Technical Officer
to provide support for ITER Magnetics Diagnostics
(Loops and Saddles)

Technical Specifications
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1 Abstract

This document describes technical needs of ITER Diagnostics Division, with particular reference to the requirement for a Technical Officer for Magnetics Diagnostics, including design activities, R&D activities and follow up activities, as appropriate.

2 Background and Objectives

ITER is a major new device that is under construction at Cadarache, near Marseille, France. This device will study the potential of controlled nuclear fusion to provide energy for mankind. To study the behaviour of this device, a set of monitoring systems (called Diagnostics) are required. These systems will provide the information required to understand and control the performance of the device.

In particular, measurements of magnetic field and flux are essential to control the plasma. The work described below is related to the hardware required for a class of magnetic diagnostics intended to measure the loop voltage along and enclosed flux within specific large closed contours, by means of loops of cable following these contours. These are known as flux loops.

A conceptual design of the ITER flux loops has been presented to an international review panel and approved as the basis for further work in 2011. Additional design work has been carried out since by ITER and will continue to the standard of a Preliminary Detailed Design review in March 2013. The design will then be continued by the European Domestic Agency (F4E) with ITER oversight.

3 Scope of Work

The primary objective of this engineering contract is to support the ITER Diagnostic Team in the technical oversight of design and R&D work, and preparation of design reviews, including follow up and documentation activities as appropriate. Elements of design and R&D work are also included. The main focus of the work will be in the area of Magnetic Diagnostic, specifically, flux loops, of which there are 7 different types.

The bidder will prepare work in the following areas:

A. Review and finalise design and R&D plan
B. Take over and finalise the design of the terminations, joints and attachments of the loops
C. Perform and oversee analysis work to support B.
D. Specify and oversee R&D activities
E. Help specify and oversee irradiation tests for cable terminations
F. Procure suitable components to support D and E.
G. Prepare, from both technical and organisational perspectives, a preliminary design review package, comprising documentation and presentations,
H. Amend this package following the PDR
I. Help prepare the technical documentation for the process of transfer of the work to F4E.
There will be a requirement to liaise with IO personnel and particular external contractors over the period of the contract.

It will be necessary to collect inputs from these contractors and use them to generate internal IO documentation.

Additional appropriate design works may arise in the duration of the contract.

It is anticipated that the contracting body will second one or more experts to ITER to fulfill the Work Description below.

4 Estimated Duration

The duration of the contract can be for up to 18 months from the starting date of the contract. It is anticipated that least 70% of time should be on-site at ITER.

5 Work Description

See References in Section 12 and 13 for background information. Specific deliverables schedule

<table>
<thead>
<tr>
<th>Scope of Work</th>
<th>Deliverable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Design and R&amp;D plan</td>
<td>Validation of design and R&amp;D planning through the PDR to support the Manufacturing Specs (at F4E). Update of the work plan. Compilation of a design justification plan.</td>
</tr>
<tr>
<td>B</td>
<td>Design description</td>
<td>Updated of the Design Definition Folder (DEF). In particular, component descriptions of terminations, joint assemblies, wiring, attachments (clips) and all other supporting hardware for the loops. Assembly and manufacturing description for each loop assembly (seven types). Oversight of CAD activities to generate appropriate updates to design models and drawings.</td>
</tr>
<tr>
<td>C</td>
<td>Analysis work</td>
<td>Specifications for thermal, electromagnetic and structural analysis of each type of loop assembly. Assessment of external reports. Compilation of structural integrity report and Design Justification Folder (DJF) elements (e.g. R&amp;D reports). Update of the Risk Tables for the magnetics. Update of the RAMI.</td>
</tr>
<tr>
<td>D</td>
<td>R&amp;D activities</td>
<td>Specify and oversee R&amp;D to (1) qualify the welding of attachments to the vessel (2) test (mechanically and thermally in vacuo) the connections of the cable to the attachments (3) test (electrically in controlled atmosphere)</td>
</tr>
</tbody>
</table>
**E** Irradiation tests  
Help with selection and ordering of samples. Review and contribution to R&D specs for any irradiation tests (Note: irradiation expert support available within ITER). Compilation of results and incorporation in DJF.

**F** Procurement of components  
For cables, connections, joints and attachments (write technical specs, liaise with companies, execute selection and follow up)

**G/H** Design reviews  
Prepare, from technical and organisational perspectives, a preliminary design review package, comprising System Design Documents and presentations. The package of System Design Documents is described in reference III of section 13. Briefly the include a requirements folder (RQF), a description folder (DEF) and a design Justification folder (DJF)

### 6 Responsibilities (including customs and other logistics)
When applicable.

### 7 List of deliverables and due dates (proposed or required by ITER)

<table>
<thead>
<tr>
<th>Subtask</th>
<th>Deliverable</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial Progress Report</td>
<td>2 months from start date</td>
</tr>
<tr>
<td>2</td>
<td>Interim Reports</td>
<td>Every 3 months thereafter</td>
</tr>
<tr>
<td>3</td>
<td>Final Report</td>
<td>On completion of period</td>
</tr>
</tbody>
</table>

### 8 Acceptance Criteria (including rules and criteria)

The selection will be done taking into account the following criteria:

1) Expert(s) CV  
2) Price
9 Specific requirements and conditions

Person(s) to carry out the work described in this document must have proven experience, as appropriate.

Role description: Technical Programme Expert
- ability to work with partners and host to define optimum/critical needs for ITER
- ability to work with ITER processes to achieve optimum results
- ability to align work priorities with overall project schedule
- excellent technical writing skills
- excellent communication and influencing skills
- excellent attention to detail
- excellent inter-personal skills
- work well under pressure
- ability to work in team environment
- ability to interface with global partners
- appropriate ability to comprehend technical issues and ensure addressed by others

10 Work Monitoring / Meeting Schedule

**Meetings and Progress Reports**

The work will be managed by means of Progress Meetings and/or formal exchange of documents transmitted by emails which provide detailed progress. Progress Meetings will be called by the ITER Organization, to review the progress of the work, the technical problems, the interfaces and the planning. It is expected that Progress Meeting will be held frequently as required, generally weekly.

The main purpose of the Progress Meetings is to allow the ITER Organization/Diagnostics Division and the Contractor Technical Responsible Officers to:

a. Allow early detection and correction of issues that may cause delays;
b. Review the completed and planned activities and assess the progress made;
c. Permit fast and consensual resolution of unexpected problems;
d. Clarify doubts and prevent misinterpretations of the specifications.

In addition to the Progress Meetings, if necessary, the ITER Organization and/or the Contractor may request additional meetings to address specific issues to be resolved.

It is expected that on occasion the Contractor will be required to make a presentation to Topical Technical Meetings either by videoconference or in person. If in person, the ITER Organization will reimburse travelling expenses, if appropriate for off-site meetings.

For all Progress Meetings, a document (the Progress Meeting Report) describing tasks done, results obtained, blocking points and action items must be written by the Contractor. Each report will be stored in the ITER IDM in order to ensure traceability of the work performed.
After the first monthly report, every 2 months, the Contractor shall submit to ITER Organization a Progress Report to be issued five working days before a Progress Meeting so that the report can be reviewed prior to, and discussed at, that Meeting.

11 Payment schedule / Cost and delivery time breakdown

Quarterly payment, after submission and acceptance of reports to the ITER Organization.

12 Quality Assurance (QA) requirement

The organisation conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system.

The general requirements are detailed in ITER document [ITER Procurement Quality Requirements (22MFG4)]( ITER Procurement Quality Requirements)

Prior to commencement of the task, a Quality Plan [Quality Plan (22MFMW)]( Quality Plan) must be submitted for IO approval giving evidence of the above and describing the organisation for this task; the skill of workers involved in the study; any anticipated sub-contractors; and giving details of who will be the independent checker of the activities.

Prior to commencement of any manufacturing, a Manufacturing & Inspection Plan [Manufacturing and Inspection Plan (22MDZD)]( Manufacturing and Inspection Plan) must be approved by ITER who will mark up any planned interventions. Deviations and Non-conformities will follow the procedure detailed in IO document [MQP Deviations and Non Conformities (22F53X)]( MQP Deviations and Non Conformities).

Prior to delivery of any manufactured items to the IO Site, a Release Note must be signed [MQP Contractors Release Note (22F52F)]( MQP Contractors Release Note).

Documentation developed as the result of this task shall be retained by the performer of the task or the DA organization for a minimum of 5 years and then may be discarded at the direction of the IO. The use of computer software to perform a safety basis task activity such as analysis and/or modelling, etc shall be reviewed and approved by the IO prior to its use, it should fulfill IO document on Quality Assurance for ITER Safety Codes [Quality Assurance for ITER Safety Codes (258LKL)]( Quality Assurance for ITER Safety Codes).

13 References / Terminology and Acronyms

These documents are available upon request:

