

Technical Specifications (In-Cash Procurement)**CFE - Tenants mechanical interfaces development for
EQ#08 and EQ#17**

The purpose of this work is to progress with development of Equatorial Ports #08 (EQ#08) and #17 (EQ#17) (ports with Disruption Mitigation System), to contribute to the mechanical interfaces development between EQ#08, EQ#17, Disruption Mitigation System (DMS) and other tenants. The task is necessary to timely achieve key port integration and DMS milestones, and to keep Diagnostic First Walls (DFW) manufacturing on schedule.

Table of Contents

1	PURPOSE	2
2	SCOPE	2
3	DEFINITIONS	2
4	REFERENCES.....	2
5	ESTIMATED DURATION.....	3
6	WORK DESCRIPTION.....	4
6.1	Engineering support of EQ#08 and #17	4
6.2	Engineering support and development of mechanical interfaces between EQ#08, EQ#17 and DMS.....	5
6.3	Tenants interfaces development	6
7	RESPONSIBILITIES	6
7.1	Contractor's obligations	6
7.2	Obligations of the ITER Organization	7
8	LIST OF DELIVERABLES AND DUE DATES	8
8.1	Deliverables related to the Preparation of the DIR of EP#08	8
9	ACCEPTANCE CRITERIA.....	8
10	SPECIFIC REQUIREMENTS AND CONDITIONS.....	8
11	WORK MONITORING / MEETING SCHEDULE	9
12	DELIVERY TIME BREAKDOWN.....	9
13	QUALITY ASSURANCE (QA) REQUIREMENTS.....	10
14	CAD DESIGN REQUIREMENTS (IF APPLICABLE)	10
15	SAFETY REQUIREMENTS	10

1 Purpose

The purpose of this work is to progress with development of Equatorial Ports #08 (EQ#08) and #17 (EQ#17) (ports with Disruption Mitigation System), to contribute to the mechanical interfaces development between EQ#08, EQ#17, Disruption Mitigation System (DMS) and other tenants. The task is necessary to timely achieve key port integration and DMS milestones, and to keep Diagnostic First Walls (DFW) manufacturing on schedule.

2 Scope

The work encompasses mechanical development of the interfacing elements between DMS ports (EQ#08, EQ#17) and tenant systems. It comprises three main activities listed below:

- Mechanical engineering support EQ#08 and EQ#17 interfaces;
- Development of the mechanical interfaces between EQ#08, EQ#17 and DMS;
- Mechanical development of EQ#08 and EQ#17 tenant components.

3 Definitions

For a complete list of ITER abbreviations see: [ITER Abbreviations \(ITER_D_2MU6W5\)](#).

Acronym	Meaning
ALARA	As Low As Reasonably Achievable
CAD	Computer Aided Design
HOF	Human Organizational Factor
HFE	Human Factors and Ergonomics
DET	Data Exchange Transfer
DFW	Diagnostic First Wall
DIR	Design Integration Review
DMS	Disruption Mitigation System
DSM	Diagnostic Shielding Module
FDR	Final Design Review
EP	Equatorial port
FDR	Final Design Review
FP	First Plasma
HIRA	Hazard Identification and Risk Assessment
ORE	Occupational Radiation Exposure
PCSS	Port Cell Support Structure
PDR	Preliminary Design Review
PFPO-1	Pre-Fusion Plasma Operation 1
PP	Port Plug
ISS	Interspace Support Structure
SDDR	Shutdown Dose Rate
SIC	Structural Integrity Component
RO	Responsible Officer
PIA	Protection Important Activity

4 References

- [1] [ITER_D_E6CNFY](#) –55.Q8 System Design Description for Equatorial Port #08.
- [2] [ITER_D_3TYYRC](#) – 55.QH System Design Description for Equatorial Port #17

- [3] [ITER_D_4BQJS9](#) – s-SRD for modular DSM equatorial ports
- [4] ITER_D_NPEVB6 Defined requirements for PBS 55 - Diagnostics
- [5] Safe Access for Maintainability [ITER_D_RUGWUK](#)
- [6] Quality Assurance for ITER Safety Codes ([ITER_D_258LKL](#))
- [7] ITER_D_QUK6LF - ITER Human & Organizational Factors Policy
- [8] ITER_D_2MU6W5 ITER Abbreviations
- [9] ITER_D_KTU8HH Software Qualification Policy

5 Estimated Duration

The duration shall be for 12 months from the date of the Kick off Meeting. Services are to be provided both at the IO work site (40%) and off-site (60%).

6 Work description

The work described in this technical specification is to progress with EQ#08 and EQ#17 (ports with Disruption Mitigation System) development accordingly to ports and tenants maturity, and harmonize interfaces on both sides. EQ#08 (Figure 1) and EQ#17 are currently at Final Design Review (FDR) and Preliminary Design Review (PDR) maturity levels respectively.

6.1 Engineering support of EQ#08 and #17

- Mechanical engineering of EQ#08 and #17 components including Port Plug (PP) (Figure 2), Interspace Support Structure (ISS) (Figure 3), Port Cell Support Structure (PCSS) (not shown) hosting DMS;
- Development of the EQ#08 and #17 interfaces with tenants, including DMS and its impact on other systems and services;
- Development of the interfaces with external PBSs, like Remote Handling, vacuum DTS etc;
- Development of PP, ISS, PCSS integration based on the design presented at EQ#12 FDR, EQ#08 and EQ#17 PDRs and tenant designs, incl. DMS;
- Support of port integrator in preparation of CAD models for neutronics, electromagnetic (EM), thermo-hydraulic and structural analyses;
- Development of local maintenance operation in the interspace and Port Plug and tenants therein, incl. DMS;

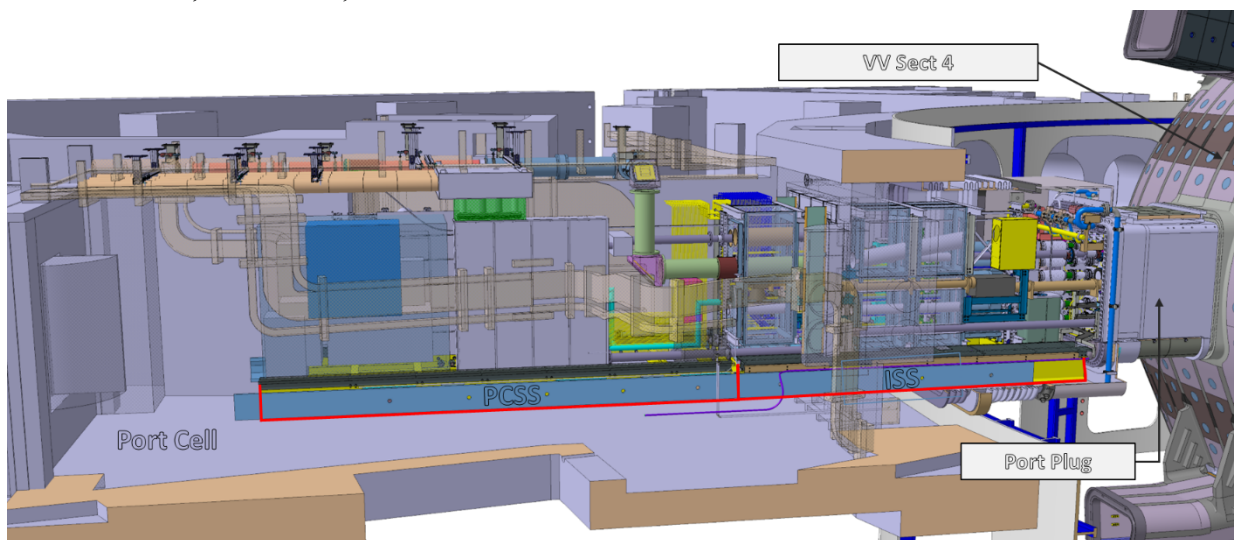


Figure 1. Integrated EQ#08 overall view (for information only).

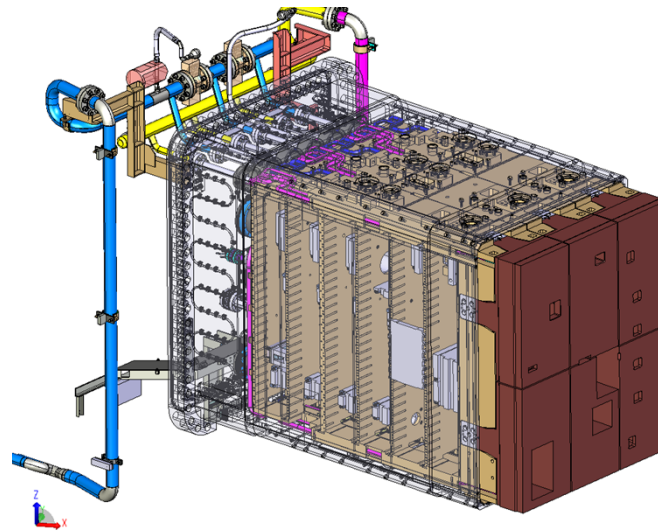


Figure 2. Equatorial Port Plug #08 overall view (for information only, port plug structure is transparent, shielding trays and tenant systems are hidden).

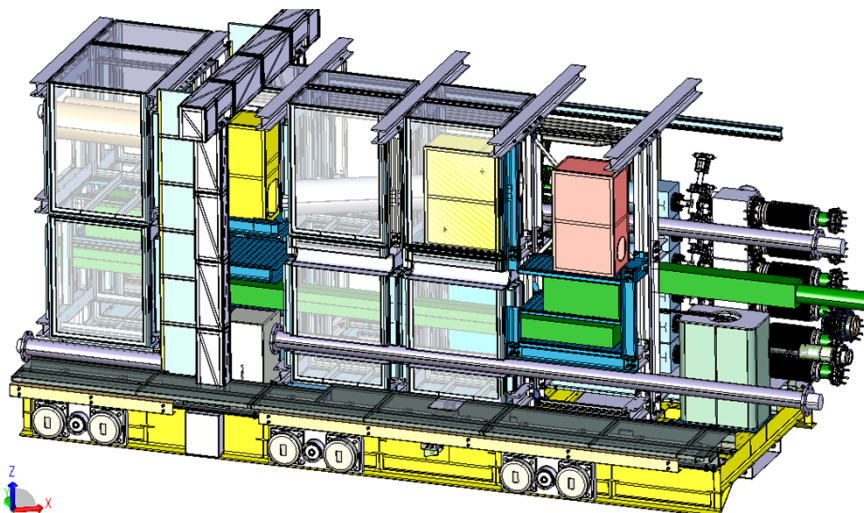


Figure 3. EQ#08 integrated interspace support structure (for information only).

6.2 Engineering support and development of mechanical interfaces between EQ#08, EQ#17 and DMS

- Mechanical engineering support of the interface with Diagnostic Shielding Modules (DSM) and DFW. The interfaces comprise (but not limited to) fixation mechanism between DMS shattering unit and DSM;
- Development of the backfilling and shielding trays around DMS pellet trajectories in the DSM;
- Development of the mechanical interfaces (Figure 4) between ISS, PCSS and DMS ex-vessel components, namely, a proper installation of the port integration supporting beams for the fixation of DMS structural frame;
- Implementation of recommendations from Human Occupational Factor (HOF) studies in the DMS ex-vessel integration in order to comply with ergonomics guidelines;
- Support of the port integration team in the routing and fixation of the DMS services (cables and pipes) in ISS and PCSS;

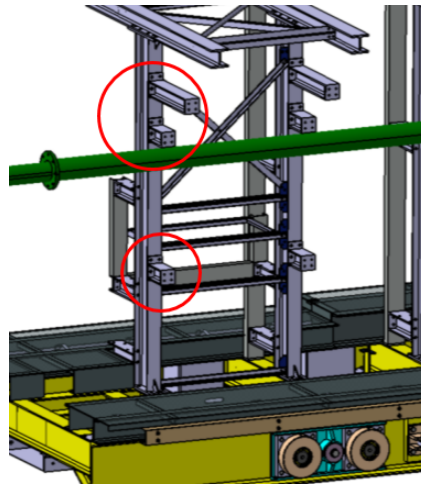


Figure 4. Example (for information only) of port integrator supporting beams (in red circles) fixing DMS frame (not shown).

6.3 Tenants interfaces development

- Engineering support of EQ#17 and EQ#17 tenants interfaces aiming to timely port integration. Example of such interfaces (but not limited to) is a fixation mechanism of mirror units to DSM, which shall comply with a number of conditions, like size of the bolts, location of the bolts, accessibility, tightening torque, material, etc;
- Engineering development of tenant components lying on the port integration critical paths. Examples of such components are mirror units (in-vessel and ex-vessel both), shutters (in-vessel), electrical connectors (in-vessel and ex-vessel both), dust covers (ex-vessel), etc;
- Tight collaboration with IO Responsible Officers of the concerned port and tenant systems;
- Finding of other relevant for port integration information (list of the materials, weights, interface loads, etc.) of the tenants.

7 Responsibilities

7.1 Contractor's obligations

As itemized above, the Contractor shall provide specialist expertise required to achieve the activities listed in the present technical specifications. The work shall be performed according to deliverables defined in the present document.

The Contractor shall warranty, represent and undertake:

- Services promptly and with all due skill, care and diligence, in a good and workmanlike manner and otherwise in line with best practice within its industry;
- Contractor's personnel shall possess the qualifications, professional competence and experience to carry out such services in accordance with best practice within the industry;
- Strictly implement the IO procedures, instructions and use templates;
- The commitments on results taken when signing up to a specific task order shall be kept even when there are changes of the resources provided for it;
- Contractor's personnel shall be bound by the rules and regulations governing the IO ethics, safety and security IO rules.

7.2 Obligations of the ITER Organization

The ITER Organization shall make available all data and information necessary to perform the activities specified in the present document.

- IO procedures required to achieve the activities according to ITER quality and safety rules,
- Information on diagnostic design and requirements for the development of the window assembly design.

The ITER Organization shall give the possibility to the contractor to review documents on the ITER documents database (IDM).

8 List of deliverables and due dates

8.1 Deliverables related to the Preparation of the DIR of EP#08

N°	Target date (months)	Deliverable description
D1	$t_0 + 4$ month	Mechanical engineering of EQ#08 and EQ#17 components including Port Plug, ISS and PCSS, as well as tenant interfaces incl. DMS. Mechanical engineering support of these interfaces with DSM and DFW. Development of port plug, ISS and PCSS integration based on the design presented at EQ#12 FDR, EQ#08 and EQ#17 PDRs. Support to port integrator in preparation of CAD models for neutronics, electromagnetic, structural, ergonomics and hazard analyses.
D2	$t_0 + 8$ month	Mechanical engineering support of the interfaces between DMS shattering unit, DSM and DFW. Development of the backfilling and shielding trays around DMS pellet trajectories in the DSM. Development of the mechanical interfaces between ISS, PCSS and DMS ex-vessel components (port integrator supporting beams for DMS structural frame). Support to port integrator team in the routing and fixation of the DMS services (cables and pipes) in ISS and PCSS.
D3	$t_0 + 12$ month	Development of the EQ#08 (FDR level of maturity) and EQ#17 (PDR level of maturity) interfaces with tenants, incl. DMS and its impact on other systems. Engineering development of tenant components lying on the port integration critical paths. Engineering support of EQ#17 and EQ#17 tenants interfaces incl. DMS (fixation mechanism to DSM, to ISS and to PCSS in compliance with size and location of the fasteners, accessibility of the fasteners, tightening torque, material, etc.)

9 Acceptance Criteria

Reports as deliverables shall be stored in the ITER Organization's document management system, IDM by the Contractor for acceptance. A named ITER Organization's Contract Technical Responsible Officer is the Approver of the delivered documents.

The Approver can name one or more Reviewers(s) in the area of the report's expertise.

The Reviewer(s) can ask modifications to the report in which case the Contractor must submit a new version.

The acceptance of the document by the Approver is the acceptance criterion.

10 Specific requirements and conditions

The Contractor's team shall cover all disciplines that may reasonably be required to carry out the Scope of Work.

It is noted that Contractor's personnel visiting the ITER site will be bound by the rules and regulations governing safety and security.

The Contractor shall have and maintain the necessary equipment and licenses to run the software tools required to carry out the tasks and produce the deliverables in accordance with the tools adopted by the IO. The Contractor shall ensure that experts are adequately supported and equipped. In particular it shall ensure that there is sufficient administrative, secretarial and interpreting provision to enable experts to concentrate on their primary responsibilities.

The official language of the ITER project is English. Therefore all input and output documentation relevant to this Contract shall be in English. The Contractor shall ensure that all the professionals in charge of the Contract have an adequate knowledge of English, to allow easy communication and adequate drafting of technical documentation. This requirement also applies to the Contractor's staff working at the ITER site or participating in meetings with the ITER Organization.

In addition, the following skills are necessary for the success of the activity:

- Ability to work with CATIA V5
- Experience in mechanical integration of sophisticated equipment
- Experience in nuclear engineering design (equipment to be maintained, maintenance tools, handling)
- Experience to integrate the system in the environment where ergonomics plays an important role
- Experience in mechanical engineering
- Ability to read and to produce technical documentation
- Experience in application of French Nuclear Safety regulations
- Experience in interface management
- Schematics definition

11 Work Monitoring / Meeting Schedule

The work will be started by a dedicated kick-off meeting and managed by means of Progress Meetings. It is expected that Progress Meetings will be held once a month at ITER site.

The main purpose of the Progress Meetings is to allow the ITER Organization/Diagnostics Division and the Contractor Technical Responsible Officers to:

- Allow early detection and correction of issues that may cause delays;
- Review the completed and planned activities and assess the progress made;
- Permit fast and consensual resolution of unexpected problems;
- Clarify doubts and prevent misinterpretations of the specifications.

In addition to the Progress Meetings, if necessary, the ITER Organization and/or the Contractor may request additional meetings to address specific issues to be resolved.

12 Delivery time breakdown

T0 is the date of the kick-off meeting.

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 \(ITER_D_258LKL\)](#).

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, it should fulfil IO document on Quality Assurance for ITER Safety Codes (Quality Assurance for ITER Safety Codes [258LKL v2.2](#)).

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.

As the window assemblies are Class 1 Safety Important Component :

- 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 \(28B39L v5.4\)](#) 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/intervenors” (ITER_D_SBSTBM).