



An ISO 9001
Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY

NOTICE INVITING TENDER

Phone: +91 431 257 7653
Email : skaruna@bheltry.co.in,
prince@bheltry.co.in
Web : www.bhel.com

TWO PART BID	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
Tender to be submitted in two Parts	2601700021	25.05.2017	26.06.2017

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.

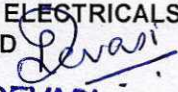
Item	Description	Quantity
10	INDUCTION HEAT TREATMENT EQUIPMENT FOR POST WELD HEAT TREATMENT OF WELDS ON EXOTIC MATERIALS – 160 kVA as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	1 Set

Important points to be taken care during submission of offer

1. 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.
2. Delivery period required is 6 months from the date of P.O.
3. Commissioning and performance prove out shall be done at BHEL Trichy by the supplier
4. Time period required for commissioning and performance prove out shall be 2 weeks from the date of intimation by BHEL
5. EMD for this tender Rs. 2,00,000/-
6. All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.

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

PRINCE DEVASI
Engineer
MM / Capital Equipment
BHEL, Tiruchirappalli - 620 014,
Engineer / Capital Equipment / MM

PART A

**QUALIFYING CRITERIA FOR THE SUPPLY OF
INDUCTION HEAT TREATMENT EQUIPMENT FOR
POST WELD HEAT TREATMENT OF WELDS
– 160 kVA Minimum (@100% Duty Cycle)**

SECTION – I

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 of the BIDDER (Original Equipment Supplier) in the field of design, manufacture and supply of 'INDUCTION HEAT TREATMENT EQUIPMENT' for post weld heat treatment of welds	
2.0	YEAR of LAUNCH of the MODEL quoted against this ENQUIRY	
3.0	Number of 'Induction Heat Treatment equipment' supplied, till date in the QUOTED MODEL	
4.0	Details on International Standards followed in Design and Testing of Induction Heat treatment Equipment.	
5.0	Comprehensive Details, on Performance Testing of Induction Heat treatment Equipment carried out at the Factory, to be furnished with the Technical Offer.	
6.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centres in India, to be furnished compulsorily. The agents / service centers claiming to provide 'Service after sales' shall have to be registered as an authorized service agency of the OEM (Original Equipment Manufacturer). It shall be certified by the OEM that their agent is authorized to sell and is capable of servicing the offered type of Induction Heat treatment equipment in India. After sale of the Induction heat treatment equipment, the service calls shall have to be attended promptly by the service agents present in India.	
7.0	BIDDER to indicate the Country of Origin for the supply of Induction Heat treatment Equipment.	

SECTION – II

The BIDDER has to compulsorily meet the following requirements to get qualified for submitting an offer for the 'Induction Heat Treatment System'

S. No.	REQUIREMENTS	VENDOR's RESPONSE
8.0	The BIDDER (OEM) shall have a minimum of TEN Years of Continuous Experience in the Design, Manufacture & Supply of 'Induction Heat Treatment Equipment'	
9.0	The BIDDER should have supplied atleast one 'Induction Heat Treatment Equipment' with rating 160 kVA (minimum) @ 100 % Duty Cycle (or) higher kVA rated 'Induction Heat Treatment Equipment' to an Indian (or) International customer. Also, indicate the number of such 'Induction Heat Treatment Equipment / machines sold internationally / within India.	
10.0	Reference of the Customer and Performance Certificate (as per ANNEXURE-A) with full contact details of CONTACT PERSON, who are the End Users of the MODEL (given under Clause No.9.0) of 'Induction Heat Treatment Equipment' that the bidder wishes to offer against the technical specifications provided in this tender	
11.0	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	

SECTION – III

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

S.No.	REQUIREMENTS	VENDOR's COMPLIANCE
12.0	The BIDDER shall submit the offer in TWO PARTS - Technical [with PART A & PART B] & Commercial and Price Bid.	
13.0	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. In case of any deviations in any of the technical specifications, such deviations should be clearly specified in the comparative statement.	
14.0	The BIDDER shall assure a continuous support for SPARES and SERVICE for TEN Years, from the date of commissioning of the equipment at BHEL Works.	
15.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details / literature on the QUOTED MODELS of Induction Heat Treatment Equipment(s).	
16.0	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 for the scope of supply.	
17.0	Earlier performance & field experience (service support) with BHEL (if any) will be a reckoning factor for the technical qualification of the OFFER.	

ANNEXURE-A**PERFORMANCE CERTIFICATE**

The Performance of the subject model INDUCTION HEATING SYSTEM (**IHS**) should be certified by the customer on Customer's Letter Head, in the following pattern/format and submitted along with the TECHNICAL OFFER positively.

- 1.0 Name of the Equipment Supplier (OEM) :
- 2.0 MODEL/MAKE of the Induction Heating System :
- 3.0 Month & Year of Commissioning of the Equipment :
- 4.0 Brief Details on the Application/Use of the I H S :
- 5.0 Performance of the Induction Heating System
stated above: Very Good /
Satisfactory /
Not Good
- 6.0 Availability of the Induction Heating System
stated above: Good / Poor
- 7.0 Service After Sales support given by the OEM /
Indian Representative, including spares supply : Satisfactory /
Not Satisfactory
- 8.0 Special Remarks / Recommendations :

Date:

Signature & Seal of the Authority
Issuing the Performance Certificate**To****DGM / Purchase
MM / CAPITAL EQUIPMENT
BHEL /TRICHY – 620 014**

PART B

**TECHNICAL SPECIFICATIONS FOR 'INDUCTION HEAT TREATMENT EQUIPMENT'
(for post weld heat treatment of welds on exotic materials)**

AA. APPLICATION :			
Sl.No.	FEATURES /BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
AA.1	This shall be a system (complete with accessories) capable of carrying out post weld heat treatment (PWHT) of welds made in a variety of metallic materials. This system shall work on the principle of induction heating and shall be a portable one (mounted on movable trolleys / wheels). This system shall be capable of heat treating welds made in Nickel based Inconel alloy pipes of wall thicknesses up to 120 mm, in the temperature range of 980° C ± 10° C. Further, the system offered shall be capable of doing the above mentioned heat treatment as per the provisions of American Welding Society standard: AWS D10.10/D10.10M:1999 <i>(Refer Annexure I for the requirement of a performance test along with test report. This performance test report is mandatory for participation in the tender. Offers without the performance test report shall be summarily rejected.)</i>		
BB. MACHINE CONFIGURATION : [The scope of supply shall consist of the following]			
Sl.No.	FEATURES /BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
BB.1	A Single Induction Heat treatment Power source (portable in nature)		
BB.2.	Induction Heating Coil (compatible with item number BB.1 mentioned above)		
BB.3	'K' Type Thermocouple wire roll / spool		

Sl.No.	FEATURES /BHEL SPECIFICATION		OFFER BY BIDDER	DEVIATIONS
BB.4	Thermocouple attachment unit (working on capacitor discharge welding principle)			
BB.5	Six Channel Temperature Recorder			
BB.6	Ceramic Fibre mats			
BB.7	Heat resistant strap band with locks.			
BB.8	Glass fibre cloth			
BB.9	Glass fibre cord			
BB.10	Other mandatory/indispensable accessories (to achieve the functionality stated in AA.1)			
BB.11	Operation & Maintenance Manuals – Two printed hard copies and two soft copies in two separate pen drives.			
BB.11 2	Commissioning of Equipment at BHEL Works and Performance Prove-out of the offered equipment by Supplier/Supplier’s representative.			
CC. EQUIPMENT SPECIFICATION : INDUCTION HEAT TREATMENT POWER SOURCE FEATURES				
Sl.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
CC.1	Type & rating	The offered power source shall be capable of producing heat on the work piece / job by means of ‘Induction Heating’ principle. The power source shall be of a minimum rating of 160 kVA at 100% duty cycle. There shall be a minimum of one control zone otherwise termed as induction loop. The other technical specifications are mentioned hereinafter.		
CC.2.	Input Voltage	3 Phase AC, 415 ± 5% V AC		
CC.3.	Input Current (rated)	250 A		
CC.4.	Input frequency	50 Hz		
CC.5.	Connection to Mains	There shall be a suitable power cable between the input terminals of the power source with the main supply of our factory. The minimum length of the power cable shall be 5 metres.		
CC.6.	Output Voltage	Vendor to specify		

SI.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
CC.7.	Output Current	Vendor to specify		
CC.8.	Output frequency	In the range of 1 to 10 kHz		
CC.9.	Portability	The power source shall be portable in nature (with four wheels minimum, facilitating mobility). It shall be easily movable to various places, as and when required, by means of manual pushing.		
CC.10.	Weight	Vendor to specify		
CC.11.	Dimensions	Vendor to specify, however the unit shall be portable as specified in clause CC.9		
CC.12.	Program controller for carrying out heat treatment	There shall be a program controller for precisely programming, executing and controlling the PWHT cycle desired for the weld joint, by means of an appropriate feedback control system. The detailed requirements of the program controller are provided below This shall precisely control the preheating and post weld heat treatment cycle. The program controller shall allow for inputting the following details with regard to the preheating / post weld heat treatment cycle of the welds (1) Rate of heating otherwise known as heating ramp – This shall be controllable in the range of 5° C/hour to 222° C/hour after the weld joint reaches 300° C. Prior to reaching 300° C in the weld, there is no upper limit for the rate of heating. The maximum achievable rate of heating shall be specified in the offer.		

SI.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
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CC,12.	Program controller for carrying out heat treatment	(2) Soaking temperature – The maximum soaking temperature reachable shall be 1000° C. The power source shall also be designed for reaching any soaking temperature lesser than or equal to 1000° C (both on the outer surface and on inner surface) in pipes made of metallic materials, with Outside diameter (OD) greater than or equal to 120 mm and with wall thicknesses up to 120 mm or higher. (3) Soaking time – The soaking time is the time for which the soaking temperature is to be maintained. The induction heating system shall be designed for maintaining the soaking temperature as specified in point (2) above for the required span of time. The maximum required soaking time shall be 720 minutes in a single PWHT cycle. (4) Rate of cooling otherwise known as cooling ramp – This shall be controllable in the range of 5° C/ hour to 222° C/hour until the weld joint reaches 300° C. After reaching 300° C in the weld, the system shall facilitate air cooling for the weld until the weld reaches the ambient temperature. There shall be suitable feedback system integrated in the power source's program controller for sensing the temperature of the job (by means of thermocouples placed at multiple locations on the weld) and to carefully control and execute the PWHT cycle of the weld joint as specified above from points (1) to (4).		
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SI.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
CC.12.	Program controller for carrying out heat treatment	The induction heat treatment system shall be capable of carrying out PWHT cycle as mentioned above, meeting to the requirements specified in clauses 6.4 and 8.4 of the American Welding Society standard - AWS D10.10/D10.10M:1999 and this shall be checked during the time of pre-dispatch inspection (PDI) as referenced in Clause NN.2 of this tender. There shall be suitable displays in the power source that will enable the user to see the values inputted for each of "rate of heating, soaking temperature, soaking time and cooling rate" of the PWHT cycle. The current temperature sensed by each of the control thermocouples at any instant of time during the course of the PWHT cycle shall be viewable by means of suitable displays or by other means. There shall be a minimum of three control thermocouples whose feedback will be taken for the carrying out the heat treatment as specified in clause CC.12 of this tender.		
CC.13.	Cooling arrangement for the power source	There shall be a suitable arrangement provided in the induction heating power source for cooling.		
CC.14.	Total noise emission during operation	The total emission of the sound from the equipment during the course of PWHT cycle shall be less than 75 dB.		
CC.15.	Digital Control	The power source shall have digital control/ Settings/ features for carrying out the PWHT of welds with parameters as described in item number CC.12 mentioned above. Type of control mechanism shall be explained by vendor.		

CC.16.	Power Input	The power source shall be capable of working by accepting input supply in the following condition 415 ± 5% V AC, 3 Phase, 50 Hz, through a 3 Wire System [4 th wire for EARTHING]		
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SI.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
CC.17.	Working temperature range	The range of working temperature of the power source shall be - 5° C to +50° C.		
CC.18.	Manufacturing standards	The power source shall be manufactured following the general safety guidelines encompassed in the international standard EN ISO 12100:2010.		
CC.19	Labels in exterior of the power source	Any labels present in any exterior sides of the power source such as those for various meters, program controllers etc. shall be in English language.		

CC.20.	Protection [BIDDER has to specifically furnish technical details on how these protective measures are addressed in the Machine Design]	a) An "Emergency Stop" shall have to be provided which shall power off the unit completely once this is pressed. b) The inductor circuit shall be protected by an "insulation monitor". The primary side voltage shall be switched off when a preset insulation resistance is not sensed / not available. c) Inbuilt protection for the Power source against Overload / Short-Circuit conditions d) All electronic circuitry of the power source shall be protected suitably to prevent damage from dust and grinding particles e) Machine Design to ensure proper earthing for the machine and its peripherals f) Degree of protection shall be according to IP 21 of International Protection Marking		
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DD. EQUIPMENT SPECIFICATION : INDUCTION HEATING COIL FEATURES				
Sl.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
DD.1	Type and length	A flexible induction heating coil of minimum 30 metres length shall be provided. This shall be a water cooled / liquid cooled type induction coil. Besides this, three more similar spare induction heating coil shall also be supplied.		

DD.2.	Chiller for cooling Induction Heating cable	A suitable cooling/chilling unit for the Induction heating coil shall be supplied. In case chilling/cooling unit needs an external power supply, the same to be clearly mentioned. There shall be a reservoir/tank of sufficient capacity to cool the induction heating coils along with necessary hoses and with required buffer quantity of water / liquid to meet the continuous heat treatment application.		
DD.3.	Induction heating coil Sheathing	Protective Sheathing to be provided for the Induction heating coils so as to withstand shopfloor rough use for the entire length of the coils.		

EE. EQUIPMENT SPECIFICATION : THERMOCOUPLE WIRE ROLL / SPOOL FEATURES

S.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
EE.1.	Type	K type (Chromel – Alumel type)		
EE.2.	Application	The thermocouple shall be capable of accurate measurements of temperature of the job / workpiece during the PWHT cycle or the preheating operation. Thermocouple shall be capable of measuring temperatures accurately until 1050° C.		
EE.3.	Configuration	Thermocouple wire, glass fiber insulated, 2 x 0.5 mm ² , 100 metres long roll / spool - No. of rolls required - 2 numbers.		

S.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
EE.4.	Compensating cables	Compensating cables of 5 to 10 metres length shall have to be supplied in required numbers for enabling fixing of minimum 6 numbers of thermocouples on the job / workpiece.		

FF. EQUIPMENT SPECIFICATION : THERMOCOUPLE ATTACHMENT UNIT (TAU) FEATURES				
S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
FF.1.	Application	A thermocouple attachment unit (TAU) working on the principle of "Capacitor discharge welding" for fast attachment of thermocouples with wire diameter in the range of 0.5 mm to 1 mm, shall be provided meeting the following specifications. The TAU shall provide a firm connection between surface of the job/workpiece and thermocouple element The TAU shall enable the welding of the thermocouples on the desired spots on the workpiece within a maximum cycle time of 5 seconds.		
FF.2.	Charging current	90 – 230 V (AC) / with frequency 50 Hz		
FF.3.	Battery operating voltage	12 V (DC)		
FF.4.	Battery capacity	3.0 Ah (Minimum)		
FF.5.	Weight	Weight of TAU shall be less than 6 kg.		
FF.6.	charging cable	The TAU shall be supplied with one charging cable		
FF.7.	Carry case	The TAU shall be supplied in a hardtop carrycase along with pliers.		

GG. EQUIPMENT SPECIFICATION : TEMPERATURE RECORDER FEATURES				
S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS

GG.1.	Application	The temperature recorder shall be capable of measuring the entire PWHT cycle right from start of the PWHT cycle until the end of PWHT cycle.		
GG.2.	Configuration	This shall be a six point, analogue type of temperature recorder so as to take care of plotting the temperature values from six different thermocouples placed in various locations of the job to be heat treated. It shall be noted that there shall be six distinct colours to plot the temperatures sensed from each of the six different channels. Further, each of these six colours shall correspond uniquely to a particular thermocouple and by seeing the colour of the plot in the chart paper, the corresponding thermocouple shall be easily locatable and this traceability shall be maintained for all the thermocouples connected in various channels.		
GG.3.	Thermocouple inputs	This shall accept inputs from a standard K type thermocouple wire and there shall be suitable provisions /sockets for connecting the output of K type thermocouples (fixed to the job / workpiece to the temperature recorder)		
GG.4.	Input Power	Shall operate in 230 V, 50 Hz AC input power		

S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
GG.5	Other features and functionalities	(1) The screen shall be capable of displaying the temperature ranging from ambient to a limit of 1050° C without spill over of certain portions of the recorded data to other chart paper. In other words, the entire PWHT cycle graph between time and temperature shall be recorded and shall be observable in a single chart paper. (2) The recorder shall have a provision to record the complete PWHT cycle starting from beginning of heating till the completion of cooling of the weld joint to the room temperature. This data of Temperature and time shall be recorded for the entire PWHT cycle. This recording of time and temperature of the whole PWHT cycle shall have to be necessarily done in a paper only. (3) The recorder shall be capable of providing hard copy of the chart for each PWHT cycle after it is completed. (4) Besides printing the PWHT cycle in a chart paper, the temperature recorder shall have a digital display wherein the instantaneous temperature sensed by each of the six channels shall be viewable as desired by the user, as and when required, during the course of the PWHT cycle.		

S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
GG.6.	Other features and functionalities	(5) Paperless recorder types are not acceptable. Only the type of recorders that can plot the time and temperature of the PWHT cycle, in a paper, is acceptable. (6) The temperature recorder shall be loaded with a roll of paper (of minimum length 10 meters) for immediate commencement of operation as soon as the machine is delivered. (7) The temperature recorder shall be a portable unit with suitable handles for carrying.		
GG.7.	Paper roll	Roll of paper (of a minimum length of 10 meters) suitable for use in the temperature recorder shall be provided – 5 units (This is in addition to the already loaded roll of the paper in the temperature recorder)		
HH. EQUIPMENT SPECIFICATION : CERAMIC FIBRE MAT'S FEATURES				
S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
HH.1.	Ceramic fibre mat	Ceramic fibre mat of a minimum thickness of 25 mm and of a minimum width of 600 mm and of a minimum length of 5 metres shall be supplied in rolled form. The required quantity is – 5 numbers of roll of ceramic fibre mat.		
HH.2.	Highest operating temperature	The ceramic fibre mat shall be capable of withstanding temperatures up to 1000° C.		

II. EQUIPMENT SPECIFICATION : HEAT RESISTANT STRAP BANDS' FEATURES				
S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
II.1.	Application & Requirement	Heat resistant strap bands for securely holding the insulation material wound on the job / workpiece, shall be supplied – required quantity – ten spools each of which shall contain strap bands of 50 meters length minimum. This shall be supplied with suitable locks / clips that can hold the strap bands tightly against the insulation material that is wound over the surface of the workpiece. The required numbers of the locks shall be 100 pieces minimum.		
JJ. EQUIPMENT SPECIFICATION : GLASS FIBRE CLOTH FEATURES				
S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS

JJ.1.	Application & Requirement	Temperature stable glass fibre cloth useable for covering the insulation material that is wound over the workpiece in order to protect the induction heating cables from the heat of the workpiece during the induction heating process. The glass fibre cloth shall withstand temperatures up to a limit of 750° C. The minimum dimensional requirements of the glass fibre cloth are provided below Thickness: 2 mm Width: 1000 mm Length: 25 metres The glass fibre cloth meeting to the above mentioned specifications shall be supplied in a rolled form / spool form	.	

KK. EQUIPMENT SPECIFICATION : GLASS FIBRE CORD FEATURES

S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
KK.1.	Application & Requirement	Glass fibre cord / tape useable for supporting of ceramic fibre mats or glass fibre cloth and heating coils. The following are the specifications Cord diameter – 3 mm (minimum) Cord in the form of roll with cord length of minimum 100 meters. Alternatively, a tape of glass fibre in a roll form, of minimum length of 100 meters is also acceptable.		

LL. EQUIPMENT SPECIFICATION : OTHER MANDATORY/INDISPENSABLE ACCESSORIES FEATURES

S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
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LL.1	Type	Other mandatory/indispensable accessories required for using the offered equipment for the application mentioned in item number AA.1 shall be supplied in sufficient numbers for trouble-free operation of the equipment up to two years.		
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MM. OPERATION & MAINTENANCE (O&M) MANUALS :

S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
MM.1	No. of Copies	2 (Two) sets of manuals of the equipment consisting of all the items mentioned in item numbers BB.1 to BB.5 to be sent along with the machine. Additionally, two soft copies of the manual in two separate pen drives shall also be provided.		
MM.2	Language of Manual	English		

S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
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MM.3	Manual Details :	a. Manual shall contain all instructions for machine installation and for carrying out Post weld heat treatment in the correct sequence/ method b. Manual shall clearly describe the operation of the Induction heating system and all other items in item numbers BB.1. to BB.5. c. Manual shall contain general circuit diagrams, showing the interconnection of various elements and other relevant details for understanding the configuration and working of the equipment. d. Manual to give other details like troubleshooting details, method of winding the induction heating coils for performing PWHT on pipe welds of different sizes and different thicknesses. e. Master List of Parts & Spares used in the machine with Make, Model, Rating, etc.		

NN. GENERAL POINTS :				
S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
NN.1.	Commissioning	The equipment shall be installed and commissioned by the supplier/supplier's representative at BHEL, Trichy Works.		
NN.2.	Pre-dispatch Inspection	The equipment shall be submitted for pre-dispatch inspection (PDI) at the manufacturer's works. The PDI will be carried out by BHEL Engineers before despatching the offered equipment to BHEL, Trichy. During the PDI, a trial PWHT experiment is to be performed as per specifications of AWS D10.10:1999 and the same shall be done in the presence of BHEL officials. The international air travel, boarding and lodging, in connection with the PDI mentioned above for two BHEL officials are in the scope of BHEL.		
NN.3.	Training	The Supplier's SERVICE ENGINEER shall give training in the Operation and Maintenance of the Machine for at least three BHEL personnel for a duration of at least 2 days, after the successful commissioning of the Induction Heat treatment equipment at BHEL, Trichy works.		
NN.4.	Guarantee	The equipment shall be guaranteed for a guarantee period of 12 months from the date of commissioning of the equipment at BHEL works or 18 months from the date of despatch.		

Annexure – 1 to Part B specifications of Induction Heat treatment equipment***Requirement of Performance Test (with Test report)***

The prospective vendor shall perform a *heat treatment trial* using the model of the Induction heat treatment equipment which the vendor proposes to offer to this tender. The details of the experiment are provided below

A Pipe of any convenient outside diameter and belonging to any of the commercially available grades of steel shall be taken. The minimum wall thickness of the pipe shall be 100 mm. The minimum length of the pipe shall be 500 mm. A heat treatment trial shall be performed in this pipe by wrapping the induction heating coils in the centre of the length (mid-length) of the pipe.

The parameters for the heat treatment cycle are given below

Rate of Heating: shall be greater than or equal to $X1\text{ }^{\circ}\text{C} / \text{hour}$ till $300\text{ }^{\circ}\text{C}$ temperature is reached on the heating location in the job (i.e. centre of the pipe) and equal to $X1\text{ }^{\circ}\text{C} / \text{hour}$ after reaching $300\text{ }^{\circ}\text{C}$ on the weld to the required soaking temperature.

Soaking Temperature: $880^{\circ}\text{C} \pm 10^{\circ}\text{C}$

Soaking Time: 150 minutes

Rate of cooling: shall be equal to $X2\text{ }^{\circ}\text{C} / \text{hour}$ till 300°C temperature is reached on the job (i.e. mid-span of the pipe's length) and thereafter air cooling shall be carried out.

X1 and X2 specified above are to be calculated using the formulae given below

$X1 = (5638.8 / t)$ and $X2 = (7061.2 / t)$ [‘t’ is equal to the wall thickness (in mm) of the pipe taken for this performance test]

Both the ends of the pipe shall be suitably closed for avoiding air draft.

The scheme of temperature recording thermocouples shall be as follows.

A minimum of one thermocouple shall be placed on the inner circumference of the pipe and a minimum of one thermocouple shall be placed on the outer circumference of the pipe and both these thermocouples shall be placed in the zone heated by laying the induction coils.

The heat treatment cycle (i.e. plot of temperature versus time) as sensed by each of the two thermocouples (fixed as mentioned above) shall be plotted in a single chart paper by a temperature recorder with two distinct colours so that the thermocouple(s) fixed on the outer circumference and that / those fixed on the inner circumference shall be easily distinguishable.

The heat treatment cycle chart (i.e. plot of temperature versus time) as sensed by each of the thermocouples plotted in a single chart paper shall be submitted along with a detailed test report containing the details pertaining to material, pipe size (Outside diameter, Thickness and length), length of induction heating coil used, number of turns of induction heating coil wound on the job and other procedural steps followed for the heat treatment cycle. Besides this, the report shall also contain photographs depicting the following

- (a) Position of thermocouples before applying insulation.
- (b) Readings of the all the thermocouples at any instant during the soaking phase of the heat treatment cycle as mentioned above.

This report and the heat treatment chart shall be submitted to us for review.

Only those Vendors who perform a heat treatment trial as stated above and submit a test report along with PWHT chart and photographs as stated above are eligible for consideration. Vendors who fail to qualify this condition will not be considered.