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Technical Specifications (In-Cash Procurement)

Specialist work relating to the final design of Port Plugs handling features and insertion / extraction procedures

CFE for:-

This document describes the technical needs of specialist work relating to the final design of Port Plugs handling features and insertion / extraction procedures including engineering design, analysis assessment, demonstration aspects and engineering definition.

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1 Purpose

This document describes the technical needs of specialist work relating to the final design of Port Plugs handling features and insertion / extraction procedures including engineering design, analysis assessment, demonstration aspects and engineering definition.

2 Scope

After the closure of the PCR 439 a conceptual proposal of the ITER Upper and Equatorial Port Plug assembly and handling procedures has been defined. As part of the work performed by CIO/DCIN/DINS the basic definition of the handling features and the components to be installed on Port plugs and VV, as well as the assembly/disassembly procedures, have been proposed.

In the context of previous works, the feasibility of such developments under controlled conditions have also been justified with the outcomes of a R&D program devoted to test the proposal in a reduced scale prototype, where a preliminary investigation of the tribology aspects has been undertaken as well.

Once the PCR 439 has been closed the design responsibilities aimed to develop the proposal until the maturity required for real implementation in the Port Plug maintenance environment have been transferred to PBS 55.

The feasibility assessment of the PCR 439 solution made by PBS 55, nonetheless, has revealed certain issues that caused the raising of a PIM (Project Issue Management) which in turn finally resulted in the setup of an inter-PBS Work Group in charge of fixing the issues discovered.

Part of the PBS 55 contribution to the Work Group activity is the assessment of new PP insertion / extraction proposals as well as the engineering development of related components (rails, skids, pad…) falling in its procurement scope.

This Task is aimed to support PBS 55 in the execution of the analyses relating its contribution to the Work Group as well as to support the production of documents supporting the Final Design Review (FDR) of handling components (rails, skids, shielding plates and pads) to be implemented in PPs and Port Extension consistently with the insertion/extraction strategy.

This task is generic to all ports in ITER, including to the ports with DMS like Equatorial Port #2, #8, #17, and several Upper Ports with DMS, and the cost share between PBS 55 (PCR-439) and DMS budget is proposed (90%/ 10%, respectively).

3 Definitions

The meanings of the main acronyms included in this report are:

CAD	Computer Assisted Design
DA	Domestic Agency
DCIF	Design Collaboration Implementation Form
DSM	Diagnostic Shielding Module
EM	Electromagnetic

EPP	Equatorial Port Plug
FW	First Wall
IBN	*Installation Nucléaire de Base*
IDM	ITER Document Management (System)
IO CT	ITER Organization Central Team
IS	Interspace
PBS	Plant Breakdown Structure
PCR	Project Change Request
PIA	Protection Important Activity
PIC	Protection Important Component
PP	Port Plug
QA	Quality Assurance
R&D	Research and Development
SIC	Safety Importance Classification
SIR	System Integration Review
TRO	Technical Responsible Officer
UHV	Ultra-High Vacuum
UPP	Upper Port Plug
VV	Vacuum Vessel

For a complete list of ITER abbreviations see: ITER Abbreviations (ITER_D_2MU6W5).

4 Estimated Duration

The duration shall be **10 months** from the starting date of the task order. Services are to be provided off-site. However, periodic attendance to meetings on-site (IO premises) of staff undertaking the work may be required in a monthly basis.

5 Work Description

The work involves the following subtasks:

Subtask 1: Insertion feasibility studies. The PP insertion/extraction procedures are extremely driven by geometrical and functional constraints introduced by the rest of interfacing PBSs (Vacuum Vessel, Remote Handling…). In addition, the tight gaps present between the PP and the surroundings makes this operation quite sensitive to the dimensional accuracy of all components involved. The development of a parametric model of the PP and the different interfacing components where dimensional imperfections can be introduced is a very convenient tool for the study of the kinematics of the insertion/extraction that permits the anticipation of issues (risks of clashes, PP getting stuck, impossibility of PP bolting, etc...).

This subtask involves the use of a CAD parametric model for the characterization of above risks under the different scenarios and conditions postulated by the PP insertion Work Group. Its scope include the analysis of up to 3 different cases (characterizing the PP, Port extension and handling components [Pads, skids and rails]) and their assessment in terms of the risks mentioned above including quantitative evaluation as well as proposal of potential mitigations.

A detailed description of the current baseline procedures and environment can be found in: https://user.iter.org/default.aspx?uid=SRTQKX.

The outcome of this subtask is a report describing the assessment performed as well as the identification of potential risks and proposal of improvements and/or mitigation measures.

Subtask 2: Tolerance and insertion studies of EPP and UPP. The deviations in the assembled position of the PP contents due to tolerances affects the evaluation of gaps during PP insertion and the design of PP to VV interfaces and handling features. In addition, such tolerance chain has effects and implications over the alignment accuracy of PP on board diagnostic systems and is needed to define the specifications, in terms of geometrical deviations and misalignment to be assumed by diagnostics. For these reasons such tolerance chain needs to be defined, and deviations due to tolerances quantified.

The outcome of this subtask is the identification and description of the FW to DSM to PP tolerance chain at interfaces, as well as the quantitative evaluation of DSM and FW position deviations in PP datum system as per the latest available interface designs.

Subtask 3: Final design of VV rails for PP insertion, including transitions between Cask and VV rails. The interfaces between remote handling cask and in-VV rails need to be redesigned in order to guarantee a smooth transition of the PP skids during the sliding phase, minimizing the wearing and galling effects, risks on PP of getting stuck as well as the effect of misalignments on assembled PPs in order to ensure that they are within the limits prescribed as a result of the other subtasks of this Specification.

In addition, the final design of in-VV rails including attachment features and other geometrical features (dimensional and tolerances) has to be completed as well.

The outcome of this subtask comprises a final report describing the detailed definition of in-VV rails (upper and equatorial) including dimensional and tolerances specifications as well.

Subtask 4: Development of structural justification of handling components (rails, skids and pads) in support of the Final Design Review. Structural integrity justification includes the writing of a System Load Specification for the components concerned and the execution of the mechanical analyses consistent with this SLS aiming to demonstrate the soundness of the design proposed.

The outcome of this activity is the delivery of a draft of the SLS and Structural Integrity Report of the PP handling/insertion components (rails, pads, skids). These reports will be used by in support of the writing of the final documents that will be presented during the Design Review.

5.1 Contractor's Responsibilities

In order to successfully perform the tasks identified in this Technical Specification, the Contractor shall:

- Strictly implement the IO procedures, instructions and use the corresponding templates.
- Provide experienced and trained resources to perform the tasks –profiles must be accredited by CVs and background summary–.
- 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.

5.2 IO's Responsibilities

The IO shall:

- Nominate the Responsible Officer to manage the Contract.
- Organise (a) monthly meeting(s) on work performed (minutes and agendas shall be prepared by the contractor).

6 List of Deliverables and due dates

The main deliverables are provided in the table below.

D #	Description	Due Dates
D01	*Report describing the assessment performed as well as the identification of potential risks and proposal of improvements and/or mitigation measures.*	T0 + 3 months
D02	*Report including identification and description of the FW to DSM to PP tolerance chain at interfaces, as well as the quantitative evaluation of DSM and FW position deviations in PP datum system as per the latest available interface designs.*	T0 + 5 months
D03	*Final report describing the detailed definition of in-VV rails (upper and equatorial) including dimensional and tolerances specifications as well.*	T0 + 7 months
D04	*Final versions of SLS and Structural Integrity Report of the PP handling/insertion components (rails, pads, skids). These reports will be used by in support of the writing of the final documents that will be presented during the Design Review (partial deliveries T0+5 months are expected as well).*	T0 + 10 months

7 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 6.

8 Specific requirements and conditions

- Experience in Mechanical Engineering and mechanical design.
- 3D modelling and 2D drawings drafting capabilities.
- Experience in tolerance and dimensional assessment.
- Experience in management of technical interfaces in mechanical systems.
- Experience in structural integrity assessments including numerical analysis.
- Experience in technical risks analyses.
- Experimental testing and mock-up development capabilities (may be subcontracted).
- System requirements management.
- Knowledge of ITER requirements and guidelines.
- Excellent skills in writing technical reports in English Language.

9 Work Monitoring / Meeting Schedule

Work is monitored through reports on deliverables (see List of Deliverables section) and at monthly project meetings.

10 Delivery time breakdown

See Section 6 – List Deliverables section and due dates.

11 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 the commencement of the task, a Quality Plan must be submitted for IO approval giving evidence of the abovementioned and describing the organisation for this task, the skill of workers involved in the study, any anticipated sub-contractors and giving details of who the independent checker of the activities will be (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).

12 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.

13 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)).