



BARC, Trombay  
Mumbai - 400 085  
Phone no. 022-25594927

**DUE DATE: 05/10/2018**

Government of India  
Bhabha Atomic Research Centre  
**Atomic Fuels Division**  
*Technical Services Section*

Ref: AFD/TSS/2018/

September 11, 2018

## **Tender Enquiry**

To,

**Sub: Works Contract for “Fabrication, Supply, Testing, Installation and Commissioning of High Vacuum Pumping System along with accessories as per specifications”.**

Sealed quotations are invited for & on behalf of the President of India for Fabrication, Supply, Testing, Installation and Commissioning of Vacuum Pumping System along with accessories as per specifications. The scope of work, general description and salient terms & conditions are as follow:

### **A: Scope of Work and General Description**

The scope of work involves following:

Fabrication & Supply of vacuum Pumping System consisting of:

- i) Direct Driven Rotary Pump
- ii) Fractioning Type Diffusion Pump
- iii) Control Panel consisting of required Switchgears and Vacuum Gauges
- iv) Pump Accessories & Spare Parts

## General Description

This Vacuum Pumping System is intended to be used for evacuation of a Resistance Heating type Tapered Retort Furnace, upto the level of  $5 \times 10^{-6}$  m-bar. The scope of work includes Pumping System Design, Fabrication, Supply, Installation and commissioning at site. All materials, consumables, labour etc shall be in the supplier's scope of work.

The system shall be installed into a radioactive environment and hence mandated safety precautions shall have to be adhered by the supplier. The departmental Health Physicist will brief about the safety procedures to be followed by the supplier's engineers and technician at site.

## B. Technical Specifications

The Desired  $5 \times 10^{-6}$  m-bar vacuum level shall be attained by utilizing two pumping systems, viz.

- i) Direct Driven Rotary Pump
- ii) Fractioning Type Diffusion Pump

The details are hereunder:

### i) Direct Driven Rotary Pump

- a) Ultimate Vacuum :  $2 \times 10^{-3}$  m-bar
- b) Displacement : 350 LPM (free air displacement capacity between atmosphere & 1 m-bar)  
250 LPM at  $1 \times 10^{-1}$  m-bar  
150 LPM at  $1 \times 10^{-2}$  m-bar
- c) No. of Stages : 2
- d) Noise Level :  $\leq 70$  dB at one meter distance

Pump shall be supplied with one charge of molecular distilled vacuum pump oil ( $\approx 1$  Ltrs).

### ii) Fractioning type Diffusion Pump

- a) Ultimate Vacuum :  $5 \times 10^{-6}$  m-bar
- b) Un-baffled Air Speed :  $\approx 700$  LPS
- c) No. of Stages : 3 with fractionating type jet (Al)
- d) Heater Rating : 1500 Watts (single phase)
- e) Cooling : Body & Top shall be Jet Water Cooled
- f) MoC : SS 304

Pump shall be provided with first charge of oxygen resistant silicon oil, suitable liquid nitrogen trap, baffle valve, air admittance valve and gas inlet valve.

### **iii) Accessories**

#### **a) Top Dummy**

To dummy shall be provided with SS 304 flange with SS304 KF-25 coupling, SS304 KF-25 blank flange, Mattering SS 304 KF-25 flange for further connection and KF-25 Clamp.

#### **b) Plumbing**

The system shall be provided with SS 304 TIG welded piping having suitable butterfly valves, Pirani gauge, Penning gauge, and Solenoid Isolation Valve. For flexible connections, Flexible SS hose with KF-25 connection shall be used.

#### **c) Vacuum Collar**

A vacuum collar shall be mounted on the above high vacuum valve and is versatile for multiple needs. The top port shall be blanked off and can be connected after removing the top plate when maximum pumping speed is required. In case of a connection to a smaller opening a KF-25 side port is to be provided.

#### **d) Safety Devices**

A water flow switch in the water circulation line of the unit to protect the diffusion pump in case of water supply failure/low pressure shall be provided. A Thermostat switch shall be fitted to the water cooling coils of the diffusion pump protects from excessive heating by switching off the heater. Over Load protection devices for the vacuum pump motor and diffusion pump shall be provided.

#### **e) Ultimate vacuum**

The unit shall be capable to achieve vacuum of  $1 \times 10^{-5}$  m-bar in clean, cool, empty degassed condition with dry Nitrogen back filling. With the incorporation of the Liquid Nitrogen Trap, the system shall have to demonstrate an ultimate vacuum level of  $5 \times 10^{-6}$  m-bar with liquid nitrogen filled in the Liquid Nitrogen trap.

### **iv) Spares**

- |  |   |       |
|--|---|-------|
| a) SS Hose 1", 2 Mtr Long with Kf Couplings  | : | 1 No. |
| b) Set of Neoprene "O" Rings & Gaskets       | : | 1 Set |
| c) Kf Coupling without Flanges Kf 10 / Kf 25 | : | 1 No. |

### **v) General Requirements**

The system shall be provided with suitable vacuum measuring instruments (digital). Vacuum System should be mounted on a trolley having good quality, heavy duty castor wheels. System shall be operated on 230 V single phases AC. All Kf "O" rings shall be made of Viton

material. All electrical lines shall be provided with flexible conduits. System shall have adequate & suitable protections such that the DP does not get "ON" if the power comes back after its failure.

All the components, sub-assemblies and final unit are to be leak tested at a leak range of  $10 \times 10^{-9}$  std cc/sec using a Helium Mass Spectrometer Leak Detector having a sensitivity of  $6 \times 10^{-11}$  std cc/sec.

### **C. Fabrication**

All fabrication shall be as per ASME Section VIII Div. 1

- i) All welding shall be by SMAW only. Welding procedure and welders shall be qualified as per ASME SECTION IX Prior to production welding.
- ii) All weld seams shall be ground flush after completion of welding and prior to final DPT and Radiography.
- iii) Prior to actual production, fabrication drawings and welding procedures shall be approved by the purchaser.

### **D. Inspection & Quality Control**

Supplier shall submit the detailed fabrication procedure along with the offer. This shall include:

- i. Fabrication and inspection stages and testing methods in sequence listing all in details.
- ii. Procedures for welding and stress relieving.
- iii. Weld sequencing and identification.
- iv. Inspection and testing procedure such as Liquid penetrant test & radiography
- v. Identification of witness and hold points in manufacturing plan.
- vi. Welding shall be qualified as per ASME boiler and pressure vessel code Section IX. Fabrication and inspection shall be as per ASME section VIII Div-1 and all NDT procedures as per ASME Section V.
- vii. All butt weld joints shall be 100% radiographed. After fabrication and radiographic clearance,
- viii. Detailed fabrication drawing indicating weld configuration, location, weld joint identification and dished end etc. shall be submitted prior to taking up the production.
- ix. Purchaser's representative shall have complete access to the works and supplier shall provide all necessary instruments, tools and documents etc. to conduct the checks.
- x. Time schedule: The firm shall submit time schedule for the following for timely completion of the order.
  - a) Fabrication drawings/ Fabrication schedule.
  - b) Quality assurance plan & stage wise inspection schedule.
  - c) Welding schedule and Welder's qualification.
- xi. The Vacuum System shall be dispatched after obtaining all clearances from the purchaser. Advance intimation about the readiness of the same for inspection shall be given to the purchaser.

#### **E. QAP (Quality Assurance Plan)**

Supplier shall submit a documented procedure for Quality Assurance Plan and get it approved from the purchaser.

#### **F. Welding requirements**

- i) Welding procedures and welder shall be qualified as per ASME section IX proper to production weld.
- ii) Tungsten electrodes shall be conforming to ASME section-II, part-C, SFA 5.12, EW-Th2.
- iii) DP test shall be carried out by on all weld joints to check surface imperfections.

#### **G. General Technical Requirements**

- i) Supplier shall carry out actual measurements at site and suggest deviations if any to make necessary changes if required.
- ii) Supplier shall prepare its own fabrication drawings as per actual site conditions and should get it approved from concerned authority before commencement of work.
- iii) All fabrication work shall be carried out as per approved drawings only.
- iv) All material supply is in the scope supplier. Supplier shall use all relevant IS standard material for this work. Material testing reports (Chemical, Mechanical etc.) from govt. approved labs should be submitted for approval. Material identification and stamping shall be witnessed by departmental representative.
- v) Supplier shall have to pass weld qualification and only qualified welders shall perform this work
- vi) In case of any technical doubts, supplier shall contact concerned authority for clarifications.
- vii) Supplier shall have to arrange for Arc / TIG welding m/c. along with all consumables (welding electrodes etc) required for this work.
- viii) Gas cutting, arc welding, grinding work etc. shall be carried out with utmost care. Supplier shall follow all safety measures while carrying out such work. Department shall provide gas cylinders for gas cutting purpose if required.
- ix) Burrs, sharp edges, projections etc. caused due to cutting, welding etc shall be removed to maintain smooth surface. Supplier shall maintain best quality workmanship.
- x) Suppliers shall have to give minimum one year guarantee for workmanship, materials and satisfactory performance of the entire system.

#### **H. Final acceptance criterions**

- i) Physical verification of all items and satisfactory performance trials at site, as per the technical specifications.
- ii) Supplier shall clear off all left out material at the end of the work and ensure clean work area before handing over.

- I. Suppliers having knowledge and experiences of preparing above mentioned documentations, BARC procedures, standard welding procedures, safety procedures, material testing and inspection facilities, calibrated equipments etc. shall be preferred for the work contract.

## J. Terms & Conditions

- i) The desired work completion period is 16 weeks from the date of issue of the work order. The quotation shall also contain the work completion period, estimated by the suppliers.
- ii) In case of delay in work completion, supplier may send request letter to concerned authority for extension in work completion period with proper justification for delay. Concerned authority may or may not give extension with / without penalty depending on the justification for delay.
- iii) Any delay which is attributable to the contractor is liable for penalty @  $\frac{1}{2}$  % per week (max. 5%) to be imposed on the contractor.
- iv) Taxes, if any, shall be specified separately.
- v) Percentage of GST payable or included in your offer may be shown separately, i.e., Basic cost. Rs. XXXXX/- plus GST Rs. YYYYY/-= Total Rs. ZZZZZ/- Cost of material. The installation charges applicable respectively may also be specified.
- vi) Income tax @2% will be deducted from the Suppliers bill.
- vii) Contractor may furnish their PAN no. & copy of GST Registration Certificate.
- viii) 100% payment will be arranged after satisfactory completion of work at AFD and on submission of:
  - ix) a) Bills in triplicate, b) Advanced stamped receipt c) Delivery Challan, d) Guarantee Certificate
  - x) Min. two workers & a supervisor shall be present at site during the work. During erection & commissioning of the furnace. The supervisor shall be experienced enough for safety (fire & personal) to oversee the site activities.
  - xi) The upkeep of area is the responsibility of contractor. Any unwanted or extra materials shall be kept at designated area which will be shown by departmental supervisor. For elevated jobs proper Safety Belts shall be used by all workers.
  - xii) Contractor shall obtain police verification certificate (PVC) for all his employees including his supervisors and workers engaged in the work.
  - xiii) Supplier shall obtain Medical Fitness certificates for all his workers involved in this work.

## K. Confidentiality clause

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

- “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 adviser or the employees of a contractor will invite penal consequences under the aforesaid legislation
- Prohibition against use of BARC’s name without permission for publicity purposes. :-The contractor or sub-contractor, consultant, adviser or the employees engaged by the contractor shall not use BARC’s name for any publicity purpose through any public media like Press, T.V. or Internet without the prior written approval of BARC.

## L. Site Visit

- i) The contractor shall have to visit the site to comprehend the scope of work. The same will be arranged by the undersigned. The site can be visited from 26/09/2018 to 27/09/2018 between 10.00 hrs to 14.00 hrs on working days only. However, for site visit, prior intimation of at least two working days is necessary for arranging the entry permits.
  - iii) **Supplier should have the previous experience of design fabrication, erection & commissioning of Vacuum Pumping Systems along with quality assurance plan and should provide documentary evidence for the same while requesting for the site visit.**
  - iv) **The quotations submitted without site visit and documentary evidences of experience will not be considered.**
- ii) Contractor shall have to carry valid Photo identity card (Driving license, passport, Aadhaar card) while visiting this premises. Failing to bring valid identity cards, vendors will not get access into our premises. Further, entry permits will not be arranged for next dates if vendors unable to visit the site on permitted dates for any reasons. Contractor should not carry any type of electronic items such as mobile, pen drive, camera etc with him/her at the time of visit.
  - iv) For preparing entry permit, you can contact the undersigned on ph. No. 25594927 or can mail to [hsharma@barc.gov.in](mailto:hsharma@barc.gov.in) giving complete details of Firm, name of visitors, occupation/designation, identity proof, PVC details, probable date of visit etc.
  - v) Quotations are to be in printed letter head / quotation format which should consists of sales tax registration number registered with local authority / Central authority, PAN of the firm, service tax registration number etc. Quotations that are received in computer generated form will be considered as invalid & rejected.
  - vi) Sealed quotations must be forwarded by **Registered Post or Speed Post ONLY**. Quotations forwarded through any other routes will not be considered.
  - vii) Sealed quotations should be super scribed on the envelope with the reference number of this letter, and should be addressed to and reached by 05/10/2018 (16.00 hrs) to:

**Shri Hariom Sharma**  
TO/D, Technical Services Section,  
Atomic Fuels Division  
Bhabha Atomic Research Centre,  
Trombay, Mumbai-400085  
Phone No. – (022) 25594927  
[hsharma@barc.gov.in](mailto:hsharma@barc.gov.in)

**(Hariom Sharma)**  
TO/D, TSS, AFD

**(Surendra Kumar)**  
SO/H, TSS, AFD  
(for & on behalf of The President of India)

Copy to: Head, AFD

encl: as above