

**NOTICE FOR EXPRESSION OF INTEREST (EOI) AND  
SELECTION OF CONTRACTOR FOR**

**"WORK CONTRACT FOR ASSEMBLY, ERECTION OF  
STEADY STATE TOKAMAK- SST-1"**

**(EOI No. EOI/IPR/ 001/09-10 DATED 8-05-2009)**

<b>LAST DATE FOR ISSUE OF EOI DOCUMENTS</b>	<b>28<sup>th</sup> MAY, 2009</b>
<b>DUE DATE FOR SUBMISSION OF PROPOSAL</b>	<b>19<sup>th</sup> JUNE, 2009</b>

**INSTITUTE FOR PLASMA RESEARCH  
NEAR INDIRA BRIDGE  
BHAT, GANDHINAGAR-382428,  
GUJARAT STATE, INDIA**

**PHONE: 079-2396 2000/2121/2122/2125/2126  
FAX: 079 2396 2277**

**INSTITUTE FOR PLASMA RESEARCH  
NEAR INDIRA BRIDGE, GANDHINAGAR HIGHWAY  
BHAT, GANDHINAGAR 381 418  
GUJARAT STATE**

**PHONE: 079-2396 2000/2121/2122/2125/2126  
FAX: 079 2396 2277**

**NOTICE FOR EXPRESSION OF INTEREST (EOI) AND  
SELECTION OF CONTRACTOR FOR ASSEMBLY AND  
ERECTION OF  
STEADY STATE TOKAMAK- SST-1**

**(EOI No. EOI/IPR/ 001/09-10 DATED 8-05-2009)**

Expression of Interest (EOI) is invited from reputed contractors for "**Assembly, Erection of Steady State Tokamak (SST-1)**" at Institute For Plasma Research (IPR).

The EOI document containing eligibility requirements, technical description of work contract for assembly, erection of SST-1 can be obtained from the Purchase Officer, Institute for Plasma Research, Bhat, Gandhinagar - 382428, Gujarat, India. The EOI documents can also be downloaded from IPR Website [www.ipr.res.in/purchasetenders.html](http://www.ipr.res.in/purchasetenders.html). The EOI documents will be issued up to 28-05-2009

Interested and eligible contractors may submit the EOI proposals along with the supporting documents mentioned in the EOI document to the Purchase Officer, Institute for Plasma Research, Gandhinagar at the above address latest by **19<sup>th</sup> June 2009** super scribing the envelope with "**EOI No:EOI/IPR/001/09-10 dated 08-05-2009 for work contract for assembly, erection of SST-1**".

## **1. INSTRUCTIONS TO PARTIES AND TERMS & CONDITIONS:**

This is an invitation for the "Expression of Interest" (EOI) for work contract for assembly, erection of SST-1. This SST-1 machine will be used for generation and confinement of steady state plasma for experimental and research works for future generation nuclear fusion based power reactors.

Following are general instructions to parties and terms and conditions.

- (a) This invitation of EOI is for work contract for assembly, erection of SST-1 at IPR.
- (b) This is a notice for submission of EOI proposal, not a tender notice.
- (c) EOI proposals are invited from Engineering Industries (contractors) registered in India and operating here for at-least last 5 years.
- (d) The EOI proposal document containing contractor eligibility requirements, technical description and scope of work etc. can be obtained from the Purchase Officer, Institute for Plasma Research, Near Indira Bridge, Bhat, Gandhinagar: 382428, Gujarat, India. While requesting for the EOI documents, such request shall indicate the **"REQUEST FOR THE EOI PROPOSAL DOCUMENT AGAINST NOTICE EOI/IPR/001/09-10 DATED 8/05/09 FOR WORK CONTRACT FOR ASSEMBLY, ERECTION OF STEADY STATE TOKAMAK SST-1"**. The request for EOI documents by post/courier should reach to Purchase Officer, IPR latest by 28/05/2009
- (e) The EOI documents can also be downloaded from IPR Website: [www.ipr.res.in/purchasetenders.html](http://www.ipr.res.in/purchasetenders.html).
- (f) Parties who have responded to this EOI notice and selected as per terms and conditions given in the EOI document, will only be eligible to participate in tendering process.
- (g) **Last date to submit the EOI Proposal:** The EOI proposal should be submitted to the Purchase Officer, Institute for Plasma Research, at the above address on or before **19<sup>th</sup> June 2009**.
- (h) Request for the extension of due date for submission of EOI proposal beyond the date as mentioned above, will not be considered.
- (i) EOI proposals which are received late (after 19-06-2009) or delayed in transit will not be considered. IPR will not be responsible for postal / courier delays or any other delays in receipt of the request for EOI proposal documents. EOI notice number with date, due date and title of EOI should be mentioned on envelop, without which EOI may not be considered.
- (j) The EOI proposal should be valid for a period of 180 days from the due date.
- (k) Party submitting the EOI proposal against this notice shall be deemed to have read and understood the terms and details mentioned in EOI document in complete.
- (l) Where counter terms and conditions have been offered by the party the same shall not be deemed to have been accepted by IPR, unless our specific written acceptance thereof is obtained.

- (m) Clarifications, if any, can be obtained from the following office provided such request is received at least 07 working days prior to the last date of submission of proposal for EOI.

Institute for Plasma Research,  
Near Indira Bridge,  
Bhat, Gandhinagar: 382428, Gujarat State  
India  
e-mail: vijay@ipr.res.in, prosenjit@ipr.res.in  
Web site: <http://www.ipr.res.in/purchasetenders.html>

- (n) IPR reserves the right to accept or reject any or all the EOI proposals received from the parties without assigning any reasons. Mere submission of proposal for EOI will not entitle a party to get selected to obtain final tender documents.
- (o) EOI proposal submitted by the party shall be complete in all respects and shall include all details asked for in this notice. The following documents will be submitted along with EOI proposal. Party will submit EOI proposal and all supporting documents in duplicate.

**DOCUMENT SET – 1 (in duplicate):**

- (i) Organizational Structure.
- (ii) Name and address of contact person of party (with details like phone nos, email-address etc).
- (iii) Core area of competence of the party (structural, vacuum, processes industries, cryogenics etc.).
- (iv) Qualification & relevant experience of the key personnel(s) of the Party.
- (v) Details of **(a)** party's expertise in various areas of manufacturing, fabrication, quality and assembly and erection activities **(b)** party's Quality Policy and Program, **(c)** Quality Audit program, **(d)** non-conformity control and reporting **(e)** testing and inspection facilities (separate list for in house and outsourced facilities). **(f)** Tie up with other industries for different activities listed above and not available in-house.
- (vi) Annual Report indicating Balance sheet and Profit and Loss account statement for the last 3 years.

**DOCUMENT SET – 2 (in duplicate):**

Documents in support of fulfilling of eligibility criteria mentioned in section 8

## **2. Roadmap from obtaining EOI to finalize the Contract:**

Following is indicative roadmap that will be followed from obtaining proposals for EOI to finalize the contract.

- (a) This Notice is for invitation of EOI proposal for work contract for assembly, erection of SST-1 Tokamak' at IPR and this is not the tender.
- (b) Introduction to SST-1 and description of the scope of work, Section - 3.
- (c) Guidelines for erection works at IPR - Section - 4.
- (d) Applicable specifications, welding, inspection and acceptance criteria are mentioned in Section - 5.
- (e) Guarantee terms, Project execution duration etc. - Section - 6 and 7.
- (f) Essential Eligibility Criteria, Section-8. (EOI proposals received from the contractors satisfying these Essential Eligibility Criteria will only be considered for further evaluation).
- (g) Party will submit EOI proposal with all necessary supporting documents as mentioned in point - (o) of section -1.
- (h) A pre-bid meeting will be held with eligible parties at IPR to explain the scope of work to be carried out that is covered under this contract.
- (i) Parties, whose EOI proposals are found suitable, shall be called at IPR and asked to make presentations. Presentation should cover following points to cover their EOI proposals -
  - (i) Party's overall profile.
  - (ii) Party's manpower and machinery/equipment mobilization at IPR site for erection works.
  - (iii) Party's work experience in similar nature jobs. List of projects executed, few of which can be discussed in detail.
  - (iv) If any special tasks carried out where it made specific contributions in manufacturing, fabrication and assembly areas using non-conventional, innovative techniques and approach for achieving the tasks in hand.
  - (v) Overall experience, infrastructure to meet job specific requirements, like (a) vacuum, cryogenic compatible requirements and welding of SS304 L made components (b) handling of cryogenic (upto liquid He temp.) items (c) design and manufacture of necessary assembly fixtures etc.
  - (vi) Understanding of overall scope of work covered herein and their approach towards successful execution of projects of this nature. Identification of major activities involved in this job and their view about their capability to undertake these activities.
  - (vii) Critical areas identified in the scope if any and proposed solutions.
  - (viii) Any special suggestions for assembly stages, procedures observed to ease assembly and ensure expected performance, quality.
  - (ix) Capability and financial abilities to undertake this type and magnitude of work contract.

- (x) Codes and standards regularly followed in manufacturing, assembly, welding and erection works.
  - (xi) Details of Quality Policy and Program, testing and inspection facilities and outsourcing places. Discussion on QA/QC strategy envisaged for the job covered under this EOI.
  - (xii) Project planning and Execution strategy, with specific emphasis on schedule and cost control. Mention if Use of specific project planning software is planned.
  - (xiii) Details of consortium if any planned to cover all the activities mentioned in this EOI and deliver them efficiently in terms of quality, cost and time schedule.
  - (xiv) Records for last three years in terms of projected and actual delivery schedule, cost overruns etc for projects / contracts with single company costing INR 100 lakhs and above.
  - (xv) Present commitments and order book position in terms of time schedules for projects/contracts costing INR 100 lakhs and above up to March 2011.
  - (xvi) Commitment from highest authority in the organization for full involvement in the work till completion of the contract.
- (j) IPR reserves the right to incorporate the suggestions made by the party in their proposal, during the presentations and meeting at its sole discretion in final tender document.
  - (k) Final selection of EOI proposals for award of tender documents shall be made based on submitted documents, presentations and discussions. This assessment shall be done considering (a) Available manpower and infrastructure, (b) Understanding of scope of work presented during presentations and discussions, (d) financial soundness to undertake such high cost contracts (e) earlier experience of doing on site jobs and in successful execution of similar nature contracts, assignments in terms of costs, quality and schedule.
  - (l) Final tender document shall be in two parts - Part-A - containing detailed scope of work, deliverables, assembly and inspection stages for deliverables, project execution plan, and technical bid format. Part-B - containing commercial terms and conditions and commercial bid format.
  - (m) Tender documents shall be made available to them whose proposal's shall be selected as mentioned in point - (2-k) above.
  - (n) Those who receive tender documents shall submit the offers in two parts. Detail procedure for submission of technical (Part-A) and commercial (Part-B) offers shall be mentioned in our tender document.
  - (o) Initially technical offers (Part - A) shall be opened.
  - (p) IPR shall evaluate technical offers received and shortlist them after scrutinizing their contents for the suitability of contract specified in tender document.

- (q) Those, whose offers (Technical offers – Part A) are short listed based on the scrutiny, shall be called for further discussion for technical content of the offers in more details and to clarify commercial terms of our institute.
- (r) IPR shall shortlist these offers further based on the outcome of the technical discussions held during meeting. This short listing shall be based on contractor's presentations informing about their past experience, their understanding of the technical contents, their approach to the work and their suitability to undertake such high cost and multi skilled activity at IPR as per drawings, technical specifications and delivery schedule given in our tender document. If needed technical bid can be revised based on the outcome of these meetings along-with their commercial bids.
- (s) Commercial offers (Part-B) of only short listed contractors (ref. above point – r) will be opened.
- (t) Based on the commercial offers, IPR shall award a contract for the execution covering the details mentioned in tender documents and finally agreed during techno-commercial meeting and finalized.
- (u) IPR reserves the right to place the entire work order for with either one or more than one contractors.

### **3 INTRODUCTION TO SST-1 AND SCOPE OF WORK:**

A Steady State Super conducting Tokamak - 1 (SST-1 from here on) is ready to be assembled at Institute for Plasma Research (IPR) for the purpose of generation and confinement of plasma for research and experimental studies. The present day Tokamak research is to ultimately develop a "Fusion Reactor" which is a source of unlimited amount of useful energy, which is clean and safe. This Tokamak is aimed for steady state operation for longer durations.

Entire SST-1 consists of a number of subsystems. Some of major the subsystems are as follows-

Cryostat, Thermal (LN<sub>2</sub> bubble pack) shields, Super Conducting Magnet Systems, Vacuum Vessel (plasma chamber), Vacuum Pumping Systems, Plasma Facing (in-vessel) Component assembly, High power RF sources, Neutral Beam Injection System, Large Power supply systems, Plasma Diagnostics, Data Acquisition and Control Systems.

All the above subsystems and their components are housed in SST-1 hall and adjoining area and are ready/available for assembly and erection and integration.

#### **SCOPE OF WORK –**

- ✚ Scope of work includes preparation of assembly documents (Assembly stages, bill of materials, identifying milestones, welding and assembly procedures, inspection and testing stages and procedures and finally acceptance reports). There is no procurement of material involved in the work, as the work description is to reassemble the dismantled components on as is where is, with necessary rework wherever it is envisaged.
- ✚ Design and manufacturing/fabrication of (with purchaser's material mostly) fixtures, clamps and few other relevant tooling required for handling, assembly, inspection and testing during various stages involved in entire scope.

#### **The Entire Scope of Contract Contains**

##### **Assembly of following sub-systems of SST-1:**

- A. Vacuum Vessel; (Made up of 16 modular segments);
- B. Cryostat; (Made up of 16 Segments);
- C. Vacuum pumps, pumping duct connections with support structures
- D. Magnet coils (16 no of TF, 9 no of PF, 7 no of TR, 2 no of VF); Outer inter coil structures (OICS) and other supports for magnet system.
- E. Cryogenics (Liquid Helium) assembly consisting of manifolds, header, sub header and distribution (piping/tubing) branching;
- F. Electrical Interface – Current Leads – (Between room temperature electrical supply and cryogenic Temperature superconductors);
- G. Related supports for above subsystems;
- H. Cooling Water connections, bus-bar connections for magnet assemblies, vacuum accessories;

## I. Mounting of flanges for Vessel & Cryostat;

The detail scope of work includes the initial preparation, assembly, testing and erection activities to be carried out by contractor at IPR site. The contractor shall ensure that progress of the work described in this document is following the schedule agreed upon at the beginning and updated from time to time during the progress of this contract. He shall be responsible for the safety of the manpower engaged in this contract, institute premises and the material, equipment deployed till the end of all the activities described herein.

Following are salient features of the scope of work to be carried out by contractor at IPR site.

- (a) Reading drawings made available and understanding the entire SST1 assembly, their dimensions and assembly tolerance requirement.
- (b) Ensure assembly work in clean environment with suitable protection so that no dust (including metallic) goes inside the machine area.
- (c) Ensure human, assembly components, tools and machinery safety during assembly and erection works.
- (d) Ensure proper planning and routing of components in hall to avoid potential conflicts with other activities that shall be running in parallel at site.
- (e) Immediate attention to rectify any if and deviations occur and notified during inspection and testing, before undertaking further activities of next stage.
- (f) Carrying out the tasks as per the predefined assembly sequence, following prescribed and agreed quality assurance plan.
- (g) The following steps are mere guidelines to contractor to enable him understand the SST-1 integration stages but they may not describe entire scope (details can be referred in enclosed drawings).

**Step - 1** Vacuum compatible cleaning of all components prior to commencement of assembly/erection works involving those components.

**Step - 2** Welding of Bottom cryostat LN<sub>2</sub> shield supports. Placing bottom LN<sub>2</sub> bubble shields (16 Nos.) on bottom cryostat plate and Fastening of them on the supports.

**Step - 3** Mounting of TF Supporting ring (1 No) on cold mass support columns (8 Nos).

**Step - 4** To assemble bottom PF3 coil along with its cap structure and mounting it on bottom cryostat plate, welding of supply feeder and venturi with PF3

**Step - 5** To lift and support bottom PF4, PF5 coils and Liquid Helium supply headers concentric with machine axis on cryostat temporarily.

**Step - 6** Ground Assembly of two TF coils (22.5° coil assembly) with a vessel module on platform (total 8 numbers of modules).

- It also contains interface activity of assembly of Vacuum Vessel LN<sub>2</sub> shield integration.

**Step - 7** Lifting and Fixing of TF coil and Vessel assembly module on machine on cantilever beams of TF coils supporting ring and tag welding of vessel modules bottom vertical port with bottom cryostat plate at the port opening.

**Step - 8** Placing and fixing of intermittent Vessel sectors on machine (8 Nos. of sectors).

**Step - 9** Insertions and welding of bottom vertical port of the vessel sector in between two successive vessel modules kept on machine.

**Step - 10** Matching of vessel sector with its adjacent vessel modules and welding with them.

**Step - 11** Complete welding of vessel sector with bottom cryostat and with adjacent vessel sector.

- Assembly of top OICS (8 No)
- adjacent TF coils lead connections (IPR activity)

**Step - 12** Assembly of PF1, PF2 top/ bottom coils and PF3 top coil on ground with its structure and mounting it on machine.

**Step - 13** Lifting, positioning and fixing of bottom LHe supply header.

**Step - 14** Lifting, positioning and fixing of bottom PF4 & PF5 coils.

**Step - 15** Mounting of LHe return header at top.

**Step - 16** LHe supply and return connection to respective manifolds, headers, which includes layout of tubing from supply to various TF, PF coils and return line to return headers.

**Step - 17** Forming and assembly of return loop of TF coil assembly.

**Step - 18** Welding of all LN<sub>2</sub> supply connection from LN<sub>2</sub> supply headers to thermal shields of Vessel sector, radial port, top & bottom vertical port, interconnecting ring etc.

- Assembly of thermal shields on the vacuum vessel parts is an interface activity.

**Step - 19** Welding of Side cryostat plate (alternate) with bottom cryostat plates.

- Assembly of thermal shields on the cryostat plates is an interface activity.

**Step - 20** Welding of all LN<sub>2</sub> return header on side cryostat plate.

**Step - 21** Insertion of inner cylinder and welding with top and bottom cryostat plate.

- Assembly of thermal shields on the inner cryostat cylinder is and interface activity.

**Step - 22** Placement and Welding of Top cryostat plates.

- Assembly of thermal shields on the top cryostat plates is an interface activity.

**Step - 23** LN<sub>2</sub> supply and return connection from headers to thermal shields of side, top, and bottom cryostat plate, inner cylinder etc.

**Step – 24** Assembly of TR1 coil with its bottom support on ground and then mounting and fixing it in SST-1 machine assembly.

**Step – 25** Welding of Top TR2 coil supports, fixing coil on them.

**Step – 26** Welding of TR2, TR3, TR4 coils (in pairs) support and fixing those.

**Step – 27** Closing of all the ports on cryostat top and bottom plates with pumping ducts and welding them on the plates.

**Step – 28** Closing of all vessel radial ports with flanges.

**Step – 29** Fixing of pumping support structure in place and then mounting and fixing turbo molecular pump along with pumping lines.

- (h) IPR shall carry out the inspection of alignment of all individual parts, subassembly on ground as well as absolute and relative measurements on machine with ECDS in co-ordination with contractor. On verifying the specified dimensional and geometric tolerances, which is accepted by the IPR representative/ engineer, the next stage or sub assembly or assembly work will start.
- (i) Entire welding during assembly of SST-1 machine will be carried out by the professional and qualified welder. Contractor need to submit the welder qualification certificates WPQ certificate as well as WPS, PQR prior to commencement of welding jobs.
- (j) All welding shall be carried out by TIG welding process. Contractor shall bring their own welding machines with consumables and make arrangements for welding gas locally through IPR or on their own. For fabrication of temporary supports etc. during execution of assembly contract, arc-welding machines may be needed which shall be deployed by the contractor from their side.
- (k) The commissioning of SST-1 means the testing of vacuum vessel and cryostat for vacuum in the order of  $1 \times 10^{-7}$  and  $1 \times 10^{-5}$  mbar. In case of non-achievement of desired vacuum level, it is contractor's responsibility to check for any source of leakages in welding or any other area and rectify it. IPR shall provide experts assistance in such events if contractor wants during leak testing to find the leaks.
- (l) In case of unsatisfactory work, deviations from actual desired parameters after inspection and testing stages they need to be rectified by rework by contractor on their own expense and keeping in mind that those re-works shall not delay the scheduled activities.

## SCOPE OF MANPOWER/MACHINERY FROM CONTRACTOR SIDE

The contractor has to fill in the Table A (man power) and Table B (machinery) required for this job.

Table A: Man Power Requirement - to be provided by Contractor

SI. No.	Type of man power	Number of man power per day	Total number of man days required	Remarks
01	6G level qualified welder			
02	Fitter / fabricator			
03	Grinder			
04	Helper (skilled/non-skilled)			
05	Experienced supervisor			

Table B: Machinery Requirement - to be provided by Contractor

SI. No.	Type of machinery	Quantity	Remarks
01	TIG / ARC welding (portable) set with accessories (like water cooling attachment etc)		
02	Gas cutting set/hand hack-saw set		
03	Hand grinding machine		
04	Hand drill machine		
05	Consumables for above machinery		

1 (one) Batch = Table A + Table B (please mention required number of batches to be provided)

Man-day: 8 (eight) hours of work can be extended as and when required depending upon work load.

IPR reserves right to demand for deployment of more than one batch at a given time (with 1 week prior notice to the contractor) depending upon work load on the assembly hall floor. Hence the contractor should have capacity to mobilise required number of batches for successful completion of the work.

## SCOPE OF WORK FOR INSPECTION/TESTING

- A. Dimensional measurements for checking assembly dimensions, their elevations from ground level and relative positioning with respect to other components / subassemblies (will be done IPR and conveyed to contractor)
- B. Pressure leak testing (by IPR)
- C. Vacuum leak testing (by IPR)
- D. Insulation testing (by IPR)
- E. Electrical continuity testing (by IPR)
- F. Inspection for Thermal Shorts between adjoining assemblies, working at different operational temperatures (by IPR)

- G. Any other relevant tests for weld joints, brazed joints like radiography, DP tests, joint strength tests etc (IPR/contractor)

Tools/fixtures preparations

- A. Suitable Handling / lifting fixtures preparation (by contractor)  
B. Assembly, testing fixtures (by contractor)

Above list indicates broadly the components, assembly sequence and stages, in SST-1 integration and assembly, which is envisaged under this contract. Though this list gives indicative details of the work content, but contractor should not construe it as a complete list. There could be few additional activities as a part of assembly, testing of these components which shall arise out like – cleaning, Material Handling, Preparation of different assembly stages, Preparation of sub assemblies for testing and inspection etc, communication of test, inspection and progress reports and co-ordination of activities with other contractor if any etc.

Contractor can give suggestions, recommendations in his proposal, during technical discussion or during execution of assembly work contract which he believe shall improve, enhance the performance, save manpower, reduce time and cost etc. Whether to consider those suggestions and implement them or not, Institute reserves the rights. They will not be binding to institute in any way.

**FACILITIES AVAILABLE AT SITE**

1. Water / compressed air / electric power supply
2. 10 ton overhead crane in SST-1 Hall.
3. ECDS Unit for dimension check,
4. Orbital welding machine for tube welding.

Contractor shall engage all other necessary machinery, manpower etc. at site during execution of this contract.

#### 4 GUIDELINES FOR THE ERECTION AT IPR SITE

Dust protection cover during mechanical work - Contractor will cover working area to ensure that grinding dust should not go out side this area.

Contractor will discuss with IPR authority and finalize the erection methodology. Contractor will submit to IPR for approval the detailed time schedule for all the activities at IPR site based on schedule given by IPR for overall activities. All the inspection stages during entire assembly and erection duration shall be brought out in Quality Assurance plan (QAP) which will be submitted to IPR for approval.

#### 5 APPLICABLE SPECIFICATIONS –

- 🔧 The latest revisions of the following specifications shall be applicable -
  - ASME B & PV codes Section IX – Welding and Brazing qualifications
  - ASME B & PV codes Section II – Part C - Specification for welding rods, electrodes and filler Metals
  - ASME B & PV codes Section – V - Test methods

- 🔧 The latest revisions of the drawings listed in **Section (9)** shall be applicable.

The Institute Reserves the right to make minor dimensional changes during the period of contract. Such Changes shall be considered within the scope of the specified work and shall not be considered extra. Any related activity with the ongoing contract will be treated as a part of the contract scope of work.

The Details provided in the drawings listed in the annexure are comprehensive and provide necessary information to the contractor to undertake the work specified herein in this document. The bidders shall scrutinize the drawings and bring out in writing any missing information / discrepancy / mismatch etc. if any to the notice of the purchaser at the time of submission of the technical part of the offers for the scope of the work specified herein which will be reviewed and scrutinized by technical experts from purchasers side and conveyed to the contractor during technical discussions. Successful bidder will be bounded by the recommendations of technical expert team.

If the bidders would like to make any changes/ suggestions in the above drawings for the details mentioned in them and bring out the discrepancies then they can do so, by marking the same in the drawings by red ink in the applicable drawings while submitting the technical part of the offer. The changes/ suggestions shall be reviewed by the purchaser for acceptability and in case found suitable shall be incorporated as part of the scope of the work.

It is within the discretion of the contractor to prepare the assembly drawings based on the drawings supplied by the purchaser. If done so, the drawings shall require the approval of the purchaser prior to start of the assembly work activities. The drawings so prepared shall take into account all the dimensions and tolerances for all individual items and subassemblies involved in the complete assembly described in the scope of the assembly.

The drawings shall be made as per the prescribed relevant standards and include correctly all the weld with their details, dimension and allied tolerance, method of inspection and testing, surface finish etc. apart from other information and details.

Though contractors shall strictly follow the approved assembly sequence during execution of the scope of supply, he may make suggestion which may effectively simplify the assembly procedure but will not change the existing layout of components / subassemblies.

All other documents such as – Quality assurance plan, identifying milestones, procedures, welding procedure, weld data sheets, assembly procedures and inspection/testing procedures shall be prepared and submitted to the purchaser for approval before taking up the scope of work for execution at various stages.

Assembly process, surface finish and workmanship required for the execution of the scope of work shall be of high quality suitable to the related class of the components and their working environment.

## **WELDING**

Welding qualification shall be done as per ASME Boiler and Pressure Vessel code - Section IX. The general recommended welding Process is Tungsten Inert Gas welding (TIG/GTAW). Welding shall be done on the job strictly following the approved welding procedures using approved and qualified welders. The contractors shall prepare written procedures for distortion control for each typical joint giving sequence of welding; heat input to weld etc and shall submit to the purchaser before taking up the scope of supply. Welding parameters, distortion etc shall be noted and record of the same shall be submitted to the purchaser at regular intervals during execution of the scope of work

## **INSPECTION**

- (a) Various inspection stages will be identified jointly by IPR and contractor and will be followed throughout erection work till its complete execution.
- (b) Contractor will carry out entire assembly and erection of all SST-1 parts at IPR site as per approved drawings. During ground assembly and assembly on machine, all dimensions will be checked with approved assembly drawings with ECDS.
- (c) During welding of various parts, contractor has to carry out DP Test and Radiography test and to submit report to IPR for further approval of work. All inspection/tests shall be as per ASME code Section -V
- (d) Contractor has to submit chemical analysis report, physical testing report to IPR, if any material is used and bought by contractor/sub contractor, which is going to be the integral part of SST-1.
- (e) Contractor will generate WPS with the help of their own engineer for welding of various parts as per their geometry and will have to be approved by IPR before implementation.
- (f) Contractor shall specify QA plan to be used before starting any erection work at IPR site and get it approved.
- (g) IPR reserves the right to appoint a third party for inspection/testing of work done. Contractor shall have no objection for third party inspection and testing. The cost for third party inspection will be borne by IPR.

In case of any failure of the subassembly/ assembly /component to comply with / meet an inspection or test required / specified, the contractor shall notify the purchaser about it. Without purchaser's written permission, contractor shall not

undertake the repair of the fault. All repair welds shall be re-examined and tested as per the requirements of the original weld and shall meet the requirements and acceptance criteria of the same.

## **ACCEPTANCE TESTS**

Acceptance tests will be carried out at different stages during and after final erection of the various SST-1 parts.

- (1) Individual, sub assembly, assembly dimensions checks at various stages.
- (2) All the dimensions/tolerances shall be checked with assembly drawings after complete erection of SST-1.
- (3) Electrical isolation test after the assembly between various subsystems like Liquid helium and liquid nitrogen.
- (4) DP test, X-ray radiography test report of various welded parts wherever possible.
- (5) Pressure testing, cryogenic temperature testing of various LHe lines, welding joints of sub header, feeding header assembly.
- (6) Vacuum testing of Vacuum vessel and cryostat after full and final welding of cryostat assembly, vacuum vessel assembly and other welded joints. Permissible leaks in any individual joint should be less than  $1 \times 10^{-8}$  mbar-lit/s.
- (7) Standard components/items shall be checked for interchangeability and ease of assembly.

## **6 GUARANTEE**

Contractor shall give guarantee for the erection work carried out for 18 (eighteen) months from the date of final acceptance. During this period if any fabrication/erection fault occurs in the workmanship, contractor will rectify/replace the same at no extra cost. It is the responsibility of the contractor to obtain similar guarantee from his sub-contractor if any.

## **7 PERIOD FOR THE EXECUTION OF THE CONTRACT/PRICE VALIDITY**

The essence of EOI for this contract is the completion of the work in time. Contractor will complete all the activities of the work in his scope within two years from the date of issue of letter of Intent (LOI). All necessary arrangements should be made to guarantee the execution time period.

Successful contractor shall submit fortnightly progress report on the progress/status of the work entrusted on him. The project reports shall be backed by photographs/write ups of all activities of the work.

## **8 ELIGIBILITY CRITERIA FOR BIDDERS**

- 1) Contractors registered in India for last five years with company profile.

*AND*

Those who have successfully executed one OR more major mechanical works consisting of –

- 2) Fabrication, testing and assembly work involving TIG welding of 304/316 series (all grades) of Austenitic Stainless Steel,
- 3) Stainless steel piping works used for large petrochemical, process industries, cryogenics application etc using TIG and allied joining processes,
- 4) Fabrication, assembly, erection, testing and commissioning of process equipments and their ancillary systems made up of stainless steel material
- 5) Executed purchase order with single company with total contract value of more than INR 100 lakhs in a financial year in last three years in the similar nature of works.

### **Additional Requirement:**

- 6) List of reputed customers (government and private) with details like project title cost, delivery time etc. shall be submitted along with the request for EOI proposal.
- 7) Sub contractors (if any) are required to be appraised and approved by IPR/purchaser before placement of contract job to the contractor

**Note:** Preference shall be given to those who have exposure to vacuum compatible fabrication, cryogenic applications and worked earlier with other reputed institutions like ISRO, DAE affiliated Units, and other similar organizations.

## 9 LIST OF DRAWINGS

List of drawings of SST-1 component and assembly supplied (in CD) by IPR along with this EOI document is mentioned below. Contractor will carry out assembly and erection at site as per these drawings. Drawing Sr. No.1 to 80 of this list are the various parts drawings of cryostat, support structure, pumping duct and pumping line, coils (super conducting and non super-conducting), and assembly of various sub system at sub-stages.

SR. No.	TITLE	DRAWING No.	SHEET
	<b>SUPPORT STRUCTURE DRAWINGS</b>		5
1.	SUPPORT STRUCTURE ASSEMBLY	2-91-164-01049	1 of 5
2.	SUPPORTING RING ASSEMBLY	1-91-164-01010	2 of 5
3.	TF MAGNET SUPPORT STRUCTURE ASSEMBLY	1-91-164-01018	3 of 5
4.	CENTRAL SUPPORT SPACER	1-91-161-01082	4 of 5
5.	SUPPORT RING ASSEMBLY WITH ANGULAR RESTRAINT	2-91-164-01047	5 of 5
6.	OUTER INTERCOIL STRUCTURE	SST1-A1-1.05.02.02-002	
	<b>CRYOSTAT AND VACUUM VESSEL DRAWINGS</b>		
7.	CRYOSTAT WITH VACUUM VESSEL ASSEMBLY	0-91-160-01005	1 of 33
8.	VACUUM VESSEL ASSEMBLY	0-91-161-01006	2 of 33
9.	CRYOSTAT BOTTOM PLATE	1-91-161-01024	3 of 33
10.	CRYOSTAT TOP PLATE	1-91-161-01025	4 of 33
11.	RADIAL PORT ASSEMBLY (NBI)	1-91-161-01035	5 of 33
12.	RADIAL PORT ASSEMBLY PORT 2-11, 13-16	1-91-161-01036	6 of 33
13.	RADIAL PORT ASSEMBLY PORT 12	1-91-161-01037	7 of 33
14.	BAKING LAYOUT FOR VESSEL ASSLY. NBI	1-91-161-01038	8 of 33
15.	BAKING LAYOUT FOR VESSEL ASSLY. NBI MODULE 2-11,13-16	1-91-161-01039	9 of 33
16.	BAKING LAYOUT FOR VESSEL ASSLY. NBI MODULE 12	1-91-161-01040	10 of 33
17.	VESSEL BAKING TUBE LAYOUT DETAILS MODULE 1-16	1-91-161-01041	11 of 33
18.	TUBE LAYOUT DETAIL FOR VERTICAL PORT 1-16	1-91-161-01042	12 of 33
19.	RADIAL PORT BAKING TUBES (NBI)	1-91-161-01043	13 of 33
20.	RADIAL PORT BAKING TUBES, PORT 2-11, 13-16	1-91-161-01044	14 of 33
21.	RADIAL PORT BAKING TUBES PORT 12	1-91-161-01045	15 of 33
22.	VESSEL ASSEMBLY NBI	1-91-161-01073	16 of 33
23.	VESSEL ASSEMBLY MODULE 2-11, 13-16	1-91-161-01074	17 of 33
24.	VESSEL ASSEMBLY MODULE 12	1-91-161-01075	18 of 33
25.	VESSEL AND RADIAL PORT ASSEMBLY NBI	2-91-161-01026	19 of 33
26.	VESSEL ASSEMBLY MODULE 2-11, 13-16	2-91-161-01027	20 of 33
27.	VESSEL ASSEMBLY MODULE 12	2-91-161-01028	21 of 33
28.	VESSEL SECTOR (MAIN VESSEL)	2-91-161-01029	22 of 33
29.	INTERCONNECTING RING (MAIN VESSEL)	2-91-161-01030	23 of 33
30.	VERTICAL PORT	2-91-161-01031	24 of 33
31.	RADIAL PORT FLANGE ASSEMBLY (NBI)	2-91-161-01032	25 of 33
32.	RADIAL PORT FLANGE ASSEMBLY PORT 2-11, 13-16	2-91-161-01033	26 of 33
33.	RADIAL PORT FLANGE ASSEMBLY PORT 12	2-91-161-01034	27 of 33
34.	RADIAL PORT FLANGE (NBI)	2-91-161-01039	28 of 33
35.	RADIAL PORT FLANGE PORT 2-11, 13-16	2-91-161-01040	29 of 33

SR. No.	TITLE	DRAWING No.	SHEET
36.	RADIAL PORT FLANGE PORT 12	2-91-161-01041	30 of 33
37.	INNER CYLINDER ASSEMBLY	2-91-161-01042	31 of 33
38.	CRYOSTAT LIP COMPONENTS	2-91-161-01043	32 of 33
39.	CRYOSTAT OUTER PLATE ASSEMBLY	2-91-161-01045	33 of 33
40.	DETAILS OF PUMPING DUCT	SST1-A1-1.02.04.00-002	
41.	PUMPING DUCT ASSEMBLY	1-91-162-01026	
42.	PUMPING DUCT ASSEMBLY (PDT 1,3,4 & 6-8)	1-91-162-01027	
43.	TOP DUCT (PDT 1,3,4 & 6-8)	1-91-162-01060	
44.	TOP DUCT (PDT 2)	1-91-162-01069	
45.	TOP DUCT (PDT 5)	1-91-162-01070	
46.	PUMPING DUCT ASSEMBLY (PDT 2)	1-91-162-01071	
47.	PUMPING DUCT ASSEMBLY (PDT 5)	1-91-162-01072	
48.	PUMPING DUCT ASSEMBLY (PDB 1,3,4 & 6-8)	1-91-162-01077	
49.	BOTTOM DUCT (PDT 1,3,4 & 6-8)	1-91-162-01078	
50.	PUMPING DUCT ASSEMBLY (PDB 2)	1-91-162-01079	
51.	BOTTOM DUCT (PDB 2)	1-91-162-01080	
52.	PUMPING DUCT ASSEMBLY (PDB 5)	1-91-162-01081	
53.	BOTTOM DUCT (PDB 5)	1-91-162-01082	
54.	DUCT BOTTOM FLANGE	3-91-162-01055	
55.	DUCT TOP FLANGE	3-91-162-01056	
56.	PUMPING LINE PIPE	3-91-162-01059	
	<b>SUPERCONDUCTING AND TRANSFORMER COILS AND ASSEMBLY DRAWINGS</b>		
57.	MAGNETS ASSEMBLY	SST1-A1-1.05.02.02-001	
58.	PF1 ASSEMBLY	SST1-A1-1.03.02.01-001	
59.	PF2 ASSEMBLY	SST1-A1-1.03.02.02-001	
60.	PF3 ASSEMBLY	SST1-A1-1.03.02.03-001	
61.	PF1/2 ASSEMBLY	SST1-A1-1.05.03.01-002	
62.	PF2/3 SUPPORTING RING BOTTOM	SST1-A1-1.05.03.01-004	
63.	PF2/3 SUPPORTING RING TOP	SST1-A1-1.05.03.01-003	
64.	ASSEMBLY OF PF4/PF5	SST1-A1-1.03.02.04-001	
65.	PANCAKE 1 FOR PF4 & PF5	SST1-A1-1.03.02.04-002	
66.	PF4 /PF5 PANCAKE 4	SST1-A1-1.03.02.04-004	
67.	PF4 /PF5 PANCAKE 2/3	SST1-A1-1.03.02.04-003	
68.	INBOARD PF SUPPORT STRUCTURE	SST1-A1-1.05.03.01-001	
69.	COMPONENTS OF PF SUPPORT	SST1-A1-1.05.03.01-005	
70.	TR1 COIL ASSEMBLY	SST1-A1-1.03.03.01-001	
71.	TR2 COIL ASSEMBLY	SST1-A1-1.03.03.02-001	
72.	TR3 COIL ASSEMBLY	SST1-A1-1.03.03.03-001	
73.	TR4 COIL ASSEMBLY	02.04.00.A3.09.TR4	01 of 01
74.	VF COIL ASSEMBLY	SST1-A1-1.03.05.01-002	
75.	DETAILS OF VF COIL PANCAKES	SST1-A1-1.03.05.01-001	
76.	TR1, 2, 3 COIL SUPPORT STRUCTURE	SST1-A1-1.05.05.01-001	
77.	VF COIL CLAMPING DETAILS	SST1-A1-1.05.07.01-001	
78.	TF CASING SUB ASSEMBLY	SST1-A1-1.03.01.02-001	
79.	SECTIONAL VIEW TF LOCATION (reference only)	02.00.01.A3.09.TF_LOC_SEC	01 of 01
80.	SST-1 ASSEMBLY STEP	02.00.00.A1.09.SST1_ASSY_STEP	01 to 34

Top Bottom Convention – Components positioned above and below mid-plane (horizontal central plane) are referred as top & bottom components

**NOTE: THOSE WHO DOWNLOAD THE EOI DOCUMENT FROM IPR WEBSITE MAY CONTACT THE PURCHASE OFFICER, IPR FOR THE CD CONTAINING THE ABOVE DRAWINGS.**