job envelope size can be taken as 4250 mm(W) x 4000 mm(H) (for jobs placed over above job support pedestal on bogie platform) x: 7500 mm (L) b) The furnace charge will be loaded in batches of jobs c) Width W and height H will form the front face of furnace. d) Maximum charge weight: 50 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 shall be max. 50 Tons (Additional wt. of pedestals between 10 to 12 Tons)	Vendor to confirm	
2.1.2	Heat treatment cycle to be carried out: Stress relieving	Vendor to confirm	
2.1.3	Maximum charge temperature: 850 ±10 Deg C Max. soaking time: variable from 60 min to any defined time controlled through SCADA/controller.	Vendor to confirm	
2.1.4	Maximum furnace design temperature: Vendor to specify this temperature in order to attain the max. charge temperature of 850 ±10 ⁰ C	Vendor to specify	
2.1.5	Rate of heating with charge 1. Up to 400 °C----- 220° C / Hr; 2. Above 400 °C ----- 50° C / Hr (selection shall also be available for control of rate of heating to infinitely variable in the range 50 °C to 220 °C / Hr and rate of heating to be controlled from 200° C)	Vendor to confirm	
2.1.6	Rate of cooling with charge	Vendor to confirm	

	(selection shall be infinitely variable in the range 50 °C to 200 °C / Hr)		
2.2	Furnace Configuration		
2.2.1	Type of furnace: LPG fired single bogie hearth furnace.	Vendor to confirm	
2.2.2	Single bogie box type configuration with front door sliding up/down for open/close.	Vendor to confirm	
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	In case of variations in loading pattern or job thickness, the temperature uniformity shall be able to be maintained by manual intervention.	Vendor to confirm	
2.2.6	Ceramic fiber module refractory system for doors and shell with high temp ceramic coating	Vendor to confirm	
2.2.7	Hard refractory construction for bogies and side walls up to burner level	Vendor to confirm	
2.2.8	Recuperator system for energy conservation	Vendor to confirm	
2.3	Furnace Inside Dimensions: Considering the job envelope size approximate size of the furnace is indicated below. However the vendor has to specify the furnace size with design considerations of job envelope size, refractory / insulation thickness, flame length, space for thermocouples and access to maintenance etc.	Vendor to Specify	
2.3.1	Inside width of furnace (after refractory lining of side walls) : around 5500 mm	Vendor to Specify	
2.3.2	Inside height of furnace above bogie top (after putting job support pedestal on bogie and roof) : around 4750 mm	Vendor to Specify	
2.3.3	Depth of furnace from door to rear wall (after refractory lining) : around 8500 mm	Vendor to Specify	
2.4	Combustion System:		
2.4.1	The furnace shall be provided with the required number of nozzle-mix high velocity burners suitably designed for firing LPG. The positioning of the burners shall be designed to create high degree of turbulence in the furnace, increased convection heat transfer to get better uniformity and thermal efficiency even at lower temperature.	Vendor to Confirm	
2.4.2	Fuel for firing will be LPG	Vendor to Confirm	
2.4.3	LPG line pressure at BHEL: 1.5 to 2.0 kg/cm ²	Vendor to confirm	
2.4.4	Max. required flow rate of LPG (Supporting heat calculation details to be enclosed)	Vendor to Specify	

2.4.5	Burner Type - (High Velocity Burners of preferably Kromschroder/Eclipse make). Burners shall be selected after BHEL acceptance. Vendor to submit all details of burners	Vendor to confirm and furnish details	
2.4.6	Number of rows and arrangement of burners (Schematic drawing shall be furnished along with the offer)	Vendor to specify	
2.4.7	Number of Burners (Calculation details shall 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	Furnace Control System: The vendor shall offer PID with mass flow control.	Vendor to Confirm	
2.4.12	No. of temperature control zones shall be min. 3 nos.	Vendor to specify	
2.4.13	LPG gas burner: Material of construction shall be SS 310/Grey Cast Iron inside portion.	Vendor to specify	
2.4.14	LPG gas igniter: Material of construction shall be SS 310/Kanthal A1 with ceramic body.	Vendor to specify	
2.4.15	Two way solenoid valve shall be brass/aluminium material and shall be flame proof as per IS: 2148 gas group class IIA, IIB.	Vendor to Confirm	
2.4.16	Vent valves opening position to be indicated in the control panel	Vendor to Confirm	
2.4.17	All vent valves shall be routed above roof for better air mix up in atmosphere.	Vendor to Confirm	
2.4.18	All valve flanges shall be raised face with serrations.	Vendor to Confirm	
2.4.19	Wherever electrical input is available with any instrument in the LPG line such as igniter cables, scanner related items, junction boxes, transmitter, limit switches they shall be provided with flame proof enclosure with double compression cable gland for cable entry/exit.	Vendor to Confirm	
2.4.20	All cables should be Flame Retardant Low Smoke design only	Vendor to Confirm	
2.4.21	Copper clad asbestos gasket to be used for valve flanges.	Vendor to Confirm	
2.4.22	Complete piping system with all mechanical components should withstand Max 6 bar pressure during initial testing.	Vendor to Confirm	
2.4.23	2 Nos. of "y" type / simplex filter with 4 Nos. of isolation valves to be provided.	Vendor to Confirm	

2.4.24	Instrument impulse line shall be SS 316, schedule 40.	Vendor to Confirm	
2.4.25	Copper washer shall be provided to all pressure gauges and switches	Vendor to Confirm	
2.4.26	All flanges shall be provided with copper earthing.	Vendor to Confirm	
2.4.27	One spectacle blind shall be provided for each furnace near terminal point at gas train piping.	Vendor to Confirm	
2.4.28	Full TIG welding shall be carried out for all welding joints in LPG pipe lines.	Vendor to Confirm	
2.4.29	Provide one push button-type isolation valve for all pressure gauge /pressure switch	Vendor to Confirm	
2.4.30	Forced Draught (FD) Fan a) FD Fan with VFD of suitable capacity (including excess air) has to be provided to ensure proper combustion and controlled cooling (whenever required) b) Air flow –calculation details to be enclosed c) Air Pressure d) Power Rating (KW)	Vendor to Confirm Vendor to specify	
2.4.31	Induced Draught (ID) Fan & Dilution Fan: a) ID Fan and Dilution fan of suitable capacity with VFD has to be provided before the stack to ensure proper combustion and controlled cooling (whenever required) b) Air flow –calculation details to be submitted with the offer c) Air Pressure of ID fan d) Air Pressure of Dilution fan e) Power Rating (KW) of ID fan f) Power Rating (KW) of Dilution fan	Vendor to Confirm Vendor to specify	
2.4.32	Type of all Blower/Fan shall be Centrifugal	Vendor to confirm	
2.4.33	Make of all Blowers- C-Doctor/ Patel / Flakt India/Nadi or any other make acceptable to BHEL.	Vendor to Specify.	
2.4.34	The FD Fan and ID Fan have to be suitably sized to ensure a Balanced Draught System. Drive mechanism for FD and ID fans shall be of belt drive.	Vendor to confirm	
2.4.35	A standby fan with motor each for the FD, ID & Dilution fan system shall be in scope of supply.	Vendor to confirm	
2.4.36	Bell mouth (silencer) inlet to be provided on the suction side of FD, ID & Dilution fans	Vendor to confirm	

2.4.37	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	
2.4.38	All the motors used for the fans shall be of Energy efficient (EFF1) class conforming to IEC/IS standards. All blower motors should be with VFD drive. VFD drive shall be of SIEMENS (preferably Sinamics) / YASKAWA/ ABB /ALLEN BRADLEY/MITSUBISHI makes only.	Vendor to confirm	
2.4.39	All the Fans (FD, ID & Dilution) shall comply with the following construction / performance <ol style="list-style-type: none"> 1. Impeller blades are to be fully welded. 2. Availability of sufficient strengthening stiffeners in the body / support structure of the blower. 3. Noise level: Max. 80 ± 3 dBA @ 1.5 meter distance 4. Vibration level: As per ISO-14694. Up to 4.8 mm/sec (RMS) with foundation 5. Dynamic balancing of impeller at rated speed. 	Vendor to confirm	
2.4.40	Dampers :		
2.4.41	Damper has to be provided before the stack in the flue gas path to regulate draught	Vendor to confirm	
2.4.42	The damper shall work on auto mode and its opening shall get adjusted automatically depending upon the draught required in the furnace (positive).	Vendor to Confirm with details	
2.4.43	Provision shall be there to operate the damper in manual mode also.	Vendor to confirm	
2.4.44	Damper gates shall be made out of heat resistant casting of IS 4522 Gr.9	Vendor to confirm	
2.5	Refractory Lining: (For Shell and doors) Ceramic fiber block 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°C; the anchor material should be SS310. <ol style="list-style-type: none"> 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 	Vendor to Specify	

Wastes (Management, Handling and Tran's boundary Movement) Rules, 2008.		
2.5.1	Size of ceramic fiber block modules (Size shall 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
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 to IS-8 & 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	Vendor to confirm

	refractories, M/s Corborundam Universal or any other make acceptable to BHEL. (Relevant data sheets to be submitted in the offer)		
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	Vendor to Confirm	
2.8	Furnace Door: One front door with vertical up/down for open/close. Provision of smooth movement of Counter weights for balancing of door weight shall be provided. The door shall be designed in such a way to avoid heat losses.	Vendor to explain in detail	
2.8.1	Number of Doors - ONE	Vendor to Confirm	
2.8.2	Operation - VERTICAL	Vendor to Confirm	
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/SMC or any other make acceptable to BHEL.	Vendor to confirm	
2.8.6	BHEL will provide air supply at a pressure of 5-6 bar 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 shall be made on the door for sand sealing at 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 shall move away from the furnace opening and move up without interfering on any furnace structure.	Vendor to confirm	
2.8.10	Interlock shall be provided so that bogie can be operated only when door is completely open.	Vendor to confirm	
2.8.11	All the pneumatic equipment and interlock elements are to be suitably protected from	Vendor to confirm	

	failure due to heat from the furnace		
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	Vendor to Confirm	
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 for side walls and minimum 8 mm for roof) (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 shall be furnished along with the offer	Vendor to confirm	
2.10	RECUPERATOR:		
2.10.1	The recuperator shall be of multi tubular metallic construction with counter flow, convective heat transfer arrangement. Material shall be SS 310 for hot face and SS 304 for cold face. (Complete details of construction shall be furnished with the offer)	Vendor to confirm	
2.10.2	Recuperator has to pre-heat the air to around 250°C. Thermal calculation to be submitted with the offer. 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 and exit temp. of air and flue gas shall be available.	Vendor to confirm	
2.11	FLUE DUCT:		
2.11.1	Flue duct Position (Suitably insulated preferably with hard refractory). All piping, ducting used in furnace shall be above ground level.	Vendor to specify	
2.12	STACK :		

2.12.1	The stack for flue gas outlet has to be designed and constructed upto 8M from 8mm thick MS plate lined inside with refractory bricks. The remaining steel plate thickness shall be min. 6mm. The venturi shall be of stainless steel material suitably to leave the waste gas at a lowest temperature. The chimney design/erection and its connection with flue line shall be submitted with technical offer.	Vendor to specify	
2.12.2	Chimney height shall satisfy the requirements of Central Pollution Control Board and Maharashtra Pollution Control Board norms with respect to emission of CO, SO _x , NO _x and Suspended Particulate Matter (SPM). The guidelines to calculate the chimney height is as follows: $H = 14 (Q)^{0.3}$ $Q - \text{SOx emission rate in Kg/hr;}$ $H - \text{Height of stack in meters from ground level.}$ <p>However the chimney shall have a height arrived at by the above formula or approximately 17 meters (Assuming roof height as 15 Meters). That is the outlet and weather cowl shall be at minimum 2 meters above the roof level. Cutting the opening for chimney at the roof of the shop shall be in the scope of vendor. The location of the chimney will be intimated by BHEL after receiving the total lay out of furnace and accessories from the vendor.</p>	Vendor to confirm	
2.12.3	Four port holes at 90 deg shall be provided at each elevation (one at 2.0 meters from the ground level and the other at a height of 6xD where D is the inner diameter of chimney). 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, shall 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 shall be provided to reach platform at both sampling planes.	Vendor to Confirm	
2.12.6	Suitable monkey ladder with safety rings shall be provided up to top of the chimney	Vendor to confirm	
2.12.7	The stack shall be provided with a weather cowl and red indicating lamp for high rise structure.	Vendor to Confirm	

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), SO _x ; NO _x ; 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. Emission certificate to be provided by the supplier after commissioning the furnace.	Vendor to Confirm	
2.13	FURNACE BOGIES:		
2.13.1	Number of Bogies: One	Vendor to Confirm	
2.13.2.	Bogie dimension: Shall cover maximum area according to design and size of furnace chamber dimensions.	Vendor to specify	
2.13.3	The bogie to be driven by fabricated rack (Pin type) and pinion arrangement motorized with reduction units, couplings and electromagnetic brakes. (Complete details shall 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 wheels (essential) and others – plain wheels. Total no. of axes shall be sufficient to support the bogie. (90 lbs parallel rails shall be arranged and erected by vendor).	Vendor to Confirm	
2.13.5	The bogie shall be able to be moved out sufficiently for loading of the jobs and carrying out the maintenance work.	Vendor to Confirm	
2.13.6	Bogie speed in M/min	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 ^o C (complete details with calculation shall be furnished with the offer)	Vendor to specify	
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	Vendor to Confirm	

	sealing between them.		
2.13.9	Heat resisting gray iron castings confirming to IS 4522 - Grade-9 shall 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 shall be provided between bogie and the furnace hearth and it shall be ensured that the alignment shall not fail due to heat transfer/material expansion. 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	
2.13.13	The bogie is to be manufactured from rolled steel sections and plates of suitable thickness (Min 16mm). (Complete details shall be furnished with the offer)	Vendor to Confirm	
2.13.14	The Bogie structure has to be designed for least possible deflection under different load conditions.	Vendor to Confirm	
2.13.15	It shall be ensured that all the wheels share the load uniformly.	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 / Premium or any other make acceptable to BHEL	Vendor to Specify	
2.14	PIPELINES & VALVES		
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/cm ² Regulator to be provided at the start of the Gas train system for fine tuning.	Vendor to Confirm	
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 with LRB mattress and aluminium sheet of suitable thickness.	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/ Eclipse/ Dungs/ Audco/ Flowjet	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	
2.14.9	Size of pipe line for the flow of LPG shall be provided to BHEL by the vendor.	Vendor to Specify	
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 $\pm 10\%$, 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 shall be of copper only.	Vendor to Confirm	
2.15.6	Requirement of grounding/earthing with required material details shall be informed by vendor well in advance so that it could be incorporated during construction of foundation. BHEL will provide earth pits at pre-designated locations. Vendor has to make all required connections to the earth pit. Separate earthing shall be provided for main power panels, Burner control panels and Chimney lightning arrester, each to be terminated at individual earth pits. Earth flats should be GI (25 mm X 3 mm). Appropriate length GI flats for earthing are vendor's scope.	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	Vendor to Confirm	

	AC. All adapters / receptacles should have compatibility with Indian equivalents. All single phase power supply/control voltage should be 230 V, 50 Hz.		
2.15.8	Motors & other electrical components shall conform to IEC or Indian Standards. Motors shall be of energy efficient (EFF1) and makes of ABB / Siemens / Kirloskar / Bharat Bijlee / Crompton Greaves / NGEF.	Vendor to Specify	
2.15.9	All the metallic cable trays required for laying of cables shall be included in the offer.	Vendor to Confirm	
2.15.10	Vendor shall ensure proper earthing for the furnace and its peripherals.	Vendor to Confirm	
2.15.11	All electrical components like contactors and OLRs etc., shall be of BCH/Siemens/Schneider/GE/ or Telemecanique make and VFD for fans shall be of SIEMENS (preferably Sinamics)/YASKAWA /ABB/ALLEN BRADLEY/MITSUBISHI make. The VFDs shall take reference from PLC output (4-20mA) to ensure controlled and efficient blower operation during furnace heating and cooling cycles.	Vendor to specify	
2.16	JOB SUPPORT PEDESTAL:		
2.16.1	Number of job support pedestals to be placed on bogie	Total 8 Nos.	
2.16.2	Material: Heat resistant cast iron as per IS 4522 grade-9	Vendor to Confirm	
2.16.3	Size: 300 x 400 x 3400 in mm (Height x Width x Length) '1' section with web thickness of min. 80mm and necessary stiffeners Drawings of pedestal to be submitted along with the offer.	Vendor to submit	
2.16.4	Weight of each pedestal	Vendor to specify	
3.0	SAFETY ARRANGEMENTS:		
3.1	Following safety features in addition to other standard safety features shall be provided on the machine:		
3.2	Furnace shall 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 shall be continuously monitored and alarm / warning indications through lights/ alarm number with messages on panel shall be available.	Vendor to specify	
3.3	A detailed list of all alarms / indications provided shall be submitted by the Vendor.	Vendor to specify	

3.4	All the pipes, cables etc. shall be well supported and protected.	Vendor to Confirm	
3.5	All the rotating parts shall be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm	
3.6	3 emergency switches shall be provided to switch off the whole furnace in case of emergency. The locations are (one at control Panel and one each on either side of the furnace.	Vendor to Confirm	
3.7	6 Nos Gas leak detector to be provided to cover critical gas leak zone. The system shall 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. Ambetronics/Oldham makes gas leak detectors or any other make acceptable to BHEL is preferred.	Vendor to Specify	
4.0	INSTRUMENTATION & CONTROL SYSTEM :		
4.1	All controls will be located in a Control Room (with 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 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 control loop with auto tuning function to be constituted within the PLC through intelligent software. Suitable interface, required software, programming device to upload, download for PLC program changing in future or upgradation of PLC version. Upgraded 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 shall be of ABB (min AC 800M) or Siemens (min S7-200). Suitable latest model PC with A4 size laser printer shall be under the scope of the vendor. Technical specifications of the PC shall be submitted by vendor (makes shall be HP (64 bit).	Vendor to specify	
4.3	Furnace over temperature control to be made available at control panel only.	Vendor to confirm	
4.4	Recuperator 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: 4 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 1.5-1.75 metre long of inconel with adjustable flange. Asbestos compensating cables to be provided for heat resistance.	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 from these locations to the recorder 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 control. This has been indicated in 2.4.11	Vendor to confirm	
4.5.5	24 Point Micro Processor based temperature recorder with chart width of 180 mm along with 50 nos. of chart paper packs. Make: Yokogawa/Eurotherm /Chino only.	Vendor to confirm	
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 shall be submitted.	Vendor to confirm	
4.5.8	Instrument cables and compensating cables are to be separated from power cables. All cables shall 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 shall be with marked ferrules for easy identification both in the control panel and for the field instruments	Vendor to confirm	
4.5.11	Suitable rating UPS with battery to be provided for the instrument panel, PC and recorder with a minimum backup of 1 hour. Makes: Emerson/APC/Microtek or any other make acceptable to BHEL.	Vendor to confirm	

4.5.12	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 shall 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 shall control all safety systems along with raising audio visual alarm.	Vendor to Confirm	
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 and SCADA	Vendor to Confirm	
	c) Safety system and alarm indication required are to be indicated.	Vendor to Confirm	
4.9	Required motor control centers shall be provided for control of all fans and blowers (This point shall be separated from instrumentation and control)	Vendor to confirm	
4.10	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 shall be of flame proof enclosure	Vendor to Confirm	
4.11	Burner purge cycles with adequate purging time for safe operation shall be provided.	Vendor to Confirm	
4.12	Manual Gas Shut Off Valve shall be provided apart from the safety shutoff valve in the gas train.	Vendor to confirm	
4.13	Push button control station shall be provided near the furnace for all manual operations (door movement, bogie movement & door locking)	Vendor to confirm	
4.14	Local push button stations shall also be provided for bogie drive, ID fans, FD fans, Dilution fans and door drives	Vendor to Confirm	
4.15	Maintenance platform at suitable height for instrumentation to be provided	Vendor to confirm	
4.16	Instruments Calibration: Calibration certificates to be provided for all instruments measuring process values like 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	

4.17	Ignition & Flame Supervision: Spark igniter of high voltage type (H.V) to be used. The flame monitoring system to be with Ionization sensor for its reliability 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 specify	
5.0	LEVELLING & ANCHORING SYSTEM		
5.1	Complete anchoring system including foundation bolts, anchoring materials, leveling shoes etc should be supplied by the supplier	Vendor to Confirm	
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, and Grease Guns etc. for Furnace operation & maintenance shall be supplied & list shall be submitted with offer. EOT crane service will be provided by BHEL inside the shop floor for erection. Any Mobile crane requirements for erection of furnace and other components are under supplier's scope.	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 shall be quoted as optional)	Vendor to Confirm	
7.2	Following spares to be quoted as necessary spares a. Burner -- 25% of total quantity b. Burner Blocks -- 20% of total quantity c. Burner controllers – 20% of total quantity d. Gas Solenoid Valve for burners-- 20% of total quantity e. Ionization sensor--20% of total quantity f. Thermocouple-duplex -- 4 Nos. g. Flow transmitter for gas: 1 No. h. Flow transmitter for air: 1 No. i. Pressure switch for gas: 1 No. j. Pressure switch for air: 1 No.	Vendor to Confirm	

	<p>k. Furnace Pressure transmitter: 1 No. l. Actuator for gas: 2 No. m. Actuator for air 2 No. n. Seal kit for pneumatic cylinder: 1 Set. o. PLC analog input module: 1 No. p. PLC analog output module: 1 No. q. PLC digital input module: 1 No. r. PLC digital output module: 1 No. s. PLC thermocouple module: 1 No. 1. PLC power supply unit: 1 No. t. Indication lamp : 1 Set u. Limit switches: 4 Nos. v. Ribbon cartridge: 3 Nos. w. Excess temp controller: 1no. x. All type of Air valves: 10% of quantity used in the furnace y. All type of Castings: 20% of quantity used in the furnace z. All type of Gas valves: 10% of quantity used in the furnace aa. All types of refractory bricks (Standard bricks and special shaped bricks): 10% of quantity used in the furnace bb. All types of ceramic fiber modules and blankets used in the furnace: 10% of quantity in each type(max. temp and density) used in the furnace cc. Couplings used in door and bogie drive assembly. – 1no each dd. Bogie drive plummer block with bearing – 1no. ee. Pneumatic valves – 1no of each type ff. Gas filter – 1 no gg. Gas filter element – 5 no's hh. GVT line Pressure Regulator – 1 no ii. Chain used in bogie drive – 1no jj. Bogie drive gearbox with motor – 1set kk. Gas leak detector – 1 no ll. Temperature recorder- 1 no.</p>		
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7.3	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	
8.0	DOCUMENTATION		
8.1	Documents to be submitted along with offer for technical Evaluation:		
	<p>The vendor to submit the following drawings / details along with offer for technical evaluation:</p> <ol style="list-style-type: none"> 1. P&I Diagram with bill of materials 2. General arrangement diagram 3. Schematic Instrument circuit diagram 4. Electrical circuit diagram 5. Electrical component layout drawings of all control panels and operator pendants. 6. Heat load calculation. All heat load calculation shall start from scratch, from inside temp to skin temp. 7. Furnace efficiency 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: <ol style="list-style-type: none"> 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. 13. Counterbalance & door locking arrangement drawing 14. FD, Dilution & ID Fan calculation 15. Refractory arrangement with Bill of materials 16. Casting arrangements. 17. Recuperator selection and heat transfer calculation. 18. Piping routing diagram 19. Quality action plan 	Vendor to enclose with offer	
8.1.1			

	<ol style="list-style-type: none"> 20. MSDS for all insulation and refractory items used in the furnace. 21. Panel layout 22. Pneumatic Circuit with bill of materials. 23. Job support pedestal drawing. 24. Details of gas measuring device 		
8.2	<p>Documents to be submitted for BHEL approval before manufacturing:</p> <p>The vendor to submit the following drawings / details for BHEL approval before manufacturing (drawing shall be submitted for approval within 1 month of placing PO and approval of drawings should be obtained by vendor within 30 days from the date of submission of drawings to BHEL for approval by providing required details/clarifications by BHEL if any):</p> <ol style="list-style-type: none"> 1. P&I Diagram with bill of materials 2. General Arrangement diagram 3. Schematic Instrument circuit diagram 4. Electrical circuit diagram (power and control circuit) with detailed BOM 5. Electrical component layout drawings of all control panels and operator consoles 6. Heat load calculation 7. Furnace efficiency calculation 8. Skin temperature calculation 9. Complete list of components in Each Burner Assembly 10. Burner capacity selection method 11. LPG consumption in Nm³/hr under following conditions, which shall be verified at the time of commissioning: <ol style="list-style-type: none"> 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. 12. Burner arrangement layout drawing. 13. Drive arrangement drawings for Bogie drive & door drive with bill of materials. 14. Counterbalance & door locking arrangement drawing 15. FD, Dilution & ID Fan calculation 16. Refractory arrangement with Bill of materials and special shaped brick drawings 	Vendor to confirm	
8.2.1			

	<p>17. Casting arrangements and casting drawings. 18. Panel layout 19. Pneumatic Circuit with bill of materials. 20. Job support pedestal drawing. 21. Quality plan. 22. Recuperator selection and heat transfer calculation 23. Piping routing diagram 24. MSDS for all insulation and refractory items used in the furnace</p>		
8.3	Documents to be submitted along with Equipment:		
8.3.1	4 sets of O&M manuals (3 Hard copies) in English language having the following documents should be supplied along with the furnace. 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 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	
8.3.1.1	The O&M Manual should contain the following	Vendor to confirm	
8.3.1.2	One copy of all approved drawings.	Vendor to confirm	
8.3.1.3	P&I Drawing of furnace	Vendor to confirm	
8.3.1.4	Electrical Wiring Drawings – Power & Control Circuits	Vendor to confirm	
8.3.1.5	Terminal drawings with check points shall be provided for Electronic Controls	Vendor to confirm	
8.3.1.6	Trouble Shooting Chart for Main and all Sub-Systems	Vendor to confirm	
8.3.1.7	Specifications, Catalogues, O&M Manuals and Engineering manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm	
8.3.1.8	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.	Vendor to confirm	
8.3.1.9	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.	Vendor to confirm	
8.3.1.10	Complete refractory lay out and shaped brick drawings with dimensions, including specification of refractory materials used.	Vendor to confirm	

8.3.1.11	Complete Casting lay out and individual casting drawings with dimensions, including specification of casting materials used.	Vendor to confirm	
8.3.1.12	Drive arrangement drawings for Bogie drive & door drive with bill of materials including specification of materials used.	Vendor to confirm	
8.3.1.13	Counterbalance and door locking arrangement drawings for door with bill of materials including specification of materials used.	Vendor to confirm	
8.3.1.14	Bogie sealing, Door sealing arrangement drawings.	Vendor to confirm	
8.3.1.15	Complete details of Combustion system- Operation and maintenance.	Vendor to confirm	
8.3.1.16	Complete Master List of spare parts used along with item part number/ specification/ type, name and address of the spare supplier	Vendor to confirm	
8.3.1.17	Calibration certificates for all the Panel instruments, Transmitters, Flow meters, Thermocouples and test certificates for Pressure switches, modulating motors and regulators.	Vendor to confirm	
8.3.1.18	Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls.	Vendor to confirm	
8.3.1.19	Complete calculations for heat load, skin temperature, burner selection, FD fan selection, refractory selection, efficiency, fuel consumption, etc.	Vendor to confirm	
8.3.1.20	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.	Vendor to confirm	
8.3.1.21	List of all alarms / indications / annunciator.	Vendor to confirm	
8.3.1.22	The vendor shall submit complete Master List of parts used in the machine.	Vendor to confirm	
8.4	One set of all the documents (hard copy and soft copy) to be shown to the BHEL Executives at the time of inspection at vendor's works.	Vendor to confirm	
9.0	TRAINING:		
9.1	The Vendor shall impart training to BHEL Operators and Maintenance crew(Mechanical, Electrical / Electronics) in Operation and Maintenance) after commissioning of the Machine at BHEL works for min 15 working days	Vendor to confirm	
10.0	FOUNDATION:		
10.1	Vendor shall submit the preliminary foundation drawing of furnace, blowers, chimney, bogie etc. with static and dynamic load details for getting BHEL's approval within one	Vendor to confirm	

	month of ordering. The layout should consist of all requirements pertaining to complete furnace including space requirement for Control Room, Blowers, and Stack, Rails etc. Based on input details from vendor, BHEL will design and construct complete foundation for the equipment. Supplier is requested to confirm the leveling of rails for bogie along with BHEL at site during execution of civil foundation.		
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. Fabrication requirements like gas, three phase welding machine, welding electrodes and mobile crane at site are in the scope of vendor. Welding electrode used for Mild Steel should be of 7018 grade and for other alloy materials & pipeline welding suitable grade electrodes acceptable to BHEL should be used.	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 Inspection & Acceptance) shall form part of the commissioning activity.	Vendor to confirm	
11.4	The Vendor should bring tools, Tackles and other necessary equipment required to carry out E&C activities.	Vendor to confirm	
11.5	The Vendor shall bring commissioning spares required for commissioning of the machine.	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.	Vendor to confirm	
12.1.2	Blowers (FD, Dilution & ID fans) to be offered for checking the performance. If required it shall be offered at blower supplier's works.	Vendor to confirm	

12.1.3	Verification of Calibration certificates of instruments.	Vendor to confirm	
12.1.4	Verification of Documents as per clause (8.4)	Vendor to confirm	
12.2	<p>Inspection at BHEL works:</p> <p>After erection of the furnace, the furnace shall be tested by the vendor for its performance prove-out as per BHEL Specifications as follows:</p> <ol style="list-style-type: none"> 1. Air leak test at 6 bar pressure for all gas and air lines (no leak is permitted) 2. The furnace shall be tested and proved for 3 cycles of stress Relieving Heat treatment (Max soaking temperature $850\pm 10^{\circ}\text{C}$) 3. Vendor shall measure the heat loss from the furnace using his thermal monitoring devices. 	Vendor to confirm	
12.2.1	<p>The heat treatment charts have to be approved by BHEL.</p> <p>During soaking cycle, the temperature uniformity along the length of the charge shall not exceed $\pm 10^{\circ}\text{C}$ between any two thermocouples under following loading pattern in auto mode.</p> <ol style="list-style-type: none"> a. The minimum load on the furnace shall be 80% of the capacity of furnace. b. The non-uniformity of loading along the length of the bogie will be maintained within 20%. <p>If the loading pattern differs from the above, the temperature uniformity has to be maintained with manual intervention.</p>	Vendor to confirm	
12.2.2	Verification of Calibration certificates of instruments.	Vendor to confirm	
12.2.3	Verification of Control logic for all functions by simulation.	Vendor to confirm	
12.2.4	Verification of Pollution control norms, skin temperature, etc.	Vendor to confirm	
12.2.5	Verification of Documents as per clause (8.3.1)	Vendor to confirm	
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	
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.	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	GENERAL		
15.1	Furnace Model No.	Vendor to specify	
15.2	Total Connected load (KVA)	Vendor to specify	
15.3	Approximate total Floor area required (Length x Width) and Height for complete machine & accessories.	Vendor to specify	
15.4	Total weight of the furnace	Vendor to specify	
15.5	Performance Guarantee: The complete furnace e with accessories and all systems shall be guaranteed for a period of 24 months from commissioning.		
16	SCOPE OF SUPPLY:		
16.1	Supplier's Scope <ol style="list-style-type: none"> 1. Design, Manufacture, Supply, Erection, Commissioning and prove out of High Temperature Solution Annealing / N&T Furnace. 2. All anchoring & foundation bolts, levelling plates for the complete furnace and its accessories and chimney 3. Levelling Instruments, Power Tools / Hand Tools for erection. 4. Mobile Crane/Winches for erection work where there is no reach of shop EOT crane. 5. Welding machines and consumables required for erection 6. Commissioning Engineer with erection crew Furnace calibration and Heat treatment cycles prove out	Vendor to confirm	
16.2	BHEL's Scope	Vendor to note	

<ol style="list-style-type: none">1. Drawings approval2. Civil foundation work as per manufacturer's drawing3. Jobs for prove out4. EOT Crane service inside shop5. Compressed air supply and LPG supply at one location as indicated in the drawing Electrical Power Supply point at one location as indicated in the drawing		
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