

**Government of India
Bhabha Atomic Research Centre
Reactor Engineering Division**

Engg. Hall No.7,
Trombay,
Mumbai-400 085.

Ref:-RED/EFS/GDS/ 452 /2BE/MF/93139 /2019

May 16,2019

**Sub:- Minor Fabrication work invitation to quote for
Supply of 15 kW 3 nos. of rod type heaters as per attached specification**

Dear Sirs,

Sealed quotations are invited by Head, Experimental Facility Section, RED on behalf of the President of India for "Design, manufacture, inspection, testing at manufacturer's works, supply and performance guarantee of 3 nos. of 15 kW rod heaters"

Scope of work:

Scope of work includes Design, manufacture, inspection, testing at manufacturer's works, supply and performance guarantee of 3 nos. of (minimum) 15 kW rod type heaters having 41 mm diameter S.S. 304 L seamless sheath 2200 mm long having sheath thickness of 2.5 mm. Detailed specification attached in Annexure 1

Completion period: Completion period shall be within 45 days from the work-order placed.

Guarantee: Material shall be guaranteed for one year from the date of delivery.

Applicable terms and conditions:

1. The quotations must reach Head, Experimental Facility Section, R.E.D., Engg. Hall-7, BARC, Trombay, MUMBAI-400 085, by Due Date 03/06/2019. The envelope shall be superscribed "Minor Fabrication" and indicate this letter Ref No. and due date of opening clearly. The envelope shall be sealed and only register post/speed post by Indian postal services will be considered.
2. The quotation will be opened on 04-06-2019
3. The fabricator shall specify the total period required for this work. Since this work is very urgent the total period shall be minimum but not more 45 days.
4. All taxes shall be quoted separately.
5. Payment will be made only on satisfactory completion of work and on production of bill, advance stamped receipt and delivery challan and Guarantee/Warranty certificate. Advance/part payment or against delivery cannot be made.
10. Income Tax @ 2% shall be deducted from your bill.
11. Payment will be made by ECS/RTGS as per Government rules after completion of the job satisfactorily and acceptance by the user.
12. Validity: The offer shall be kept open for acceptance for a period of 90 days from the date of opening of quotation.
13. Proof of ability: A brief list of similar jobs executed, if any, and the name of the client organisation shall be furnished.
14. Head, Reactor Engineering Division reserves the right to accept/reject any or all the quotations received without assigning any reason whatsoever.

15. Sub contraction of work must be informed to the indenter.

16. Confidentiality:

No party shall disclose any information to any third party concerning the matters under this contract generally. In particular, any information identified as "Proprietary" in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior consent of the original disclosing party. This clause shall apply to the sub-contractors, consultants, advisors or the employees engaged by a party with equal force.

17. "Restricted information" categories under Section 18 of the Atomic Energy Act, 1962 and "Official Secrets" under Section 5 of the Official Secrets Act, 1923.:

Any contravention of the above-mentioned provisions by any contractor, sub-contractor, consultant, advisor or the employees of a contractor will invite penal consequences under the aforesaid legislation.

18. Prohibition against use of BARC's name without permission for publicity purposes:

The Contractor, sub-contractor, consultant, advisor or the employees engaged by the contractor shall not use BARC's name for any publicity purpose through any public media like Press, Radio, T.V. or Internet without the prior written approval of BARC.

19. With your offer please furnish the detailed information regarding an employee of BARC is working in your organization or whether any of your relative is working in DAE/BARC or you are an ex-employee of DAE/BARC. In absence of such information or wrong information, quotation or contract is likely to be rejected / cancelled.

20. Any delay which is attributable to the contractor is liable for penalty @ 1/2% per week (maximum 5%) to be imposed on the contractor.

21. In case any extension in delivery period to be granted to the supplier, party's request for extension shall be received before expiry of work order.

22. Quotations shall be submitted on printed letter heads only otherwise it will be treated as invalid quotation.

23. Quotation shall bear PAN No./GST No. without which their quotation shall be treated as invalid quotation. Bidders without having above details need not quote as their quotation will be treated invalid.

Thanking you,

Yours faithfully, .

Dr. R.D. Kulkarni
(Dr. R.D.Kulkarni) 15/5/2019

Head, Experimental Facility Section, RED
For & On behalf of The President of India (The Purchaser)

डॉ. आर. डी. कुळकर्णी
Dr. R. D. Kulkarni
अध्यक्ष / Head
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इंजीनियरी हॉल नं. 7 / Engineering Hall No. 7,
ट्रॉम्बे, मुंबई-85. / Trombay, Mumbai-400 085.

Annexure 1

Technical Specifications of 15 kW rod Type, S.S. 304L Sheathed heaters

1.0 Scope of work:

Design, manufacture, inspection, testing at manufacturer's works, supply and performance guarantee of 3 nos. of 15 kW of each rod heaters having 41 mm diameter S.S. 304 L seamless sheath having thickness of 2.5 mm and 2200 mm long.

This specification may not cover fully all the aspects of design and fabrication of the heaters. However, supplier shall be thoroughly conversant with the specified requirements, high quality and standards in engineering and workmanship for satisfactory and trouble free operation of the heaters throughout the guaranteed life time.

2.0 Applicable codes/Documents:

Equipment shall conform to the latest applicable standards and codes of practice as per the requirement of this specification.

- a) IS: 302-1981 - General & safety requirements for household & similar electrical appliances.
- b) IS: 9080 (part-II/sec-2) - Safety requirement in electro-heat installations.

3.0 Description of heater unit:

This heater unit is having total length of 2200 mm. This heater has 1650 mm cold length at the top and 25 mm cold length at the bottom and 25 mm extra length at the bottom for casing joint.

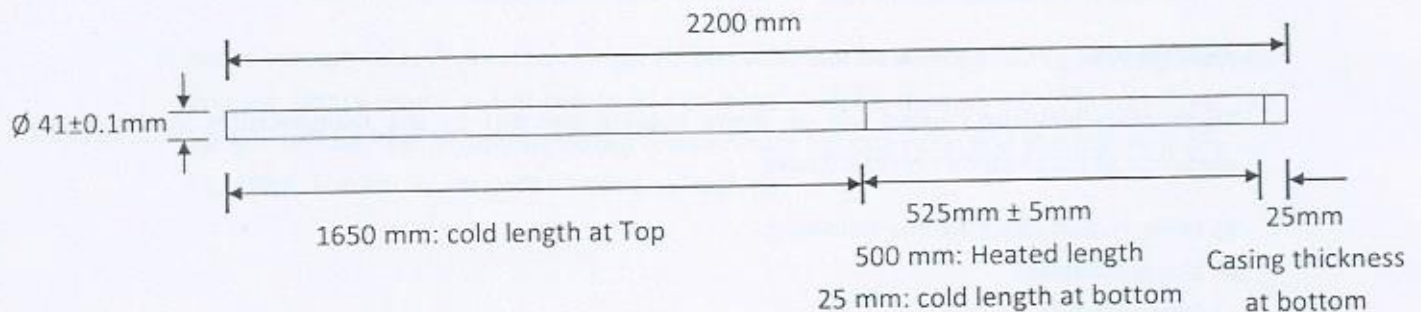


Fig. 1 Schematic of heater rod

4.0 Service conditions:

- a) Maximum operating temperature: 250° C
- b) Medium to be heated: Heater rod shall be immersed in the water and shall be subjected to steam-water mixture at 15 bar pressure.

5.0 Technical requirements of heating elements:

- 1) Power rating: minimum 15 kW each at 240 volts.
- 2) Nos. of heaters : 3
- 3) Input power supply: 415 volts \pm 10%, 3-phase, 50 Hz \pm 3%, AC
- 4) Power density: 23 watt/cm²
- 5) Temperature: 250°C
- 6) Sheath material : Stainless steel 304L seamless tube
- 7) Heating element: To be selected by manufacturer.
- 8) Insulating material: To be selected by manufacturer
- 9) Shape of heating element: 'straight' type
- 10) Length of heating element: Heated length 500 mm shown in Fig.1.
- 11) Terminals: sufficiently long (~ 3.5 meter) high temperature free cable capable of withstanding temperature of 300°C should be provided at the top as the heater rod will be moving upward downward inside the channel.
- 12) Thermocouples inside heater rod: minimum 3 nos. K type (one at center and one each at the top and bottom end of the heated length)
- 13) Annealing: Annealing shall be done at 1000 \pm 100°C for a period of 30 minutes after cold working (Swaging)
- 14) Available dimension for heater unit: \varnothing 41 mm \times 2200 mm H

6.0 Inspection & testing:

The heating element will be subjected to 'routine test' & 'type test' in accordance with the provision of applicable standard as in section 2.0 above.

6.1 Routine test:

These tests shall be carried out on every heating element by the manufacturer in the presence of purchaser's representative.

- a) Dimensional check for the following.
 - i) Outer diameter
 - ii) Overall length
- b) Electrical resistance of heating element at ambient conditions

- c) Insulation resistance (IR) test at 500 Volt DC for 1 minute. IR value shall be minimum 50 MΩ at room temperature.
- d) High voltage withstand test at room temperature at 1500 Volts AC, 50 Hz for one minute
- e) Hydrostatic pressure test for external pressure on heater rods as per ASME and B&PV code.

6.2 Type test:

All heating elements shall be subjected to following tests by the manufacturer in the presence of purchaser's representative.

- a) Ultra-sonic test for sheath wall thickness measurement as per ASTM E 797-95 and for volumetric examination for internal defects as per ASTM E213-02.
- b) Radiographic examination (as per ASTM E 94-04(2010)) over the full length at 90°C to determine the concentricity of heating coil within the sheath and for butt weld joints, if any.
- c) Moisture resistance test followed immediately by IR test at 500 volt DC and high voltage test at 1500 Volts AC for one minute. IR value shall be more than 10 MΩ.
- d) Leakage current test: this test is to be carried out as per IS: 302. The test shall be carried out at a reduced voltage in the air in vertical position so as to simulate average temperature of the magnesium oxide in the heating element.

The leakage current thus recorded shall be extrapolated at 110% of normal heat discharge as follows.

(Rated wattage × 1.1)

Extrapolated leakage current = × leakage current at reduced voltage
(V×I) at reduced voltage

The extrapolated reduced current shall not exceed 200 μAmp as per IS: 302

- e) Rated voltage test: The rated voltage of 240 volts will be applied to the heating element and the temperature at the centre of hot length will be monitored till it stabilizes. The sample will be kept at this stabilized temperature for one hour and the failure if any will be noted. The above test will be done in fresh air.

7.0 Submission of documents/radiographs:

Minimum two sets of the following shall be submitted by the supplier.

- 7.1 Material test certificate of the Sheath material and the electric insulating and thermal conducting powder/ceramics from the manufacturers for scrutiny prior to the date of inspection by the purchaser.
- 7.2 Radiograph of sample heating element along with consignment.
- 7.3 Test report of tests carried out by the supplier along with the consignment.

8.0 Marking:

Heating elements shall be marked for its rated voltage and capacity by etching process. at the non-heated end (top) of the heater rod. No engraving or punching is permitted on the sheath.

9.0 General conditions:

The supplier shall not sub-contract any work without written consent from the Engineer In-charge. However, if allowed by the Engineer In-charge, the supplier shall be responsible to the purchaser for all work of the sub-contractor.

10.0 Notes:

All heating element shall be handled care fully and protected from all mechanical damage, scratches and from moisture entering the terminal sealing area.
