



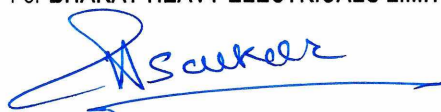
An ISO 9001
Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY		Phone: +91 431 257 7653 Email : skaruna@bheltry.co.in , ajay@bheltry.co.in Web : www.bhel.com	
NOTICE INVITING TENDER			
TWO PART BID	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
Tender to be submitted in two Parts	2601700033	29.06.2017	25.07.2017
You are requested to quote the Enquiry number date and due date in all your correspondence. This is only a request for quotation and not an order. Please note that under any circumstances both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of tender opening.			
Item	Description		Quantity
10	Thermocouple Calibration Furnace		1 No.
20	Box Type Electrical Furnace for Rod Heating		1 No
30	Box Type Electrical Furnace for Hardening – 1 No & for Tempering -1 No.		2 No
as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)			
Important points to be taken care during submission of offer 1. The Technical Documents for the above item has been split in to Three Portions each containing the respective Technical Specification for the above three furnaces. 2. Compliance Form No: TRY/IMP/02 & TRY/ IND/ 02A to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation. 3. For Line Item 10 - Delivery period required is 3 months from the date of P.O. 4. For Line Item 20 & 30 - Delivery period required is 4 months from the date of P.O. 5. Commissioning and performance prove out shall be done at BHEL Trichy by the supplier 6. For Line Item 10 - Time period required for commissioning and performance prove out shall be 3 week from the date of intimation by BHEL 7. For Line Item 20 & 30 - Time period required for commissioning and performance prove out shall be 4 week from the date of intimation by BHEL 8. EMD for this tender Rs.2,00,000/- 9. 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), compliance form and technical specification 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.			
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  AJAY V ASALKAR SR. MANAGER MM / Capital Equipment BHEL, Tiruchirappalli - 620 014. Sr. Manager / MM - Capital Equipment	

PART A: - BOX TYPE ELECTRICAL 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	OEMs, should have supplied and commissioned at least ONE Box type High temperature Electrical furnaces (1200 Deg C or above), in the past - Vendor to specify	
1.1	Only those vendors (OEMs) should quote, who have supplied and commissioned in the last 5 years (as on the original date of this tender opening) at least ONE Box type High temperature Electrical furnaces with a TEMPERATURE Rating of 1200 Deg. C or above". The referred furnaces shall be presently working satisfactorily for more than one year from the date of commissioning (as on the original date of this tender opening). The name and contact addresses of the customers to whom the above said furnaces were supplied to be furnished with details.	
1.2	Vendor has to submit at least One Performance Certificate from their customers (as per format provided in ANNEXURE – A) for satisfactory performance of such furnace explained at clause No 1.1 above which is working satisfactorily for a minimum period of one year from the date of commissioning (as on the original date of opening of this tender), supplied and commissioned in the last 5 years.	
1.3	The vendor should submit the following information from whom the performance certificate was obtained.	
1.4	Name and postal address of the customer or company where the furnace is installed.	
1.5	Name and designation of the contact person of the customer.	
1.6	Phone, FAX no and email address of the contact person of the Customer.	
1.7	BHEL reserve the right to verify the information provided by the Vendor for the referred furnace at their referred customer's works. It shall be the responsibility of the vendor to facilitate the visit of BHEL's team at their referred customer works. The Travel, Board, and Lodging expenses for BHEL Personnel shall be borne by BHEL. In case the information provided by vendor is found to be false / incorrect, the offer shall be rejected. BHEL reserves the right to accept or reject the OEM'S based on the assessment of their technical and financial capability.	

SECTION – I I

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, for whom Box type Electrical furnace of 1200 Deg C or above have been supplied in the past.(latest 10 customers shall be furnished).	
3.0	Specify any Box type Electrical furnace is supplied to any of the BHEL units. If yes furnish Year of commissioning with details	
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 BIDDER to note:

S.No.	TENDER REQUIREMENTS	VENDOR's COMPLIANCE
3.1	The BIDDER shall submit the offer in TWO PARTS - Technical [with PART A & PART B] & Commercial and Price Bid.	
3.2	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. In case of any deviations in any of the technical specifications, such deviations should be clearly specified in the comparative statement. All systems and sub systems proposed in the offer should be described in detail with illustrations/photographs, if required	

3.3	The BIDDER shall assure a continuous support for SPARES and SERVICE for five years, from the date of commissioning of the equipment at BHEL Works.	
3.4	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details / literature on the PROPOSED MODEL.	
3.5	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 for the scope of supply.	
3.6	Earlier performance & field experience (service support) with BHEL (if any) will be a reckoning factor for the technical qualification of the OFFER. Vendor can furnish detail of supply to BHEL units of similar capability.	

ANNEXURE -A**Suggestive Format for Performance Certificate**

The Performance should be certified by the customer on Customer's Letter Head and submitted along with the offer/can be sent to BHEL directly (DGM/PURCHASE/MM/CE).

PERFORMANCE CERTIFICATE

1.0	Type of the Furnace:	
2.0	Supplier's Name and Address	
3.0	Make & Model Number of the FURNACE	
4.0	Month & Year of Commissioning	
5.0	Application for which the Furnace is used	
6.0	FURNACE DETAILS :	
6.1	Size of the Furnace (W X H X D) mm	
6.2	KW rating of furnace	
6.3	Maximum loading Capacity (Tons)	
6.4	Maximum Operating Temperature	
7.0	Performance of the Furnace (Please tick the appropriate option)	Satisfactory Not Satisfactory
8.0	Service after Sales (Please tick the appropriate option)	Satisfactory Not Satisfactory
9.0	Other remarks (if any)	
Date :		Signature & Seal of the Authority Issuing the Performance Certificate

PART- B**TECHNICAL SPECIFICATION OF BOX TYPE ELECTRICAL FURNACE FOR ROD HEATING**

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
1.0	PURPOSE	Electrically heated double ended Furnace having usable dimension of about 450 (W) X 400 (H) X 9000 (D) mm suitable for heating rods of spring steels and high alloy steel materials and able to accommodate 4 Nos of 80 mm Rods of 8000 mm long in one heating cycle. Maximum job temperature is 1350°C.	
1.1	APPLICATION	To heat the Rods to a max temperature of 1350 Deg C for enabling spring coiling.	
1.2	JOB DETAILS	Rods of varying diameters will be placed in the furnace for heating. Max Weight of Single 80 mm Rod : about 320Kg Max Weight of 4x80 mm Rods : about 1300 Kg Heat Treatment Cycle : Heating and soaking only	
2.0	FURNACE CONFIGURATION		
2.1	Type	Electrically Operated Box type Furnace	
2.2	Working Chamber dimensions:	Effective loading area inside the box after insulation shall be as mentioned below.	
2.2.1	a. Width	About 450 mm- Vendor to confirm	
2.2.2	b. Height	About 400 mm- Vendor to confirm	
2.2.3	c. Depth	About 9000 mm- Vendor to confirm	
2.3	Max Furnace temperature	1400 Deg C	
2.4	Type of elements:	Kanthal make	
2.5	Power rating	Vendor to specify (calculation should be given by vendor)	
2.6	Maximum rate of rise of temperature	15 Deg C per minute up to 1000 deg C, then 6 Deg C per minute from 1000 Deg C to 1350 Deg C	
2.7	No of control zones:	Four	
2.8	Loading Capacity	4 Rods of dia 80 mm cross section (total Weight about 1280 Kg)	
2.9	Furnace bed height	The job/Rod loading height will be around 830 mm from floor level	
2.10	Job Material	Spring Steel & Special alloy steels	

S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
2.11	Job Handling	Rods after heating has to be withdrawn at high heat. Vendor shall provide an arrangement for withdrawing the heated rods from the furnace. The spring coiling machine's mandrel will be perpendicular to the rod axis or furnace axis along the Depth (9000 mm). Suitable Job loading tray size along with material of construction containing drawing to be submitted for approval prior to manufacture.	
2.12		EOT Crane will be used for bringing the job nearer to the furnace for loading.	
3.0	FURNACE CONSTRUCTIONAL FEATURES		
3.1	Operation	The furnace will be subjected to three cycles of heating in a shift of 8 hours for spring manufacturing.	
3.2	Soaking Time	1 Hour (maximum)	
3.3	Job temp uniformity in soaking	± 10 deg. C Max.	
3.4	Furnace Doors	The furnace shall be provided with two doors one at each end of the furnace. The doors shall be of vertical sliding motorized operating type With suitably powered motor. The door design shall be such that there is no heat loss through sides when the door is closed. Motor type shall be of brake motor with energy efficient EFF 1. Suitable interlock shall be provided - during furnace door opening, heating control should be in off condition with indication. Incase if the system suggested by the vendor for handling the heated rods as said in Clause No 2.11, then the furnace design will be with single door only. - Vendor to confirm. Motor power rating – Vendor to specify.	
3.5	Furnace insulation	Loading surface (bottom) shall be insulated with refractory brick. Roof and two sides shall be insulated with ceramic fiber insulation. SiC plate (thickness not less than 12 mm) shall be placed on the hearth for keeping the charge.	
3.6	Furnace Shell	Furnace chamber shall be built out of 10 mm (minimum) thick mild steel plates for covering (enclosure) and suitable 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 to furnish the preliminary drawing with the Technical Offer.	
S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
3.7	Heating Elements	1. Material: Kanthal make 2. Size of the heating element vendor to specify. 3. Heating Elements supporting system shall be suitable for freely radiating the heat. 4. Test Certificate for Kanthal heating elements is to be furnished by the supplier, with the documentation of the Furnace. 5. The heating elements shall be arranged or supported on the sidewalls of the furnace. Heating elements shall not be located on the doors. 6. Refractory bricks if 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. 7. The heating elements holding arrangement should be rigid enough, ease of maintenance and avoid sagging of the elements in due course of furnace operation. The rigidity of the supports has to be ensured from the furnace wall. Heating element assembly drawing with termination drawings shall be submitted to BHEL for approval prior to taking up the manufacture.	
3.8	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.	
4.0	DIGITAL PROGRAMMABLE TEMPERATURE CONTROLLER		
4.1	Make	Eurotherm /Honeywell/Yokogawa/Chino	
4.2	Technical Details	1. Display : Minimum 4 digit display (range for 0-1350°C) 2. Display Parameter : simultaneous colour display of PV, SV with units and out put	

		3. Input : Universal (T/c inputs, RTD, mA, mV etc.) with user selectable 4. Scale and Unit : User selectable 5. Panel cut out size : 92X92 mm 6. No. of output : Two 7. Control Output : 4-20 mA 8. Alarm output : Relay. 9. Operating ambient: 0 to 50 deg C, 10. Configuration and programming: Through Front panel key. 11. Accuracy : 0.25% of FSV 12. No of program : Minimum 2 program 13. Program pattern : Configurable for Ramp, Soak & cool (Min 16 steps/ program) 14. Cold junction compensation: Automatic 15. Power supply : 230 V. AC/ 50 Hz. 16. Auto tuning : To be provided to perform precision control 17. Standard Calibration facility: Standard error adjustment facility to be provided through front panel key. 18. Front Panel key: Membrane keypad/ Bezel keypad (Miniature switch cover with sheet is not acceptable.)	
5.0	POWER CONTROLLER		
5.1	Type	The Controller shall be of Thyristor type and contactor type. Selector switch should be provided to select the type of controller. It should be suitably designed for automatic heating requirements/ cycles, without any manual intervention.	
5.2	Controller Unit	1. The furnace temperature shall be controlled by Thyristor Controller through Programmable Controller in auto / manual mode. 2. The furnace temperature shall be controlled by Contactor through Programmable Controller in auto / manual mode. 3. The Power control shall be through a system consisting of Thyristorised Power Pack and Control Cards. 4. The power controller shall be of EURO THERM / JELTRON make.	
5.3	Control Panel	1. Two control panels shall be provided. 2. One panel to house the Programmable temperature controller, Temperature recorder, Safety Controller. 3. Second panel to house Power controller, MCB, Indicating lamps, Energy meter, Digital ammeter and voltmeter, auto/manual selector, input/output terminals, starters for all drives, over-load relays, On/Off controller.	

		Suitable rating of ACB shall be mounted in control panel. 3 pin socket, Panel lighting. Suitable transformer shall be used for 415/ 230V and 415 / 24 V. Panel AC with suitable rating shall be provided.	
5.4	Display	Provision for monitoring the electrical parameters like current for each phase, voltage, kWh, etc. through a suitable Display Unit.	
S.No.	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER [with Complete Technical Details]
6.0	PAPERLESS TEMPERATURE RECORDER		
6.1	Make	Eurotherm (preferable)	
6.2	Technical Specification	- No. of channels : 12 - Input: Universal input (T/c. types K,R,S, RTDs, mV & mA etc.) - Calibration temperature range : 0 to 1400 °C - Specific working trend speed : Initial set speed will be 20 mm/Hr (Speed A) up to 100°C then speed should be automatically selected to 60 mm/Hr (Speed B) above 100°C up to end of the process. When the temperature is below 100°C or sensor open, automatically trend speed should be selected to 20 mm/Hr. (Configurable). - Trend speed : 1 to 1500 mm/Hr (configurable). - Display : Colour, TFT Display & Touch type screen. - Display requirement: Bar graph, digital display and Strip chart background with major minor divisions (configurable) - Power : 180 to 260 V, 50 HZ. - Communication: Ethernet and serial port. - Upload/download function: To be provided to upload/download data backup with necessary software. - Protocol : TCP /IP. - Display : 100mm VGA for Trend, Digital & Bar graphic display. - Cold junction compensation: Off, Internal, external (user selectable) - Calibration facility: Provision for error adjustment and touch screen calibration facility to be provided. - Internal memory : Minimum 96 MB - Removable media memory: Minimum 8GB Memory capacity USB memory stick to be provided. - Software : Suitable software to be provided to configure recorder from remote	

		location through on line, to view the Trend history in XY strip chart background with major & minor divisions(Configurable) and to take print out of temperature data on specific date & time through PC. PC shall be provided by BHEL with windows7/8 64 bit loaded software. 18. Scale & unit print: Should print at intervals of 1Hr at 30 mm trend speed. 19. Real time data Print: Trend print and digital print in EXCEL Format For a specified period of time. 20. Note function: To be provided to enter the job details with alpha numerical character. 21. Message capacity : Minimum 60 character for Message print. 22. Message print: Batch description, Machine name, location, and job details at start up time. 23. Back up battery: For Real time clock and to retain real time data in case of electrical power failure and internal & external alarm event function to stop recording in case of backup battery low/ failure. 24. Data protection: Facility to be provided to retrieve the data in case of backup battery low / failure. 25. Power cord : To be provided.	
7.0	SAFETY TEMPERATURE CONTROLLER		
7.1	Make	Eurotherm /Honeywell/Yokogawa/Chino /Masibus / Radix	
7.2	Technical Details	1. Type of control : ON/OFF control. 2. Display : minimum 4 digit display 3. Display Parameter : simultaneous colour display of PV and SV 4. Type of Input : Universal input T/c inputs, RTD, mA, mV etc. (User selectable) 5. Working range : 0-1400°C (User selectable) 6. Accuracy : 0.3 % of FSV 7. Hysteresis setting : $\pm 5^{\circ}\text{C}$ 8. Ambient temperature : up to 50°C 9. No. of output : Two 10. Control Output : Relay. 11. Alarm output : Relay. 12. Relay output capacity: 230V AC, 2A 13. Power supply : 230V +/- 10%/50 HZ 14. CJ Compensation : To be provided 15. Temperature and Hysteresis setting: Front panel 16. Panel cut out size : 92 W X 92H	

		17. Thermocouple burnt out protection: Up scale 18. Standard Calibration Facility: Standard error adjustment facility to be provided through front panel key.	
8.0	THERMOCOUPLE		
8.1	Type	R – Type thermocouple – for Zone Temperature measurement	
8.2	Number of Thermocouple (TC)	One number Duplex and one number Simplex type TC for each furnace zone for connection to the Program Controller, Temperature Recorder and - Safety Controller.	
S.No.	PARTICULARS	DESCRIPTION	BIDDER'S RESPONSE
9.0	GENERAL POINTS		
9.1	Input Power Supply	1. The furnace shall be suitable for an input supply through a $415 \pm 10\%$ V, $50 \pm 3\%$ Hz. 3 Phase AC, 3 - Wire System. (No neutral) 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.	
9.2	Pneumatic air supply	If any pneumatic is required, BHEL will supply air at 60 – 70 psi at one point. Distribution from BHEL terminal point, including filter – regulator shall be in the scope of Vendor.	
9.3	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.	
9.4	Make of Motors	Motors shall be of M/s Siemens / KEC / ABB / BBL makes. Single phasing preventers shall be incorporated for all the motors. All motors should be energy efficient – EFF1.	
9.5	Control Elements	The electrical switch and control elements shall be of Siemens / L&T / GEC Alsthom / Telemechanique / Mitsubishi make.	
9.6	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.	
9.7	Cabling Code	All wires, cables, instrument tappings, etc. shall be terminated at components / devices / terminals using suitable number ferrules.	
9.8	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. –Compensating cables shall be routed through separate cable trays.	

9.9	Safety Systems	Necessary safety interlocks incorporated for the safe operation of the furnace shall be elaborated in the offer.	
9.10	First fill of Oil	In Vendor's scope	
10.0	SPARES		
10.1	OPERATING SPARES	1. R-type Duplex Thermocouple - 2no 2. R-type Simplex Thermocouple - 2no 3. Programmable Temperature Controller – 2no 4. Safety Temperature Controller – 2no 5. Paperless Temperature recorder (12 channel) – 1no. 6. Heating coils - 20 Sets of each type. 7. Diode used in power system – 2 Sets of each type. 8. Thyristor used in the control system (each type) – 2 Sets of each type. 9. PCBs – 1 Set of each type. 10. Contactors, push buttons, limit switches – 2 Sets of each type. 11. 1 set of ceramic materials (like ceramic tubes, cuplocks, washers etc. as applicable) used in holding of the electrical coils. 12. Twenty percent of ceramic fibre insulation materials and refractory bricks.	
10.2	COMMISSIONING SPARES	Bidder to List Down the items with the TECHNICAL OFFER, which are likely to be replaced during the erection & commissioning, where these items are likely to be replaced due to damage or failure. THESE ITEMS ARE TO BE REPLACED AT THE COST OF THE SUPPLIER.	
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, ceramic fibre 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. Temperature Program Controller, Safety Temperature Controller, Temperature Recorder and Thermo-Couples shall be supplied with Calibration certificate traceable to national/International standards	

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. One heating cycle with job for the max temperature of soaking shall be run and proved out. 3. Two more heating cycles with job at different temperatures of soaking shall be run and proved out.	
S.No.	PARTICULARS	DESCRIPTION	BIDDER'S RESPONSE
12.0	ERECTION & COMMISSIONING		
12.1	Erection	1. Erection of Complete furnace and its auxiliaries - is under supplier's scope. 2. Suitable foundation bolts / anchoring materials shall be supplied by the supplier. 3. Civil foundation Work will be under BHEL scope. 4. The vendor shall provide the foundation drawing / detail to BHEL in advance for preparation of foundation. 5. 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.	
12.2	Commissioning	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).	
13.0	FURNACE DOCUMENTATION		
13.1	O & M Manuals	a. Three hard Copies of the Operation & Maintenance Manual to be supplied along with the supply of the furnace. b. One soft copy of all documentation including Operation & Maintenance Manual shall be supplied in pen drive c. The following documents and details (as given under Clause No. 13.2 shall form part of the Operation & Maintenance Manual	

13.2	Documents and Technical Details	The below listed documents in hard copy & soft copy -3 sets to be provided; a. GA Drawing of the Furnace in Total. b. Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose. d. Electrical Wiring Drawings – Power & Control Circuits e. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls f. Specifications / Ratings of All Bought-Out-Items g. Trouble Shooting Chart for Main and all Sub-Systems h. Drawings of all the refractory components with specifications. i. O&M manual of Temperature controllers & recorder	
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 3 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	
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 12 months from the date of performance acceptance at BHEL Works.	