Bharat Heavy Electricals Limited

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

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

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620600052	**11.08.2006**	**23.09.2006**
Your are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order			

Item	**Description**	**Quantity**	**Delivery Schedule**
10	10 Ton Car Bottom Type Stress Relieving Furnace with Double Bogie construction as per the technical specification & commercial conditions applicable (to be downloaded from web site **www.bhel.com**)	1 No.	10.05.2007

Note:

(1) The detailed Technical Specification along with technical point-by-point confirmation, Commercial Terms & Conditions applicable for this Enquiry, Confirmation of acceptance for BHEL commercial terms & conditions and Price Bid formats have been posted in BHEL Corporate web site www.bhel.com under Enquiry reference "2620600052". Your offer should be based on all the above documents.

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

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

PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF *ELECTRICALLY OPERATED CAR BOTTOM (BOGIE HEARTH TYPE) FURNACE*

SECTION – I

The BIDDER / VENDOR has to necessarily provide the following details, for making an assessment of the firm's capability and competency, to effect the supply :

[The BIDDER is expected to give complete details against each clause in the table given below and wherever necessary, an additional sheet may be attached (giving clear reference number) to cover the required details]

S. No.	PARTICULARS	VENDOR'S RESPONSE
1.0	Number of Years of Experience, the BIDDER/ VENDOR has in the field of design, manufacture, supply, erection & commissioning of Electrically Operated Heat Treatment Furnaces	
2.0	Number of ELECTRICAL FURNACES manufactured, installed and commissioned till date, with details on the electrical power rating and chamber size of the furnaces already supplied	
3.0	Number of Electrical Heat Treatment Furnaces supplied, installed and commissioned till date for the following category of CUSTOMERS a) Heavy Engineering Companies (Fabricators of Pressure Vessels / Columns / Steel Structures) b) Process / Chemical Industries c) Research Establishments	
4.0	Details of Design Set-Up [List of Design Personnel with Qualification and Experience] and Technology Back-Up tied up / collaboration signed for the PRINCIPAL Equipment Maker / Supplier	
5.0	Details on International Standards / Process Codes followed in Design of the Furnaces [including lining & insulation, control system and heating media]. Copy of the English Version of relevant portion of the Standards / Codes followed, to be given compulsorily with the Technical Offer.	
6.0	Comprehensive Details on Performance Testing - of the Furnace quoted, to be given with the Technical Offer	

S. No.	PARTICULARS	VENDOR'S RESPONSE
7.0	Details of Quality System followed [Furnish the salient aspects of the Quality Assurance System followed] and Stages of In-House Inspection, including Third Party Inspection Schedule.	
8.0	The performance feedback on the previously supplied furnaces to any one of the BHEL Units, will be one of the main yardsticks for the Technical Qualification of the BIDDER / VENDOR. So, BIDDER has to indicate the details of the supply of Furnaces to BHEL Units, in the last ten years.	
9.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centres in South India	
10.0	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – II

The BIDDER has to compulsorily meet the following requirements to get technically qualified for submitting an offer for the Electrically Heated Furnace.

S. No.	PARTICULARS	VENDOR'S RESPONSE
11.0	The BIDDER / VENDOR shall have a minimum of 10 Years of Continuous Experience in Design, Manufacture, Supply, Erection & Commissioning of Electrically Heated Furnaces.	
12.0	The BIDDER / VENDOR shall have supplied at least one number of Electrically Heated Furnace of Power Rating more than 300 kW, say in the last five years.	
13.0	Reference List of Customers and Performance Certificate (from minimum two Customers) with full address / details of CONTACT PERSON. These Customers shall be the users of furnaces of rating above 250 kW.	
14.0	BIDDER has to co-ordinate for the visit of BHEL Team to Customer's Works, to witness the functioning of an existing Electrically Heated Furnace (power rating above 250 kW), if warranted.	

SECTION – III

The BIDDER / VENDOR has to comply with the following, for accepting the Technical Offer for scrutiny by the Purchaser:

S. No.	PARTICULARS	VENDOR'S RESPONSE
15.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS - Technical Offer [with PART A & PART B] & Commercial and Price Bid.	
16.0	The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. A just 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement may lead to disqualification of the Technical Offer.	
17.0	The BIDDER / VENDOR shall assure a continuous support for SPARES and SERVICE for TEN Years, from the date of commissioning of the equipment at BHEL Works.	
18.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' with copies of Product Catalogue and Selection Criteria	
19.0	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	
20.0	BIDDER has to indicate the Country of Origin for the supply of main equipment / important bought-out items.	
21.0	The reference List of Customers shall be accompanied with the details (Phone Number /E-Mail ID) of the CONTACT PERSON for cross reference by BHEL	

PART B

TECHNICAL SPECIFICATIONS FOR ELECTRICALLY OPERATED CAR BOTTOM (DOUBLE BOGIE) FURNACE

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
1.0	**FURNACE CONFIGURATION**		
1.1	Type	Electrically Operated Car Bottom (Bogie Hearth) Furnace – Electric Coils to be employed for heat generation	
1.2	Loading Capacity	10 Metric Tons (maximum by weight)	
1.3	Application	To carry-out stress relieving of forged and cast steel valve bodies after welding and part processing	
1.4	Job Material	Carbon Steel & Alloy Steel with Weld Over-Lays and Hard Facings (in the form of Steel Castings/Forgings or Steel Fabricated Parts)	
1.5	Job Details	Valve Bodies of Gate Valves, Globe Valves, Stop Valves, etc. Single Valve Body Envelop Dimensions : 1.8 M x 1.2 M x 1.2 M (max.) Section Thickness : 20 mm to 200 mm Weight of Single Job : NOT exceeding 9. 0 Tons. Weight of Job Lot : NOT exceeding 10.0 Tons. Heat Treatment Cycles : Stress Relieving, Annealing & Tempering, Normalising.	
1.6	Job Handling	1. Jobs will be loaded as a single piece or in multiples based on the size and weight of the individual pieces, but never exceeding the carrying capacity of the Bogie and the Free Dimensions of the Heating Chamber. 2. The job loading and unloading will be done always with the Bogie drawn outside the Furnace. 3. Normally EOT Cranes will be used for job loading and unloading. Since steel crates will be used to contain more number of small jobs, concentric loading is expected on the Bogie Hearth.	

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
2.0	**FURNACE CONSTRUCTIONAL FEATURES**		
2.1	Operation	The Heat Treatment Cycle in the furnace shall extend upto a maximum period of 120 hours, comprising of repetitive heating/soaking/ cooling processes and the continuous soaking time shall be 10 hrs., at the maximum.	
2.2	Furnace Temperature	The furnace design shall be suitable to raise upto and maintain the charge (job) temperature at 1000°C , through-out the soaking time .	
2.3	Heating Rate (Steplessly Variable)	a. Initially, a maximum rate of heating of 400 ^{o}C/hr. shall be achievable upto 400 ^{o}C. b. Beyond 400 ^{o} C, the maximum rate of heating shall be 100^{o} C/hr. c. BIDDER has to confirm the above heating rates with the support of technical details or list down the design aspects / practical hurdles in achieving these heating rates and indicate the maximum possible rates by normal design parameters.	
2.4	Soaking Time	10 Hours (maximum)	
2.5	Variation in Temperature	Within ± 5°C from the set value for the temperature inside the furnace heating chamber	
2.6	Power Rating	BIDDER to specify the rating (in kW) and shall submit the design calculations to arrive at the power rating.	
2.7	Heating Chamber Dimensions	Length : 4000 mm ; Breadth : 2500 mm ; Height : 2500 mm [Effective loading area on the bogie shall be 4.0 M x 2.5 M and with a clear height of 2.5 M from the bogie surface]	
2.8	Furnace Bogie	a. The Furnace is to be provided with Double Bogie (2 Bogies) and two vertical sliding doors (on either side of the furnace chamber), so that one of the Bogies will be inside the furnace with charge/job undergoing heat treatment and the other Bogie outside for loading/unloading operations. b. Both the Bogies to have independent drive mechanism for the movement of the Bogie on rails, grouted onto the floor.	

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
2.9	Bogie Construction	1. The bogie shall be provided with motorized drive through a suitable reduction gear box. Bidder to specify the speed of travel of the bogie, generally recommended. 2. The Bogie drive mechanism and gear-box are to be located on the side of the furnace for ease of maintenance. 3. Drive transmission from gearbox to car bottom bogie shall be of Ratchet & Wheel type. 4. Provision shall be made to move the bogie manually (using other mechanical means) during power failure. BIDDER has to provide details on this offered arrangement. 5. Rails for bogie movement should be included in the scope of the supply. 6. Bogie shall be provided with refractory hearth suitable to withstand the job load and temperature. 7. Provision shall be included in the design to provide sand sealing on both sides of the bogie. 8. The bogie shall be designed in such a way that perfect matching between the bogie refractory and furnace hearth refractory is ensured / maintained, in order to minimize the heat loss. 10. The bogie shall have top layer to be lined with IS 8 quality firebricks backed by light weight fire bricks of suitable thickness. 11. The loading surface of the bogie shall be provided with suitable cast iron job supports to prevent damage of refractory while loading the job. BIDDER has to give technical details from the design point of view, to meet the above listed requirements.	

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
2.10	Furnace Door Construction	a. Structural design to take care of strength and anti-buckling quality features of the Furnace Doors under high temperatures. b. Opening & Closing of Doors shall be motorized, in the form of doors sliding from top to bottom and vice versa - with suitable counter balance, gear reduction and sprocket & chain drive mechanism. c. Doors locking should be positive mechanical type in order to minimize the heat loss when the furnace is in operation. d. The Doors shall be provided with facilities for manual operation in case of power failure or failure of the motorized system.	
2.11	Furnace Wall Insulation	a. The wall insulation shall be of ceramic fibre blanket or modules of suitable density and thickness to maintain the charge (job) temperature at 1000°C. b. The maximum skin temperature should not exceed 65^{o}C (including ambient temperature). c. The supplier should submit the heat balance calculation for proof of achieving the skin temperature as per BHEL specification. d. Ceramic fibre blankets / modules of suitable density and thickness shall be used for both sliding doors as well as for all the sides of the furnace for insulation purpose . e. Wall insulation design with ceramic fiber blankets / modules shall be submitted along with offer.	

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
2.12	Furnace Shell	Shall be built out of 10 mm (minimum) thick mild steel plates for covering (enclosure) and reinforcements with rolled sections of suitable dimensions, to give a rigid and sturdy construction to the Furnace Shell, to withstand distortions due to thermal & mechanical stresses, to house the insulation and refractory brick work, to hold other related structures and components and to give a prolonged life span for the furnace. BIDDER has to furnish the basic preliminary drawing with the Technical Offer.	
2.13	Heating Elements	1. Material: KANTHAL A-1 STRIPS and the dimensions are to be designed by the supplier to suit the furnace specification. 2. Heating Elements supporting system shall be suitable for strip-corrugated elements for freely radiating style / similar arrangement. 3. Test Certificates for Kanthal A-1 Strips is to be furnished by the supplier, with the documentation for the Furnace. 4. The heating elements shall be arranged or supported on the sidewalls and the roof of the furnace. (No heating elements shall be located on the doors). 5. The number of refractory blocks supporting the heating elements shall be kept at a minimum and the complete arrangement drawings shall be submitted to BHEL for approval prior to taking up the manufacture. (Coil pitch and spacing between coils shall be designed in such a way to avoid deflection, arcing and short-circuiting between strips and coils.)	
2.14	Ventilation	BIDDER has to suggest / recommend for suitable ventilation arrangement for the inner chamber of proposed furnace, for an effective and optimum working cycle .	

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
2.15	Internal Circulation **[OPTIONAL FEATURE]**	1. Two number of 3 HP circulating fans, with water-cooled bearings and AISI-310 material for impeller shaft, are to be provided in the furnace for air circulation during the heating and soaking cycle of heat treatment of the job. 2. Power interlock arrangement shall be provided to stop the cooling fan when water flow fails. 3. BIDDER has to give separate PRICE OFFER for this Feature and furnish details on the arrangement of fans and heating coils including mounting, with the TECHNICAL OFFER.	
2.16	Painting	1. The furnace shall be painted with rust preventive coat, one coat of Zinc Chromate Primer and two coats of Heat Resistant Aluminum Paint, with suitable Dry Film Thickness (DFT) and curing time. Furnace Door Counter Weights are to be painted with yellow and black zebra strips. 2. The final coat of finish painting shall be done at BHEL Works, before handing over the Furnace after the successful commissioning and performance prove-out.	
3.0	**TEMPERATURE CONTROLLER**		
3.1	Type	The Controller shall be of SCR type and suitably designed for automatic heating cycles, without any manual intervention.	
3.2	Capacity	The capacity of the Thyristor pack shall be suitable for maximum charge temperature of 1000°C of resistive load.	
3.3	Controller Unit	1. The furnace temperature shall be controlled by Thyristor Controller through Programmable Controller (controlled mode) as well as by the Manual ON/OFF Controller (ON/OFF mode). 2. The Power control shall be through a system consisting of SCR Power Pack and Control Cards, inclusive of suitable fan cooling arrangement. 3. Power Supply Cards and Protections Cards of M/s ABB, Siemens or Indramat shall be used.	

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
3.4	Control Panel	1. Two numbers of control panel shall be provided (one Control Panel for Temperature Control and the other Control Panel for the instruments like Programmable Controller Temperature Recorder, Blind Controller, ON/OFF Controller etc. 2. Control Panel shall also accommodate the Power Controller. 3. The Panel shall contain (other than the controllers), necessary items like incomer ACB/ Fuse Switch depending upon the furnace rating, Power/ Control Protection Fuses, Indication Lamps, Digital Ammeter and Voltmeter with selector switches, Auto / Manual Selection, Input / Output Terminals, Starters for Door Drive, Bogie Drive, Overload Relays, Push- Buttons, etc.	
3.5	Display	Provision for monitoring the electrical parameters like current for each phase, voltage, kWh., etc. through a suitable Display Unit.	
4.0	**PROGRAMMABLE CONTROLLER**		
4.1	Type	Shall be of multi-programmed Programmer with four programs of (upto) eight ramp / dwell combinations.	
4.2	Make	Eurotherm, Model: 2404P4	
4.3	Range	0 – 1200 °C	
4.4	Input to the Programmable controller	Universal type	
4.5	Output from the Programmable Controller	4 mA to 20 mA	
4.6	Display	Digital Display	
4.7	Power Supply	230±10% V, 50 Hz Single Phase AC Supply	

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
5.0	**TEMPERATURE RECORDER**		
5.1	Make / Type	16 Channels CHINO LAXSONS make, Hybrid Temperature Recorder, microprocessor based with digital display, Model: LE127 20RNN, with a recording chart having width of 250 mm.	
5.2	Range	0 - 1200°C	
5.3	Scale Width	250 mm	
5.4	Power Supply	230±10% V, 50 Hz Single Phase AC Supply	
5.5	Backup Power Supply	Suitable U P S (uninterrupted power supply) provision shall be made to operate the Temperature Recorder for six hours, in case of electrical power failure.	
6.0	**BLIND (SAFETY) CONTROLLER**		
6.1	Make	APLAB	
6.2	Range	0 - 1200°C	
6.3	Input to the Controller	K-Type Thermocouple	
6.4	Output from Controller	Relay type, Relay rate 5 Amps 230V AC	
6.5	Power Supply	230±10% V, 50 Hz Single Phase AC Supply	
7.0	**THERMOCOUPLE**		
7.1	Type	K – Type thermocouple	
7.2	Number of Thermocouple (TC)	a. One number Duplex and one number Simplex type TC for each furnace zone for connection to the Programme Controller, Temperature Recorder and Blind Safety Controller. b. 12 Nos. of K-type, 4000 mm long, 6.0 mm OD, mineral insulated thermocouple for job temperature measurements. c. Additional provisions shall be made on both sidewalls of the furnace to insert thermo couples for measurement during furnace qualification / calibration exercise.	

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S RESPONSE
8.0	**GENERAL POINTS**		
8.1	Input Power Supply	1. The furnace shall be suitable for an input supply through a 415 ± 10% V, 50 ± 3% Hz. 3 Phase AC, 3 - Wire System. 2. BHEL will provide the input power supply at one point only and further tappings (for sub-systems) are to be managed by the Supplier, through suitable step-down transformers and proper internal wiring. 3. Supplier has also to specify the means & mode of giving power supply to the heating elements.	
8.2	Ambient Conditions	The control elements shall meet all the specified requirements while working in an ambient temperature of maximum 50 ° C and 90 % of relative humidity.	
8.3	Make of Motors	Motors shall be of M/s Siemens / NGEF / KEC / ABB / BBL makes. Single phasing preventers shall be incorporated for all the motors.	
8.4	Control Elements	The electrical switch and control elements shall be of Siemens / L&T / GEC Alsthom / Telemechanique make.	
8.5	Gear Boxes	The gear boxes are to be of Greaves / Radicon / Elecon / Shanthi Gears make only and necessary Test and Guarantee Certificate are to be submitted.	
8.6	Remote Control Unit	Remote Control Pendant (hand held type) shall be provided for bogie and front sliding door operations.	
8.7	Cabling Code	All wires, cables, instrument tappings, etc. shall be terminated at components / devices / terminals using suitable number ferrules.	
8.8	Inter-Connecting Cables	The required length of Power and Control (Copper) Cables to inter-connect the Power Controller and Terminals, Field Instruments, Motors etc. with Panel shall be quoted	
8.9	Safety Systems	Necessary safety interlocks incorporated for the safe operation of the furnace shall be elaborated in the offer.	

S.No.	PARTICULARS	DESCRIPTION	BIDDER'S RESPONSE
9.0	**SPARES**		
9.1	OPERATING SPARE PARTS	a. The Supplier shall LIST DOWN with the OFFER, the complete set of replaceable parts / items / components coming in the Furnace and other Sub-Systems / Accessories / Attachments and shall QUOTE the Unit Price for each item. b. Bidder has to COMPULSORILY quote for the following items with the TECHNICAL OFFER : 1. Mechanical wearing components due to linear movement and rotation, etc. 2. Electrical & Electronic Items – viz., PCB , PLC I/O Card, Digital to Analogue Card, CPU Card, HMI, Field Sensors (such as, Optical Sensors, Proximity Switch, Limit Switch), Display Unit, etc. c. BHEL will procure almost all parts listed under the above category with the Furnace.	
9.2	COMMISSIONING SPARES	Bidder has to COMPULSORILY List Down the items with the TECHNICAL OFFER, which are likely to be replaced during the erection & commissioning operations, where these items are likely to be replaced due to failure or damage. THESE ITEMS ARE TO BE REPLACED AT THE COST OF THE SUPPLIER.	
10.0	**SCOPE OF SUPPLY**		
10.1	Furnace & Auxiliaries	Design, Manufacture, Inspection, Supply, Erection & Commissioning, Performance Prove-Out, Documentation, Performance Guarantee as per BHEL Specifications.	
10.2	Consumable Additional Supply & Quantity	Heating Elements (KANTHAL Al STRIPS) } 20 % extra Refractory Blocks supporting Heating Elements } of used qty. Cr/Al Thermocouples (Duplex-2 Nos./Simplex–1 No.) - 2 sets Temperature Recorder Chart Paper Rolls - 10 Nos.	

S.No.	PARTICULARS	DESCRIPTION	BIDDER'S RESPONSE
11.0	**FURNACE INSPECTION & ACCEPTANCE**		
11.1	Inspection	1. The supplier has to offer, for inspection at Supplier's Works by BHEL Officials, all the furnace components (structures, insulation material, refractory bricks, etc.), mechanical sub-assemblies, heating elements, accessories & attachments forming part of the electrical and control systems, spares, anchoring & supporting materials, etc., which are in individual despatchable consignments. 2. Items like Temperature Controller, Programme Controller, Temeprature Recorder, Blind Controller, Thermo-Couples, etc, shall be tallied with the Test Certificates of the OEM.	
11.2	Acceptance	1. The acceptance of the Furnace in Total will be only after the testing for its performance prove-out as per BHEL Specifications, at BHEL Works, after the completion of erection and commissioning activities. 2. Various heat-treatment cycles such as stress relieving, normalizing, tempering shall be run and proved out for meeting BHEL Specification requirements, by utilizing one cycle in each category of heat-treatment.	
12.0	**ERECTION & COMMISSIONING**		
12.1	Erection	1. Erection of Complete furnace and its auxiliaries (including Bogie travel rails) is under supplier's scope. 2. Civil foundation Works will be BHEL scope. 3. BHEL will provide electricity, water and crane for handling and lifting of furnace components / materials at erection site (free of cost). However, welding machines, accessories and consumables will be under the scope of supplier for erection and commissioning.	

S.No.	PARTICULARS	DESCRIPTION	BIDDER'S RESPONSE
12.0	**ERECTION & COMMISSIONING**		
12.2	Commissioning	1. Commissioning of the Equipment and Smooth Functioning of all the Sub-Systems (at BHEL Works) shall be the RESPONSIBILITY of the Supplier, including the performance prove-out heat-treatment cycles (minimum three cycles). 2. The below mentioned heating cycles shall be proved by the supplier, during commissioning of the furnace with load, at BHEL Works :- a. Rate of heating at 25°C/hr., 50°C/hr. & 100°C/hr. b. Maximum charge (job) temperature : 1000°C± 5°C c. Soaking Time : 10 Hours.	
13.0	**FURNACE DOCUMENTATION**		
13.1	O & M Manuals	a. Three Copies of the Operation & Maintenance Manual to be given in Hard Bound Paper Copies with three copies in CD form (SOFT COPY) b. One Hard Copy of O & M Manual shall be submitted at the time of INSPECTION of the Furnace (materials & sub-systems) by BHEL Officials at Supplier's Works. c. The following documents and details (as given under **Clause No. 13.2** shall form part of the Operation & Maintenance Manual	

S.No.	PARTICULARS	DESCRIPTION	BIDDER'S RESPONSE
13.2	Documents and Technical Details	a. GA Drawing of the Furnace in Total. b. GA Drawing of Individual Mechanisms / Sub-Systems / Sub - Assemblies. c. Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose.. d. Electrical Wiring Drawings – Power & Control Circuits e. Pneumatic Circuit Diagram (if any) f. PLC Ladder Diagrams (Soft Copy) with Flash Memory Card and PLC Ladder Diagrams (Hard Copy) g. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls h. Alarm Log, Error Code, Error Messages & Remedies and On-Line Fault Diagnostics to be provided. i. PLC Programming Tool : On-Line Troubleshooting, Software Modification, Upload and Down-load of Programs. j. Specifications / Ratings of All Bought-Out-Items k. Warranty / Guarantee Card for all Bought-Out-Items l. Trouble Shooting Chart for Main and all Sub-Systems m. Drawings of all the refractory components with specifications. n. Total Weight of the furnace structures, lining & insulation, mechanical sub-systems, etc.	

S.No.	PARTICULARS	DESCRIPTION	BIDDER'S RESPONSE
14.0	TRAINING	a. The Supplier shall train BHEL Staff in the Trouble Shooting and Maintenance of the Furnace Supporting Systems, free of cost, during the inspection at the Supplier's Works. b. The Supplier's Service Engineer shall train BHEL Staff in the Operation, Trouble Shooting and Maintenance of the Furnace for a minimum period of 15 Working Days, after the SUCCESSFUL COMMISSIONING of the furnace, at BHEL Works, free of cost.	
15.0	TECHNICAL OFFER	The Technical Offer shall contain the following : a. Complete Scope of Supply, including Main Equipment, Safety systems, All Accessories and Attachments, etc. b. List of Operating Spares, Commissioning Spares, Foundation / Anchoring Materials c. Erection, Commissioning and Performance Prove-Out Details. d. Complete description of all systems & sub-systems forming part of the Furnace. e. A schematic diagram showing the layout of the furnace & associated systems with salient dimensions f. The technical write-up on the operating sequence of the furnace with broad outline of various operations involved	
16.0	PERFORMANCE GUARANTEE	The Performance of the Furnace in total and/or the Components / Sub-Assemblies / Bought-Out-Items in particular, shall be guaranteed for a minimum period of twenty- four [24] months from the date of performance acceptance at BHEL Works.	