

[illegible]

S.NO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.0	PURPOSE & WORKPIECE MATERIAL				
1.1	Purpose: (Operations/Jobs involved): Stress relieving of jobs various sizes and materials at temperature up to 750 °C with controlled rate of heating and cooling.	Vendor to Confirm			
2	SPECIFICATION:				
2.1	Type: LPG mix Air fired.	Vendor to Confirm			
2.2	Hearth:	Vendor to Confirm			
2.3	Width: 4000 mm	Vendor to Confirm			
2.4	Length: 4000 mm	Vendor to Confirm			
2.5	Working height above hearth: 3500 mm	Vendor to Confirm			
2.6	Loading Capacity: 25 Ton or more	Vendor to Confirm			
2.7	Casting bedplate design detail & material specification will be provided by vendor. The bed plate will be supplied by BHEL	Vendor to specify			
3	Lining arrangement:				
3.1	Hearth: Insulation details with material to be specified by vendor.	Vendor to specify			
3.2	Side wall up to hearth: Details of refractory bricks to be specified by vendor.	Vendor to specify			
3.3	Walls and Roof Layer wise insulation details with material and fibre module details and density to be specified by vendor.	Vendor to specify			

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3.4	Average LPG consumption for charge weight 10, 15, 20, 25 ton to be specified by the vendor.	Vendor to specify			
3.5	Skin temperature of door and wall from outside (when furnace temperature is 700°C) should be maximum 50°C above ambient. Suitable design to be made for air cooling front face of furnace (excluding vertical sliding door).	Vendor to Confirm			
	4 Bogie/Carriage:				
4.1	Loading Capacity: 25 Ton or more	Vendor to Confirm			
4.2	Bogie drive: Suitable to carry load of 25 Ton or more	Vendor to Confirm			
4.3	Type: Motor driven with reduction gearbox	Vendor to Confirm			
4.4	Rating of motor in H.P	Vendor to Specify			
4.5	Travel speed:	Vendor to Specify			
4.6	Door arrangement should be vertical sliding type with pneumatic clamping arrangement. Details of clamping arrangement to be provided by vendor	Vendor to Confirm			
4.7	Front side of the furnace door to be sealed with Asbestos rope.	Vendor to Confirm			
4.8	Thickness of front wall of furnace ≥ 20 mm (with suitable stiffeners)	Vendor to Confirm			
4.9	Door and other wall construction details to be provided by vendor	Vendor to specify			
4.10	Sand sealing should be provided at joining face of bogie with side walls and door with furnace at the top.	Vendor to Confirm			

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5	Combustion equipment: Burners of suitable capacity at varied locations to provide an average rate of heating to 25 ton charge at required controlled rate of heating as mentioned below:	Vendor to Confirm			
5.1	Rate of heating adjustable in the range (temp. rise) of 50°C - 120 °C/ hour above 200 ° C.	Vendor to Confirm			
5.2	Rate of cooling should be less than 120 °C/ hour from soaking temperature up to 200 ° C.	Vendor to Confirm			
5.3	The system should include the following:				
5.3.1	Gas pipeline to furnace from supply point. BHEL will provide one supply point near to furnace as specified by vendor.	Vendor to Confirm			
5.3.2	Gas pressure reducer of suitable capacity	Vendor to Confirm			
5.3.3	Gas control valves of suitable capacity	Vendor to Confirm			
5.3.4	Gas solenoid valve of suitable capacity	Vendor to Confirm			
5.3.5	Gas flow meter with totaliser. Details to be provided by vendor. BHEL will supply the item	Vendor to Specify			
5.3.6	Blowers of suitable capacity	Vendor to Confirm			
5.3.7	Valves fitted in air pipeline of suitable capacity	Vendor to Confirm			
5.3.8	Gas pressure regulator of suitable capacity	Vendor to Confirm			
5.3.9	Ignition transformer of suitable capacity	Vendor to Confirm			
5.3.10	Spark plug	Vendor to Confirm			
5.3.11	Sequence controller	Vendor to Confirm			

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5.3.12	Automatic temperature control of furnace atmosphere		Vendor to Confirm			
5.3.13	Ignition Method : Solenoid valve, high voltage generation and spark plug.		Vendor to Confirm			
5.3.14	Pneumatic pressure available: 4 Bar (Compressor to be quoted separately if pressure required is more than pneumatic pressure available).		Vendor to Confirm			
5.3.15	Available LPG Pressure: 0.03 Bar (300 mm water column)		Vendor to Confirm			
	6 Operation & Control System:					
6.1	On-Off switch with indication lamp.		Vendor to Confirm			
6.2	Digital temperature indicator and controller.		Vendor to Confirm			
6.3	Closed Loop feedback control of temperature and time along with manual override to maintain specified heating/cooling rate and soaking time and temperature.		Vendor to Confirm			
6.4	Mineral insulated K type thermocouple to be provided		Vendor to Confirm			
6.5	Paperless temperature recorder able to plot the T-T diagram with date and time log and different colours for different thermocouples (Minimum 8 channels). The data should to be transferable to USB port of PC. Supplier to give detail. BHEL will supply this item.		Vendor to Specify			
6.6	All the controls of switchgear, instruments should be housed in a neatly wired control panel		Vendor to Confirm			
	7 Uniform temperature throughout furnace with in					
7.1	Difference in temperature < 100 °c for temp less than 250°c		Vendor to Confirm			

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7.2	Difference in temperature < 75 °c for temp between 250°C - 500°C	Vendor to Confirm			
7.3	Difference in temperature < 50 °c for temp more than 500°C	Vendor to Confirm			
7.4	Difference in temperature < 20 °c at soaking temperature.	Vendor to Confirm			
	8 Ignition System				
8.1	Minimum 3 numbers high velocity burners at each side wall (Total ≥ 6) will be provided. Vendor to offer the best fuel efficient burner and give details.	Vendor to confirm			
8.2	Burner flame release velocity:	Vendor to specify			
8.3	<p>The ignition systems will consists of following.</p> <ul style="list-style-type: none"> • Minimum 6 numbers of high velocity burners. • Minimum 6.numbers of spark plugs • Minimum 6 numbers of Ignition transformers to create the spark. • Minimum 6 numbers of profile programmers. • Minimum 6 numbers of UV sensors. • Minimum 6 number of sequence controllers, 	Vendor to confirm			
8.4	Operation: The sequence controller should purge the furnace first with air, allow LPG in the burner, spark to be created simultaneously. The burner flame be generated. UV sensor should sense the flame and allow the LPG supply to continue. Otherwise LPG supply should be discontinued. Job temperature will be set manually.	Vendor to confirm			

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8.5	The furnace temperature to be controlled automatically with the help of profile programmer. The profile programmer should take input from the furnace atmosphere temperature through flexible K type thermocouple individually.	Vendor to confirm			
9	CONSTRUCTION:				
9.1	Furnace shell to be fabricated of mild steel plates and rolled sections.	Vendor to confirm			
9.2	Electric cables will be supplied by BHEL. Vendor to give details of requirement	Vendor to Specify			
9.3	Chimney of suitable diameter having 15 meter height to be provided. (Vendor to specify the diameter)	Vendor to confirm			
10	LIGHTINGS:				
10.1	Lights for sufficient illumination at control panel should be provided for clear visibility.	Vendor to confirm			
10.2	All light fittings, consumables, adapters / receptacles should have compatibility with Indian equivalents	Vendor to confirm			
11	ELECTRICAL SYSTEM :				

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11.1	415V $\pm 10\%$, 50HZ $\pm 3\%$, 3 Phase AC (3 wire system with out neutral) Power Supply Source will be provided by BHEL at a single point near the furnace, as per layout recommended by Vendor. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the furnace/control cabinets, shall be the responsibility of vendor. Requirement of grounding/earthing with required material details is to be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to confirm			
11.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized	Vendor to confirm			
11.3	All electrical & electronic control cabinets & panels should be dust and vermin proof	Vendor to confirm			
11.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm			
11.5	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220V/olts, 5/15 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents.	Vendor to confirm			
11.6	Motors shall conform to IEC or Indian Standards	Vendor to confirm			
11.7	Vendor should ensure the proper earthing for the furnace and its peripherals.	Vendor to confirm			
11.8	Automatically controlled damper arrangement to be provided consisting of pressure transmitter, pressure controller, actuator, motor with 4-20mA control input. Details of suitable damper to be provided.	Vendor to confirm			

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12	SAFETY ARRANGEMENTS: Following safety features in addition to other standard safety features should be provided on the furnace:				
12.1	Flash back Arrester for line, non return valve for air line and regulators for air and LPG-air mixture.	Vendor to confirm			
12.2	All the pipes, cables etc. on the furnace should be well supported and protected.	Vendor to confirm			
12.3	Emergency Switches at suitable locations as per International Norms are to be provided.	Vendor to confirm			
12.4	Furnace explosion port to be provided at suitable location.	Vendor to confirm			
13	ENVIRONMENTAL PERFORMANCE: The furnace shall conform to following factors related to environment :				
13.1	Chimney exhaust and system for residual oxygen to be provided.	Vendor to confirm			
13.2	Provision should be available to install oxygen analyser on the furnace exhaust line.	Vendor to confirm			
13.3	Paint of the furnace should be heat resistant aluminium and should not peel off during furnace operation..	Vendor to confirm			
14	LEVELING & ANCHORING SYSTEM				
14.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, levelling shoes etc shall be supplied for the furnace.	Vendor to confirm			
15	TOOLS FOR ERECTION, OPERATION & MAINTENANCE :				

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15.1	Special tools and equipment required for erection of the furnace shall be brought by the vendor. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the furnace should be supplied. List of such tools should be submitted with offer	Vendor to confirm			
16	ACCESSORIES: Accessories if any like blower fans etc to be used	Vendor to specify			

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17	SPARES (To be quoted as Optional item):				
17.1	Unit price list for itemised breakup of mechanical, hydraulic, electrical and electronic spares used on the furnace in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. The list to include following, in addition to other recommended spares: (Unit Price of each item of spare should be offered)	Vendor to specify			
17.2	a) Mechanical Spares: All types of Valves, All types of pressure switches / transducers, All types of filters, All types of seals	Vendor to specify			
17.3	b) Electrical /Electronic/Spares: Temperature controller, Sequence controller, UV Flame Detector with sensor etc.	Vendor to specify			
17.4	All types of spares for total furnace and accessories should be available for at least ten years after supply of the furnace. If furnace or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required	Vendor to specify			
17.5	Recommended set of spares for all attachments are to be offered with details.	Vendor to specify			
17.6	Vendor to confirm that complete list of spares for furnace and accessories, along with specification / type / model, name & address of the spare supplier shall be furnished along with documentation to be supplied with the furnace	Vendor to confirm			

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18	DOCUMENTATION : Four sets of following documents (Hard copies) in English language should be supplied along with the furnace				
18.1	Operating manuals of furnace.	Vendor to confirm			
18.2	Detailed Maintenance manual of furnace with all drawings of furnace assemblies/sub-assemblies/parts including electrical diagrams. All Assembly/Sub Assembly Drawings shall be supplied with the part list also	Vendor to confirm			
18.3	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm			
18.4	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to confirm			
18.5	Operating Manuals, Maintenance Manuals & Catalogues for supplied Accessories.	Vendor to confirm			
18.6	Complete Master List of parts used in the furnace shall be submitted by the vendor.	Vendor to confirm			
18.7	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to Specify			

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19	FOUNDATION:				
19.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI)/ P.O. , whichever is earlier. Soil condition data will be furnished by BHEL along with the approval. Complete Foundation Design including details of steel reinforcement etc. and final Layout Drawings shall be submitted by the supplier within three months after getting BHEL's approval. The Layout should consist of all requirements pertaining to complete machine and all accessories, including space requirement for any other accessory. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipment required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and grouting procedure etc. for foundation bolts of the machine.	Vendor to confirm			
19.2	Rail supply and grouting will be done by BHEL. Supplier to give details of rail size, length & layout	Vendor to specify			

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20	ERECTION & COMMISSIONING				
20.1	Supplier to take full responsibility for carrying out the erection, start up, testing of furnace, it's control system & all types of other supplied equipment.. Service requirement like power, air, LPG shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor to confirm			
20.2	Successful proving of Furnace for one cycle on BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at clause 22 (furnace Acceptance) shall form part of the commissioning activity.	Vendor to confirm			
20.3	Tools, instruments and other necessary equipment required to carry out all above activities should be brought by the supplier.	Vendor to confirm			
20.4	Commissioning spares, required for commissioning of the furnace within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm			
20.5	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			
20.6	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to Specify			

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20.7	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.		Vendor to Specify			
21	AMBIENT CONDITIONS & THERMAL STABILITY : Total furnace including all system and all supplied items should continuously work trouble free and efficiently under following operating conditions and should give specified accuracies. Ambient Conditions: Temperature = 5 to 50 degree Celsius Relative Humidity = 95% max. (Vendor to confirm that furnace is suitable for above and details of provisions on the furnace for the same are to be furnished by Vendor)		Vendor to confirm			
22	FURNACE ACCEPTANCE: (Tests/Activities To be Performed by Vendor)		Vendor to accept & confirm			
22.1	Tests/Activities should be carried out at supplier's works on the furnace before dispatch :					
22.1.1	Raw material, bought out item and sub assembly will be checked as per specification.		Vendor to confirm			
22.2	Test to be carried out at BHEL works while commissioning the furnace		Vendor to confirm			
22.2.1	The furnace should be tested for continuous running of 36 hrs. If any break down occurs during this test, the test should be repeated for 36 hrs from that time.		Vendor to confirm			

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22.2.2	Demonstration of all features of the furnace & all accessories to the satisfaction of BHEL.	Vendor to confirm			
22.2.3	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to confirm			
22.2.4	On Job prove out will be done running a furnace calibration charge	Vendor to confirm			
22.2.5	One week supervision of independent operation of furnace by BHEL after job prove out.	Vendor to confirm			
22.2.6	Training of BHEL furnace operators in operation of complete furnace & accessories etc by the supplier's experts / engineers during their stay at BHEL works	Vendor to confirm			
23	PACKING: Rigid packing for all items of complete furnace, all Accessories and other supplied items to avoid any damage/loss in transit.	Vendor to confirm			
24	GUARANTEE: 12 months from the date of acceptance of the furnace.	Vendor to confirm			
25	GENERAL : The vendor should submit the following information:				
25.1	Floor area required (Length, Width, Height) for complete furnace & accessories	Vendor to specify			
25.2	Total weight of the furnace	Vendor to specify			
25.3	Weight of heaviest part of furnace	Vendor to specify			
25.4	Dimensions of largest part/ subassembly/ assembly of the furnace	Vendor to specify			

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25.5	Vendor to submit, along with offer, the reference list of customers where similar furnaces have been supplied mentioning the customer, furnace Model, major specifications of the supplied furnace, Year of Supply etc	Vendor to specify			
25.6	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to specify			
26	QUALIFYING CONDITIONS : Only those manufacturers should quote who are regular manufacturers of SR furnace and have supplied or have done major renovation on stress relieving furnace of hearth size 4000 x 4000mm and 25 ton or higher capacity and such furnace is presently working satisfactorily. The following information is to be submitted by the vendor about the companies where similar machines have been supplied.	Vendor to Confirm			
26.1	Name of the customer / company where similar machine is installed.	Vendor to Specify			
26.2	Complete postal address of the customer.	Vendor to Specify			
26.3	Year of commissioning.	Vendor to Specify			
26.4	Application for which the machine is supplied	Vendor to Specify			
26.5	Name and designation of the contact person of the customer.	Vendor to Specify			
26.6	Phone, FAX no. and email address of the contact person of the customer.	Vendor to Specify			
26.7	Performance certificate from the customers regarding satisfactory performance of machine supplied to them	Vendor to Confirm			
26.8	8. BHEL reserves the right to verify information provided by vendor. In case the information provided by vendor is found to be false/incorrect, the offer shall be rejected.	Vendor to Confirm			