

Technical Specifications (In-Cash Procurement)

Call for Expertise: Senior mechanical engineer to support the preparation of the ITER In-vessel assembly and installation works

Technical specification for call for expertise for a senior mechanical engineer to support the preparation of the ITER in-vessel assembly and installation works, based on the correct assembly and installation sequence, planning, co-activities and resource estimates.

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1 Purpose

The ITER Organization (IO) is actively preparing the construction contracts and execution of the construction works for the ITER Tokamak on Worksite 1.

This Specification is for the services of one Senior Mechanical Engineer to provide engineering and planning support to the ITER Organization in the preparation for the assembly of nuclear and non-nuclear components of the ITER Tokamak on Worksite 1, including the Assembly Hall (Building 13), Tokamak pit (Building 11) and the Cleaning Facility (Building 17).

2 Scope

2.1 Overview

IO's Ex-Vessel Delivery and Assembly Division (EVDA) in the Machine Construction Department (MCD) requires engineering support to assist with all aspects of the preparation for installation of in-vessel components of the tokamak. This includes but is not limited to:

- Overseeing the work of 4 designers provided by IO:
 - to undertake assembly feasibility and construction reviews as required, including proposals for process and tool improvements to reduce risk and / or optimise schedule;
 - Preparation and / or update of Construction Process Descriptions (CPDs) and / or assembly sequences;
- Provision of the requisite engineering and technical support in order to assist preparation of documentation for construction;
- Review of IO's technical documentation for assembly tenders and contracts
- Review of tenderer / contractor technical documentation for assembly tenders and contracts
- Technical support for schedule preparation and cost estimating.

Note: The Contractor is not responsible for the performance of the 4 designers supplied by IO.

3 Definitions

Abbreviation	Definition
C-R	Contractor Responsible Officer
CMA	Construction Manager as Agent
CST	Construction Department
CWP	Construction Work Package
DO	Design Office (IO)
ECH	Electron Cyclotron Heating
EWP	Engineering Work Package
IDM	ITER Document Management (system)
INB	Installation Nucléaire de Base
IO	ITER Organization
PIA	Protection Important Activity
PIC	Protection Important Component

Abbreviation	Definition
PRO	Procurement Responsible Officer
QA	Quality Assurance
RO	Responsible Officer (IO)
SIC	Safety Important Class
SQEP	Suitably Qualified and Experienced Personnel
TRO	Task Responsible Officer (IO)

For a complete list of ITER abbreviations see: [ITER Abbreviations \(2MU6W5\)](#).

4 References

- [1] [Work Breakdown Structure for Site Construction Phase I \(QPY7MQ\)](#) [latest version]
- [2] [Internal Regulations \(27WDZW v2.2\)](#)
- [3] [In-Cash Procurement Technical and Management Documentation Exchange and Storage Working Instruction \(G8UMB3 v3.0\)](#)
- [4] [ITER Procurement Quality Requirements \(22MFG4 v5.0\)](#)
- [5] [Requirements for Producing a Quality Plan \(22MFMW v4.0\)](#)
- [6] [Quality Assurance for ITER Safety Codes Procedure \(258LKL v2.2\)](#)
- [7] [Procedure for the Usage of the ITER CAD Manual \(2F6FTX v1.1\)](#)
- [8] [Procedure for the CAD management plan \(2DWU2M v2.0\)](#)
- [9] [Specification for CAD data production in ITER Contracts \(P7Q3J7 v2.0\)](#)
- [10] [CAD Manual 07 - CAD Fact Sheet \(249WUL v4.0\)](#)
- [11] [Order dated 7 February 2012 relating to the general technical regulations applicable to INB - EN \(7M2YKF\)](#)
- [12] [PRELIMINARY ANALYSIS OF THE IMPACT OF THE INB ORDER - 7TH FEBRUARY 2012 \(AW6JSB v1.0\)](#)

5 Duration

The duration shall be for 10 months from the starting date, defined by the Contract.

6 Location

All work shall be carried out at the Contractor's premises.

The contractor's personnel may be required to attend the IO site when requested by IO staff to attend onsite in person meeting such as assembly workshops and VR room meetings.

Each visit will require the contractor to obtain a visitors pass for the duration of his onsite presence. The contractor's personnel may also be requested to visit the premises of IO suppliers and contractors for meetings and inspections.

7 Work Description

EVDA requires the Contractor to:

1. Update and existing Produce a Construction Process Description (CPD) to include to installation of the Toroidal Field Mapping System GDC Temporary Electrode Installation.
2. Produce a CPD for In-Vessel coil (IVC) Feeders and feedthroughs for First Plasma configuration.
3. Produce a CPD for Upper & Equatorial Port Plug rail and dogleg installation for First Plasma configuration.
4. Produce a CPD for Upper and Equatorial Port Plugs, PCSS & ISS Installations for First Plasma configuration.
5. Produce a CPD for On-site Preparation of Port Closure Plates and Port Plug Double Flanges and their installation for First Plasma configuration.

Note! The production of a CPD requires the assembly process to be studied and agreed with the IO before the production of the CPD document.

6. Vacuum Vessel (VV) welding – Assess the VV Welding contractor’s tool and equipment design and proposed Working methods. Recommend their suitability based on Safety (both personnel and investment protection) and identify their impact on IO schedule and other system installations. Where any concerns are identified propose solutions to rectify. The assessment should investigate:
 - personnel and equipment movement inside the VV
 - tools installation and removal
 - work required by personnel during the installation and operation of tools and equipment and their access requirements
 - location of VV welding contractors control equipment in the pit
 - impact of tool design on the complete process of VV and ports welding including final removal
 - VV Contractors Schedule**(The level of effort required for this topic is anticipated to be 30% of contract duration)**
7. Provide technical advice for the installation of VS coils by reviewing the contractors documentation and analysing the impact on IO schedule.
8. Participate in the ITER Beryllium Management and Control Program (BMCP). Monitor the implications of the ITER Beryllium Code of Practice and the ITER Beryllium Management Plan for the blanket trial assembly in TAPB and in-vessel assembly. **Estimate 5 person-days including preparation and follow-up of actions;**
9. Participate as technical expert in IO Design, Construction Readiness and Manufacturing Readiness Reviews, related to in-vessel components. **Estimate 5 person-days per contract duration;**

All work performed shall be documented in the Contract Deliverables (ref. section 9).

Deliverables shall be submitted by the Contractor for IO approval, the format being agreed based on information availability and the specific purpose/scope of the Deliverable requested.

In the event that sufficient input information is not available, or as a consequence of reprioritisation of scope, the scope of the tasks and / or alternative deliverables may be agreed, with any changes regarding content, timing, or format of Deliverables being recorded in Monthly Progress Meeting minutes, signed by both the Contractor Responsible Officer (C-R) and the IO Task Responsible Officer (TRO) or delegated Responsible Officer (RO).

8 Responsibilities

8.1 IO Responsibilities

The IO shall appoint a TRO for the Contract, who will be the point of contact for all technical matters, and a Procurement Responsible Officer (PRO) for all contractual and commercial matters. The TRO shall organise a Monthly Meeting with the Contractor on work performed.

In addition, IO shall provide:

- ITER laptop, access to IDM and software required to fulfil specified functions;
- Component CAD models or access to the CAD models in ENOVIA / CATIA;
- Access to requirements documents, presentations and other information explaining installation concepts on which current schedules are based (where available);
- Access to IO design and design review information and reports as available/requested;
- Any input information needed by the Contractor for production of the various Deliverables.

8.2 Contractor Responsibilities

The Contractor shall:

- Appoint a TRO for the Contract, who will be the point of contact for all technical matters, and a C-R for all matters related to this Contract;
- Appoint an operational point of contact for the management of the Deliverables;
- Provide suitably experienced and trained resources (Engineers) to complete all aspects of Deliverables and associated documentation;
- Strictly implement the IO procedures, instructions and use IO templates, where provided;
- Organise work in an efficient way according to the workload and monthly commitments and objectives;
- Report to the TRO any issues during the performance of the Contract which require IO intervention or decision including potential delays in the submission of Deliverables;
- Provide monthly reports, minutes of meetings, records of decisions and other Deliverables as required in section 8;

Contractor's personnel shall be bound by the rules and regulations governing the IO ethics, safety and security – refer [2] [Internal Regulations \(27WDZW v2.2\)](#).

9 List of Deliverables and Due Dates

The deliverables for this task are:

- Quality Plan if applicable.
- Minutes of monthly progress meetings, to be submitted 1 day after the monthly progress meeting. *The kick-off meeting shall be considered as the first monthly progress meeting.*
- Monthly reports describing the work done on activities mentioned in section 7 or alternatives as agreed in advance in writing by TRO.

The monthly report shall:

- Be submitted monthly, starting one month after the kick-off of the contract.
- Summarise the activities completed in the month concerned, including IDM references of documents reviewed/produced;
- Highlight specific issues requiring further action / summarise improvement opportunities;

Deliverable Ref.	Deliverable Description	Due Date
D1	Quality Plan (if applicable) Minutes of kick-off meeting Monthly report including links to the deliverables completed in the previous month.	T0 + 1
D2	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month.	T0 + 2
D3	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month.	T0 + 3
D4	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month.	T0 + 4
D5	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month.	T0 + 5
D6	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month.	T0 + 6
D6	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month.	T0 + 7
D8	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month.	T0 + 8
D9	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month.	T0 + 9
D10	Minutes of monthly progress meeting. Final monthly report including links to the deliverables completed in the previous month.	T0 + 10

10 Deliverables Acceptance Criteria

Deliverables shall be submitted in accordance with [3] [In-Cash Procurement Technical and Management Documentation Exchange and Storage Working Instruction \(G8UMB3 v3.0\)](#)

The following criteria shall be the basis of the acceptance of the successful accomplishment of the work.

Delivery Date Criteria

On-time delivery of Deliverables according to the dates provisionally defined in Section 9.

Report and Document Review Criteria

Reports and Deliverables shall be stored in the ITER Organization's document management system, IDM, by the Contractor for acceptance. A named ITER Organization's TRO is the Approver of the delivered documents. The Approver can nominate or delegate one or more Reviewers(s) in the area of the Deliverable's expertise. The Reviewer(s) may ask for modifications to be made to the report in which case the Contractor must submit a new version. The acceptance by the Approver is an acceptance criterion for completion of a Deliverable.

11 Specific Requirements and Conditions

The work will require qualified Engineers with suitable proven technical skills commensurate with the work scope of this Specification. It is the responsibility of the Contractor to ensure that work is performed by Suitably Qualified and Experienced Personnel (SQEP) and the suitability of Contractor resources shall be demonstrated by the Contractor in any proposals.

The following general requirements are applicable:

- The working language of the project is English, and all contributors are expected to be able to communicate clearly and effectively – both orally and in writing;
- Experience in international projects;
- Proficient command of the Microsoft Office packages;
- Experience in tender package compilation and procurement;
- Prior knowledge of and experience on the ITER project.

The following specific requirements apply for respective resources:

Senior Mechanical Engineer

- Bachelor's degree in Mechanical Engineering;
- At least 20 years' professional experience in the development of assembly concepts and processes, and the design and manufacturing of the corresponding assembly tools;
- At least 20 years' professional experience in manufacturing and assembly of components and systems in fusion or research projects;
- At least 15 years' professional experience in preparing technical specifications and documentation associated with procurement, tendering and contract administration for complex construction contracts;
- At least 15 years' professional experience of the assembly of tokamaks, or very similar experience involving large and heavy components, precision alignment, ultra-high vacuum and clean conditions;
- Working knowledge of ultra-high vacuum and related requirements and testing techniques;
- At least 10 years' experience in the application of QA and QC to manufacturing and assembly operations;
- Proven ability to autonomously conduct assembly studies, identify improvements, resolve issues, and produce clear documentation;
- Detailed knowledge of tolerances and large volume metrology;
- Detailed knowledge of procedures for working with beryllium and beryllium-contaminated environments;
- Working knowledge of the European Machinery Directive and applicable French Health and Safety legislation;
- Experience of preparing and designing safe working environment for construction activities;
- Detailed knowledge of ITER tokamak assembly.

12 Work Monitoring / Meeting Schedule

12.1 Kick-off Meeting

A Kick-off Meeting shall be arranged by the TRO approximately one week after the commencement of the Contract for the purpose of confirming background documentation, plans, schedules, and design data defining the work. All of the resources appointed at that time, plus the C-R (if separate), shall be required to attend.

The minutes of the Kick-off Meeting shall be submitted by the Contractor as a Deliverable.

12.2 Progress Reporting

Monthly Progress Meetings will be arranged by the TRO.

Personnel in charge of preparing the Deliverables will be expected to attend Monthly Progress Meetings.

The main purpose of the Progress Meetings between the ITER Organization/CST Department and the Contractor is to:

- Review the completed activities and assess the progress made;
- Permit fast and consensual resolution of unexpected problems;
- Agree the specific tasks and corresponding deliverables to be completed in the month ahead;
- Review the technical issues and opportunities
- Clarify doubts and prevent misinterpretations of the technical specifications.

Monthly reports shall be submitted by the Contractor as deliverables for IO approval. Monthly Reports shall include a break-down of Contractor activities, with reference to detailed technical reports and actual / potential issues.

The minutes of Progress Meeting shall be submitted by the Contractor as Deliverables.

13 Quality Assurance (QA) Requirements

The organisation conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system. Alternatively the contractor may opt to follow the IO QA processes. In this case, the requirement to prepare a Quality Plan is not applicable. Specific training shall be provided by IO.

The general requirements are detailed in [4] [ITER Procurement Quality Requirements \(22MFG4 v5.0\)](#).

Prior to commencement of the Contract, a Quality Plan (where applicable) must be submitted for IO approval giving evidence of the above and describing the organisation for the Contract; the skill and experience of workers involved in the study; any anticipated sub-contractors; and giving details of who will be the independent checker of the activities, if required - see [5] [Requirements for Producing a Quality Plan \(22MFMW v4.0\)](#).

Documentation developed as the result of this Contract shall be retained by the Contractor 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 activity such as analysis and/or modelling, etc. shall be reviewed and approved by the IO prior to its use, in accordance with [6] [Quality Assurance for ITER Safety Codes Procedure \(258LKL v2.2\)](#).

14 CAD Design Requirements

The Contractor shall ensure that all designs, CAD data and drawings delivered to IO comply with the [7] [Procedure for the Usage of the ITER CAD Manual \(2F6FTX v1.1\)](#), and with the [8] [Procedure for the CAD management plan \(2DWU2M v2.0\)](#).

The reference scheme is for the Contractor to work in a fully synchronous manner on the ITER CAD platform (see detailed information about synchronous collaboration in the ITER [9] [Specification for CAD data production in ITER Contracts \(P7Q3J7 v2.0\)](#)).

This implies the usage of the CAD software versions as indicated in [10] [CAD Manual 07 - CAD Fact Sheet \(249WUL v4.0\)](#) 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 Contractor.

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 Sub-contractors 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) – refer [11] [Order dated 7 February 2012 relating to the general technical regulations applicable to INB - EN \(7M2YKF\)](#).
- 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 Sub-contractor following the requirements of the Order 7th February 2012 [12] [PRELIMINARY ANALYSIS OF THE IMPACT OF THE INB ORDER - 7TH FEBRUARY 2012 \(AW6JSB v1.0\)](#).