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CFB, Trombay
MUMBAI - 400 085

**GOVERNMENT OF INDIA
BHABHA ATOMIC RESEARCH CENTRE
Cryo-Technology Division**

Ref: BARC/CrTD/MF/TR/19-20/OPA/184401

Date: 01/10/2019

Tender Due Date: 22nd October 2019.

Subject: Invitation to submit your quotation

On behalf of the President of India, Head, Cryo-Technology Division, Bhabha Atomic Research Centre invites lowest quotation in sealed envelope for the work given below as per the technical specifications enclosed herewith.

S. No.	Description of Job	Completion Period
1	Fabrication of Cryogenic Test Loop of 20 meters span length at CFB, as per Tender specifications.	4 months from date of W.O.

The terms and conditions are given below:

1. Qualifying criteria for bidders

- 1.1 Suppliers willing to bid for above mentioned job shall have been vetted by Security Section of BARC.
- 1.2 All the supervisors and workers required to visit BARC premises, should have valid Police Verification Certificate (PVC). The list of manpower available with firm shall be submitted along with their details of PVC.
- 1.3 The past work experience certificate of the supplier of similar nature in BARC/DAE shall be made available with Work Order copy and satisfactory completion certificate from the user. Also the list of ongoing jobs inside BARC premises with expected completion period shall be provided.
- 1.4 Vendors / Suppliers firm having past experience in fabrication / machining work of cryogenic equipment & piping, only shall be accepted for this work. Accordingly, the details of the vendor's experience may be submitted along with the quotation.
- 1.5 Interested bidders shall contact the undersigned on the mentioned telephone or email, with above given details, for any queries or details.

2. Detailed job description & scope of work: As per Annexure I.

3. Facilities required to be available with the vendor: Machining & fabrication facilities such as CNC machines, for machining of components of materials such as stainless


steel, brass, fiberglass, etc. and for fabrication of cryogenic equipment & piping. Suitable testing facilities for testing of fabricated equipment.

4. The quotation envelope shall be superscripted with **Description of the job and the Tender Ref. No. and Due date**, along with Attn. to, Head, Cryo-technology Division as mentioned below.

Head, Cryo-Technology Division,
278-H, CrTD Office, 2nd floor,
Common Facility Building (CFB),
Bhabha Atomic Research Centre,
Trombay, Mumbai- 400 085

5. The complete quotation shall reach the above address on or before due date i.e. 22nd October, 2019, by **Registered Post/ Speed post**. The quotations will be opened on the next working day at Cryo-Technology Division, BARC between 1400 to 1600 Hrs.
6. **There is no FIM.**
7. **Printed Letter Head:** Quotation should be printed on the letter head; Computer generated quotation is not valid.
8. **Validity of the Offer:** Validity of the offer shall be 90 days from date of opening of quotation.
9. **Guarantee:** Vendor shall have to give guarantee of the quality and workmanship of work done for the period of 12 months from the date of completion of the work.
10. **Offer of Firm:** Offer of those firms, who do not submit their quotation as per the details given in the technical specification and incomplete quotations in any respect will not be considered. Contractor shall quote lump sum price for the execution of the complete job in addition to itemized quote.
11. The department reserves the right to extend the date of opening the quotations. Head, Cryo-Technology Division, BARC reserves the right to accept or reject any or all the quotations without assigning any reason.
12. **Payment Terms:** Accounts Division BARC Mumbai-400085 shall make full and final payment only after submission of the satisfactory work completion certificate issued from the undersigned, bill, guarantee certificate, delivery challan, ECS and advanced stamped receipt. No advance is admissible.
13. **Income Tax Recovery Clause:** Income tax @ 2% will be deducted from the bill.
14. If any of the employee, consultant, or partner of the company is an Ex BARC employee, the same must be stated in the quotation clearly.

- 15. Penalty:** Any delay which attributable to the contractor is liable for penalty @ 0.5 % per week (max 5 %) to be imposed on contractor.
- 16. ST/VAT/PAN Number:** Quotation shall consist of GSTN number registered with local GST authority /CGST authority and PAN number of the firm.
- 17. Quantity Variation Clause:** Quantity variation of $\pm 10\%$ is possible during the execution of the job. Actual payment shall be made based on the actual work carried out by the contractor after completion of entire job. Minor variation in specifications may be possible subject to written approval from the purchaser.
- 18. Safety & Security Rule:** The vendor shall follow all the safety procedures as per the normal industrial practice during the execution of the job at site. Any mishap occurring during the work due to unsafe workmanship shall be the vendor's liabilities. Security and transportation rules at BARC, Trombay premises shall be strictly followed.
- 19. Confidential Clauses:**
- i. Confidentiality:** No party shall disclose any information to any third party concerning 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 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, advisors, or the employees engaged by a party with equal force.
- ii. "Restricted information" categories under section 18 of the Atomic Energy Act, 1962 and "Official secrets" under section 5 of the of the Official Secret Act, 1923:** Any contravention of the above mentioned provisions by any contractor, sub- contractor, consultant, advisor or the employee of a contractor will invite Penal consequences under the aforesaid legislation.
- iii. Prohibition against use of BARC's name without permission for any publicity Purpose.** The contractor or Sub contractor, consultant, advisor or the employees engaged by the contractor shall not be use any public purposes through any media like press, TV, or internet, without the prior written approval of BARC


1-10-2019

Scientific Officer (E) (Tejas Rane)
Government of India, Scientific Officer – E
Cryo-Technology Division, CrTD, BARC
Bhabha Atomic Research Centre, (ranetr@barc.gov.in)
Mumbai – 400 085. (022-25591752)

Technical Specifications for Fabrication of Cryogenic Test Loop of 20 meters span length at CFB

ANNEXURE 1

BARC/CrTD/MF/TR/19-20/OPA/184401, DATED 01-10-2019

**Cryo-Technology Division
Bhabha Atomic Research Centre,
Trombay, Mumbai 400 085.**

<September><2019>

Contents

1. Introduction	3
2. Scope of supply	3
3. Applicable codes, documents and Standards	4
3.1. List of Standards.....	4
4. Technical requirements of flexible metal hoses	4
5. Specification of Materials	5
6. Construction, Fabrication and Assembly	5
6.1. Cleaning.....	5
6.2. Welding	5
6.3. Testing.....	6
7. Notes.....	6
8. Preservation, Packaging and Delivery.....	6
8.1. Preservation.....	6
8.2. Packaging	6
8.3. Delivery	7
9. Payment	7
9.1. Terms of payment.....	7
9.2. Confidentiality.....	7

1. Introduction

Test setup of a CNS facility has been planned at CFB, CrTD, BARC. The test loop of span 20 meters provides for cryogenic flow connecting the refrigerator with the test cryostat. This document details the technical specifications for development of the test loop.

The 20m span test loop consists of the vacuum jacketed supply and return cryogenic piping along with the U-tubes with bayonet joints and the vacuum ports.

2. Scope of supply

The scope of supply for the vendor includes the following—

- 1.1. Austenitic Stainless steel pipes of the following quantity as per table 2.1 shall be supplied by the vendor. Length of each piece shall be 6 meters.

Table 2.1. Details of Stainless steel pipes to be supplied by the vendor

Sr. No.	Item	Details	Quantity (meters)
1	Pipe 1 ¼" NPS (DN 32), Schedule 10	Material : SS304L	60
2	Pipe 3" NPS (DN 80), Schedule 10	Material : SS304L	60
3	Pipe 1" NPS (DN 25), Schedule 10	Material : SS304L	6
4	Pipe 3 ½" NPS, (DN 90), Schedule 40	Material : SS304L	6

- 1.2. In addition, the following items (set of saddle clamps with fasteners, metal flexible hoses and Stainless steel plate) as shown in table 2.2 are also within the scope of supply.

Table 2.2. Additional items to be supplied by the vendor

Sr No.	Item	Details	Quantity
1	Stainless steel Pipe saddle clamps for medium duty, including fasteners (stainless steel bolts and nuts).	-	16
2	Metal Flexible Hoses (Braided bellows) of Austenitic stainless steel (SS304L), Size DN 32, with Flexible length of 200 mm	As per section 4	12
3	Metal Flexible Hoses (Braided bellows) of Austenitic stainless steel (SS304L), Size DN 32, with Flexible length of 400 mm	As per section 4	12
4	Metal Flexible Hoses (Braided bellows) of Austenitic stainless steel (SS304L), Size DN 80, with Flexible length of 250 mm	As per section 4	4
5	Stainless steel 304L sheet (1 m X 1 m X 0.8 mm thick)	Conforming to ASTM 240	1

- 1.3. Welding joints as per the following table 2.3. All welding shall be Tungsten Inert gas welding. Scope of work also includes fitting work of the components for welding.

Table 2.3. Details of weld joints to be executed by the supplier

Sr. No.	Weld pipe size	Material	Number of Welds
1	Pipe 1 ¼" NPS (DN 32), Schedule 10	SS304L	80
2	Pipe 3" NPS (DN 80), Schedule 10	SS304L	110
3	Pipe 1" NPS (DN 25), Schedule 10	SS304L	10
4	Pipe 3 ½" NPS, (DN 90), Schedule 40	SS304L	30
5	Pipe 5" NPS (DN 125), Schedule 10	SS304L	10

Note: The supplier shall provide quotation for each size of weld separately.

- 1.4. Wire Electrical Discharge Machining (EDM) procedure shall be required for fabrication of parts. Following are the pipe sizes and approximate number of cutting operations required.
 1. 3" NPS, Schedule 10, 22 number of cuts.
 2. 5" NPS, Schedule 10, 4 number of cuts.
- 1.5. 100% radiography for all 1 ¼" (DN 32) welds.
- 1.6. Material composition tests for all materials used for fabrication along with test certificates for all materials including filler rods for welds.
- 1.7. Tests and reports for susceptibility to inter granular corrosion test as per ASTM A 262 Practice A/E, for stainless steel materials used in fabrication.

3. Applicable codes, documents and Standards

3.1. List of Standards

- ASME B31.3-2014 Process Piping.
- ASME Boiler and Pressure Vessel (BPV) Code-2015.
- ASME Y14.5M Dimensioning Tolerance Code.
- ASTM A380 Cleaning and De-scaling Stainless Steel Parts.
- Expansion Joint Manufacturers Association, (EJMA), or EN 12434 for cryogenic flexible hoses.

4. Technical requirements of flexible metal hoses

- 4.1. The sizes, flexible length (excluding end sleeves and end connections) and quantity of flexible hoses is listed in table 2.2.
- 4.2. The material of end connections shall be SS304L. All other parts shall be fabricated using Austenitic stainless steel only.
- 4.3. Working pressure of the hoses is 25 bar g.
- 4.4. Leak tightness measured by helium mass spectrometer leak detection is less than 10^{-9} mbar • litre/s. Leak tests shall be carried out at vendor's site.
- 4.5. Items shall be qualified with pneumatic pressure tests.
- 4.6. The approximate static and dynamic bending radius are given in table 2.4.

Table 2.4. Static and Dynamic bending radii of the required flexible hoses

Sr. No.	Description	Bending radius – static (mm)	Bending radius –dynamic (mm)
1	Flexible hose size DN 32	110	250
2	Flexible hose size DN 80	205	450

4.7. The flexible hoses shall be tested for thermal cycling with liquid nitrogen and shall be replaced if any failure occurs.

5. Specification of Materials

- Materials to be supplied by the vendor are mentioned in the scope of supply (table 2.1).
- All materials and process of manufacture shall be new, of high quality and in accordance with good practice pertinent to the manufacture of Stainless Steel components.
- Material composition and all other required tests such as hydrostatic or Non-destructive tests, shall be carried out as per ASME Section II, Part A – SA312 (Specification for seamless and welded austenitic stainless steel pipes).
- All stainless steel materials shall be tested for susceptibility to inter granular corrosion test as per ASTM A 262 Practice A/E. The above material test reports shall be provided for all material supplied by the vendor.
- In case of any deviation, ambiguity or alternatives in specifications, written approval shall be obtained from the purchaser.

6. Construction, Fabrication and Assembly

6.1. Cleaning

- Each pipe supplied, shall be cleaned to provide an inner surface of all pipes and tubes free of grease, flux, moisture, dirt, and other foreign materials by vapour degreasing or suitable pickling process. Surfaces shall be visibly inspected and wiped down with a white cloth. In order to be considered free of contamination, no discoloration shall appear on the white cloth.
- Cleaning agents shall be suitable for the materials of construction, and shall be neutralized if necessary. After cleaning, each section shall be blown dry with clean dry air until no visual moisture remains.

6.2. Welding

- The number of welds and details are mentioned in scope of supply (Table 2.3).
- All weld joint preparation and welding techniques shall be performed in accordance with Section VIII-Division 1 and IX of the ASME BPVC and/or Chapter V of the ASME B31.3 code.
- All the welding machines, equipment and filler rods (as per ASME B 31.3/ ASME Section II) and shielding gas (Argon – 99.995% pure) shall be provided by the supplier and welding is required to be done at purchaser's site.
- The Supplier shall conduct the tests required to provide a Procedure Qualification Record (PQR) for each Welding Procedure Specification (WPS) as required by Section VIII-Division 1 and Section IX of the ASME BPVC and/or Chapter V of the ASME B31.3 code.

- The Supplier shall conduct the tests required to qualify each welder to a Welder Performance Qualification (WPQ) as required by Section VIII-Division 1 and IX of the ASME BPVC and/or Chapter V of the ASME B31.3 code.
- The Supplier shall maintain records in accordance with paragraph UW-48 Section VIII-Division 1 of the ASME BPVC for all welders and welding operators working on the Transferline.
- All welding performed shall utilize the Gas Tungsten Arc Weld (GTAW) process using welding quality argon gas for the inert shield.
- All welds shall be internally purged with welding quality argon gas during the time of welding and post welding treatment.
- Welds that show evidence of a lack of purge shall not be accepted.
- All welding shall be performed in such a manner that the weld surface is smooth and free of irregularities. All external surfaces in the weld area shall be cleaned of heat tint, slag, and other deposits.
- All WPS, PQR, and WPQ documents shall be qualified in accordance with ASME BPVC Section VIII-Division 1 paragraphs UW-28 and UW-29 and Section IX of the ASME BPVC and submitted and approved by purchaser.
- The Supplier shall supply weld maps which identify each weld and name of welder performing the weld.

6.3. Testing

- 100% Radiography tests shall be carried out for all welds for Pipe 1 ¼" NPS (DN 32), Schedule 10 only, and will be done at purchaser's site as per ASME B 31.3.
- All welds shall be leak tight in Helium Mass spectrometer Leak Detection (MSLD) with an allowable maximum leak rate of 10^{-9} mbar • litre/s. Leak tests are in scope of the purchaser.
- The Supplier shall submit genuine reports of all tests carried out at the time of on-site inspection.

7. Notes

- The Supplier shall have adequate experience in fabrication of cryogenic equipment.
- The number of weld joints as mentioned in table 2.3, are approximate. In case lesser number of welds are executed, the payment shall be for the welds executed only, as per the rates given in the quotation.
- Minor changes in drawings / specifications may be possible without significantly affecting the scope of work. However any deviations in specifications if required shall be carried out only after written approval from Purchaser.

8. Preservation, Packaging and Delivery.

8.1. Preservation

- All the pipes shall be protected for the entire period of storage and dispatch against damage due to atmospheric factors and rough handling in transit.
- The pipes shall be preserved in their finished form, retaining their surface finish and dimensions.

8.2. Packaging

- Sound packaging of suitable material conforming to the size and weight of the contents shall be used.

- The equipment shall be securely fastened and packed to prevent shifting, rolling or rattling.
- Following particulars shall be clearly marked on both sides of all packages in block letters, with water proof paint.
- Destination b) Purchase order No and date c) Dimensions d) Gross weight and e) Handling instructions (if any).

8.3. Delivery

- It is the responsibility of the manufacturer to arrange for the delivery of the pipes at the purchaser's site.
- The equipment shall not be dispatched without prior consent of the purchaser. The consignee as well as person concerned at the place of delivery shall be intimated at least 10 days in advance about the dispatch of the equipment.
- The delivery and completion of work shall be 4 months from date of receipt of Work order, which may be extended, only after approval from purchaser.
- Any delay which is attributed to the contractor is liable for penalty @ 1/2% per week (max.5%) to be imposed on the contractor. However, in case any extension in delivery is to be granted to contractor, party's request for extension may be called for before expiry of work Order. The same may be justified by the Division, whether extension granted is with or without levy of liquidated damages.

9. Payment

9.1. Terms of payment

- No advance payment shall be made.
- Full payments shall be made only after completion of the job.
- The number of weld joints as mentioned in table 2.3 are approximate. In case lesser number of welds are executed, the payment shall be for the welds executed only, as per the rates given in the quotation.
- Payment shall be made through ECS, by Accounts Officer, BARC. The fabricator shall have to submit in advance duly signed and stamped receipt along with the bills, for the immediate payment.

9.2. Confidentiality

- Party shall not disclose any information to any third party concerning the matters under this contract generally. In particular, any information identified as "Property" 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, advisers or the employees engaged by the 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 vendor, sub-contractor, consultant, adviser or the employees of a vendor will invite penal consequences under the aforesaid legislation.