

Technical Specifications (In-Cash Procurement)

CFE: In-Vessel & In-Divertor Electrical Services Design Finalisation and Manufacturing Monitoring

This document describes the technical needs for an expert specialist in engineering of Diagnostics. Specifically the technical needs of the Diagnostics Division with particular reference to design development and construction preparation, predominantly in the following areas: Mechanical design development and integration Assessment and justification of engineering designs Monitoring of design development and justification undertaken by Third Parties Manufacturing (construction) preparation, ...

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1 Purpose

This document describes the technical needs for an expert specialist in engineering of Diagnostics. Specifically the technical needs of the Diagnostics Division with particular reference to design development and construction preparation, predominantly in the following areas:

- Mechanical design development and integration
- Assessment and justification of engineering designs
- Monitoring of design development and justification undertaken by Third Parties
- Manufacturing (construction) preparation, follow-up and monitoring
- Installation (construction) preparation, follow-up and monitoring

2 Scope

The work aligns with the ITER project, currently under construction in France. This device will study the Fusion concept on a scale previously unequalled on earth. To study the behaviour of this device, a set of monitoring systems (called diagnostics) are required. This will provide all the information to show and understand the performance of the device. The present scope of work involves technical expertise for supporting multiple diagnostic projects.

NOTE: There are no Protection Important Activities (PIAs) within the scope of this work.

3 Definitions

CAD	Computer aided design
CMM	Configuration and management model
DA	Domestic Agency
DM	Detailed model
IO	ITER Organization
IO-TRO	ITER Organization Technical Responsible Officer.
UHV	Ultra High Vacuum

For a complete list of ITER abbreviations see: [ITER Abbreviations \(ITER_D_2MU6W5\)](#).

4 References

Links inserted in text

5 Estimated Duration

The duration shall be for 12 months from the contract Kick Off Meeting (KOM). Services shall be provided approximately 25% at the IO work site. The IO expect some missions within Europe (to DA and other premises), they will be defined in the course of the contract.

6 Work Description

The work involves technical expertise for multiple ITER diagnostic projects working in close collaboration with the IO-TROs. It involves many areas of activity, including but not limited to:

- Engineering design proposals, produced in consultation with interfacing parties and stakeholders (e.g. Design Integration, Safety)

- Record of progress against schedule, with proposals for improvements;
- Updated and re-evaluated loads, including nuclear loads and other engineering specifications;
- Technical requirements collection and production of Technical Specifications, including follow up/oversight of Third Parties (e.g. DAs, manufacturers, etc.);
- Review and iteration of technical documents (e.g. Design Description Documents, Maintenance and Inspection procedures, Technical Specifications) produced by Third Parties;
- Reviewing draft interface sheets;
- Reviewing draft assembly/installation procedures;
- Technical review notes for DA technical documents in IO IDM. Several technical documents per month need to be reviewed;
- Generating meeting preparatory notes, including agenda and draft attendee selection;
- Producing notes for IO meetings called by interfacing systems and review bodies;
- Drafting minutes for IO and DA meetings;
- Technical input in support of project change requests and other actions;
- Input documents, presentations and meeting notes related to Interface meetings.
- Input documents, presentations, meeting notes related to Monthly IO or DA meetings;
- Implementation reports for Chit resolution from IO and DA design reviews;
- Input documents, presentations, meeting notes related to meetings of DA representatives with IO experts;
- Input documents, presentations, meeting notes related to workshops.

Travel to the DA or other sites in Europe may be required to carry out the work.

Within the broader topics listed above, the work will predominantly focus on the following three main topics in support of the Diagnostics Electrical Services:

6.1 Topic 1: In-Vessel Electrical Services component manufacturing

The 55.NE.V0 In-Vessel Electrical Services comprise a complex network of mineral insulated cables, clamps and connector boxes, with many tens of thousands of components in total. Due to the complexity of the scope and the difference in assembly need dates, the system has been split into multiple work packages.

The responsibility for manufacturing one of these work packages is with the European Domestic Agency and its supplier, while another work package will be manufactured through a contract placed by IO. In both cases, the following process will be followed by the manufacturer: preparation of manufacturing specifications and drawings, performing a Manufacturing Readiness Review (MRR), implementing modifications following actions placed at the MRR, procurement of raw materials, manufacturing of components, factory testing, packaging and shipping.

The Contractor shall perform a peer review of the documents provided as input information to the MRRs, checking consistency between the documents, drawings, procedures and requirements in the initial Technical Specifications, raising actions for aspects to be addressed (e.g. documents or drawings to be modified). Following the MRR, the Contractor shall assist the TRO in monitoring the ongoing manufacturing activities, responding to any questions,

deviations and non-conformities which may arise, and creating regular progress and schedule updates.

6.2 Topic 2: In-Divertor Electrical Services design completion and manufacturing preparation

The 55.NE.D0 In-Divertor Electrical Services, which comprise Remote Handling (RH) compatible connectors bridging the ITER Vacuum Vessel and Divertor Cassettes, and associated components such as mineral insulated cabling, clamps, clips and junction boxes. The components are located both on the Vacuum Vessel and the Divertor Cassettes.

The design of this system is being undertaken by the European Domestic Agency and their suppliers, and is progressing towards a Final Design Review, to be held in late 2022. The Contractor shall perform a peer review of the documents provided as input information to this review, checking consistency between the documents, diagrams and drawings. Design risks, aspects that have been overlooked or could be improved upon shall be highlighted and recorded.

As part of the peer review process, the Contractor shall perform calculations such as estimations of electromagnetic and mechanical loads, fatigue assessments and structural evaluations in order to provide independent corroboration of the design input documents.

In addition, the Contractor shall arrange reviews and discussions with key teams at IO and in the Domestic Agencies, to ensure that the components being designed can be correctly integrated into the ITER environment.

Experience with design of Remote Handling-compatible components is needed for this task.

6.3 Topic 3: Production of installation/construction documentation

Installation of ITER diagnostic systems, including the in-vessel electrical services, will commence in the near future. In preparation for these activities, IO is producing detailed installation documents (e.g. technical specifications, Scope of Work lists), drawings and diagrams, which will be studied and further elaborated by IO's installation contractor.

The Contractor shall author the required documents, coordinate the production of the associated drawings (by Third Party resources), perform a thorough review of generated input documents and drawings, to ensure they are consistent and easily understandable by Third Parties, and provide regular status and progress updates to ensure the production of the required documents is tracked and on-time.

The Contractor shall present and discuss the documents at review meetings (e.g. Construction Readiness Reviews), and issue clarifications and updates to the documents as required, in response to questions received during such reviews.

7 Responsibilities

7.1 Contractor’s Responsibilities

In order to successfully perform the tasks in these Technical Specifications, the Contractor shall:

- Strictly implement the IO procedures, instructions and use templates;
- Provide experienced and trained resources to perform the tasks;
- Provide monthly schedule updates for the tasks being worked on by the Contractor;
- Contractor’s personnel shall possess the qualifications, professional competence and experience to carry out services in accordance with IO rules and procedures;
- Contractor’s personnel shall be bound by the rules and regulations governing the IO ethics, safety and security rules.

7.2 IO’s Responsibilities

The IO shall:

- Nominate a Responsible Officer to manage the Contract;
- Organise a monthly meeting(s) on work performed;
- Provide offices at IO premises;
- Review documents in a timely fashion

8 List of Deliverables and due dates

D #	Description	Due Dates
D1	Progress Report 1 for Topic 1 (including links to reviewed documents, risks, outstanding issues, schedule updates and forward work plan)	T0 + 2 months
D2	Progress Report 1 for Topic 2 (including links to reviewed documents, risks, outstanding issues, schedule updates and forward work plan)	T0 + 4 months
D3	Progress Report 1 for Topic 3 (including links to reviewed documents, risks, outstanding issues, schedule updates and forward work plan)	T0 + 6 months
D4	Progress Report 2 for Topic 1 (including links to reviewed documents, summary of MRR, risks, outstanding issues and schedule updates)	T0 + 8 months
D5	Progress Report 2 for Topic 2 (including links to reviewed documents, summary of FDR preparation, risks, outstanding issues and schedule updates)	T0 + 10 months

D #	Description	Due Dates
D6	Progress Report 2 for Topic 3 (including links to reviewed documents, risks, outstanding issues, schedule updates and forward work plan)	T0 + 12 months

9 Acceptance Criteria

The deliverables will be posted in the Contractor's dedicated folder in IDM, and the acceptance by the IO will be recorded by their approval by the designated IO TRO. These criteria shall be the basis of acceptance by IO following the successful completion of the services. These will be in the form of reports as indicated in Section 8.

10 Specific requirements and conditions

The personnel proposed by the Contractor to carry out the work described in Section 6 must have:

- A professional qualification in engineering with relevant experience in engineering design in a complex technical environment;
- Good technical writing skills;
- Good inter-personal skills;
- The ability to be consistent and work well under pressure with good attention to detail;
- Capability to work in English language, both verbally and written;
- Able to work with partners and the ITER host to define critical needs;
- Ability to align work priorities with overall project schedule;

Experience in the following areas is required:

- Design of diagnostics for large fusion installations and knowledge of ITER diagnostic systems;
- Design of mechanical or electrical components for high vacuum environments;
- Experience of specifying mineral insulated signal and thermocouple cabling;
- Development of equipment designs for fusion facilities;
- R&D oversight experience;
- Experience of Remote Handling design requirements, techniques and limitations;
- Design organization;
- Technical document generation;
- System requirements management;
- Technical risk analysis
- Project Management

11 Work Monitoring / Meeting Schedule

Work is monitored through monthly project meetings as required (the frequency of meetings can be increased through agreement between the Contractor and the IO TRO).

12 Delivery time breakdown

See Section 8, “List of Deliverables and due dates”.

13 Quality Assurance (QA) requirements

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 Procurement Quality Requirements \(ITER_D_22MFG4\)](#).

Prior to commencement of the task, a 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 (see [Procurement Requirements for Producing a Quality Plan \(ITER_D_22MFMW\)](#)).

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, in accordance with Software qualification policy ([Software Qualification Policy \(ITER_D_KTU8HH\)](#)).

14 CAD Design Requirements

For the contracts where CAD design tasks are involved, the following shall apply:

The Supplier shall provide a Design Plan to be approved by the IO. Such plan shall identify all design activities and design deliverables to be provided by the Contractor as part of the contract.

The Supplier shall ensure that all designs, CAD data and drawings delivered to IO comply with the Procedure for the Usage of the ITER CAD Manual ([ITER_D_2F6FTX](#)), and with the Procedure for the Management of CAD Work & CAD Data (Models and Drawings [ITER_D_2DWU2M](#)).

The reference scheme is for the Supplier to work in a fully synchronous manner on the ITER CAD platform (see detailed information about synchronous collaboration in the [ITER_D_GNJX6A](#) - Specification for CAD data production in ITER Contracts.). This implies the usage of the CAD software versions as indicated in CAD Manual 07 - CAD Fact Sheet ([ITER_D_249WUL](#)) and the connection to one of the ITER project CAD data-bases. Any deviation against this requirement shall be defined in a Design Collaboration Implementation Form (DCIF) prepared and approved by DO and included in the call-for-tender package. Any cost or labour resulting from a deviation or non-conformance of the Supplier with regards to the CAD collaboration requirement shall be incurred by the Supplier.

15 Safety requirements

ITER is a Nuclear Facility identified in France by the number-INB-174 (“Installation Nucléaire de Base”).

For Protection Important Components and in particular Safety Important Class components (SIC), the French Nuclear Regulation must be observed, in application of the Article 14 of the ITER Agreement.

In such case the Suppliers and Subcontractors must be informed that:

- The Order 7th February 2012 applies to all the components important for the protection (PIC) and the activities important for the protection (PIA).
- The compliance with the INB-order must be demonstrated in the chain of external contractors.
- In application of article II.2.5.4 of the Order 7th February 2012, contracted activities for supervision purposes are also subject to a supervision done by the Nuclear Operator.

For the Protection Important Components, structures and systems of the nuclear facility, and Protection Important Activities the contractor shall ensure that a specific management system is implemented for his own activities and for the activities done by any Supplier and Subcontractor following the requirements of the Order 7th February 2012 ([PRELIMINARY ANALYSIS OF THE IMPACT OF THE INB ORDER - 7TH FEBRUARY 2012 \(AW6JSB v1.0\)](#)).

Compliance with [Defined requirements for PBS 55 - Diagnostics \(NPEVB6 v2.0\)](#) or its flowed down requirements in [SRD-55 \(Diagnostics\) from DOORS \(28B39L v5.2\)](#) is mandatory.

NOTE: There are no Protection Important Activities (PIAs) within the scope of this work.