

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

Ref: EmA&ID/22/1/35069

Date: 14/03/2022

**Sub: Development, laser cutting, end sealing & installation of Multi-layer insulation blankets on multi coil superconducting magnet**

Dear Sir/Madam,

1. Quotations are invited for development, laser cutting, end sealing & installation of Multi-layer insulation blankets on multi coil superconducting magnet.
2. Bidder shall quote for Support for development, laser cutting, end sealing & installation of Multi-layer insulation blankets on radiation shields & cold mass of superconducting magnet. The above mentioned job will be carried out at RCnD Building, & CFB Building BARC.
3. Taxes and Excise Duties shall be quoted separately. Form AF / H whichever is applicable shall be provided, if required.
4. **The quotation must reach The Head, Electromagnetic Applications & Instrumentation Division by 23/03/2022 and must be sent in a sealed envelope super scribed with the reference number & the due date given above. The quotations must be send by speed post/ registered post only.**
5. The address on the envelop should read:

**The Head,  
Electromagnetic Applications & Instrumentation Division,  
RCnD Bldg., North Site  
BARC, Trombay,  
Mumbai - 400 085.  
(Kind Attn: Udai Giri Pratap Singh Sachan, SO/D)**

6. The fabrication job, assembly & integration of loop shall be done in the presence of our engineers. A minor modification in the loop drawings shall be done in presence of our engineers. All tools and components will be provided by purchaser. However this needs to be handled as per procedures. The purchaser is not responsible for any injury to personnel during carrying out the above jobs.
7. The bidder shall complete the above mentioned job within 12 weeks from the date of firm work order issued to the bidder.
8. Head, Electromagnetic Applications & Instrumentation Division reserves the rights to accept / reject any or all quotations without assigning any reason.
9. Quotation must also indicate the validity of offer.
10. Technical specification must be returned along with the offer.
11. Quotation must also indicate the VAT no and PAN no of the party.
12. The quotation has to be signed by authorized person with company seal

Encl.: Technical Specification Sheet no.- EmA&ID/MR/MLR/01

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Udai Giri Pratap Singh Sachan  
(SO/D, EMAS, EmA&ID)

## Specification for Minor Fabrication Work order

Specification no.	Revision no.	Date of Issue	No of pages
EmA&ID/MR/MLR/01	0	01/03/2022	03

### Development, laser cutting, end sealing, testing & installation of Multi-layer insulation blankets on multi coil superconducting magnet

#### **1.0 SCOPE**

Tender is invited for support for design, development, laser cutting, end sealing & installation of Mylar blankets on radiation shields & cold mass of superconducting magnet. inside BARC premises. The complete job shall be carried out 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 as the "buyer".

Supplier shall provide complete manpower support to carry out the above mentioned job successfully. The supplier shall arrange for the required raw material/ components etc required for development & integration of Mylar blankets on radiation shields & cold mass after obtaining approval from purchaser. Supplier shall be qualified as per Para (7.0). The brief description of contents of this tender specification document is as described below.

Para 2.0 gives detailed job description.

Para 3.0 gives the general requirement details.

Para 4.0 gives requirement of raw material procurement

Para 5.0 gives requirement of engineering manufacturing and workmanship.

Para 6.0 gives the inspection and testing

Para 7.0 gives the requirements of supplier qualifications.

Para 8.0 gives the requirements of price and delivery schedule.

#### **2.0 DELIVERABLES**

S. No:	Description	Quantity
	Development, laser cutting, end sealing, testing & installation of Mylar blankets on radiation shields & cold mass of superconducting magnet	
1	Mylar blankets for thermal shield -04 Nos; Mylar blankets for cold mass-04 Nos and the leftover Mylar rolls & tapes	01 Set

#### **3.0 DETAILED JOB DESCRIPTION**

Development of Mylar blankets is required for radiation shields & cold mass of 2 Tesla room temperature bore superconducting magnet.

- I. 1.5-Tesla Nb-Ti wounded superconducting magnet is cooled by two stage pulse tube cryocooler. The heat removal capacity of these cryocoolers is limited to 1.5 watt at 4.2 K for second stage and 40 W at 50 K for first stage.
- II. Radiation losses of the horizontal magnet are reduced by installation of intermediate temperature thermal shield. PT Cryocoolers are used to extract heat loads from these thermal shields.
- III. Aluminized Mylar (MLI) is wrapped on outer surface of these shields to reduce radiative thermal heat load of the magnet.

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- IV. Cryocooler extenders are used to connect low temperature ports of the magnet to 4.2 K. Construction material of cryocooler extenders have to be strictly OFHC copper in such a way that minimum 4 numbers of straps can be connected with it.
- V. The vessel is 1.2 meters long with an outside diameter of 1.3 meters. Cryostat comprises of a vacuum vessel, radiation shields at 50 K, cold mass at 4.2K, magnet suspending system (tie rods and compression posts), current leads, thermal interconnects, cold plates, cold fins, quench protection system etc. All the above mentioned components/systems operate at cryogenic temperatures.
- VI. To limit the heat load up to  $2\text{W}/\text{m}^2$ , three layers of blankets are required on thermal shields. Magnet cold mass also requires three layers of blanket wrapping.
- VII. All the blankets need to be laser cut with laser tube power restricted to 100 watts.
- VIII. MLI blankets engineering drawings has to be developed by the supplier. Once blanket design is approved by the purchaser, then only supplier has to move for laser cutting of the blankets. The cut blankets have to be strictly as per the approved design. The dimensional tolerances for the blankets along length and breadth is 2 mm only. Supplier has to arrange for laser cutting machine of medium power.
- IX. During laser cutting of the blankets sacrificial layer has to be used. After laser cutting of the blankets, the same shall be visually inspected for end sealing. If the blanket ends are sealed less than 80 % in perimeter dimension, the same shall be discarded.
- X. Supplier has to ensure that during blanket cutting there should be no tear or burn marks on the blanket.
- XI. Supplier has to use fresh Mylar roll whose manufacturing date is not more than two months.
- XII. Buyer reserves the right to discard the Mylar roll if any signs of oxidation is found.
- XIII. Utmost care has to be taken during installation of MLI blankets to avoid tearing. Only aluminized Mylar tapes shall be used for blanket installation. If required Velcro tapes of white color may be used.
- XIV. Supplier has to purchase Coolcat MLI blanket rolls of 50 meters and Mylar tapes for blanket installation.
- XV. After laser cutting of blankets, the same shall be kept in a low humidity ( $< 50\%$ ) environment. During storing of these blankets no heavy weight shall be put on the blanket. There shall be no wrinkles on the blanket.
- XVI. If the blanket gets damaged during installation, supplier has to replace it.
- XVII. During installation of consecutive layers staggering has to be carried out. Blankets has to handle by wearing lint free gloves only. No cryogenic part of the magnet system shall be exposed to 50 K or 300 K. Similarly, no part of radiation shield shall be exposed to 300 K directly.
- XVIII. After blanket installation shortening of blankets with 50 K & 300 K surfaces will be checked. Once it is confirmed by the purchaser that there is no shortening in the blankets, sealing of vessel will be carried out.

### **3.0 GENERAL REQUIREMENTS**

- i. The supplier shall workout a detailed design to meet fabrication requirements and work description, quantity and main fabrication material. He shall submit along with offer dimensional drawing giving all the salient features, material details of individual items.
- ii. Supplier shall arrange for a laser cutting machine whose bed dimensions is more than  $3\text{m}\times 2\text{m}$ . Supplier has to arrange for argon cover gas.

- iii.** It is expected that the laser cutting length of the blanket is approximately 45 meters for which 1 roll shall suffice. In case if the blanket gets wasted at the time development, supplier has to arrange for extra rolls.
- iv.** Supplier should have similar work experience and along with the offer shall submit the details of past experience with documentary proof.
- v.** Supplier shall supply skilled manpower (fitters & electronic technicians) for the above mentioned job.
- vi.** The above job shall be carried out strictly under the supervision of our engineers in test facility at BARC premises.
- vii.** Working personnel shall observe all the safety precaution during working.
- viii.** The contractor shall be solely responsible, in case of any causality involving working personnel. However first aid will be provided by BARC.
- ix.** General BARC safety rules shall apply to all the working personnel.
- x.** 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.
- xi.** 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).
- I.** Job Location: CFB Building, RCnD Building, New RCnD Building

#### **4.0 RAW MATERIAL**

The following materials shall be used

- I. COOLCAT 2NW super insulation for MLI blankets
- II. COOLCAT B-R 50 double sided aluminized adhesive tapes with polyester carrier, COOLCAT 1050 low absorptivity adhesive tapes with aluminium carrier

#### **5.0 ENGINEERING MANUFACTURING & WORKMANSHIP REQUIREMENTS:**

- I. Blankets shall not be oxidized and it shall be kept in a moisture free box.
- II. Blankets shall not be touched with bare hands. Always lint free blue color hand gloves shall be used.
- III. Suitable precautions shall be taken while laser cutting of the blankets. Cover gas shall be provided before cutting starts.

#### **6.0 INSPECTION & TESTING**

- I. Visual inspection of the blankets shall be carried out. During cutting and integration operations there should be no wear and tear of the blankets.
- II. Dimensional checks may be performed on MLI blankets.

#### **7.0 REQUIREMENTS OF SUPPLIER QUALIFICATIONS**

**I.Past experience:** The supplier must give their past one-year turnover and job executed by them with reference, volume of work and completion schedule, present commitments and anticipated commitments inside and outside India.

#### **8.0 REQUIREMENTS OF PRICE AND WORK COMPLETION**