



An ISO 9001
Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirapalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY

NOTICE INVITING TENDER

Phone: +91 431 257 7421/7297

Email : vkaruna@bhel.in

: hari.r@bhel.in

Web : www.bhel.com

TWO PART BID

Tender to be submitted in two Parts

Enquiry
Number:

2602000002

Enquiry
Date:

29.02.2020

Due date for submission
of quotation:

27.03.2020

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 should reach physically on or before 14.00 Hrs(IST) on the Date of tender opening. Tenders received after 14.00Hrs (IST) will not be considered for evaluation.

Item	Description	Quantity	(Indigenous Vendors) Matl. Will be Delivered to
10	"Resistance Heating Based Local PWHT Equipment with Flexible Ceramic Pad" as per the technical specification & commercial conditions applicable(To be downloaded from web site www.bhel.com/tender/tender_home.php or https://eprocure.gov.in/epublish/app)	1.00 No.	FOR, BHEL,Stores, High Pressure Boiler Plant, Tiruchirappalli - 620014

Important points to be taken care during submission of offer

- 1) Material shall be delivered to (By Indigenous vendors): As stated above.
- 2) Delivery required 20 Weeks from the date of purchase order.
- 3) Erection & Commissioning period required 1 Week from the date of intimation by BHEL to vendor for deputation of their Engineers for E&C.
- 4) EMD for this Tender will be ₹ 60,000.00
- 5) Compliance Forms. TRY/IND/06 to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.
- 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 / GENL / 001-EMD) including bank guarantee formats and list of consortium banks, commercial terms check-list can be downloaded from BHEL web site www.bhel.com/tender/tender_home.php or from the Government tender website <https://eprocure.gov.in/epublish/app> under Enquiry reference 2602000002 .

Tenders should be submitted before 14.00Hrs (IST) 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

V. Karunakaran
29/2/2020
DGM / Capital Equipment / MM

V. KARUNAKARAN
Dy. General Manager
Capital Equipment / MM
BHEL / Tiruchirappalli - 620 014

PART A**QUALIFYING CRITERIA FOR THE SUPPLY OF
RESISTANCE HEATING BASED LOCAL PWHT
EQUIPMENT- 75 kVA Rating****SECTION - I**

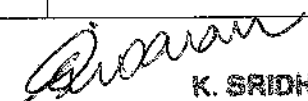
The BIDDER is expected to give complete details against each clause in the table given below and wherever necessary an additional sheet may be attached (giving clear reference number) to cover the required details.

S. No.	TENDER 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 'Resistance Heating Based Local PWHT Equipment' for R&D/Production	
2.0	YEAR of LAUNCH of the MODEL quoted against this ENQUIRY	
3.0	Number of "Resistance Heating Based Local PWHT Equipment" supplied, till date in the QUOTED MODEL	
4.0	Details on International Standards followed in Design and Testing of Welding Machines	
5.0	Comprehensive Details, on Performance Testing of Local PWHT Units 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.	
7.0	BIDDER to indicate the Country of Origin for the supply of power source.	

SECTION - II

The BIDDER has to compulsorily meet the following requirements to get qualified for submitting an offer for the "Resistance Heating Based Local PWHT Equipment"

S. No.	TENDER REQUIREMENTS	VENDOR'S COMMENTS
8.0	The BIDDER shall have a minimum of TEN Years of Continuous Experience in the Design, Manufacture & Supply of 'Resistance Heating Based Local PWHT Equipment'	
9.0	The BIDDER should have supplied atleast one "Resistance Heating Based Local PWHT Equipment" with unit rating 50kVA or more in India. Also, indicate the number of such units sold in India.	

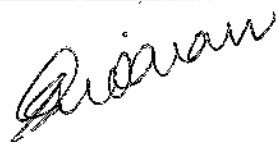


S. No.	TENDER REQUIREMENTS	VENDOR's COMMENTS
10.0	Reference of the Customer and Performance Certificate with full contact details of CONTACT PERSON, who are the End Users of the MODEL (given under Clause No.10.0) of 'Resistance Heating Based Local PWHT Equipment'	
11.0	BHEL reserves the right to verify 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.	TENDER REQUIREMENTS	VENDOR's COMMENTS
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.	
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 the Unit and accessories.	
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**

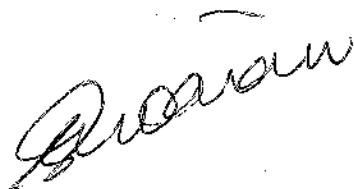
The Performance of the subject model **RESISTANCE HEATING BASED LOCAL PWHT EQUIPMENT** should be certified by the customer on Customer's Letter Head, in the following pattern/format and submitted along with the TECHNICAL OFFER positively.

- | | | | |
|-----|--|---|---|
| 1.0 | Name of the Equipment Supplier (OEM) | : | |
| 2.0 | MODEL/MAKE of the Equipment | : | |
| 3.0 | Month & Year of Commissioning of the Equipment | : | |
| 4.0 | Brief Details on the Application/Use of Equipment | : | |
| 5.0 | Performance of the Equipment stated above | : | Very Good /
Satisfactory /
Not Good |
| 6.0 | Availability of the Equipment 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**

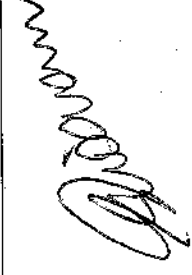
PART B

**TECHNICAL SPECIFICATIONS FOR
'RESISTANCE HEATING BASED LOCAL PWHI' EQUIPMENT WITH FLEXIBLE CERAMIC PAD'**

AA. APPLICATION :			
SL.No.	FEATURES /BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
AA.1	The offered equipment shall be portable system (complete with accessories) capable of carrying out local post weld heat treatment and preheating of welds made in a variety of metallic materials. This system shall work on the principle of resistance heating using flexible ceramic pads. The system shall be capable of heat treating welds of tubes and pipes of carbon steel, alloy steel, stainless steel and nickel based super alloys of outer diameter upto 711 mm. This system shall be capable of heat treating welds made in alloy steel pipes, in the temperature range of $760^{\circ}\text{C} \pm 10^{\circ}\text{C}$ and the system shall also be capable of heat treating welds made in Nickel based Inconel alloy pipes, in the temperature range of $980^{\circ}\text{C} \pm 10^{\circ}\text{C}$. (See Annexure I for further details-The vendor shall submit the report of the same). 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		

Quorum

BB. MACHINE CONFIGURATION : [The scope of supply shall consist of the following]			
Sl.No.	FEATURES /BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
BB.1	The local PWHT system shall consist of a 75-kVA Power source with a contactor switching, recorder and programmable control with manual/automatic selector switches with neon indicator lamp. The controller should have atleast 6 Channel output each having PID controller, energy regulator, with auto/manual switch and suitable indicator lamp, thermocouple input and output socket & 250 A single pole contactor, Input: 415V $\pm$ 10% V AC, 3 phase, 50 Hz, Output 60 V/80 V AC for each channel. <i>Required Qty: 1 No.</i>		
BB.2.	Ability to automatically and simultaneously heat treat different diameters of tube and pipe sizes (engaging one or more of the available all 6 channels) with outer diameter upto 711 mm and wall thicknesses up to 120 mm.		
BB.3	The machine shall be operable in automatic closed loop feedback system and shall not require any manual intervention once PWHT parameters are inputted.		
BB.4	Shall have Contactor Switching.		
BB.5	Shall have 12-point recorder system – to provide the facility to monitor temperature gradients on thick walled pipe work.		
BB.6	Shall consist of 60 V / 80 V secondary low voltages for personnel safety		
BB.7	Shall have adequate number of interconnection cables.		
BB.8	The local PWHT system shall be capable of performing both pre-heating, inter-pass (during welding) and post weld heat treatment operations either singularly or simultaneously up to 711 mm OD.		

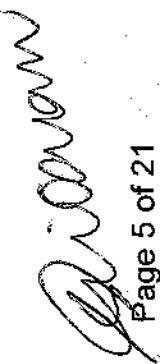


BB. MACHINE CONFIGURATION :		[The scope of supply shall consist of the following]		
Sl.No.	FEATURES /BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS	

Q. Anon

BB9	The general specification shall be: Unit Rating: 75 kVA No. of Circuits: 06 No. of 12 point recorders: 1 No. Digital display, Universal 180 mm Chart Width, 0-1200 °C Fully Automatic Controller: 1 No. Energy Regulator: 06 No. No. of K-Type Thermocouple Plugs: 06 No. Auxiliary Power Output 230V: 01 No. Input Voltage: $415 \pm 10\%$ V AC, 3 Phase, $50 \pm 2\%$ Hz, through a 3 Wire System [4th wire for EARTHING] – No Neutral Conductor Frequency: 50 Hz Input current: 3 phase (max) 92A Output voltage: 60/80 V Output Current per phase: 360A Type of heating method: Electrical Resistance-Flexible Ceramic Pads Heaters (45A) per circuit: 04 No. Total no. of heaters for PWHT: 24 No. Rating of heaters or elements: 60V; 2.7 kW(minimum) to 4.0 kW (maximum) Cablings Feed Cable shall be capable of carrying the total current offered by the power source through six channels. This shall be of length 25 metres (minimum). The number of feed cables required to be supplied shall be six. Nos. of 25 m, Return Cable (400 A): 06 Nos. Nos. of 25 m, Compensating Cable: 12 Nos. Nos. of 4-way splitters: 12 Nos.	
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CC. EQUIPMENT SPECIFICATION : POWERSOURCE FEATURES			
S/N ^o .	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER
CC.1	Rating	The unit shall be suitable for a 3 phase 92 amp, 415 $\pm$ 10% V AC, 50 Hz supply (AC). The transformer shall be mounted in a sheet steel enclosure and shall have the following characteristics: Rating - 75 kVA Input - 415 $\pm$ 10% V AC, 50/60 Hz set on 415 Volt tapping (AC) Output - 60/80 Volts - 360A per phase (AC) Protection-Necessary protective measures to ensure safety of the equipment and the operator shall be taken care, including: - Inbuilt protection for the Power source against Overload / Short-Circuit conditions - All electronic circuitry of the power source shall be protected suitably to prevent damage from dust and grinding particles - Machine Design to ensure proper earthing for the machine and its peripherals - Degree of protection shall be according to IP 21. Connections - All secondary output and control circuits shall have plug and socket features (camlock type).	
CC.2.	Channel Provision	Each of these six channel shall have a PID controller, energy regulator, with automatic to manual switching provision, thermocouple input and output socket, 250 A single pole contactor, Input: 415 V $\pm$ 10% V, 3 phase, 50 Hz, Output: 60 V/80V AC.	



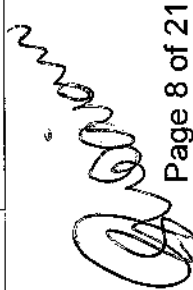
CC. EQUIPMENT SPECIFICATION : POWERSOURCE FEATURES				
S/No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
CC.3.	Cooling system	The power source shall be a natural cooled field proven unit, suitable for heat treatment with a six-channel control system complete with camlock sockets to facilitate a total of 24 elements for post weld heat treatment of pipe weld joints		
CC.4.		The following shall be the features of Control Circuit:		
CC.4.1	Control Circuit	Each of the channel shall provide semi-automatic controlled circuits independently for resistance heating. Each circuit shall be individually controlled by means of contactor switching and a percentage energy regulator unit and 0 - 1200 °C temperature controllers.		
CC.4.2	Current regulation	There shall be means for controlling the current output from the secondary side so that the power delivered to the heating shall be controlled in the range of 0 – 100%		
CC.4.3	Program control and Feedback system	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		



CC. EQUIPMENT SPECIFICATION : POWERSOURCE FEATURES			
S.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER
CC.4.3	Program control and Feedback system	(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, the rate of heating shall be greater than or equal to 222° C. The maximum achievable rate of heating shall be specified in the offer. (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 in pipes made of metallic materials, with Outside diameter (OD) lesser than 500 mm and with wall thickness upto 120 mm. (3) Soaking time – The soaking time is the time for which the soaking temperature is to be maintained. The resistance 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).	



CC. EQUIPMENT SPECIFICATION : POWERSOURCE FEATURES			
Sl.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER
CC.4.3	Program control and Feedback system	The resistance 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).	
CC.5	Standard to follow	The machine shall be capable of carrying out PWHT cycle as per AWS D10.10 standard and this shall be checked during the time of pre-dispatch inspection.	
CC.6	Power Sockets	4 Nos. of 230 Volt sockets shall be available in the power source for providing power for the temperature recorder required for recording the post weld heat treatment (PWHT) cycle, Thermocouple Attachment Unit (TAU) recharging etc.	
CC.7	Power source supports	The power source shall be portable with wheels (minimum 4 Nos) by manual pushing.	
CC.8	Temperature controller	The temperature controller shall be fully automatic type. There shall not be any requirements for manual intervention for controlling the temperature. There shall be appropriate feedback systems for temperature control and this needs to be suitably integrated with the power source.	
CC.9	Weight	The weight of the power source shall not exceed 500 kg	

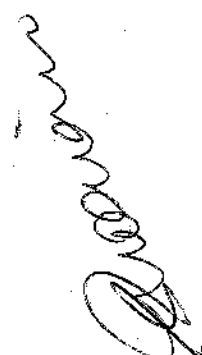


CC.10	Dimension	The total dimension of the power source shall not exceed the following dimensions Height: 2000 mm, Width: 1500 mm, Length: 1500 mm.	
CC.11	Total noise emission during operation	The total emission of the sound from the equipment during the course of PWHT cycle shall be less than 75 dB	

EQUIPMENT SPECIFICATION : THERMOCOUPLE ATTACHMENT UNIT(TAU)			
SINo.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER DEVIATIONS
DD.1	TAU	A thermocouple attachment unit (TAU) working on the principle of "Capacitor discharge welding" for fast attachment of thermocouples on to the job. Thermocouple Attachment Unit: 230 V, Manual for welding 'K' type thermocouple (TC) wire. The time taken to welding the TC shall be less than 5 seconds.- <i>Required Qty: 2 unit.</i> The TAU shall provide a firm connection between surface of the job/workpiece and thermocouple element. For thermocouple wire refer clause HH of this tender specification	
DD.2	Rating	The specification shall confirm to the following: Operating Voltage: 230 V Battery Voltage: 12 V Battery Capacity: 4.5 Ah Power Consumption: 10.0 ± 5 VA Thermocouple Diameters: Shall be selectable among 0.5, 1, 2 mm	
DD.3	Charge condition display	There shall be an LED display for displaying the charge condition of the battery of the TAU	

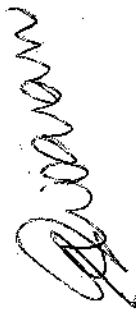
DD.4	Weight	Weight of TAU shall be less than 4 kg.		
DD.5	charging cable	The TAU shall be supplied with one charging cable		
DD.6	Carry case	The TAU shall be supplied in a hardtop carrycase along with pliers.		

E.E. EQUIPMENT SPECIFICATION : TEMPERATURE RECORDER				
S.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
EE.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.		
EE.2.	Type colour	Temperature recorder shall be of 12 point analogue type so as to take care of plotting the temperature values from 12 different thermocouples placed in various locations of the job to be heat treated.		
EE.3.	Input	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 to the temperature recorder.		
EE.4.	Input Power	Shall operate in 230 V AC input power		
EE.5.	Recording	The screen shall be capable of recording 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 observable in a single chart paper. (atleast 6 different colours for different record of cycle)		



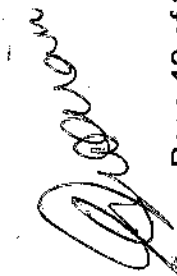
EE.6.	Display	The temperature recorder shall have an analogue (or) digital display with a provision to record the complete PWHT cycle starting from beginning of heating till the completion of cooling of the weld joint to the room temperature. This data of Temperature and time shall be recorded for the entire PWHT cycle. This recording of time and temperature of the whole PWHT cycle shall have to be necessarily done in a paper only.		
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EQUIPMENT SPECIFICATION : TEMPERATURE RECORDER				
S.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
EE.7.	Recording type	Paperless recorder types are not acceptable i.e. those types of recorders which stores the full data of PWHT time and temperature in a flash drive / pen drive and requires a PC for viewing, are not acceptable. Only the type of recorders that can plot the time and temperature of the PWHT in a paper, is acceptable. Other types are not acceptable. 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.		
EE.8.	Temperature monitoring	There shall also be provisions for observing the instantaneous temperature (in digital form) recorded by each of the thermocouples connected to the job, during the course of the PWHT cycle.		
EE.9.	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)		

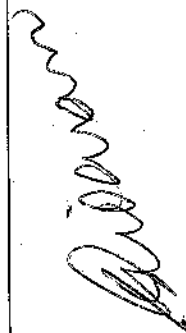


EE.10.	Handling	The temperature recorder shall be a portable unit with suitable handles for carrying.		
EE.11.	Carry Case	Carry case with handles shall be provided for the temperature recorder		
EE.12.	Number required	1 unit, meeting to the features specified in item numbers EE.1. to EE.11.		

FF. EQUIPMENT SPECIFICATION : FLEXIBLE CERAMIC HEATING ELEMENT				
S.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
FF.1	Dimension	Flexible ceramic pads shall have rating of minimum 2.7 kW and maximum of 4 kW, 60V, 45/50A) and Size: 150mm x 330 mm. <i>Required Qty: 50 Nos</i>		
FF.2	Dimension	Flexible Ceramic Pads shall have rating of minimum 2.7 kW and maximum of 4 kW, 60V, 45/50A) and Size: 1220 mm x 'B' mm where B is a number in the range of 44 to 47. <i>Required Qty: 50 Nos</i>		



Dimension	Ceramic rope type heater with a minimum rating of 2.7 kW and maximum of 5 kW and voltage rating of 80 V (or) 60 V. These heaters shall have ceramic ferrules / beads all over the over the Nichrome heating element and shall withstand a maximum temperature of 1050° C. These rope type heaters shall be provided with a suitable camlock socket provisions and shall be compatible with resistance heating power source mentioned in S.No. CC.1 to CC.11 <i>Variant 1:</i> The rope type heaters shall have a diameter of minimum 10 mm and length of minimum 1.2 metres. <i>Numbers required in Variant 1: 30 Nos.</i> <i>Variant 2:</i> The rope type heaters shall have a diameter of minimum 15 mm and length of minimum 1.2 metres. <i>Numbers required in Variant 2: 30 Nos.</i>		
FF.3	Heaters per heating circuit	There shall be a minimum of four heaters (45A) per heating circuit	
FF.4	Rating	The total number of heaters shall be 24 numbers for the 6 total number of channels. The rating of heaters or elements shall be 60V, 2.7 kW minimum	
FF.5	Gripping of FCP	There shall also be suitable steel bands/ Strips to hold the pads in position after they had been tied on the job / workpiece. <i>Required Qty: 5 coils.</i>	
GG. EQUIPMENT SPECIFICATION : CABLING			



GG.1.	Interlink cable	The Interlink cable work shall be: Triple Cable Set for 75kVA: 25 m long having Feed Cable and Return Cable, each of size 25sq.mm or higher and they shall be of type double insulated HOFR copper cable with male & female camlock connectors and compensating cable with thermocouple plugs. <i>Required Qty: 6 Set</i>		
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GG. EQUIPMENT SPECIFICATION : CABLING

S.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
GG.2	Splitter Cable	4 way Splitter cable having 16 Sq.mm double insulated HOFR copper cable with male and female camlock connectors. <i>Required Qty: 12 Set</i>		
GG.3	Power Cable	Power Cable (4 core unarmoured Cu, 50sq.mm area). <i>Required Qty: 2 Nos of 10 meter each</i>		
GG.4	Connection	All power cable extension leads, paralleling leads and interconnection cable work shall end with a twist/lock and camlock plug socket connections, to facilitate rapid and electrically sound connections.		
GG.5	Cable tray	Cable Tray 2.5 metres 4 no. per source. <i>Required Qty: 4 Nos</i>		
GG.6	Compensating cable	The compensating cable shall be : Colour coded copper/Constantan compensating cable complete with polarised plug and socket to connect thermocouples to a temperature recorder shall be provided. This shall enable providing a time/temperature chart print-out of the heat treatment cycle.		

HH. EQUIPMENT SPECIFICATION: THERMOCOUPLE WIRE

HH.1.	Capacity	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.	
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HH. EQUIPMENT SPECIFICATION: THERMOCOUPLE WIRE			
S.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER
HH.2.	Specification	The specifications of the thermocouple are provided below: (a) This shall be a 21 (or) 22 Standard Wire Gauge (SWG) Type 'K' nickel-chromium/nickel-aluminium twin thermocouple wire manufactured as per BS4837: Part 4, 1973. (b) Thermocouple Wire Type K of diameter 21 (or) 22 standard wire gauge, double insulated, High Temperature (Red & Yellow 100 Meter Roll) – <i>Required Qty: 5 nos.</i> (c) A roll shall consist of 100 meters of thermocouple and five such rolls shall be supplied (d) A valid calibration certificate for each roll of the thermocouples shall be provided	
II. EQUIPMENT SPECIFICATIONS: SPARES			



II.1.	Cable	Triple Cable Set for 75kVA: 25 m long having Feed Cable and Return Cable, each of size 25sq.mm or higher and they shall be of type double insulated HOFR copper cable with male & female camlock connectors and compensating cable with thermocouple plugs. <i>Required Qty: 6 Set</i>		
II.2	Splitter Cable	4 way splitter cable having 16 sq.mm Double insulated HOFR copper cable with male and female camlock connector. <i>Required Qty: 6 Nos</i>		

II. EQUIPMENT SPECIFICATIONS: SPARES

S.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
II.3.	Additional Spares	300 Amps male and female camlock sets - <i>Required Qty: 10 Nos</i> 300 Amps Panel Mounting camlock – <i>Required Qty: 10 Nos.</i> 60 Amps male and female camlock sets – <i>Required Qty: 12 Nos.</i> K type thermocouple connector male and female set – <i>Required Qty: 10 Nos.</i> Energy Regulators – <i>Required Qty: 3 Nos.</i> Indicating lamps – <i>Required Qty: 6 Nos</i> Auto / Manual switch – <i>Required Qty: 3 Nos.</i> Fuses (Pack of 10)- <i>Required Qty: 10 Nos</i>		

JJ. EQUIPMENT SPECIFICATION: INSULATION



JJ.1.	Dimension	Ceramic Fiber Insulation 25mm thickness 7620mmX 610mm, 128 kg/m ³ density, 1260 deg-C. <i>Required Qty: 4 Nos</i>		
JJ.2.	Gripping of Insulation	There shall be suitable steel bands/strips to hold the insulation in position after they had been tied on the job/workpiece/FCP. <i>Required Qty: 5 Coils</i>		
KK. RESISTANCE HEATING PAD FOR INTER-STAGE HEAT TREATMENT				
KK.1.	Dimension	Strip type Flexible ceramic pads shall have width not exceeding 30 mm, capable of winding a pipe of OD upto 711 mm and wall thickness upto 200 mm in stages with temperature ranging from 0 to 1050 deg-C. <i>Required Qty: 1 Set</i>		

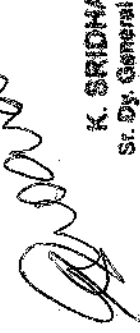
LL. O & M MANUALS :

S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
LL.1	No. of Copies	3 (Three) sets containing manuals of power source, heating elements, thermocouples, thermocouple attachment units, temperature recorder etc. to be sent along with the equipment. Soft copy of the same to be provided in pen drive		

LL.2 Manual Details :	a. Manual shall contain all instructions for machine installation and operation trial, testing in sequence. b. Manual shall clearly describe the operation of the power source, heating elements, thermocouples, thermocouple attachment units, temperature recorder, etc. b. Manual to give general circuit diagrams, showing the interconnection of various elements and also details on PCBs [Printed Circuit Board] like tapping voltages, main electronic elements' specifications and ratings, etc. c. Manual to give other details like trouble shooting chart, etc. d. Master List of Parts & Spares used in the machine with Make, Model, Rating, etc. a) The Bought-Out Items - like Motors, ICs, Relays, Contactors, Switches, Electronic Elements, etc., used in the Power source shall be of Internationally Reputed Manufacturers only. b) BIDDER has to furnish the MAKE of Bought-Out Items used in the power source, with OFFER .	
LL.3 Bought-Out Items		



LL.4	Pre-dispatch Inspection	The equipment shall be submitted for pre-dispatch inspection (PDI) at the manufacturer's works by BHEL Engineers before despatching the same to the BHEL, Trichy. During the PDI, a trial PWHHT experiment is to be performed as per specifications of AWS D10.10:1999 and the same shall be done in the presence of BHEL Engineers. The international or national air travel (to and fro – both the ways inclusive), boarding and lodging in connection with the PDI mentioned above for two BHEL officials are in the scope of BHEL.		
LL.5	Commissioning	The equipment shall be installed and successfully commissioned at free of cost by the supplier/supplier's representative at BHEL Works. The commissioning shall be adjudged successful if and only if the trial mentioned in Annexure I is demonstrated at BHEL work, but at any rate of heating/cooling. The pipe/tube for this trial shall be under the scope of BHEL.		
LL.6	Training	The Supplier's SERVICE ENGINEER shall give training in the Operation and Maintenance of the Machine for BHEL Staff, after the successful commissioning of the Resistance Heating Based Local PWHHT Equipment for a minimum of 3 days.		
LL.7	Performance Guarantee	The equipment shall be guaranteed for a minimum of 12 months from the date of commissioning at WRI/BHEL or 18 months from the date of despatch.		
LL.8	Language	English		


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ANNEXURE -1

Special Performance Requirement (with Test Report)

The prospective vendor shall perform a post weld heat treatment experiment using the model of the Resistance Heat Treatment equipment (using flexible ceramic pads) which the vendor proposes to offer to this tender. The details of the experiment are provided below

Vendor shall take two pipes/tubes both belonging to any of the commercially available grades of steel.

One end of the each of the pipes/tubes shall be edge prepared and the both the pipes/tubes shall be butt welded at the edge prepared ends. A post weld heat treatment trial shall be performed in this pipe weld joint.

The parameters for the PWHT are given below:

Rate of Heating: shall be greater than or equal to $55^{\circ}\text{C} / \text{hour}$ till 300°C temperature is reached on the weld and equal to $55^{\circ}\text{C} / \text{hour}$ after reaching 300°C on the weld

Soaking Temperature: $980^{\circ}\text{C} \pm 10^{\circ}\text{C}$

Soaking Time: 150 minutes

Rate of cooling: shall be equal to $55^{\circ}\text{C} / \text{hour}$ till 300°C temperature is reached on the weld and shall be greater than or equal to $55^{\circ}\text{C} / \text{hour}$ after below 300°C on the weld

The scheme of temperature recording thermocouples shall be as follows.

Three thermocouples spaced at an angular interval of 120° on the outer circumference of the pipes/tubes on the weld zone.

Three thermocouples spaced at an angular interval of 120° on the inner circumference of the pipes/tubes on the weld zone exactly or near-exactly beneath the same spots where the thermocouples are placed on outer circumference of the pipe/tube welds

The PWHT cycle (i.e. plot of temperature versus time) as determined by each of the six thermocouples (fixed as mentioned above) shall be plotted in a single chart paper by a temperature recorder.

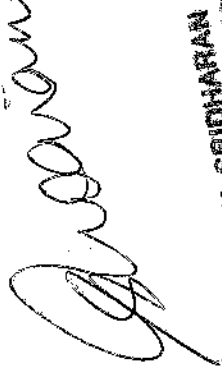
The PWHT cycle chart (i.e. plot of temperature versus time) of each of the six thermocouples plotted in a single paper shall be submitted along with a detailed test report containing the details pertaining to material, pipe/tube size, type of edge preparation, type of welding process, electrode used, procedural steps followed for PWHT of the pie weld joint.

This report will be reviewed and the PWHT chart will be reviewed for the maximum temperature gradient across the wall thickness of the pipe/tube weld joint during the soaking stage of the PWHT cycle. This temperature gradient shall be restricted to a maximum of 20°C and shall not exceed beyond 20°C .



Resistance Heating Based Local PWHT Equipment with Flexible Ceramic Pad

Only vendors who perform a PWHT experiment as stated above and submit a test report along with PWHT chart as stated above are only eligible for consideration. Other vendors who fail to qualify this condition will not be considered.



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