

Technical Specifications (In-Cash Procurement)

**Call for Expertise for Senior Engineer for preparation of
Integrated Testing and Commissioning of Purpose-Built
Sector Lifting Tools**

This Specification is for the services of one Senior Mechanical Engineer to provide engineering support to the ITER Organization in the preparation, specification and supervision of site acceptance testing and commissioning of purpose-built tools for the assembly of nuclear and non-nuclear components of the ITER Tokamak.

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1 Purpose

This Specification is for the services of one Senior Mechanical Engineer to provide engineering support to the ITER Organization in the preparation, specification and supervision of site acceptance testing and commissioning of purpose-built tools for the assembly of nuclear and non-nuclear components of the ITER Tokamak.

2 Scope

2.1 Overview

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

IO will be assisted with the management of the assembly, installation and support contracts by a Construction Manager as Agent (CMA). IO is required to develop and prepare the engineering packages for Tender and for Construction, which define and describe the corresponding work scope, to be provided to the CMA. The CMA will transfer the data to the appropriate Contractors contracted by ITER.

IO's Construction Department (CST) requires engineering support to assist with the all aspects of the preparation, specification and supervision of site acceptance testing of purpose-built tools for the assembly of nuclear and non-nuclear components of the ITER Tokamak for Construction. This includes:

- Preparation of test requirements for site acceptance testing of purpose0-built assembly tools, including integrated testing of tool combinations;
- Conception and development of test methods and acceptance criteria;
- Contribution to preparation, review and compilation of the engineering and existing data for construction and / or for the specification and procurement of purpose-built tools;
- Provision of engineering support to follow-up detailed design and manufacture of purpose-built assembly tools;
- Review input documents received for tool and component design reviews, providing justified comments and constructive criticism in writing.

3 Definitions

Abbreviation	Definition
C-R	Contractor Responsible Officer
CAD	Computer Aided Design
CD	Current Drive
CHWS	Chilled Water System
CCWS	Component Cooling Water System(s)
CMA	Construction Manager as Agent
CODAC	Control, Data Access and Communication
CST	Construction Department
CWP	Construction Work Package
DA	Domestic Agency
DCIF	Design Collaboration Implementation Form

Abbreviation	Definition
DO	Design Office (IO)
ECH	Electron Cyclotron Heating
EWP	Engineering Work Package
H & CD	Heating and Current Drive
I2P	Instruction to Proceed
ICH	Ion Cyclotron Heating
IDM	ITER Document Management (system)
INB	Installation Nucléaire de Base
IO	ITER Organization
IV	In-Vessel
NB	Neutral Beam
PBS	Plant Breakdown Structure
PIA	Protection Important Activity
PIC	Protection Important Component
PRO	Procurement Responsible Officer
QA	Quality Assurance
RF	Radio Frequency
RO	Responsible Officer (IO)
SIC	Safety Important Class
SQEP	Suitably Qualified and Experienced Personnel
TRO	Task Responsible Officer (IO)
VVPSS	Vacuum Vessel Pressure Suppression System
WBS	Work Breakdown Structure

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 12 months (a maximum of 220 working days) from the starting date, defined by the Contract.

6 Work Description

The Contractor's personnel will provide support to CST at IO Headquarters, Cadarache, France, due to the need for frequent liaison and discussion with ITER Staff.

IO is going to lift 1,200 tons mechanical components set up as single items in the assembly building. These "heavy lifting operations" will be performed several times on a range of components and sub-assemblies, including cryostats sub-assemblies and sector modules (sub-assembly of 1 vacuum vessel sector, 2 toroidal field coils and the corresponding thermal shield components).

Heavy lifting operations will typically be performed using 2 cranes with 4 hooks in a tandem mode. The components will be lifted using a setup of beams, upending tools, sector lifting tools, spreader beams etc.

Before these lifting operations, preparatory work is required:

- To check the interface between lifting equipment provided by different vendors;
- To perform site acceptance testing of individual tools, including functional tests;
- To demonstrate by test, measurement and any relevant practical checks the capability of the combinations of tools to effect the heavy lifting operations;
- To propose / check the correct application of the lifting, machine regulation and occupational safety regulations.

This preparatory work scope covers all the lifting apparatus, devices, accessories and machines used to lift:

- The components of 9 sector modules from laydown areas into the sub-assembly tool;
- 9 completed sector modules to the tokamak pit;
- 4 cryostat sub-assemblies (base, lower cylinder, upper cylinder and lid) from the assembly building to the tokamak pit.

Preparatory work shall include writing of necessary procedures and specifications. Procedures shall take into account the mass, centre of gravity and expected variations thereof for the components and assemblies to be lifted.

7 Responsibilities

7.1 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:

- Office accommodation;
- Computing facilities and ITER laptops, 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;
- Access to construction site;
- Any input information needed by the Contractor for production of the various Deliverables.

7.2 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 \(27WDZW v2.2\)](#).

8 List of Deliverables and Due Dates

All work shall be output and recorded as Deliverables, comprising documents submitted by the Contractor for IO approval, in the format 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, substitution of Deliverables may be agreed; with any changes regarding content, timing, or format of Deliverables being recorded on Monthly Progress Meeting minutes, signed by both the Contractor Responsible (C-R) and the IO Task Responsible Officer (TRO) or delegated Responsible Officer (RO).

Deliverable reports shall include:

- **Meeting Minutes:** Kick-off and Progress Meeting minutes prepared in accordance with Section 8 of this Specification.
- **Progress Reports:** Monthly Reports prepared in accordance with Section 8 of this Specification.

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 6.1 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:
 - **Engineering Work Packages:** Inputs to Engineering Work Packages;
 - **Design of access platforms and tools;**
 - **Issue tracking:** new issues identified, actions taken, issues closed;
 - **Recommendations & Reports:** recommendations or reports.
- Include 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. First draft of procedure for the integrated load test and associated commissioning of Sector Lifting tools and related infra-structures	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. Second draft of procedure for the integrated load test and associated commissioning of Sector Lifting tools and related infra-structures	T0 + 9

D10	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month.	T0 + 10
D11	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month. Final procedure for the integrated load test and associated commissioning of Sector Lifting tools and related infra-structures	T0 + 11
D12	Minutes of monthly progress meeting. Monthly report including links to the deliverables completed in the previous month.	T0 + 12

9 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 8.

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.

10 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

- Master's degree in Mechanical Engineering or equivalent;
- At least 15 years' professional experience in the design, manufacture and / or assembly of large components and tools in a regulated sector such as nuclear or aerospace;

- At least 10 years' experience of the design, manufacture and testing of assembly tools; assembly concepts and processes, and the design and manufacturing of the corresponding assembly tools;
- At least 5 years' experience in the design and manufacture of large components in stainless steel;
- Good knowledge of welding and associated NDT techniques;
- At least 2 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;
- Proven ability to autonomously conduct assembly studies, identify improvements, resolve issues, and produce clear documentation;
- Detailed knowledge of tolerances and large volume metrology;
- Good knowledge of the European Machinery Directive and applicable French Health and Safety legislation;
- Experience of testing and commissioning large tools and equipment;
- Good knowledge of nuclear codes;
- Experience of working in a multi-cultural environment would be a definite advantage;
- Prior knowledge of the ITER tokamak assembly would be a definite advantage.

11 Work Monitoring / Meeting Schedule

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

11.2 Progress Reporting

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

Monthly Progress Meetings will be arranged by the TRO.

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 for IO approval. Monthly Reports are to include a break-down of Deliverables, Contractor activities and actual / potential issues.

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

12 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 \(258LKL v2.2\)](#).

13 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 databases. 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.

14 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 \(AW6JSB v1.0\)](#).