

## Technical Specifications (In-Cash Procurement)

### **Maintenance of port-based diagnostic systems**

The objective of this engineering contract is to provide the study for the hands-on or assisted/distantly operated maintenance of port-based diagnostic systems, including common structures such as Port Interspace and Cell Support Structures, flanges, shielding blocks, feedthroughs etc, in IO ports where integration is affected by the Disruption Mitigation System (DMS). The diagnostics, DMS and services have to be integrated within tokamak complex. Ex-port plug components, as well as ...

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## 1 Purpose

The objective of this engineering contract is to provide the study for the hands-on or assisted/ distantly operated maintenance of port-based diagnostic systems, including common structures such as Port Interspace and Cell Support Structures, flanges, shielding blocks, feedthroughs etc, in IO ports where integration is affected by the Disruption Mitigation System (DMS). The diagnostics, DMS and services have to be integrated within tokamak complex. Ex-port plug components, as well as transmission lines, supports and shielding blocks and cables, will be located in different places across the tokamak complex and have to be replaced, to be maintained and to withstand the operational and maintenance loads, and to minimize worker's exposure during maintenance period by introduction of dedicated maintenance tools – hands-on or distantly operated.

## 2 Scope

The work involves the support the ITER Diagnostic Team in definition of maintenance tasks for ex-PP components, including ORE assessment and hands-on or assisted/ distantly operated tooling design.

## 3 Definitions

CM	Configuration Model
DA	Domestic Agency
DM	Detailed Model
DMS	Disruption Mitigation System
FDR	Final Design Review
RH	Remote Handling
IDM	ITER Document Management
IO	ITER Organization
IO-TRO	ITER Organization Technical Responsible Officer
ISS	Interspace Support Structure
ORE	Occupational and Radiation Exposure
PBS	Plant Breakdown Structure
PCSS	Port Cell Support Structure
PDR	Preliminary Design Review

For a complete list of ITER abbreviations see: [ITER Abbreviations \(ITER\\_D\\_2MU6W5\)](#).

## 4 References

- [1] V.S. Udintsev et al, “Final Design of the Generic Equatorial Port Plug Structure for ITER Diagnostic Systems”, [Fusion Engineering and Design](#) 2015
- [2] V.S. Udintsev et al, “Support structure concept for integration of ITER diagnostics in the port cell”, [Fusion Engineering and Design Volume 88, Issues 6–8](#), October 2013, Pages 1215–1218

## 5 Estimated Duration

The duration shall be for 12 months from the starting date of the Contract. Services are to be provided at about 50% time at the IO work site, with visits on-site for meeting as and when necessary and requested by IO. No provisions for travel are necessary.

## 6 Work Description

During ITER operation, the Diagnostic Port Plugs (Upper or Equatorial) are regularly removed from the tokamak and delivered to the Hot Cell Facility for refurbishment using the Remote Handling Equatorial Cask System. After cleaning, it is then passed on a trolley into the maintenance area to either a refurbishment station or a buffer storage area. This is a “red” zone, where no human access is allowed due to the high contamination (Tritium and Beryllium) and radiation levels. Port plug maintenance will generally consist of replacement of damaged or malfunctioning components plus simple operations, such as cleaning, adjustment, and minor refurbishment. The Diagnostic Shield Module/ Diagnostic First Wall assembly is taken off the Port Plug structure in the vertical orientation by a crane operated remotely. After refurbishment, Port Plug is delivered to the Port Plug Test Facility for environmental and functional tests [1].

Contrary, the Port Interspace and Port Cell equipment [2] (see Figure 1) is not maintained by the Remote Handling tools, but assisted-manual tools which imply semi-robotic and distantly manipulated operations due to the activation of equipment and possible contamination by beryllium and tritium. Once removed from the Port Cell, this equipment will be handled hands-on in a dedicated area in the Hot Cell Facility where human presence is allowed but restricted.

The following sub-tasks are foreseen:

- Develop integrated (meaning for the infrastructure with tenant systems and services, including DMS) port maintenance strategy which requires identification of tasks, proposals for tooling, hands-on or distant operations assessment, worker’s exposure assessment and time to perform all necessary maintenance tasks.
- Propose and justify maintenance and handling schemes by analysis for port-based diagnostics and other tenants and services, such as DMS, taking into account the needs of the integrated ports plug, needs for a workstation to perform maintenance tasks, as well as maintenance of the individual systems integrated within the given ports and their specific requirements.
- Propose design of maintenance tools required to service diagnostic systems and services which would satisfy quick and reliable refurbishment of systems in-situ or in the Hot Cell.
- Follow-up and prepare (together with tenant system ROs) the input packages for upcoming Design Reviews of diagnostic port following Staged Approach.

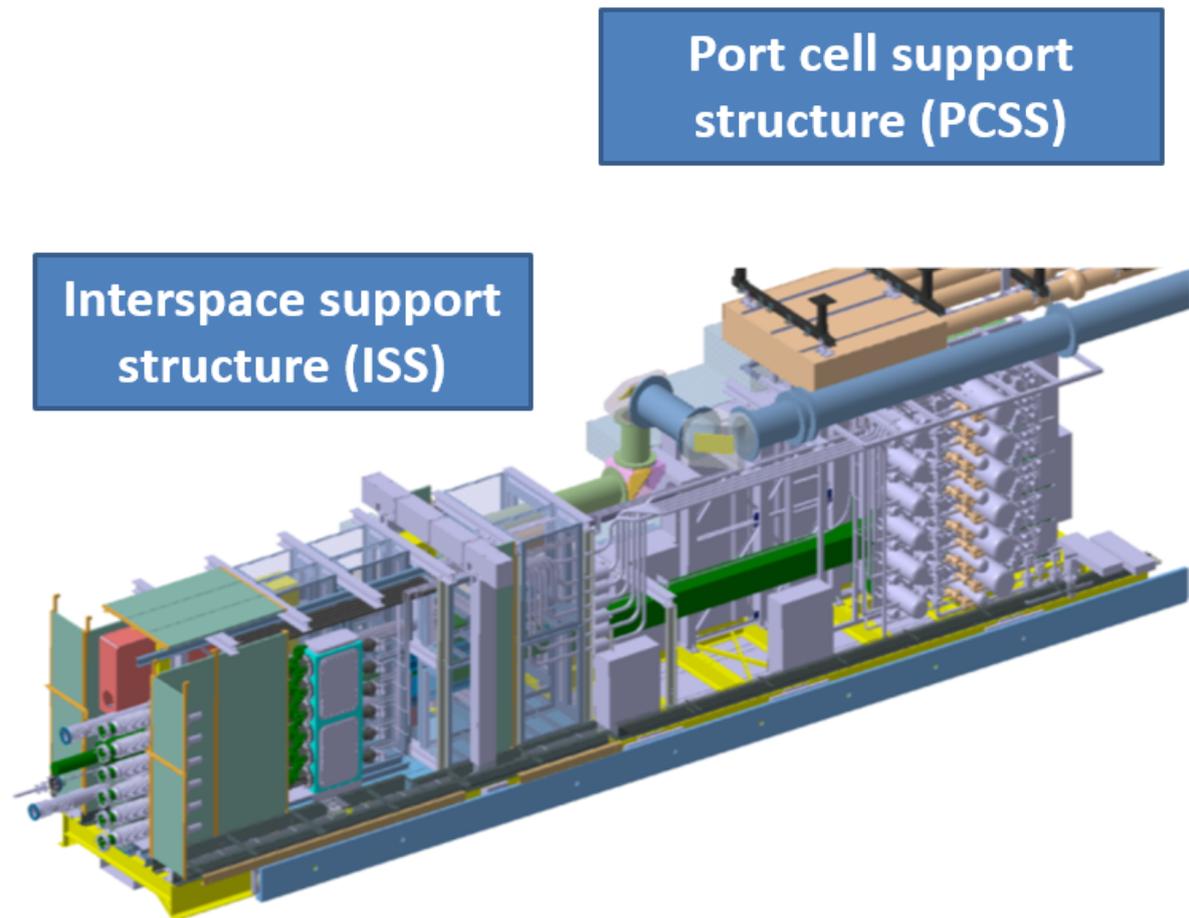


Figure 1. General layout of integrated port interspace support structure in the typical Equatorial Port #8 (modular design approach).

## 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;
- 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 IO rules.

### 7.2 IO's Responsibilities

The IO shall:

- Nominate the Responsible Officer to manage the Contract;
- Organise a monthly meeting(s) on work performed;

- Provide offices at IO premises.

## 8 List of Deliverables and due dates

The main deliverables are grouped in the following Work Package, as given in the table below:

D #	Description	Due Dates
D01	<p>Update or create ORE documents for diagnostic port based on latest maintenance schemes, port designs and assumptions for the Equatorial Port #8 PDR closure.</p> <p>Discuss with interface ROs (RH, maintenance, DMS design team, safety, diagnostic experts, neutronics expert) and update/ upload the related documents in the PLM/IDM for review and approval.</p> <p>The reviewers of the report need to be coherent with the <a href="#">ITER_D_2EXFXU - Sign-Off Authority for Project Documents</a>.</p>	T0 + 3 months
D02	<p>Prepare maintenance assessment docs and supportive maintenance analysis for systems located in Equatorial Port #17 in preparation for EP#17 PDR. Discuss them with experts and put in the IDM for review/ approval. Prepare the proper input package for the PDR. Answer eventual chits from the PDR and document them in PLM/IDM before PDR closure.</p> <p>The reviewers of the input package need to be coherent with the Document Production Plan.</p>	T0 + 6 months
D03	<p>Review ORE documents, as well as maintenance assessment documents for diagnostic equatorial and upper ports based on latest maintenance schemes and modular port designs.</p> <p>Discuss with interface ROs (RH, maintenance, DMS design developers, safety, diagnostic experts, neutronics expert) and update/ upload the related documents in the PLM/IDM for review and approval.</p> <p>The reviewers of the report need to be coherent with the <a href="#">ITER_D_2EXFXU - Sign-Off Authority for Project Documents</a>.</p>	T0 + 9 months
D04	<p>Prepare maintenance assessment docs and supportive maintenance analysis for systems located in Equatorial Port #8 in preparation for EP#8 FDR, following the configurations as they are defined in the Staged Approach. Discuss them with experts and put in the IDM for review/ approval. Prepare the proper input package for the FDR. Answer eventual chits from the FDR and document them in PLM/IDM before FDR closure.</p> <p>The reviewers of the input package need to be coherent with the Document Production Plan.</p>	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, Table of deliverables.

## 10 Specific requirements and conditions

- Experience in interpretation of neutronics/ shutdown dose rate analysis;
- Experience in mechanical engineering;
- Experience in Remote Handling/ maintenance;
- Experience in application of French Nuclear Safety regulations;
- Experience in interface management;
- Schematics definition;
- Design organization;
- Technical document generation;
- System requirements management;
- Technical risk analysis.

## 11 Work Monitoring / Work Monitoring / Meeting Schedule

Work is monitored through reports (see List of Deliverables section).

## 12 Delivery time breakdown

See Section 8 "List Deliverables section 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 \(ITER\\_D\\_KTU8HH\)](#).

## 14 CAD Design Requirements (if applicable)

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 ([2F6FTX](#)), and with the Procedure for the Management of CAD Work & CAD Data (Models and Drawings [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 [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 ([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.

This task is PIA.

The supplier must comply with the all requirements expressed in “Provisions for implementation of the generic safety requirements by the external actors/interveners” (ITER\_D\_SBSTBM).