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Technical Specifications (In-Cash Procurement)

Call for Expertise for engineering support in the development and qualification of assembly process for the TF Magnet system.

IO's Tokamak Assembly Division in the Construction Department (CST) requires engineering support:

• in the preparation of a full concept, specification of related process, process qualification and tools for tightening of pre-compression rings (PCR);

• to assist with the supervision of ongoing process qualifications related to TF magnet intercoil structures;

• to contribute to the preparation of related Construction Work Packages (CWP) for the instruction of the Tokamak Assembly Contractor.

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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 development and qualification of assembly process for the TF Magnet system.

2 Overview

IO's Tokamak Assembly Division in the Construction Department (CST) requires engineering support:

- in the preparation of a full concept, specification of related process, process qualification and tools for tightening of pre-compression rings (PCR);
- to assist with the supervision of ongoing process qualifications related to TF magnet intercoil structures;
- to contribute to the preparation of related Construction Work Packages (CWP) for the instruction of the Tokamak Assembly Contractor.

2.1 PCR

The purpose of the PCR is to put the Toroidal Field Coils (TFC) in hoop compression. During energization and plasma operation, without this initial compression, toroidal gaps would open between the TFC and result in loosening of the poloidal shear keys. This pre-compression also reduces the toroidal loads on the intermediate outer intercoil structures. A single PCR set-up has 36 flanges; each flange having 2 M80 bolts and 2 M110 bolts (See Figure 1 and Figure 2). The PCR tightening is to be carried out in a restricted space. The high pre-loads and resulting stored energy in the PCR require that the process shall be subject to a careful hazard analysis, and ideally be performed with no personnel near the PCR unit during the tightening. The tightening process shall be monitored to ensure the equal pre-load of the PCR. The process is required to be qualified prior to actual assembly. Subject to successful qualification of the process, commissioning at IO site may be required. In accordance with the European Machinery Directive, tools shall be CE marked.

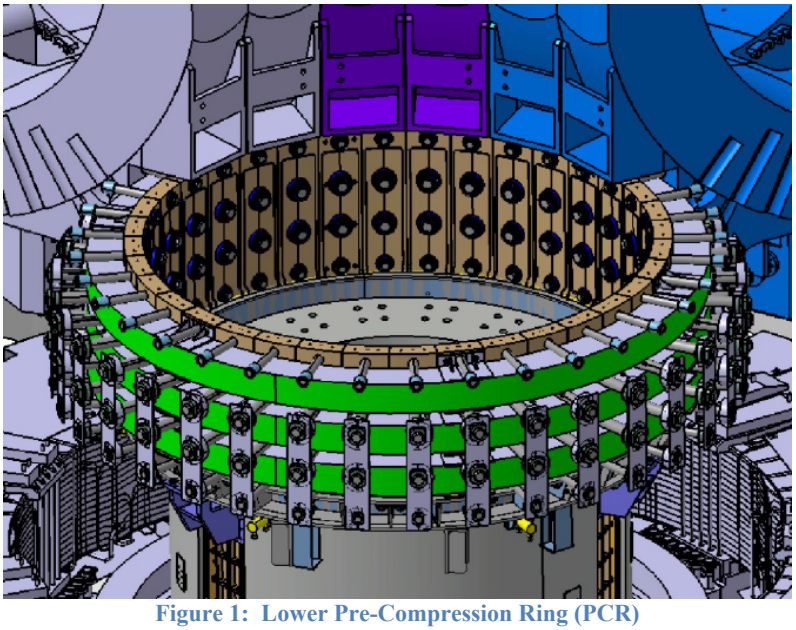

Figure 1: Lower Pre-Compression Ring (PCR)

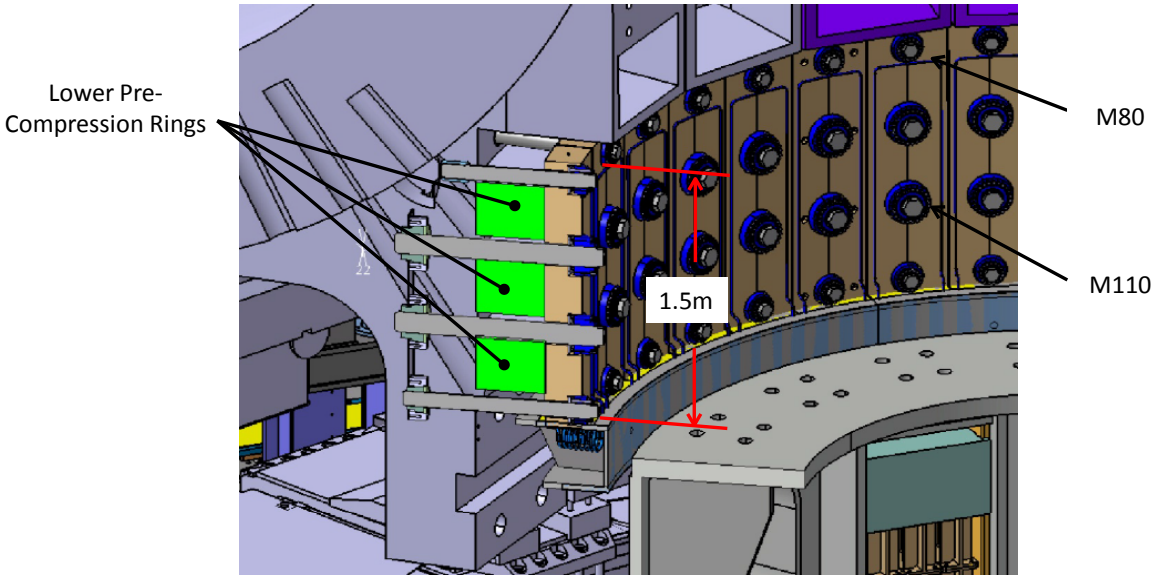

Figure 2: PCR Assembly

3 Definitions

Abbreviation	Definition
C-R	Contractor Responsible Officer
CAD	Computer Aided Design
CMA	Construction Manager as Agent
CST	Construction Department
CWP	Construction Work Package
DO	Design Office (IO)
EWP	Engineering Work Package
IDM	ITER Document Management (system)
ILIS	Inner Leg Intercoil Structure
INB	Installation Nucléaire de Base
IO	ITER Organization
PCR	Pre-Compression Ring
QA	Quality Assurance
RO	Responsible Officer (IO)
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 12 months (a maximum of 220 working days) from the starting date, defined by the Contract.

6 Work Description

Due to the need for frequent liaison and discussion with ITER Staff and Tokamak Assembly Contractors, the Contractor's personnel will provide regular support to CST on-site at IO Headquarters, Cadarache, France.

The work foreseen under this specification is as follows:

- Preparation of requirements, including technical, environment, space, access, quality and safety for the PCR tightening;
- Conception and development of a tightening process for the PCR;
- Definition and specification of the PCR tightening control system and instrumentation;
- Development of process qualification (including mock-ups) and conceptual design of tooling (ideally based on commercially available equipment);
- Preparation of the technical specification for a contract for the qualification of the PCR tightening process and the detailed design, supply and testing of the tooling;
- Follow the contract for the qualification of the PCR tightening tooling and process qualification;

The above tasks are expected to occupy around 50% of the time of 1 Senior Engineer.

- Supervision of an ongoing contract which has already been placed to qualify processes for the installation of InterCoil Structures;

The above task is expected to occupy around 25% of the time of 1 Senior Engineer.

- Contribution to the preparation of related Construction Work Packages (CWP) for the instruction of the Tokamak Assembly Contractor to perform the tasks of tightening the PCR, fitting the Inner Leg Intercoil Structure (ILIS) and other Intercoil Structures including, but not limited to:
    - Preparation of the draft inspection plan
    - Preparation of a hazard and safety analysis
    - Definition of personnel training requirements
    - Verification of personnel and tooling access in the respective working environments

The above task is expected to occupy around 25% of the time of 1 Senior Engineer.

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 (1 Engineer) 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 in IDM (ITER Document Management System).

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).

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.*
- **The monthly report** which shall be submitted at the end of the month, shall describe the work done on activities mentioned in section 6 of this specification (or alternatives as agreed in advance in writing by TRO) and shall include:
    - Include IDM references of documents reviewed/produced as follows:
        - Specific technical deliverables such as drafts of processes etc.
    - 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
D7	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. 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.	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 a qualified Engineer with suitable proven technical skills commensurate with the work scope of this Specification. IO estimates that the Engineer will be required full-time for 1 year. 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 in English;
- 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 would be beneficial.

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;
- 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 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.

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).