

Government of India
Bhabha Atomic Research Centre
Electromagnetic Application & Instrumentation Division

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Ref: EmA&ID/2021/KM/ P-20233

Date: 20.12.2021

-----To whom so ever it may concern-----

Sub: Development, testing and integration of low temperature Liquid helium still for cryogenic test setup

Dear Sir/Madam,

1. Quotations are invited for development, testing and integration of low temperature Liquid helium still for cryogenic test setup
2. Bidder shall quote for raw material along with engineering supportas per the tender technical specification.
3. Taxes and Excise Duties shall be quoted separately. Form AF / H whichever is applicable shall be provided, if required.

The quotation must reach The Head, Electromagnetic Application & Instrumentation Division by 31.12.2021 and must be sent in a sealed envelope super scribed with the reference number & the due date given above only through India Ordinary Post/Speed Post.

4. The address on the envelop should read:

The Head,
Electromagnetic Application & Instrumentation Division,
RCnD Bldg., North Site
BARC, Trombay,
Mumbai - 400 085.

(Kind Attn: Kallol Mukherjee, SO/D)

5. The bidder shall complete the job within 3 months from the date of firm work order issued to the bidder.
6. Head, Electromagnetic Application & Instrumentation Division reserves the rights to accept / reject any or all quotations without assigning any reason.
7. Quotation must also indicate the validity of offer. Quotation must also indicate the GST No and PAN number of the supplier.
8. The quotation has to be signed by authorized person with company seal.
9. Payment will be made by EFT only after satisfactory completion of work on production of bill, delivery challan and advance stamped receipt. Income tax as applicable will be collected at the time of payment.
10. In case of any technical clarifications, the supplier may kindly contact the indenting officer through email only (Email ID: kallolm@barc.gov.in)

Encl.: Technical Specification Sheet no: EmA&ID/KM/21/08 dated 12.12.2021

Kallol Mukherjee

Kallol Mukherjee
SO/D, EmA&ID

Specification for Tender No: EmA&ID/2021/KM/ P-20233 dated: 20.12.2021

| Specification no. | Revision no. | Date of Issue | No of pages |
|-------------------|--------------|---------------|-------------|
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Development, testing and integration of low temperature Liquid helium still for cryogenic test setup

1.0 SCOPE

Tender invited for DEVELOPMENT, TESTING AND INTEGRATION OF LOW TEMPERATURE LIQUID HELIUM STILL FOR CRYOGENIC TEST SETUP. The complete job shall be carried out strictly as per requirements, specifications and its compliance standards as detailed in this document. In this specification, the supplier shall be referred to as the "supplier" and Bhabha Atomic research Centre shall be referred to as the "buyer".

Supplier shall provide complete raw material and man power support to carry out the above jobs. The supplier shall be qualified as per Para 7.0 of this document. The brief description of contents of the tender specification document is as described below.

Para 2.0 gives the detailed job description and technical requirements.

Para 3.0 gives the general requirements.

Para 4.0 gives the requirements for raw material procurement.

Para 5.0 gives the requirements of inspection and testing.

Para 6.0 gives the requirements of documentation.

Para 7.0 gives the requirements of supplier qualifications.

Para 8.0 gives the requirements of manufacturing and workmanship.

Para 9.0 gives the requirements of welding/brazing specification.

Para 10.0 gives the requirements of applicable standards.

Para 11.0 gives the requirements of pre dispatch inspection.

Para 12.0 gives the confidentiality clause.

2.0 DETAILED JOB DESCRIPTION AND TECHNICAL REQUIREMENTS

2.1 The scope of supplier consists of development, testing and integration of low temperature liquid helium still assembly for cryogenic test setup.

2.2 Still assembly has three part still cup, upper plate of still and film heater assembly. Still cup is cylindrical copper pot. The height of the still should be 30mm and outer diameter should be 73mm. Bottom plate thickness of the still cup should be 5mm. The still inner baffle should be attached to the bottom plate of the still cup.

2.3 The top plate of the still should be properly brazed with the still cup. Thickness of the top plate should be 5 mm. SS-316L made knife edge should be brazed with the top plate.

2.4 Film heater assembly should be machined from a single copper rod. The film heater assembly is connected to the top plate of the still through film heater outer tube. Film heater inner tube should be directly brazed with the assembly. Still cup, bottom plate, top plate film heater and inner baffle of the still should be made up of OFHC copper.

2.5 The film heater assembly should be connected to the DN16 evacuation line. Still heater assembly's inner tube, outer tube and knife edge material should be SS316L/LN

2.6 The total height of the still assembly should be 100 mm. Details of the still assembly shown in figure.

2.7 All the details of the still along with its components shown in figure1. **Vendor should fabricate 02 no's of still assembly as shown in figure.**

2.8 The supplier shall work out the assembly sequence and shall develop standard components with support of outside industry. The developed components shall be integrated inside BARC. The integrated assembly shall be qualified for helium leak testing. The expected helium leak rate is less than 10^{-9} torr.l/s. The helium leak detector for testing shall be provided by supplier.

3.0 GENERAL REQUIREMENTS

3.1 The supplier shall workout a detailed design to meet fabrication requirements and work description, quantity and main fabrication material. They shall submit along with the offer dimensional drawing giving all the salient features, material details of individual items and assembly view of the fixtures.

3.2 The part number and the source of all the hardware's shall be cleared mentioned before purchase of the same from the market. They shall be purchased and installed only after prior approval from BARC. Any component of inferior quantity purchased without prior approval will be rejected strictly.

3.3 The Supplier shall indicate in detail the standards adopted for the materials and processes and the quality control procedures followed by them.

3.4 Supplier can suggest the color, aesthetics, and other details as suitable. Supplier must offer best quality/IS certified material only.

3.5 Supplier should have similar work experience and along with the offer, shall submit the details of past experience with documentary proof.

3.6 Materials, tools, manpower etc required for the above work will not be supplied by the user. Supplier has to arrange the above on his own (No free issue material).

3.7 The supplier shall incorporate minor changes in the design as required at the time of execution of work at no extra cost.

3.8 The above job shall be done strictly under the supervision of our engineers in test facility at BARC premises.

3.9 Working personnel shall observe all the safety precaution during working.

3.10 The working personnel shall behave well with other officers and workers inside BARC campus.

3.11 The contractor shall be solely responsible, in case of any casualty involving working personnel. However, first aid will be provided by BARC.

3.12 General BARC security rules shall apply to all the working personnel.

3.13 Entry permit will be issued on weekly basis and contractor shall have valid photo pass with valid Police Verification certificate (PVC) as per the norms of BARC security.

3.14 Prior permission will be taken from security if the persons are required to do the job on Saturday, Sunday, Holidays and beyond normal working hours (08:00 to 18:00 hrs).

4.0 Job execution requirements

4.1 After placement of firm order, the bidder shall collect the 3D model of the drawings and prepare detailed engineering 2D and 3D drawings. Detailed QA/QC document, inspection and test report format document for approval.

4.2 Assembly of these components shall be carried out to check for any assembly integrity issues.

5.0 Inspection and testing requirements

5.1 QA/QC documents: The supplier shall develop detailed QA/QC document of various fabrication process, inspection and testing requirements. The minimum required documentation is listed below. The QA/QC document shall be mutually agreed upon and signed by authorized persons of the supplier and purchaser.

5.2 Material certification: The supplier shall provide material certification/documents of all the materials.

5.3 Helium leak testing: The components shall be assembled and tested for helium leak testing. The testing shall conform to ASTM/ISO standard. The leak test procedure shall be approved by the purchase before carrying out the testing.

6.0 Documentation requirements

6.1 Technical documentation to be furnished within one month from date of award of the contract

6.1.1 Written programme detailing the design, qualifications, manufacturing, inspection and testing schedules of the system.

6.1.2 The Bidder shall submit a quality assurance (QA) plan to the buyer for acceptance.

6.1.2.1 The plan shall ensure that each item offered for acceptance conforms to the requirements herein.

6.1.2.2 The plan also lists out the leak test, individual welding/brazing qualification, ferrite number measurement.

6.2 Technical documents to be provided prior to starting the fabrication

6.2.1 Qualification test certificates of welder and operators.

6.2.2 Welding/brazing procedure specifications and welding/brazing procedure qualification records.

6.2.3 The inspection procedure, which shall clearly say about the type of intervention required like review, witness or hold points.

6.2.4 The list of the jobs which they want to sub contract and the details of the sub-contractor. The same shall be approved by the buyer before subcontracting.

6.3 Technical documentation prior to final inspection and testing

6.3.1 Weld inspection plan

6.3.2 Material certificates and traceability records

6.3.3 Leak test protocol

6.4 Technical documentation before shipping of the supply

6.4.1 The approved fabrication drawings.

6.4.2 Welding/brazing procedure specification and procedure qualification report as per ASME Section IX.

6.4.3 Leak test report of the sub assembly and the vacuum vessel and the respective leak detector calibration certificates.

6.4.4 Laydown, loading, preparation and shipping procedure for prior approval before shipping of items.

6.4.5 Dimensional check reports.

7.0 Bidders' qualification requirements

7.1 The supplier shall be qualified and experience in carrying out similar such cryogenic jobs previously.

7.2 The supplier shall also provide proof of document for carrying out similar such jobs inside BARC premises.

7.3 A detailed list of machines, facilities available to carry out these systems shall be provided by the supplier.

8.0 Manufacturing and workmanship requirements

8.1 The test setup shall be fabricated to meet the requirements of ASME code and their quality shall be consistent with vacuum service.

8.2 Machining, deburring and polishing

8.2.1 Suitable precaution shall be taken to finish the surfaces communicating with the inside vacuum areas. The preferred technique for the finishing may be only machining. Metal removal other than by machining such as grinding, honing, EDM may be avoided. If polishing has to be done excessive pressure during polishing may be avoided.

8.2.2 The machining coolant shall be sulfur free to reduce outgassing.

8.2.3 Deburring may be with file, deburring knife or using abrasives. Deburring by abrasive vibrating or tumbling may be avoided.

8.3 Cleanliness

8.3.1 The contamination of the stainless steel material shall be avoided. Surfaces shall be cleaned as fabrication is progressing.

8.3.2 Internal surfaces shall be cleaned to remove all trace of oil, grease and other chemical contaminations. Visual examination shall demonstrate the absence of all contaminants and if at all any defects such as dirt, metal chips and sharp edges.

8.3.3 The surfaces communicating with the inside vacuum areas may be subjected to ultrasonic cleaning, high pressure water jet cleaning as per ASTM A380-06.

8.3.4 Parts and assemblies of cryogenic system must be cleaned following a procedure which conforms to the requirements of ISO 23208.

8.4 Electro polishing and Surface finish

8.4.1 The surfaces communicating with the inside vacuum areas shall have a mirror polished (better than 1.6 micron) surface finish.

8.4.2 Electro polishing may be done to the inner surfaces. The electro polishing shall be done as per ASTM B912-02. The surfaces shall be cleaned prior to electro polishing as per ASTM B322-99.

8.5 Buyer reserves the right to witness any or all the fabrication process at the Bidder's facility.

9.0 Welding/brazing specification and its quality requirements

9.1 All welding/brazing shall be performed by qualified welders in accordance with section IX of ASME code or approved equivalent. The certificate of the same shall be send to the buyer if asked. The welding/brazing procedure shall also be qualified in accordance with section IX of ASME code or equivalent.

9.2 All the welds shall be identified by a unique number. All documents related to weld (welder name and qualification, welding/brazing procedure and qualification, filler material certificate, results of nondestructive test etc) shall reference the identifier of the weld.

9.3 All butt welds shall be made with through-thickness penetration.

9.4 Weld surfaces shall not be modified by grinding or by any other form of mechanical abrasion.

9.5 It is the responsibility of the Bidder to evaluate whether post –welding/brazing heat treatment is necessary for stress relieving prior to final machining. If necessary, all heat treatment shall be executed according to written procedures, which shall be submitted to buyer for approval.

9.6 All welding/brazing repairs shall be documented.

9.7 Welding/brazing Procedure Specifications (WPS/BPS) for all joint configurations shall be prepared and submitted for approval. Details for the welding/brazing filler to be used in welding/brazing (if any) shall be mentioned in WPS/BPS along with other details. Welding/brazing procedure and parameters shall be established based on based on the test samples prepared based on WPS/BPS. All the welding/brazing parameters shall be recorded in Procedure Qualification Report (PQR). All welded/brazed samples shall be subjected to tests. After test specimens qualify all the testing, the submitted WPS/BPS shall be approved and followed during entire fabrication activities.

9.8 Radiography and other non-destructive evaluation requirements shall be as per ASME Section V. Nondestructive testing personnel shall be qualified to ISO 9712 to the minimum level 2, industrial sector welding/brazing.

9.9 General Guidelines to be followed during entire welding/brazing/fabrication:

9.9.1 Before welding/brazing all parts shall be cleaned initially with detergent and then with acetone or 1:1:1 Tri-Chloro-Ethane.

9.9.2 As specified in the drawings all welds which are to be done should be Tungsten argon arc welding (TIG) according to ASME – Sec. IX.

9.9.3 During welding/brazing high purity (99.99%) Argon purge gas shall be used to reduce or eliminate oxygen entrainment and carbide precipitation that cause outgassing.

9.9.4 Whenever possible welds shall be made on the inside vacuum side. Trapped volume shall be avoided during welding/brazing on vacuum side surfaces. Full penetration weld shall be employed wherever it is possible. When welding/brazing is to be done on both sides of the wall, continuous welding/brazing on inner side (high vacuum side) and tack welding outside is to be done.

9.9.5 Single pass welds up to a maximum extent is preferred. Interruption during welding/brazing shall be reduced to a minimum possible extent.

9.9.6 Filler material, if used, shall be compatible with the parent material and procured from original manufacturer. Bidder shall submit the material test certificate of filler material from the original Bidder. Bidder shall take approval from buyers, for the use of filler material needed.

10.0 Applicable codes and standards

10.1 Construction of Vacuum and pressure vessel: ASME Boiler pressure vessel Code Section VIII Division I & II latest Version.

10.2 Welding/brazing Qualifications: ASME Boiler pressure vessel code Section IX latest version or ISO equivalent.

10.3 Nondestructive testing as per ASME BPVC section V.

11.0 REQUIREMENTS OF PREDISPATCH INSPECTION

11.1 The complete system will be tested for its requirements as mentioned in Para 2.0. Any deviation of the components/sub systems from the technical requirement will be subjected to rejection of the same.

12.0 CONFIDENTIALITY CLAUSE

12.1 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 disclosing party shall be kept strictly confidential 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 sub-contractors, consultants, advisors or the employees engaged by a party with equal force.

12.2 "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 the contractor will invite penal consequences under the aforesaid legislation.

12.3 Prohibition against the use of BARC's name without permission for publicity purpose. The contractor or sub-contractors, consultants, advisors or the employees engaged by a party shall not use BARC's name for publicity purpose through any public media like: press, radio, TV or Internet without any prior approval of BARC (wide circular ref.: 2/Misc-9/Lgl/2001/92 date 30/04/2001)

Figure: Still for low temperature helium pot

