

# Technical Specifications

## Mechanical Design and Structural Analysis of ITER Diagnostics Components

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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 contract duration shall be up to 2 years (440 working days) and shall commence after the official start date and upon the mutual agreement of both parties. It is envisaged that a significant fraction of the services shall be performed ON Site at IO, however, some work could be performed off site. Any such off site work shall be defined at a later stage.

## 5 Work Description

- Suggesting mechanical and thermo-hydraulic design of diagnostic components, especially optical systems.
- Mechanical, Thermal and Hydraulic analysis of General diagnostics, diagnostics port plugs, diagnostics port plug structures and diagnostics windows assemblies.
- Perform, collate and check the analytical and numerical calculations supporting diagnostic design in the area of mechanical, thermo-hydraulics and electromagnetics.
- Application and checking of appropriate codes and standards against diagnostic designs, examples of such codes would be such like RCC-MR and ASME codes.

- Perform 3D numerical thermal, electromagnetic (EM) and structural analysis of various diagnostic components.
- Perform stress analysis at specified load combinations, in order to obtain stresses, strains and displacements in all specified structural parts of the components.
- 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).
- Provide appropriate Structural Analysis, Technical Analysis and Structural Integrity Reports in a suitable format as per IO templates.
- Support the Diagnostic Division, as appropriate, to fulfil its mission in the design engineering and analysis area.

## 6 Evaluation Criteria

This criteria shall be the basis of acceptance by IO following the successful completion of the services. These will be in the form of monthly progress reports.

Report and Document Review criteria.

Reports as deliverables shall be stored in the ITER Organization's document management system, IDM by the Contractor for acceptance. A named ITER Organization's Contract Technical Responsible Officer is the Approver of the delivered documents.

The Approver can name one or more Reviewers(s) in the area of the report's expertise.

The Reviewer(s) can ask modifications to the report in which case the Contractor must submit a new version.

The acceptance of the document by the Approver is the acceptance criterion.

## 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.

## 9 Payment schedule

Interim monthly payments will be made after submission and acceptance by the IO responsible officer of Monthly Progress Report, supporting timesheets, and upon receipt of a correctly rendered invoice.

## 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 \(22MFMW\)](#) 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