

Technical Specifications (In-Cash Procurement)

**Design Analysis for the development of the design of the
ITER Hot Cell Complex (HHC)**

Specification for design analysis to the ITER Organization in aid of the development of the design of the Hot Cell Complex (HCC).

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1 Purpose

The objective of this engineering contract is to provide design analysis to the ITER Organization in aid of the development of the design of the Hot Cell Complex (HCC).

2 Scope

The scope of work is focussed on the radwaste processing (RW) and remote handling (RH) in the Hot Cell Complex, see Figure 1. The Hot Cell Complex consists of three distinct areas, the Hot Cell Building, the Radwaste Building (RWB) and the Personnel Access Control Building (PACB).

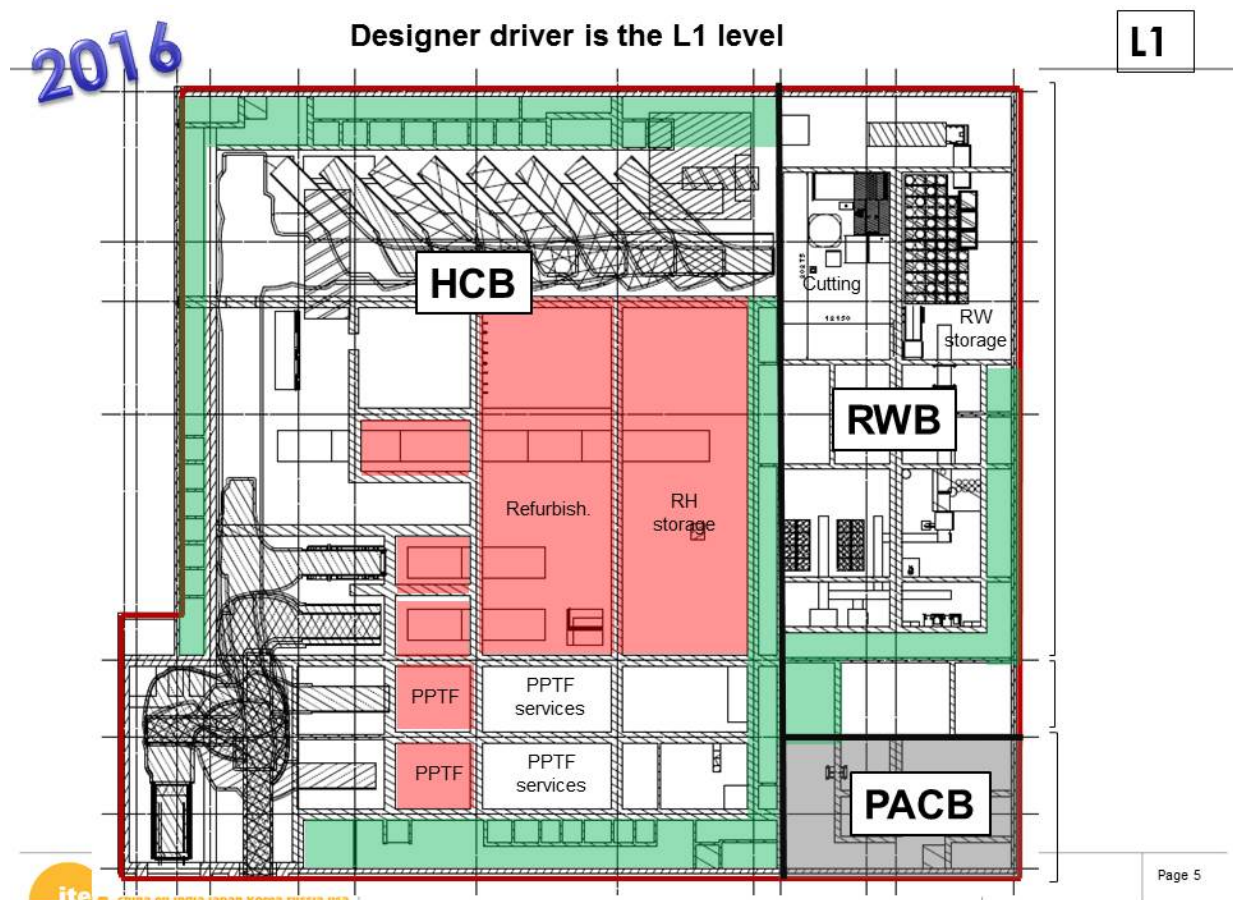


Figure 1 Level L1 of the 2016 Design of the Hot Cell Complex.

3 Definitions

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

4 References

Acronyms:

- C-R: Contractor Responsible. See Contract specifications for definition of duty.
- C-TRO: Contractor Task Responsible Officer. See Contract specifications for definition of duty.

- IO-RO: ITER Organization Responsible Officer. See Contract specifications for definition of duty.
- IO-TRO: ITER Organization Task Responsible Officer. See Contract specifications for definition of duty
- CDR: Conceptual Design Review
- PBS: Project Breakdown Structure

5 Estimated Duration

The contract duration shall be one year and shall commence after the official start date and upon the mutual agreement of both parties. It is envisaged that most of the services shall be performed on-site at IO, however, some work could be performed off-site. Any such off-site work shall be defined at a later stage.

6 Work Description

6.1 Objective of the contract

The objective of this engineering contract is the analysis of the radwaste processing and remote handling planned in the Hot Cell Complex. This includes the following specific subject areas,

- Reviewing and reporting on current and developing plans for the radwaste routing and processing, including treatment, characterization and packaging, for the following types of radwaste,
 - Type B Waste
 - Type A Waste
 - Purely Tritiated Waste
 - TFA Waste
- Reviewing and reporting on current and developing plans for remote handling in the Hot Cell Complex, including,
 - Remote decontamination
 - Remote maintenance of Building Systems (e.g. cranes, doors, trolleys)
 - Remote maintenance of radwaste equipment
 - Remote maintenance of Tokamak In-Vessel Components

During this contract duration, the IO-CT will be working with a Third Party contractor on the engineering design of the Hot Cell Complex. The present contractor will follow and report to the IO on progress made by this Third Party in the above areas, and will provide feedback to the Third Party contractor on behalf of the IO-CT.

6.2 Process description

The Hot Cell Facility is described in [ITER_D_L9V43M - Functional description of the Hot Cell Building](#). The Radwaste facility is described in [ITER_D_L5G67Y - HCC TF - Functional description of the Radwaste Building](#)

Design reviews were already been held on the Port Plug test Facility, the Detritiation System and the Hot Cell Remote Handling of ITER Remote Maintenance (PBS23.06 RM).

Four CDRs are planned in 2017 for the following systems:

- Radwaste type B process (PBS66 type B),
- Hot Cell Remote Handling of Components Maintenance (PBS23.06 CM),
- Hot Cell Remote Handling of the Radwaste type B system (PBS23.06 RW),
- Hot Cell Remote Handling of red Zones (PBS23.06 RZ).

The geographical breakdown of the Hot Cell remote handling Systems of the Hot Cell is given at the link [ITER_D_RRCF2U - Geographical Breakdown structure Overview of the Hot Cell remote Handling System](#)

For each of the CDR, the main documents and data to be assessed will be:

- The System Requirement,
- The Interface Control Documents and the Interface Sheets,
- The System Design description Document,
- The Configuration Management model,
- The Load Specifications,
- The process Flow Diagrams, Drawings and calculations,
- The operational and maintenance plans,
- The schedule, cost and risk assessment.

To be noted that the design activities of the process will be performed in parallel with a building engineering contract, which correspond to the following summary description [ITER_D_SVNUJ5 - Technical summary Hot Cell Complex Building Engineering](#). The consistency between the process design activities and the sub-contracted building design is a key criterion of the expected assessment.

Lessons learned and feedback from existing technologies widely used in nuclear field is another important criterion to be considered, in particular versus safety aspects and cost optimization. Goal is also to secure and to reach successfully the CDR closure planned in 2017.

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	Document describing the preliminary assessment of the current radwaste process design and plans, including an assessment of the degree to which the HCC building design is accommodating these processes. This document is to be delivered to the IO, who in turn will share it with the Third Party Contractor.	T0 + 3 months
D2	Document describing the preliminary assessment of the current remote handling process design and plans, including an assessment of the degree to which the HCC building design is accommodating these processes. This document is to be delivered to the IO, who in turn will share it with the Third Party Contractor.	T0 + 6 months
D3	Document describing the final assessment of the current radwaste process design and plans, including an assessment of the degree to which the HCC building design is accommodating these processes. This document is to be delivered to the IO, who in turn will share it with the Third Party Contractor.	T0 + 9 months
D4	Document describing the final assessment of the current remote handling process design and plans, including an assessment of the degree to which the HCC building design is accommodating these processes. This document is to be delivered to the IO, who in turn will share it with the Third Party Contractor.	T0 + 12 months

The radwaste and remote handling process design will be described in documents to be established before a series of Conceptual Design Review planned in 2017 (see section 6.2).

The table in appendix summarizes main features of the Hot Cell Complex, illustrating the level of complexity and the required skills.

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 monthly progress reports as indicated in section 8, table of deliverables and further detailed below:

- Report and Document Review 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.
- The acceptance criteria of the document correspond to:
 - A depth and detailed analysis of the process design and plan, based on:
 - Justified and documented comments,
 - Lessons learned of existing nuclear facilities,
 - Reference to existing technologies and proven solutions used in nuclear field,
 - Reference to existing and applicable Norms and Standards,
 - Reference to research program when needed (in particular regarding dust and tritium issues),
 - Recommendations to improve the design and plans, in particular versus safety, risks, cost investment and operational cost.
 - A review of the overall treatment strategy and an optimized process flow versus cost,
 - A check of the overall consistency of the design and plans, with a particular attention to standardization and compliance between the process design and the building constraints.

10 Specific requirements and conditions

- Significant experience in the design and analysis of remote handling and radwaste systems
- Significant experience in the design and operation of nuclear facilities
- Experience in radioactive decontamination techniques, both for dust and for tritium

11 Work Monitoring / Meeting Schedule

The work will be managed by means of Progress Meetings and/or formal exchange of documents transmitted by emails which provide detailed progress. Progress Meetings will be called by the ITER Organization, to review the progress of the work, the technical problems, the interfaces and the planning. It is expected that Progress Meeting will be held weekly or biweekly or as needed, via videoconference. Progress meetings will involve C-R, CTROs, IO-RO and IO-TROs.

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

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

In addition to the Progress Meetings, if necessary, additional meetings to address specific issues to be resolved may be requested by the ITER Organization.

It is expected that on occasion a presentation to Topical Technical Meetings either by videoconference or in person may be required.

For all Progress Meetings, a document (the Progress Meeting Report) describing tasks done, results obtained, blocking points and action items must be written by the Contractor. Each report will be stored in the ITER IDM in order to ensure traceability of the work performed.

12 Delivery time breakdown

See Section 8 – Deliverables and Due Date

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].

16 Appendix: Main features of the Hot Cell Complex

	Requested experience	Main features of the Hot Cell Complex facilities
Nuclear civil engineering of complex large scale project	High technology project	First-of-a-kind or research construction projects
	Strong links with industry and potential Plant manufactures	Wide range of disparate leading edge/high-tech systems and equipment to be designed, in order to avoid risk of change during suppliers manufacturing design.
	International projects	ITER stakeholders are China, the European Union, India, Japan, Korea, Russia and the United States. It corresponds to 35 different nations.
	Engineering/design	Design and overall integration of : <ul style="list-style-type: none"> - Building structure. Volume about 300,000 m³ nuclear concrete building - Approximately 600 rooms within the Hot Cell Complex, - Building systems, e.g. Heating, Ventilation, and Air Conditioning (HVAC), fire protection, electrical distribution, Instrumentation & Control (I&C), liners, red zone cooling, piping, - Mechanical heavy handling, e.g. cranes, doors, trolleys
Hot Cells expertise	Numbers of hot cells / red zones	15 different hot cells in HCB, in total volume of red zones / C4 ventilation class = 26,000 m ³
	Management of irradiated and contaminated components	Contact dose rate = 250 Sv/h due to activation in the Tokamak. Contamination of tritiated and activated dust on In Vessel components and IRMS Constant efforts to prevent spread of dust in red zones (from design stage to operational procedures), ALARA
	Tritiated environment	High level of tritium concentration > 4000 DAC (Derived Atmospheric Contamination) in red zones Red zone / C4 areas fully covered by stainless steel liner, with a gap between the concrete wall and the liner. This gap is maintained under air Detritiation System.
	Nuclear maintenance	10 different hot workshops, 300 m ² average each, dealing with hands-on maintenance on components after remote decontamination, ALARA
	Remote heavy handling in red zone	Handling of various heavy components, non-exhaustive list: <ul style="list-style-type: none"> - Equatorial Port Plug (50t, 3.5m length x 2.4 m x 2m), - Upper Port Plug (25t, 6 m length), - Divertor (9t, 3.5m length, 2m high, 0.8m wide), - Vacuum Cryopump (2.9m length, 1.7m diameter),

Requested experience		Main features of the Hot Cell Complex facilities
		<ul style="list-style-type: none"> – Oversized Neutral Beam components up to 8m length, 3m high and 3.3m wide <p>Two lines of defence: high reliability of heavy transfer systems and mitigation means in case of unexpected load drop.</p>
	Docking of transfer casks	Transfer and docking of Remote Handling Transfer Cask, large size docking door: 2m x 2.4m, between the TKM and the HCC, and within the Hot Cell Building.
Radwaste management	Treatment of radioactive solid waste	<p>Orders of magnitude during 20 years operation:</p> <ul style="list-style-type: none"> – 1000 tons of MAVL waste – 100 tons FMA-VC – 100 tons purely tritiated waste – 10 tons TFA
	Treatment of radioactive liquid effluent	Orders of magnitude: 200 m ³ / year
	Radwaste process remotely controlled	Type B radwaste process located in the red zones / C4 areas shall be fully remotely controlled (no man access) and with in situ remote maintenance or hands-on maintenance after remote decontamination.
Hot Cell Remote Handling	Complex remote operation	<p>Port Plug refurbishment, example of tasks to be performed fully remotely:</p> <ul style="list-style-type: none"> – tilting 90° of 50t port plugs, – removal of subcomponents, – welding and control, – testing.
	Hot Cell Remote Handling	<p>Design and integration of:</p> <ul style="list-style-type: none"> – Tens of heavy duty long range manipulators, fully powered by electrical motors, – Few telescopic power manipulators, – Shielded windows, – Lighting and viewing systems, – Frames and handling tools, <p>Buffer storage, remote decontamination, hands-on maintenance.</p>
	Centralized control system	Functions such as ventilation management, remote transfers, remote refurbishment of In Vessel Components, remote waste treatment, shall be controlled from a centralized control room located in the Personal Access Control Building
	Seismic requirement	High seismic requirement (2 to 3 g acceleration in different dimensions) on building structure and part of the building system and process which is seismic classified according to the safety analysis

