

## **Technical Specifications (In-Cash Procurement)**

# **Technical Specification Remote Handling Compatibility and Maintenance studies of diagnostic designs**

The objective of this engineering contract is to provide the study for the remote and hand-on maintenance of port-based diagnostic systems, including common structures such as Port Plugs and Diagnostic First Walls, as well as to produce maintenance plans for diagnostic integrated ports and design of handling tools. The diagnostics have to be integrated within tokamak complex. Port structures, such as Diagnostic Shield Modules, Interspace and Port Cell Support Structures, as well as in-port plug ...

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## 1 Purpose

The objective of this engineering contract is to provide the study for the remote and hand-on maintenance of port-based diagnostic systems, including common structures such as Port Plugs and Diagnostic First Walls, as well as to produce maintenance plans for diagnostic integrated ports and design of handling tools. The diagnostics have to be integrated within tokamak complex. Port structures, such as Diagnostic Shield Modules, Interspace and Port Cell Support Structures, as well as in-port plug mirrors, shutters, permanent components, transmission lines 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.

## 2 Scope

The scope of work for this task order will be the following Diagnostics development activities: **Produce Remote Handling Compatibility and Maintenance studies of diagnostic designs to be compliant with maintenance requirements in the tokamak complex.**

The work comprises of design of distributed in-port and ex-vessel diagnostic systems and their maintenance assessments.

Task encompasses several activities divided in Deliverable-based Sub-Tasks.

## 3 Definitions

DA	Domestic Agency
DFW	Diagnostic First Wall
DIR	Design Integration Review
DSM	Diagnostic Shield Module
PBS	Plant Breakdown Structure
PDR	Preliminary Design Review
RH	Remote Handling
SIR	System Integration 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

Work to be carried out over a period of 12 months predominantly at IO working site. Some missions of a short duration may be envisaged for the purpose of the execution of the Contract.

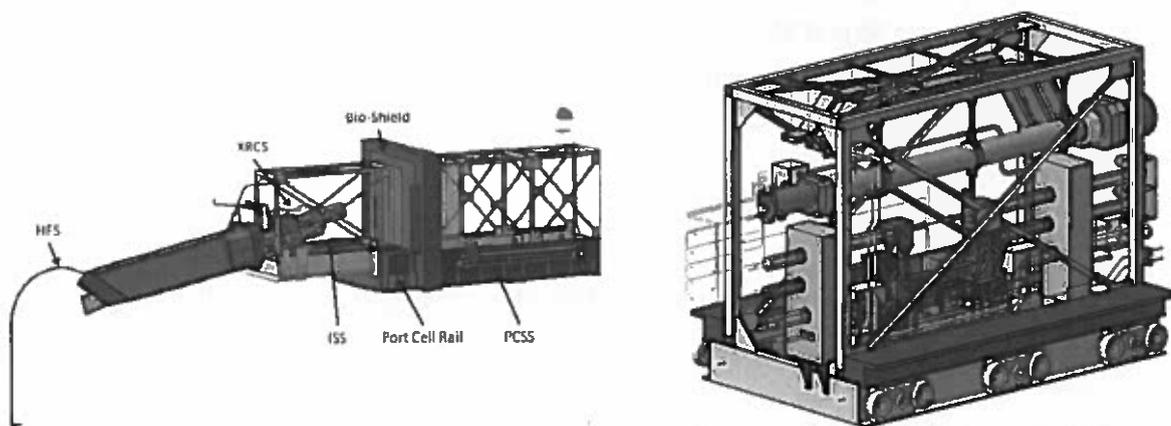
## 6 Work Description

During ITER operation, the Diagnostic Port Plug and Lower Port racks are removed from the tokamak and delivered to the Hot Cell Facility for refurbishment using the Remote Handling Equatorial Cask System. After cleaning, they are 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 and lower port rack maintenance will generally consist of replacement of damaged or malfunctioning diagnostic components (mirrors, shutters, cleaning systems etc) plus simple operations, such as dust cleaning or adjustment. 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 and Lower Port Racks are delivered to the Port Plug Test Facility for environmental and functional tests [1].

Removal of the port plugs and lower port racks also involves prior removal of the ex-port plug support structures which are housing diagnostic extensions and back-ends. Although maintenance of these structures is considered to be hands-on, due to the high activation in this area, the human intervention is limited and the maintenance has to rely of semi-robotic operations to meet ALARA. Maintenance assessment and maintenance plans for integrated ports, including systems located in the port interspace and port cell, have to be produced and justified.

The following sub-tasks are foreseen:

- Propose and justify remote maintenance schemes by analysis for port-based diagnostics and service systems, taking into account the needs of the integrated ports plug, as well as individual systems integrated within the given ports and their specific requirements (see Figure 1 for example of the integrated port).



*Figure 1. Examples of integrated upper port (left) and integrated interspace support structure (right).*

- Propose design of remote maintenance tools required to service diagnostic systems which would satisfy quick and reliable refurbishment of systems in-situ or in the Hot Cell.
- Follow-up and prepare (together with Port Integrating DA) the Remote Handling Compatibility Assessment input packages for upcoming Design Reviews of first plasma diagnostic port.

- Prepare maintenance plans for specific integrated diagnostic ports, discuss them with respective ROs and expert at IO-CT and upload them for review in the IDM.
- Prepare inputs for Design Review and present maintenance/ remote handling studies; answer possible chits following design review and document them in the IDM.

## 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

D #	Description*	Due Dates
D1	Produce maintenance assessment of integrated First Plasma equatorial ports based on the modular design of the Interspace Support Structure and Port Cell Support Structure. Produce maintenance plan, discuss with experts at IO-CT and concerned DAs and upload it in the IDM for review.	T0 + 3 months
D2	Assessment of RH compatibility documentation for equatorial port-based diagnostics based on the modular Diagnostic Shield Module design in preparation for Preliminary Design Reviews of the First Plasma Equatorial Ports. Agreement of propose RH schemes with RH experts within IO and approval of documents before PDRs.	T0 + 5 months
D3	Assessment of RH tooling required to handle diagnostic ports in the Hot Cell Facility by means of RH tools. Propose standard tooling, verify the findings with experts in the nuclear robotic operations at IO-	T0 + 8 month

	CT and worldwide. Prepare a report in the IDM.	
D4	Assessment of RH compatibility documentation for upper port-based diagnostics in preparation for Preliminary Design Review of a specific Upper Diagnostic Port. Agreement of propose RH schemes with RH experts within IO-CT and concerned DAs and approval of documents before PDR.	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 remote handling compatibility assessment preparation;
- Experience in mechanical analysis;
- Experience in production of maintenance plan;
- 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 / 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 Quality Assurance for ITER Safety Codes (ITER\_D\_258LKL).

## 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)).