Mechanical, Thermo-Hydraulic and Electromagnetic Analysis of ITER Diagnostics Components

Technical Specifications
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1 Abstract

This document describes the specific technical needs of the Diagnostics Division with particular reference to Design Engineering Work, predominantly in the following areas:
- mechanical
- thermo-hydraulics
- electromagnetics

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. In order to study the behaviour of this device, a set of monitoring systems (referred to as Diagnostics) is required, these systems will provide the information required to understand the performance of the device.

The work described below is related to the design of the equipment required to physically support the diagnostics in ITER, e.g. port plugs and similar structures, and in some cases the diagnostics themselves.

3 Scope of Work

The objective of this engineering contract is primarily to support the ITER Diagnostic Team in the analysis that supports the diagnostic design, with particular emphasis in the areas of mechanical, thermo-hydraulic and electromagnetic analysis.

4 Estimated Duration

The duration shall be 2 years from the starting date of the contract.
The work base will be at the home institution/office of the contractor for the majority of the time.
Occasional visits to the ITER working site, anticipated at up to 4 times per annum, as determined by the ITER Responsible Officer (RO), will be required.

5 Work Description

Description of the tasks to perform:

1. Perform, collate and check the analytical and numerical calculations supporting diagnostic design in the area of mechanical, thermo-hydraulics and electromagnetics.

2. Suggesting mechanical and thermo-hydraulic design of diagnostic components.

3. Application and checking of appropriate codes and standards against diagnostic designs, examples of such codes would be such like RCC-MR and ASME codes.

4. Perform 3D numerical thermal, electromagnetic (EM) and structural analysis of various diagnostic components.
5. Perform stress analysis at specified load combinations, which are required for the Conceptual (or other) Design Review of the components, in order to obtain stresses, strains and displacements in all specified structural parts of the components. The ultimate goal of this analysis is to demonstrate the feasibility of the design solution concept and if not feasible, optimize the existing one or propose a suitable new design.

6. Perform the evaluation of static strength of the parts in accordance with the specified design criteria (examples such as SDC-IC or ASME VIII, div.2, RCC-MR, etc).

7. Provide appropriate Structural Analysis, Technical Analysis and Structural Integrity Reports in a suitable format as per IO templates.

8. Support the Diagnostic Division, as appropriate, to fulfil its mission in the design engineering and analysis area.

6 Evaluation Criteria

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

1) Expert CV(s)  
2) Price

7 Specific requirements and conditions

The staff proposed by the bidder to carry out the work described in Section 5 must have proven experience in the following areas:

- the design and analysis of tokamak systems (minimum 4 years)
- structural, thermo-hydraulic and electromagnetic analysis (both analytic and computational) of mechanical systems (minimum 10 years)
- capability to work in English language, both verbally and written
- excellent technical writing skills
- knowledge of appropriate industrial codes (e.g. ASME VIII Div 2, ASME III, RCC-MR)
8  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 weekly or bi-weekly or as needed, via videoconference.

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.

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.

Every 3 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.

The Quarterly Progress Report shall illustrate the progress against the baseline work plan and indicate variances that should be used for trending. Performance indicators, suitable to measure the progress of the work as compared to the approved work plan, shall also be reported in the Quarterly Progress Report.

9  Payment schedule

Interim monthly payment, after submission and acceptance of the Monthly Progress Report with supporting timesheet and corresponding invoices to the ITER Organization.
10 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)]

Prior to commencement of the task, a Quality Plan [Quality Plan (22MFWM)] 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)] 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)]

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

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 fulfil IO document on Quality Assurance for ITER Safety Codes [Quality Assurance for ITER Safety Codes (258LKL)].

11 References / Terminology and Acronyms