

Electrically heated Solutionising Drop bottom furnace (for small items) Rev 02

		BHARAT HEAVY ELECTRICALS LIMITED (A Govt. of India Undertaking) Boiler Auxiliaries Plant Ranipet - 632406, INDIA	
Ref: BAP:CAPEX: 3.3a Rev 02			
Part I :- Scope & Pre-Qualification Criteria			
Scope:- Design, Manufacture, Supply, Erection & Commissioning, Performance Prove-Out, Documentation and Performance Guarantee of Electrically heated Solutionising Drop bottom furnace (for small items) as per BHEL Specification.			
Pre Qualification Criteria			Remarks
1	The Bidder must be an OEM,manufacturing the above machines of quoted capacity or higher OR Bidder must be an Authorized representative of OEM in which case the OEM shall furnish the orginial authorization letter/deed containing the name, contact address, complete postal address, email id of the authorized representative and the validity period of the agreement.		Vendor to confirm
2	The BIDDER shall have a minimum of ten years of continuous experience in the field of design, manufacture & supply of Electric Furnaces		Vendor to confirm
3	Only those bidders(OEMs) who have supplied & commissioned at least two electrical furnaces in last 10 years of same or higher sizes and capable of achieving accuracies in temperature adn quench time as specified in Part II shall quote.The machine referred shall be installed in countries other than from where the machine tool was manufactured (<i>Except for Indian Manufacturers having manufacturing facilities available in India</i>).The referred machine shall be presently working satisfactorily for more than two years after commissioning (on the date of opening of Tender).References cited from countries within the war zone shall not be considered.		Vendor to confirm
4	Reference list of global organizations (with postal address, contact person, E-mail ID, contact numbers) to whom similar equipment has been supplied & Installed by the bidder shall be furnished. Performance certificates issued for at least two installations with reputed users of same or similar or higher size machines in past, shall be furnished along with the offer.Such Performance certificates shall be duly signed and stamped by the concerned customer.		Vendor to confirm
5	Bidder shall submit the details of all the machines supplied in India and give the details of date & year of supply, date & year of commissioning and status of present working condition. BHEL reserve right to visit the site of installations and verify.		Vendor to confirm
6	If the bidder is from a foreign country, bidder shall have dedicated service center/service partner in India. The service centre shall have been functioning during last 5 years and shall have proven track record of servicing. They shall have trained & experienced service personnel to provide service support. Please give complete details with documentary evidence		Vendor to confirm
7	BHEL reserves the right to verify the information provided by the bidder for all the clauses mentioned above. In case if there is any suppression of facts or the information provided by the bidder is found to be false/incorrect, the offers shall be summarily rejected.		Vendor to confirm
8	All the required documents shall be furnished in English only.		Vendor to confirm

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9	Bidder should have average annual financial turnover of minimum INR 30 lakhs or equivalent amount in the last three financial years ending 31.03.2019 and should submit their audited balance sheet and profit and loss account in support of the same	Vendor to confirm
10	Bidder should submit the filled in form as per Annexure F attached.	Vendor to confirm
11	BHEL reserves the right to accept/reject the bids if any of the above details are not submitted.	Vendor to confirm

Part II Technical Specification

S.No	FEATURES	PARAMETERS / DESCRIPTION	BIDDER'S OFFER(with technical detail)	Remarks
1.0	Scope	Design, Manufacture, Inspection, Supply, Erection & Commissioning, Performance Prove-Out, Documentation and Performance Guarantee of electrically heated solutionising Drop bottom furnace(for big items) as per BHEL Specification.		
2.0	FURNACE CONFIGURATION			
	Furnace offered by Bidder should be as per AMS 2750 E Class II and other relevant standard specification.			Vendor to confirm
2.1	Furnace Type	Electrically heated Drop Bottom Furnace with Fixed furnace and moving cart(quenching tank)		Vendor to confirm
2.2	Application	To carry out Solutionising Heat treatment of Aluminium alloy parts		Vendor to confirm
2.3	Loading Capacity	Minimum 600 kg including charge baskets		Vendor to confirm
2.4	Job Details	Various Aluminium alloy components like Baffles, internal tubes etc		Vendor to confirm
3.0	FURNACE & Quenching tank CONSTRUCTIONAL FEATURES			
3.1	Furnace usage	The furnace shall be made enable for continuous operation with repeated heating/soaking/quenching		Vendor to specify
3.2	Charge Temperature	The maximum charge (job) temperature shall be up to 600 deg C. The furnace should be capable of maintaining this temperature as soaking temperature throughout the soaking period for full load.		Vendor to confirm
3.3	Furnace temperature	Vendor to specify the maximum temperature, this furnace can generate.		Vendor to specify
3.4	Rate of Heating	Vendor to specify		Vendor to specify
3.5	Soaking Time	User defined as per the heating cycle requirements		Vendor to confirm
3.6	Uniform Soaking temperature	The charge temperature must be uniform during soaking. The maximum variation allowed is ± 5 °C for 600 deg. C cycle. Vendor to specify the mechanism for achieving this uniformity		Vendor to confirm
3.7	Power Rating	BIDDER to specify the power rating of the furnace and other associated parts in kW.		Vendor to specify

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		Bidder should submit design calculation sheet for the power rating specified above.		Vendor to specify
3.8	Heating Chamber Dimensions	Effective loading area in the chamber should be more in such a way to accomodate basket of size 0.9 M x 0.9 M x 0.9 M with suitable clearance from sides of furnace		Vendor to specify
3.9	Basket Dimension	1. Basket should be of size as specified in Clause 3.8 shape to hold the components in the basket without any issue.		vendor to confirm
		2. Basket material should be made of Stainless steel of suitable grade to withstand high temp of furnace at the same time maintaining strength and durability		vendor to specify
		3. Basket should be provided with necessary hook or clamp arrangement to lift and lower it through hoist system.		vendor to specify
		4. Maximum weight of Basket should not exceed 300 kg.		vendor to specify
3.10	Furnace Shell	a.. The furnace shall be rigid enough to withstand distortions due to thermal & mechanical stresses.It should be rigid enough to hold other related structures and components ,and shall have a prolonged life span.		Vendor to specify
		b. Furnace outer shell shall be made of suitable steel plates for structural stability at maximum furnace temperature.Vendor to submit details like material, thickness etc.		Vendor to specify
		c. Proper reinforcements should be provided of suitable dimensions to ensure rigid and sturdy construction.		Vendor to specify
3.11	Quenching tank	1. Vendor to offer suitable size Quench tank to accommodate the size of maximum basket and provide necessary arrangements to take care of maximum temperature rise of quench tank(max 10 deg C) as per AMS standard requirement.		Vendor to specify
		2. Tank should be placed on Cart which is provided with electro mechanical direct drive and wheel block system(Demag or equivalent) to move the cart.		Vendor to specify
		3. Vendor to provide suitable guide mechanism to place the quench tank directly below the furnace .		Vendor to specify
		4. Provision shall also be made to move the bogie manually (using other vehicle) during power failure. BIDDER has to provide details on this offered arrangement.		Vendor to specify
		5. Rails for cart should be of specification CR 80, IS 3443, with center to center distance to be provided by supplier		Vendor to specify
		6. Quench tank should be provided with suitable Eductors, thermocouples ,water level switches, overflow protection and other safety features.		Vendor to specify
		7. Control panel for water quenching tank should have digital temperature controller, safety controller and all other switch gear items.		Vendor to specify
		8. Quench tank should be made of suitable material preferably Stainless steel with necessary supports to make it rigid, robust and long lasting.		Vendor to specify

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		9. Quenching tank should be provided with suitable insulation.		Vendor to specify
		10. All the above system like movement of cart, guiding of quench tank, safety features etc should be automated.		
		BIDDER has to furnish technical details of quench tank from the design point of view, to meet the above listed requirements.		Vendor to specify
3.12	Furnace Door Construction	a. Furnace door should be provided in such a way to facilitate Quenching operation and Quench delay time maximum of 10 seconds from starting of furnace door opening to full dipping of load in quenching medium.		vendor to confirm
		b. Structural design to take care of strength and anti-buckling quality features of the Furnace Door under high temperatures. Suitable shock absorbers and cushions to be provided to avoid bounce back and damage of doors.		vendor to confirm
		c. Opening & Closing of Door shall be controlled by PLC, and the total operation including quenching to be completed within 10 seconds .		Vendor to specify
		d. It should be provided with suitable sealing assembly to avoid heat loss.		Vendor to specify
		e. Vendor to furnish Details of the door drive system, sealing and other relevant details.		Vendor to specify
3.13	Furnace Wall Insulation	a. The wall insulation shall be of ceramic fibre modules of suitable density and thickness to maintain the charge (job) temperature at max temp. of 600 °C at full load.		Vendor to specify
		b. Ceramic fibre modules shall be used for the doors and for all sides of the furnace.		Vendor to specify
		c. Max. skin temperature of chamber should not exceed ambient temp + 25 deg C.		Vendor to specify
		d. Wall insulation design with ceramic fiber blankets shall be submitted along with offer.		Vendor to specify
3.14	Heating Elements	1. Material: Kanthal or equivalent make heating elements		Vendor to specify
		2. Type and Size of the heating element		Vendor to specify
		3. Heating Elements supporting system shall be suitable for freely radiating the heat. The supporting system must be compatible with heating elements in respective with heat conduction/dissipation etc to avoid any hot zone areas		Vendor to specify
		4. Test Certificate for heating elements is to be furnished by the supplier, along with the documentation of the Furnace.		Vendor to specify
		5. The heating elements shall be arranged or supported preferably on the side walls of the furnace.		Vendor to specify
		6. Heating elements shall not be located on the doors.		Vendor to specify
		7. If Refractory are used for supporting the heating elements, then they shall be kept minimum and the complete arrangement drawings shall be submitted to BHEL within one month of PO/LOI, BHEL will take maximum three weeks time from date of submission/clarification.		Vendor to specify

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		8. The heating elements holding arrangement should be rigid, easy for 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.		Vendor to specify
3.15	Temperature Control Zones	Bidder to specify.		Vendor to specify
3.16	Air circulation system	1. BIDDER has to provide a suitable ventilation/Blower arrangement for the inner chamber of furnace, for an effective and optimum working cycle as per their design. 2. Vendor to provide sufficient no. of fans to ensure uniform temperature throughout the furnace at peak temperature with maximum deviation of ± 5 deg. C		Vendor to specify
3.17	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.		Vendor to specify
		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.		Vendor to specify
3.18	Loading & Unloading of job to furnace	1. Furnace should have hoist system with controlled acceleration/ deceleration while lifting and lowering the load. 2. Loading of the job will be in Vertical position in the basket. 3. A suitable mechanism should be there to secure the load in place when it is inside the furnace. 4. Loading mechanism should be sufficient enough to hold the maximum load specified above. 5. Vendor to provide necessary arrangements for precise movement of loaded basket in and out of the furnace. Details of the guide system to be provided by vendor. 6. All this system should be automated.		Vendor to specify
4.0	DIGITAL PROGRAMMABLE TEMPERATURE CONTROLLER			
4.1	Make	Eurotherm /Honeywell/Chino/Fuji		Vendor to specify
		1. Display : Minimum 4 digit display (with one decimal place range for 0-600°C)		Vendor to specify
		2. Display Parameter : Simultaneous colour display of Process Value(PV) and Set Value(SV) with units and output		Vendor to specify
		3. Input : Universal (Thermocouple inputs, RTD, mA, mV etc.) with user selectable		Vendor to specify
		4. Scale and Unit : User selectable		Vendor to specify
		5. No. of output : Two		Vendor to specify
		6. Control Output : 4-20 mA & Relay Output (User selectable.)		Vendor to specify
		7. Alarm output : Relay output.		Vendor to specify
		8. Operating ambient: 0 to 50 deg C,		Vendor to specify

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4.2	Technical Details	9. Configuration and programming: Through Front panel key.		Vendor to specify
		10. Accuracy : Preferably 0.25 % of Full scale value		Vendor to specify
		11. Program pattern : Configurable for Ramp, Soak & cool (Min 16 steps/ program)		Vendor to specify
		12. No of program : Capable for loading 2 programs		Vendor to specify
		13. Cold junction compensation: Automatic		Vendor to specify
		14. Input Power supply : 415V +/- 10%, Three phase 50hz AC supply or 230V +/- 10% single phase 50Hz AC or 24V +/- 10%DC		Vendor to specify
		15. Auto tuning : To be provided to perform precision control setting.		Vendor to specify
		16. Standard Calibration facility: Standard error adjustment facility to be provided through front panel key.		Vendor to specify
		17. Front Panel key: Membrane keypad/ Bezel keypad		Vendor to specify
5.0	POWER CONTROLLER			
5.1	Type	The Controller shall be of Thyristor type.For precision control 4-20mA PID control shall be used.It should be suitably designed for automatic heating requirements/ cycles, without any manual intervention.		Vendor to specify
5.2	Controller Unit	1. The furnace temperature shall be controlled by Thyristor Controller through Programmable Controller in auto / manual mode.		Vendor to specify
		2. The Thyristorised Power control shall be through a system consisting of Power Pack and Control Cards.		Vendor to specify
		3. The power controller shall be of EUROTHERM / JELTRON / CHINO or any other reputed make acceptable to BHEL.		Vendor to specify
5.3	Control Panel	1.Two control panels shall be provided.		Vendor to confirm
		2. One panel to house the Programmable temperature controller, Temperature recorder, Safety Controller.		Vendor to confirm
		3. Second panel to house Power controller, MCCB, Indicating lamps, Energy meter, Digital ammeter and voltmeter, auto/manual selector, input/output terminals, starters for all drives, over-load relays, On/Off controller. Three pin socket, Panel lighting. Suitable transformer shall be used for 415/ 230V and 415 / 24 V. Control panel should be provided with Panel AC (Make:Rittal/Hoffman) of suitable rating shall be provided.		Vendor to confirm
5.4	Display	Provision for monitoring the electrical parameters like current for each phase, voltage, kWh, etc. through a LCD Multi function True RMS meter. The make shall be SCHEINDER, Siemens, L&T or any other reputed make acceptable to BHEL. Vendor to quote Make & Model. The offered model shall have RS485 communication facility		Vendor to specify
6.0	PAPERLESS TEMPERATURE RECORDER			
6.1	Make	EUROTHERM - 6180A preferably or any other reputed make acceptable to BHEL for meeting AMS 2750E standard.		
		1. No. of channels : Minimum 12		Vendor to specify
		2. Input: Universal input (T/c. types K,R,S, RTDs, mV & mA etc.)		
		3. Calibration temperature range : 0 to 600 °C		Vendor to confirm

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6.2	Technical Specification	4. 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).		Vendor to specify
		5. Trend speed : 1 to 1500 mm/Hr (configurable).		Vendor to specify
		6. Display : 10 inch (minimum), Colour TFT Display & Touch screen type.		
		7. Display requirement: Bar graph, digital display and Strip chart background with major minor divisions (configurable)		Vendor to specify
		8. Power : 180 to 260 V, 50 HZ.		
		9. Communication: Ethernet and serial port.		Vendor to specify
		10. Upload/download function: To be provided to upload/download data backup with necessary software.		
		11. Protocol : TCP /IP.		Vendor to specify
		12. Cold junction compensation: Off, Internal, external (user selectable)		Vendor to specify
		13. Calibration facility: Provision for error adjustment and touch screen calibration facility to be provided.		
		14. Internal memory : Minimum 96 MB		Vendor to specify
		15. Removable media memory: Minimum 64GB Memory capacity, Two nos. of USB memory stick to be provided.		
		16. Software : Suitable software with perpetual original license 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 Vendor with latest windows 64 bit loaded software.		Vendor to specify
		17. Scale & unit print: Should print at intervals of 1Hr at 30 mm trend speed.		
		18. Real time data Print: Trend print and digital print in EXCEL Format for a specified period of time.		Vendor to specify
		19. Note function: To be provided to enter the job details with alphanumerical character.		
		20. Message capacity : Minimum 60 character for Message print.		Vendor to specify
		21. Message print: Batch description, Machine name, location, and job details at start up time.		
		22. Data protection: Facility to be provided to retrieve the data in case of backup battery low / failure.		Vendor to specify
		23. Power cord of suitable length to be provided.		Vendor to specify

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7.0	SAFETY TEMPERATURE CONTROLLER			
7.1	Make	Eurotherm /Honeywell / Chino /Masibus / Fuji		Vendor to specify
7.2	Technical Details	1. Type of control : ON/OFF control.		Vendor to specify
		2. Display : minimum 4 digit display		Vendor to specify
		3. Display Parameter : simultaneous colour display of PV and SV		Vendor to specify
		4. Type of Input : Universal input T/c inputs, RTD, mA, mV etc. (User selectable)		Vendor to specify
		5. Working range : 0-600°C (User selectable)		Vendor to specify
		6. Accuracy : 0.25 % of FSV		Vendor to specify
		7. Hysteresis setting : $\pm 5^{\circ}\text{C}$		Vendor to specify
		8. Ambient temperature : up to 50°C		Vendor to specify
		9. No. of output : Two		Vendor to specify
		10. Control Output : Relay.		Vendor to specify
		11. Alarm output : Relay.		Vendor to specify
		12. Relay output capacity: 230V AC, 2A		Vendor to specify
		13. Power supply : 415V +/- 10%, Three phase 50hz AC supply or 230V +/- 10% single phase 50Hz AC or 24V +/- 10%DC		Vendor to specify
		14. CJ Compensation : To be provided		Vendor to specify
		15. Temperature and Hysteresis setting: Front panel		Vendor to specify
		16. Thermocouple burnt out protection: Up scale		Vendor to specify
		17. Standard Calibration Facility: Standard error adjustment facility to be provided through front panel key.		Vendor to specify
8.0	THERMOCOUPLE			
8.1	Type	Vendor should offer thermocouple to meet the requirement given in this spec. Preferably "N" type .		Vendor to specify
8.2	Number of Thermocouple (TC) per zone	As per AMS 2750 E standard		Vendor to specify
9.0	GENERAL POINTS			
9.1	Input Power Supply	1. The furnace shall be suitable for an input supply through a $415 \pm 10\% \text{ V}$, $50 \pm 3\% \text{ Hz}$. 3 Phase AC, 3ph wire system. (No neutral)		vendor to confirm
		2. BHEL will provide the input power supply at one point only and further tapings (for sub-systems) are to be managed by the Supplier, through suitable step-down transformers and proper internal wiring.		vendor to confirm
		3. Supplier has also to specify the means & mode of giving power supply to the heating elements.		vendor to confirm
9.2	Pneumatic air supply	If any pneumatic supply is required, BHEL will supply air at 5-6 bar at one point. Distribution from BHEL terminal point, including filter – regulator shall be in the scope of Vendor. Pneumatic cylinder should be of Janatics/Airmax/any reputed make acceptable to BHEL.		vendor to specify
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.		vendor to confirm
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 – IE2		vendor to specify
				vendor to specify

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9.5	Control Elements	The electrical switch and control elements shall be of Siemens / L&T / GEC Alstom / Telemecanique / Mitsubishi make. It should be provided with DIN rail.		vendor to specify
9.6	Gear Boxes	The gearboxes are to be of Greaves / Radicon / Elecon / Shanthi/Demag or any other reputed make acceptable to BHEL. Necessary Test and Guarantee Certificate are to be submitted.		vendor to specify
9.7	Cabling Code	All wires, cables, instrument tappings, etc. shall be terminated at components / devices / terminals using suitable number ferrules.		vendor to specify
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.		vendor to specify
9.9	Safety Systems	1. Necessary safety interlocks incorporated for the safe operation of the furnace shall be elaborated in the offer.		vendor to specify
		2. Facility should be in compliance with prevailing Indian standards in terms of safety and emission.		vendor to specify
9.10	Noise level	Noise level of the furnace and its accessories should be as per relevant standards.		vendor to specify
9.11	First fill of Oil	In vendor's scope		vendor to confirm
10.0	SPARES			
10.1	OPERATING SPARES	1. Vendor should give the list of recommended spares with unit price of each item for two year of trouble free operation.		vendor to confirm
		2. Vendor to confirm the validity of price of these spares for next 2 years		vendor to confirm
		3. Vendor to quote price of recommended spares along with the machine separately. This will not be taken for price bid evaluation.		vendor to confirm
		4. All types of spares for total machine and accessories should be available for ten years after supply of the machine. If machine 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 confirm
10.2	COMMISSIONING SPARES	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on non returnable basis.		vendor to confirm
		One set of Tools like Torque Wrench, Keys, Spanners, and Grease Guns etc. for Furnace operation & maintenance shall be supplied along with the Furnace to BHEL.		vendor to confirm

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11.0	FURNACE INSPECTION & ACCEPTANCE			
11.1	Inspection at Supplier's Works	1. The supplier has to offer, for inspection at Supplier's Works by BHEL Officials, all the furnace components (structures, ceramic fibre insulation material, 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.		vendor to confirm
		2. Temperature Program Controller, Safety Temperature Controller, Temperature Recorder and Thermo-Couples shall be supplied with Calibration certificate traceable to national/International standards		vendor to confirm
11.2	Acceptance at BHEL Works	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.		vendor to confirm
		2. Minimum three heat-treatment cycles (with at least one at Maximum temp. for maximum soaking specified by BHEL, other cycle at BHEL specified temperature and time) shall be run and proved out for the furnace acceptance. During proving out vendor to prove the temperature uniformity throughout the furnace and on the job when proving with job, by placing suitable no. of thermocouple for prescribed furnace cycle by BHEL. During Prove out furnace should run without any interruption or deviation, if any such deviation or interruption then it should be started again for proving out.		vendor to confirm
		3. Vendor to demonstrate the Quench delay time, positioning of Quench tank, Quenching tank temperature rise etc as per BHEL tech spec during prove out.		
		4. Vendor to perform system accuracy test as per AMS 2750 E standard .		vendor to confirm
12.0	ERECTION & COMMISSIONING			
		1. Erection of Complete furnace and its auxiliaries is under supplier's scope. Supplier should send the consignment to BHEL Ranipet in packed condition. Supplier has to depute its representative during unloading of items for verification.		vendor to confirm
		2. Vendor should depute his representative well verse in communicating to BHEL staff directly or through translator for Erection works.		vendor to confirm
		3. Suitable foundation bolts / anchoring materials shall be supplied by the supplier.		vendor to confirm

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12.1	Erection	4. Civil foundation Work and unloading of job at BHEL works will be under BHEL scope.		vendor to confirm
		5. Vendor shall submit the preliminary layout drawing along with the offer. Vendor to submit Complete Foundation Design including details viz. static / dynamic load details etc. and Final Layout drawings shall be submitted by the supplier within one month from PO/LOI for BHEL approval. BHEL will approve the drawing within three weeks time from date of submission/clarification. Tentative Soil bearing capacity of BHEL Ranipet is 50KN/sqm. Submission of drawing should not have any impact on delivery schedule of facility		vendor to confirm
		6. 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.		vendor to confirm
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 as specified by BHEL). 2. Vendor should depute his representative well verse in communicating to BHEL staff directly or through translator at BHEL works for commissioning.		vendor to confirm
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.		vendor to confirm
		b. One soft copy of all documentation including Operation & Maintenance Manual shall be supplied in pen drive		vendor to confirm
		c. The following documents and details (as given under Clause No. 13.2 shall form part of the Operation & Maintenance Manual		vendor to confirm
13.2	Documents and Technical Details	a. Drawing of the Furnace and quenching tank in Total.		vendor to confirm
		b. Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose.		vendor to confirm
		c. Electrical Wiring Drawings – Power & Control Circuits		vendor to confirm
		d. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls		vendor to confirm
		e. Specifications / Ratings of All Bought-Out-Items		vendor to confirm
		f. Trouble Shooting Chart for Main and all Sub-Systems		vendor to confirm
		g. O&M manual of Temperature controllers & recorder		vendor to confirm
		h. Vendor to give list of bought out items.		vendor to confirm
		i. Details of the Quench tank along with its accessories.		
		j. Vendor to provide relevant certificates required for the furnace complying the AMS 2750 E specification and any other applicable standard.		vendor to specify & provide

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14.0	TRAINING	a. The Supplier shall train BHEL Staff in the Operation, Trouble Shooting and Maintenance of the Furnace for a period of 3 Working Days, after the SUCCESSFUL COMMISSIONING of the furnace, at BHEL Works free of cost.		vendor to confirm
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.		vendor to confirm
		b. List of Operating Spares, Commissioning Spares, Foundation / Anchoring Materials		vendor to confirm
		c. Erection, Commissioning and Performance Prove-Out Details.		vendor to confirm
		d. Complete description of all systems & sub-systems forming part of the Furnace.		vendor to confirm
		e. A schematic diagram showing the layout of the furnace & associated systems with salient dimensions		vendor to confirm
		f. Vendor to give point by point compliance of this technical offer, with details wherever required. In case of unavailability of the same, it will be taken as accepted by Vendor.		vendor to confirm
16.0	Warranty	The Performance of the Furnace in total and/or the Components / Sub-Assemblies / Bought-Out-Items in particular, shall be for a minimum period of 12 months from the date of performance acceptance at BHEL Works.		vendor to confirm