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EXTERNAL REFERENCE / VERSION

Technical Specifications (In-Cash Procurement)

Engineering contract to provide the analysis for the installation and maintenance of individual and integrated diagnostic systems

Tech Spec for the above position

Table of Contents

1 Purpose

The objective of this engineering contract is to provide the analysis for the installation and maintenance of individual and integrated diagnostic systems, with particular emphasis in the areas of diagnostic integration within ports and in the buildings. The diagnostics have to be integrated within tokamak complex. Transmission lines, cables and cubicles will be located in different places across the tokamak complex and have to be replaced, to be maintained and to withstand the 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: **Advance diagnostic designs to be compliant with maintenance and assembly 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 (to be published)

[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 24 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 is 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] is not maintained by the Remote Handling tools, but assisted-manual tools which imply semi-robotic and semi-hands on operations due to the activation of equipment. 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 port maintenance strategy which requires identification of tasks, proposals for tooling, remote or semi-remote operations assessment, worker's exposure assessment and time to perform all necessary maintenance tasks.

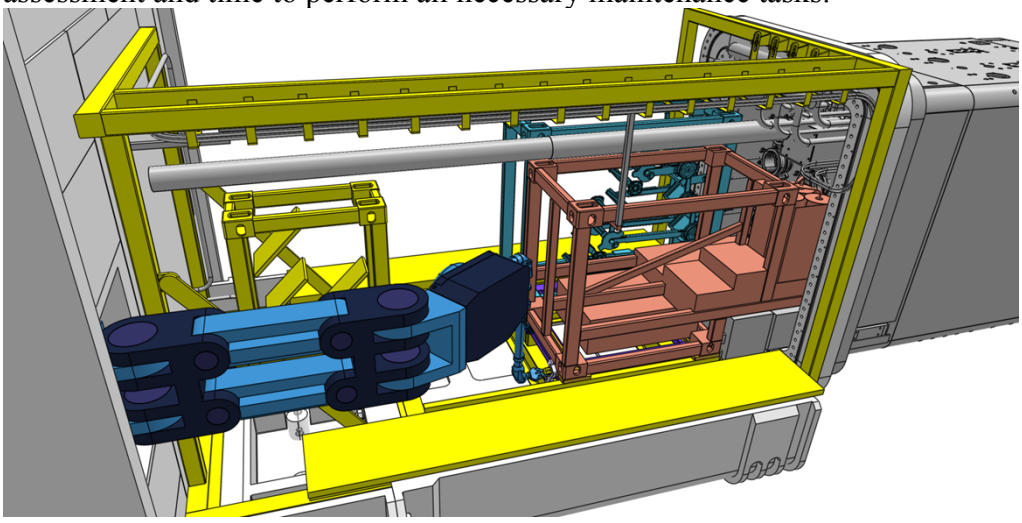

Figure 1. A concept of a human assisted equipment handling in the port cell.

- Propose and justify maintenance and handling schemes by analysis for port-based diagnostics, taking into account the needs of the integrated ports plug, as well as individual systems integrated within the given ports and their specific requirements.

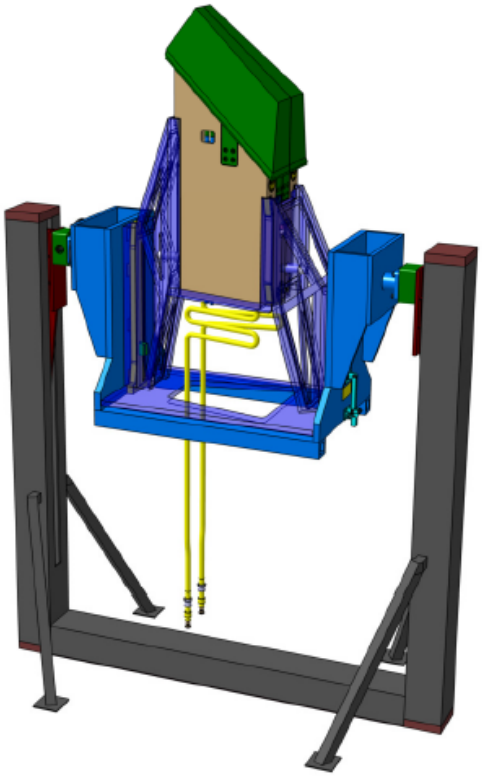

Figure 2. A concept of a workstation to refurbish diagnostic shield module in the Hot Cell (Remote Handling operation).

- Propose design of maintenance tools required to service diagnostic systems which would satisfy quick and reliable refurbishment of systems in-situ or in the Hot Cell.

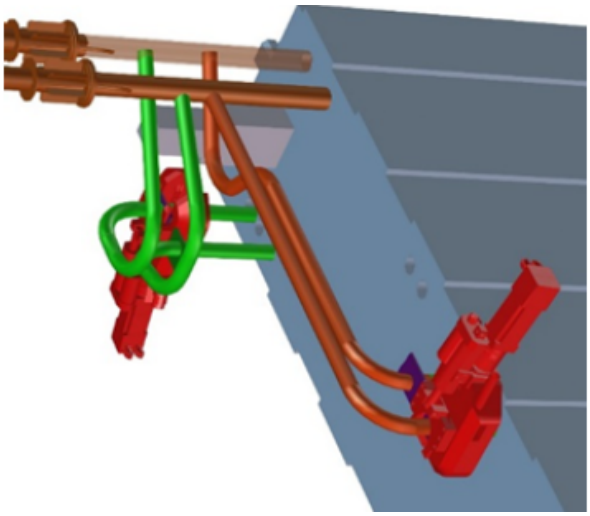

Figure 3. Pipe welding on the back of the diagnostic shield module by RH welding tool.

- Follow-up and prepare (together with Port Integrating DA) the input packages for upcoming Design Reviews of first plasma diagnostic port.

- Provide effective management of deliverables and associated work to IO-TRO to meet project schedule in relevant areas.

7 Responsibilities

N/A

8 List of deliverables and due dates

D #	Description*	Due Dates
D1	Report on current maintenance strategy for First Plasma Phase diagnostic equatorial ports (EqP11 and EqP12). Preliminary report on maintenance an installation of diagnostics in these ports.	T0 + 2 month
D2	Preliminary report on maintenance an installation of diagnostics in these ports following on from assessment of current maintenance strategy for First Plasma Phase diagnostic upper ports (UpP18 and Upper Ports 4/5/6/7).	T0 + 4 month
D4	Report on assessment by analysis and document preliminary tooling requirements to assemble and to maintain (at different stages of operation) diagnostic systems located in EqP11, EqP12, UpP18 and Upper Ports 4/5/6/7.	T0 + 6 months
D5	Assembly and Maintenance Plan for EqP17 justified by analysis and preparation of a list of tooling required for assembly and maintenance (at different stages of operation) of diagnostic systems in this port. Presentation of results of the study at the EqP17 PDR and close off any chits (if any) if they are raised.	T0 + 9 month
D6	Input package for the PDR of the first plasma port prepared by tracking and solving inter-PBS interface issues and reporting on the related chits as closed after the PDR ensuring that all CAD models are up-to-dated and properly integrated in ENOVIA.	T0+ 10 months
D7	Assembly and Maintenance Plan for EqP8 justified by a preliminary analysis and preparation of a list of tooling required for assembly and maintenance (at different stages of operation) of diagnostic systems in this port. Presentation of the results of the study at the EqP8 SIR and close off any actions (if any) if they are raised.	T0 + 12 month
D8	Assembly and Maintenance Plan for UP4/5/6 justified by analysis and preparation of a list of tooling required for assembly and maintenance (at different stages of operation) of diagnostic systems in this port. Presentation of the results of the study at the UP4/5/6 SIR and close	T0 + 15 months

	and close off any actions (if any) if they are raised.	
D9	Assembly and Maintenance Plan for LoP14 justified by a preliminary analysis and preparation of a list of tooling required for assembly and maintenance (at different stages of operation) of diagnostic systems in this port. Presentation of the results of the study at the LoP14 SIR and close off any actions (if any) if they are raised.	T0 + 17 months
ZD10	Updated Assembly and Maintenance Plans for EqP17 and EqP8. Preparation of respective input packages for PDRs of these ports, discussions and agreement of the contents with interfacing ROs and tenants and answering of eventual chits from Design Reviews.	T0 + 20 month
D11	Preparation of (together with Port Integrating DA) the input package for the SIR (between PDR and FDR) of the first plasma port. Report on tracking and solving of inter-PBS interface issues and their resolved actions as closed after the SIR. All CAD models are-up-dated and properly integrated in ENOVIA.	T0+ 22 months
D12	Analysis and documentation of tooling requirements to assemble and to maintain port-based diagnostic systems at the dedicated port handling/ commissioning building (eg Bld 55). Preparation of all necessary inputs for System Integration Review or DIR of the area.	T0 + 24 month

9 Acceptance Criteria

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 made on deliverables completion, as indicated in section 8, table of deliverables.

10 Specific requirements and conditions

- Maintenance tasks in nuclear environment;
- Remote Handling tools to refurbish activated and contaminated equipment in nuclear installations and in the hot cells;
- ALARA principle for remote and hands-on maintenance tasks in nuclear installations
- ENOVIA/ CATIA CAD environment

11 Work Monitoring / Meeting Schedule

The contractor will issue a monthly progress report made on deliverables completion. This progress report will at least track:

- Management plan.
- Task performed during the last month.

Work meetings may be organized by the IO-TRO on request depending on the need of the execution of the contract.

12 Delivery time breakdown

See table in section 8 for deliverable's time breakdown.

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 [20].