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

Ref: EmA&ID /EMAS/2020/112741  
Date: 05/11/2020

Sub: Fabrication, cutting & stamping of electrical steel sheets from mother coil

Dear Sir/Madam,

1. Quotations are invited for fabrication, cutting & stamping of electrical steel sheets from mother coil.
2. Bidder shall quote for fabrication, cutting & stamping of electrical steel sheets from mother coil.
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 13th November, 2020 and must be sent in a sealed envelope super scribed with the reference number & the due date given above.
5. The quotations must be send via speed post or registered post only.
6. The address on the envelop should read:
   
   The Head, Electromagnetic Applications & Instrumentation Division,
   RChD Bldg., North Site
   BARC, Trombay,
   Mumbai - 400 085.
   (Kind Attn: Shri Uday Giri Pratap Singh Sachan)

7. Necessary inspection facilities should be provided to our engineer during fabrication at bidder’s premises.
8. The bidder shall deliver the finished components after approval by our engineer within 4 weeks from the date of firm work order issued to the bidder. The finished components along with the left over material shall be delivered by the bidder at Electromagnetic Applications & Instrumentation Division, BARC, Trombay, Mumbai - 400 085.
9. Head, Electromagnetic Applications & Instrumentation Division reserves the rights to accept/ reject any or all quotations without assigning any reason.
10. Delivery charges if any must be clearly mentioned in the offer.
11. Quotation must also indicate the validity of offer.
12. Quotation must also indicate the GST no and PAN no of the party.
13. The quotation has to be signed by authorized person along with company seal.

Encl.: Specification Sheet no.- ES/MC/LM

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

Copy to:
1. BARC website for uploading
Annexure A

<table>
<thead>
<tr>
<th>Technical Specification no.</th>
<th>Date of Issue</th>
<th>Total no of pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dipole/Core/Lam</td>
<td>27/10/2020</td>
<td>7 Nos</td>
</tr>
</tbody>
</table>

Fabrication, cutting & stamping of electrical steel sheets from mother coil

1. **SCOPE**

Tender is invited for supply, fabrication, cutting and stamping of electrical steel sheets from mother coil roll as per the conceptual design drawings provided in this specification 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”.

The general description of the water cooled long dipole magnets is provided in the Para 4.0. The technical specifications of the electromagnet and its subcomponents are provided in the Para 5.0. Supplier shall arrange required raw material/ facilities for manufacturing, rerolling, plaining, die punching, laser cutting, water jet cutting, dimensional measurement testing of long dipole magnet laminations. Suppliers shall cut the laminations and test the same for acceptance testing as per the Para 6.0.

The suppliers shall be evaluated based on the supplier’s pre-qualification requirement mentioned in the Para 7.0. The technical documentation required for evaluation shall contain details as requested in the Para 8.0. Only overall cost will be compared.

The brief description of contents of the tender specification document is as described below.

Para 2.0 gives the details of deliverables.
Para 3.0 gives the statement of purpose.
Para 4.0 gives the general description.
Para 5.0 gives the technical requirements.
Para 6.0 gives the inspection and testing requirements.
Para 7.0 gives the suppliers prequalification criteria
Para 8.0 gives the information required with the tender.
Para 9.0 gives the documentation requirements.
Para 10.0 gives the installation and commissioning requirements.
Para 11.0 gives the quality assurance requirements.
Para 12.0 gives the packaging and safe delivery requirements.
Para 13.0 gives the price and delivery schedule requirements.

2.0 DETAILS OF DELIVERABLES

<table>
<thead>
<tr>
<th>S.No</th>
<th>Component</th>
<th>Nos</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fabrication, cutting &amp; stamping of electrical steel sheets from mother coil</td>
<td>1 Set</td>
</tr>
</tbody>
</table>
3.0 STATEMENT OF PURPOSE

3.1 The water cooled long dipole magnet is used to generate 1.6 Tesla magnetic field with a field uniformity of 180 ppm in an air gap volume of 0.254 mm and 1000 mm long. The magneto motive force required for generating the magnetic field is provided using water cooled OFHC conductor coils supported in the H- shaped magnet yoke assembly.

3.2 During normal operation the 8000A current is passed through the magnet coils. The joules loss generated in the magnet coil (32 KW) is removed using demineralized low conductivity water cooling system. The total flow rate to the magnet coil is around 86 LPM with a pressure drop of 7 bar.

3.3 The fabrication of coil is not in the scope of the supplier. However, for assembly purpose supplier has to fabricate a dummy coil of any low cost material so that the fitment of coil with core can be checked.

3.4 The list of design drawings of the long dipole magnet core and its part components drawings are provided in the Annexure-II of this specification sheet.

4.0 GENERAL DESCRIPTION

4.1 The long dipole magnet consists of H- shaped yoke. The H- shaped yoke assembly shall be fabricated using ferrous silicon sheets of thickness 0.5 mm. The H shaped core assembly consist of trimmed laminations for end packs, body laminations for central portion, long tie plates to hold the laminations in compressed state, short tie plates for integration of both the half cores. The Silicon Steel (as per standard IS:648 Grade: 50C700) plates of thickness 0.5mm and C5 insulation (organic insulation, thickness 2 - 5 microns) has to be purchased by the supplier.

4.2 The details of electrical steel sheets are as given below:

Table 1.0:

<table>
<thead>
<tr>
<th>Grade/Coating/Dimension Details</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. No:</td>
<td>Particulars</td>
</tr>
<tr>
<td>1</td>
<td>Grade</td>
</tr>
<tr>
<td>2</td>
<td>Coating</td>
</tr>
<tr>
<td>3</td>
<td>Avg. Coating Thickness</td>
</tr>
<tr>
<td>4</td>
<td>Insulation Resistance</td>
</tr>
<tr>
<td>5</td>
<td>Nominal Thickness</td>
</tr>
<tr>
<td>6</td>
<td>Width</td>
</tr>
<tr>
<td>7</td>
<td>Thickness Tolerance</td>
</tr>
<tr>
<td>8</td>
<td>Coil Weight in MT</td>
</tr>
<tr>
<td>9</td>
<td>Coil ID</td>
</tr>
<tr>
<td>10</td>
<td>Burr</td>
</tr>
<tr>
<td></td>
<td>50C700</td>
</tr>
<tr>
<td></td>
<td>C-6A</td>
</tr>
<tr>
<td></td>
<td>0.4 ~ 1.0 microns</td>
</tr>
<tr>
<td></td>
<td>&gt; 0.5</td>
</tr>
<tr>
<td></td>
<td>0.5 mm</td>
</tr>
<tr>
<td></td>
<td>1000-1200 mm</td>
</tr>
<tr>
<td></td>
<td>± 15 microns</td>
</tr>
<tr>
<td></td>
<td>4 MT-6MT</td>
</tr>
<tr>
<td></td>
<td>508±10mm</td>
</tr>
<tr>
<td></td>
<td>&lt; 20 microns</td>
</tr>
</tbody>
</table>
Magnetic & Mechanical properties (Grade 50C700) are listed below:

Table 2.0:

<table>
<thead>
<tr>
<th>Assumed Density (Kg/dm³)</th>
<th>Magnetic flux density (Tesla)</th>
<th>Tensile Strength (N/mm²)</th>
<th>Yield Strength (N/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.64 (Typical) @2500AT/m</td>
<td>&gt;1.7 (Guaranteed) @5000AT/m</td>
<td>385+20</td>
<td>260+20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hardness at HV1 in VPN</th>
<th>Lamination Factor %</th>
<th>Elongation @ 50mm GI in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>125±15</td>
<td>&gt;96 Guaranteed</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>98 Typical</td>
<td></td>
</tr>
</tbody>
</table>

4.3 The pole profile shape of the magnet is important and the required pole profile indicated in the appropriate drawings shall be fabricated strictly according to the specified dimension details provided in the drawings within the given tolerance limits. The same shall be checked after the assembly of the complete yoke. To achieve the required uniformity poles have been provided with shims.

4.4 The magneto motive force (MMF) required for generating the magnetic field in the air gap is achieved using two sets of water cooled coils. These coils will be mechanically fastened/supported to the poles of the yoke assembly. Both water cooled racetrack coils are connected in series electrically and in parallel hydraulically.

4.5 The dimensional measurement of the yoke laminations, die punching/water jet cutting/laser cutting shall be carried out at the suppliers premises before the magnet stacking.

5.0 TECHNICAL REQUIREMENTS

5.1 H-SHAPED YOKE ASSEMBLY

5.1.1 The H shaped yoke assembly will be carried out on v groove linear guides. These guides are commercially available in length of 6.1m (approx.). Linear guides with inbuilt Sagitta of 16 mm shall be purchased from the supplier. Assembly of H shaped dipole magnets will be carried out in two halves. For stacking of laminations minimum number of 4 v groove linear guides shall be used.

5.1.2 Laminations shall be cut by either die punching water jet cutting/laser cutting. If the laminations are cut by die punching, then deburring operations has to be carried out. Each lamination shall be checked by Go/No Go gauges and random samples (1 out of 20) shall be checked as per CMM measurements.

6.0 INSPECTION AND TESTING REQUIREMENTS

The tests listed are the minimum required and are not intended to supplant any controls, examinations, inspection, or tests normally employed by the supplier to assure the quality of the product.

6.1 At suppliers premises

6.1.1 Lamination testing:

6.1.1.1 After stamping random samples of laminations will be selected for CMM measurement. In every 50 laminations, one lamination will be selected for CMM
measurement. If the random sample is not as per the dimensional tolerances, then all samples (50 Nos) will be rejected

6.2 At buyers premises

6.2.1 After delivery, the core shall be assembled in the buyer’s premises and visually inspected for mechanical damage suffered during transit.

7.0 REQUIREMENTS OF SUPPLIER QUALIFICATIONS

7.1 The supplier shall be evaluated on the basis of the following criteria

7.1.1 The supplier shall have three years minimum experience in development and stacking of medium power transformers and motors. Proof document of the same shall be submitted along with the tender.

7.1.2 A list of previous projects, similar or comparable in size and scope to assess the supplier’s viability and ability to accomplish the job.

8.0 INFORMATION REQUIRED WITH THE TENDERS

8.1 The bidder shall provide with the tender documents sufficient information for technical evaluation of the supplier. These shall include

8.1.1 A draft time schedule showing the manufacturing & testing of the yoke.

8.1.2 A list of previous projects, similar or comparable in size and scope to assess the supplier’s viability and ability to accomplish the job.

8.1.3 The supplier shall provide the following details

8.1.3.1 Human resources: The details of human resources including Engineers, assembly mechanic, quality control inspector etc.

8.1.3.2 Infrastructure: The details of infrastructure suitable for execution of the job such as etc.

8.1.3.3 Past experience: The supplier shall give their past three year turn over and job executed by them with reference, volume of work and completion schedule, present commitments and anticipated commitments inside and outside India.

8.1.3.4 Sub Contract: Supplier shall list the jobs, which they want to sub-contract. They should also produce the list of sub-contractors and their infrastructures and facilities.

8.1.4 The supplier shall provide the following specific technical information

8.1.4.1 Engineering Design: Proposed method of supporting the magnet assembly and its subassembly components.

9.0 DOCUMENTATION REQUIREMENTS

9.1 Documentation to be furnished after the receipt of purchase order and before fabrication/integration jobs

9.1.1 The mutually finalized proposed schedule for the execution of the project.

9.1.2 Manufacturing drawings of the cores and its support structures

9.1.3 Details of the proposed techniques for the machining to be carried out on the yoke assembly.

9.1.4 List of the tests (electrical, mechanical and hydraulic) to be carried for the coils, magnet yoke and assembled magnet.

9.2 Documentation to be furnished along with the supply of system

9.2.1 Approved manufacturing drawings of the core and its support structures.

9.2.2 Test report on the dimensional measurement test which has been carried out on magnet yoke and assembled magnet.
10.0 INSTALLATION AND COMMISSIONING REQUIREMENTS

10.1 The supplier shall carry out the installation and commissioning of the electromagnet core at the buyers site. All expenses such as to and fro travel fare, hotel, lodging, boarding, conveyance and any other incidental expenses towards deputation and stay of the suppliers engineers for installation and commissioning of the equipment at buyers site shall be borne by the supplier.

10.2 It will be the supplier’s responsibility to arrange police verification certificate for his workmen/technicians/engineers to enable carrying out installation/erection commissioning of the magnet inside the buyers premises.

11.0 QUALITY ASSURANCE REQUIREMENTS

11.1 The supplier shall maintain a documented quality assurance program that will insure that each item offered for acceptance or approval conforms to the requirements. The requirements of the ISO 9001 shall be considered as a guideline for the QA plan.

11.2 Quality surveillance and expediting, relating to all the aspects of the contract will be carried out by the purchaser or his authorized representative for which purpose the supplier and his subcontractor shall

11.2.1 Allow access at all reasonable times during manufacture, assembly and testing to the premises in which the work is being carried out.

11.2.2 Furnish the latest drawings and/or tooling, gauges, instruments, testing equipment etc. required for inspecting the jobs. Prints of all the latest required drawings and approved procedures shall be made available for inspection and retention, if so desired.

11.2.3 Produce an inspection plan to the purchaser’s satisfaction and notify when checkpoints on the plan are imminent so that the purchaser’s representative may be present, if it is so desired.

11.2.4 Obtain acceptance of the components in the form of a shipping release from the purchaser’s representative before the shipment.

11.3 The supplier shall be responsible for the inspection of the components that is subcontracted by them.

11.4 Waiving of quality surveillance by the purchaser’s or acceptance of the items by the purchaser or his authorized agent, shall not relieve the supplier from the responsibility for supplying the items in accordance with specification requirements of this document and purchase order.

12.0 PACKAGING AND SAFE DELIVERY REQUIREMENTS

12.1 Each component shall be marked with supplier’s identification as well as the identification indicated in drawing in such a way that the markings can be conveniently read and cannot get destroyed during handling, cleaning, etc.

12.2 Supplier shall make necessary arrangements for all components using a suitable PVC cover or molded thermocol. Proper care should be taken while handling the component during inspection, testing and packing. Acceptance of the system will be made only after the complete magnet testing at buyer’s premises.

12.3 After completion of all testing and identifying the components, the components shall be packed suitably for shipment, so that no damage occurs in transit. The purchaser shall subject the packing procedure to prior approval. At least one copy of packing list shall be kept in the package for quick and easy verification.

12.4 The supplier shall be responsible for proper and safe delivery. The supplier shall provide support for the installation of the electromagnet at buyer’s premises.
13.0 PRICE AND DELIVERY SCHEDULE REQUIREMENTS

13.1 Overall lump sum cost will be only compared. However, the supplier shall provide the break up cost of individual items, cost for installation, testing etc.