Task Specification

“RH Control System Support Engineer”
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1 Abstract

The purpose of this contract is to acquire the services of an RH Control System engineer for a fixed period to assist in the achievement of control system deliverables for RH procurements.

2 Background and Objectives

The ITER remote handling section is responsible for the remote maintenance of the ITER machine. During the current phase of the project, the RH section is defining the specifications for the design and manufacture of the RH equipment systems.

The main approach for machine maintenance at ITER is to:-
- remove vessel components using dedicated handling equipment,
- transfer the components to the Hot Cell facility using a transfer cask system,
- maintain/refurbish components in the Hot Cell facility using general purpose RH equipment (lifting devices, dextrous manipulators, tooling),
- transfer the component back to the Tokamak,
- install the components back on the machine.

Machine maintenance will generally be performed during long term shutdowns which are scheduled to occur every 2 years.

The RH System is made up of several RH equipment systems:-
- 23.01 Blanket RH System: System for installation and removal of the blanket modules,
- 23.02 Divertor RH System: System for installation and removal of the divertor cassettes,
- 23.03 Cask and Plug RH System: System for port plug handling and performing equipment / component transfers,
- 23.04 In-Vessel Viewing System: System for performing in-vessel inspections and metrology during short term shutdowns,
- 23.05 NB Cell RH System: System for performing in-situ maintenance of the NB system,
- 23.06 Hot Cell RH System: System for performing the cleaning and maintenance operations in the Hot Cell facility,
- 23.10 Multi-purpose deployer: System for performing general purpose tasks inside the vessel such as inspection, dust removal, diagnostic testing.

The RH equipment control systems shall be integrated together to form a uniform RH Control System operating from the RH control room(s). PBS 23.07 Supervisory Control System is a procurement that integrates the RH maintenance equipment systems into a single RH Plant System. The overall RH Control System is estimated to contain approximately 250 control cubicles.

To support the integration process, the RH Section provides a common architecture and functional specification for the control system element of each of the RH procurements. The RH Section shall also promote the use of standards for hardware, software, communications, and behaviour of the RH equipment systems.

An RH control system working group has been created where IO and its DA partners collaborate on the RH control system architecture and standards.
3 Scope of Work

The scope of the work of this contract is to provide control system support to the IO in the preparations of the RH procurements:
- Supervisory Control System (23.07)
- Cask & Plug RH System (23.03),
- In-Vessel Viewing System (23.04),
- NB Cell RH System (23.05)
- Hot Cell RH System (23.06)

4 Work Description

The engineer would be expected to provide support to the RH control system responsible officer on a range of preparation tasks:
- Analysis and design for Supervisory Control System (SCS),
- Document preparation for SCS concept design review,
- Preparation of contract documents for SCS procurement,
- Reviewing RH Control System architecture and standards,
- Preparation of control system data for RH equipment procurements,

5 Required Skills

The engineer providing the services should meet the following requirements:
- Degree in mechanical, electrical, electronic or control engineering,
- Minimum of 5 years’ experience developing and implementing control systems,
- Experience in robotic/remote handling industry,
- Experience analysing requirements and writing specifications,
- Experience with a wide range of relevant industry products:
  - Remote handling equipment,
  - Robots,
  - Controllers.
- Knowledge/skills in the following are an advantage:
  - Real-time systems,
  - Human-machine interfaces,
  - Virtual reality systems,
  - Cabling schematics,
  - Remote viewing systems,
  - Networks.
- Excellent knowledge of English, to allow easy communication and adequate drafting of technical documentation.
- Ability to work independently and produce reports.
6 List of deliverables and due dates

The control system engineer shall work closely with the ITER RH staff throughout the period. The contract shall have the following deliverables and due dates:

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Deliverable description</th>
<th>Due date</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Review of RH Control System Design</td>
<td>T0 + 8 weeks</td>
</tr>
<tr>
<td>D2</td>
<td>Control System chapter for NB Cell RH System (based on previous work for 23.01, 23.02)</td>
<td>T0 + 16 weeks</td>
</tr>
<tr>
<td>D3</td>
<td>Design review data for Supervisory Control System</td>
<td>T0 + 26 weeks</td>
</tr>
<tr>
<td></td>
<td>- Sequence Diagrams</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Design compliance matrix</td>
<td></td>
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<tr>
<td></td>
<td>- Hazard analysis</td>
<td></td>
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<tr>
<td></td>
<td>- Risk analysis</td>
<td></td>
</tr>
<tr>
<td>D4</td>
<td>Develop details for RH Hot-Cell Control System (23.06)</td>
<td>T0 + 34 weeks</td>
</tr>
<tr>
<td>D5</td>
<td>Supervisory Control System Technical Specification document for contract</td>
<td>T0 + 44 weeks</td>
</tr>
<tr>
<td>D6</td>
<td>Reconcile output of finishing R&amp;D contracts with RH Control System Design</td>
<td>T0 + 52 weeks</td>
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<tr>
<td></td>
<td>- F4E Prototype activities</td>
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<tr>
<td></td>
<td>- F4E RadTol activities</td>
<td></td>
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<tr>
<td></td>
<td>- Viewing System</td>
<td></td>
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</tbody>
</table>

Further details of the deliverables shall be established by the IO-TRO at the beginning of the relevant work period.

7 Acceptance Criteria

The deliverables shall comply with ITER QA requirements and shall be reviewed by the IO-TRO for acceptability.

8 Specific requirements and conditions

The official language of the ITER project is English. Therefore all input and output documentation relevant for this Contract shall be in English.

Documentation developed shall be retained by the contractor 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, it should fulfil IO document on calculation code for safety analysis.

The work shall require the presence of the expert engineer at the site of the ITER Organization, Cadarache, 13108 St Paul-lez-Durance, France. It is expected that the expert engineer shall be on-site for at least 80% of the duration of the contract.

For all deliverables submitted in electronic format the Contractor shall ensure that the release of the software used to produce the deliverable shall be the same as that adopted by the ITER Organization.
The expert engineer provided for on-site duties shall keep the normal daily working hours of the ITER Organization.

9 Work Monitoring / Meeting Schedule
The engineer expert shall report to the ITER Organization TRO and the RH section leader. Meetings shall be held as and when deemed necessary by the ITER RH staff.

10 Quality Assurance (QA) requirement
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 document: ITER Procurement Quality Requirements (22MFG4 v4.0) and can be used in analogy to this Task Agreement.
Prior to commencement of the task, a DA Quality Plan (conformant with 22MFMW v3.0) 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.

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, it should fulfil IO document on Quality Assurance for ITER Safety Codes (Quality Assurance for ITER Safety Codes 258LKL v1.4).
11 References / Terminology and Acronyms

11.1 References

[RD1] RH Control System Design Handbook (2EGPEC v2.3)

11.2 Terminology and Acronyms

In the following table denominations and definitions are given of all the actors, entities and documents referred to in this Specification, together with the acronyms used in this document.

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Definition</th>
<th>Acronym</th>
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<tbody>
<tr>
<td>ITER Organization</td>
<td>For this Contract the ITER Organization</td>
<td>IO-</td>
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<tr>
<td>ITER Organization Task Responsible Officer</td>
<td>Person delegated by the IO-RO for all technical matters, but limited to one specific task order</td>
<td>IO-TRO</td>
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<tr>
<td>Remote Handling</td>
<td>Remote handling</td>
<td>RH</td>
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