

Technical Specifications (In-Cash Procurement)

Lower Port Services Engineering

This document describes the technical needs for expert specialists in engineering of Diagnostics. Specifically the technical needs of the Diagnostics Division with particular reference to design development and construction preparation, predominantly in the following areas: • Mechanical engineering, integration and CAD (Enovia)

Table of Contents

1	PURPOSE	2
2	SCOPE	2
3	DEFINITIONS	2
4	REFERENCES.....	2
5	ESTIMATED DURATION.....	2
6	WORK DESCRIPTION.....	2
7	RESPONSIBILITIES	4
7.1	Contractor's Responsibilities	4
7.2	IO's Responsibilities	4
8	LIST OF DELIVERABLES AND DUE DATES	4
9	ACCEPTANCE CRITERIA.....	5
10	SPECIFIC REQUIREMENTS AND CONDITIONS.....	5
11	WORK MONITORING / MEETING SCHEDULE	6
12	DELIVERY TIME BREAKDOWN.....	6
13	QUALITY ASSURANCE (QA) REQUIREMENTS.....	6
14	CAD DESIGN REQUIREMENTS.....	6
15	SAFETY REQUIREMENTS	7
APPENDIX 1	8

1 Purpose

This document describes the technical needs for expert specialists in engineering of Diagnostics. Specifically the technical needs of the Diagnostics Division with particular reference to design development and construction preparation, predominantly in the following areas:

- Mechanical engineering, integration and CAD (Enovia)

2 Scope

The objective of this Task Order is to boost the ITER Diagnostics team in the evaluation and establishment of diagnostics systems, providing mechanical engineering design, modelling, analysis and development of mock ups and prototypes required for design validation, and input to construction work descriptions.

3 Definitions

CAD	Computer aided design
CMM	Configuration and management model
DA	Domestic Agency
DM	Detailed model
DR	Diagnostic Rack
HC	Hot Cell
IO	ITER Organization
IO-TRO	ITER Organization Technical Responsible Officer.
IV	In Vessel
RH	Remote Handling
UHV	Ultra High Vacuum

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

4 References

Links inserted in text

5 Estimated Duration

The duration of the task is spread over 11 months, from the date of the Kick Off Meeting. It is expected that the contractor is able to spend on average ~1 week/month on-site.

6 Work Description

This work relates to Lower Port Diagnostic systems (55.L2, 44.L8, 55.LE). These systems are present in 3 lower ports. The key component of these systems are the diagnostic racks (DR), which are 10.5 ton steel structures housing various diagnostic tenants and they also contribute to the nuclear shielding performance of the ITER machine. These DRs need to be fed with fluid (water and gas) pipes and electrical cables to actuate subsystems and observe plasma

parameters. Being inside the VV, these racks are fully RH compatible, human presence not allowed in this environment.

The present task aims at further developing the above described water-, gas supplies and electrical services for the racks, in preparation of the PDR of the system, and also to contributing to the PDR meeting and closure or the PDR. The logic of DR services is shown in Appendix 1. A short description is as follows:

- **Electrical services:** electrical cables (MI cables) shall start from the tenants inside from the rack, and routed to the main RH connector of the rack. Some tenants shall require additional RH connector. From the main RH connector, the cable is organized in looms and routed to the marshalling area, from which point the signal chain is the responsibility of 55.NE. The scope of the work focuses on cabling inside the rack. (RH connector is out of scope). See Figure 2.
- **Gas services:** gas pipes are required for shutter operation and leak detection for some tenants. From the gas FT (normally installed together with IV piping), the pipes are attached to VV until the RH connector of the rack. From there, they must be routed inside the rack to the RH connector of the tenant. This second RH connection is handled in the HC. The scope of the work is the entire IV routing of the pipes (attachment, routing, connections). See Figure 1
- **Water services:** water pipes are required to heat the rack during baking, cool it during pulse, and also to provide cooling for tenants. From the water FT (normally installed together with IV piping), the pipes are attached to VV until the RH connector of the rack. From there, they must be routed inside the rack to the RH connector of the tenant. This second RH connection is handled in the HC. See Figure 2

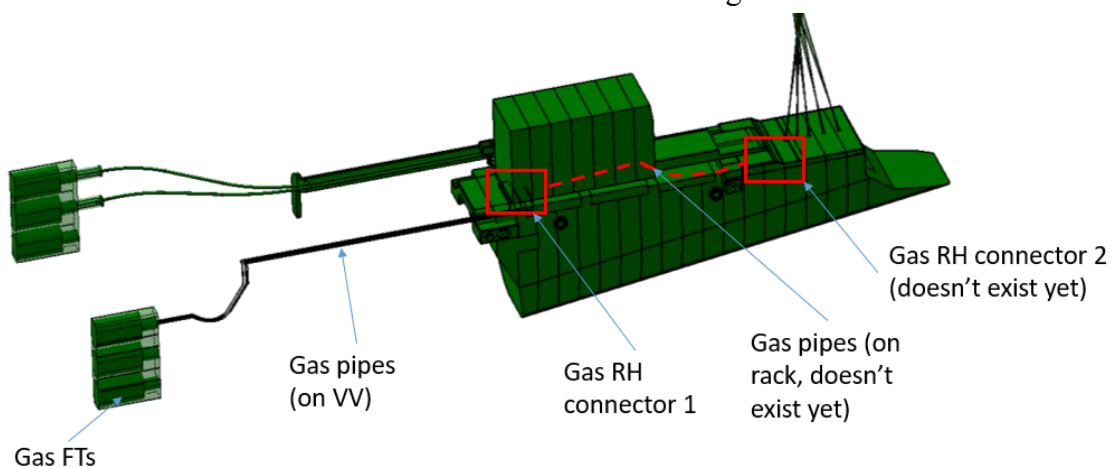


Figure 1: Gas piping for IV components of diagnostic racks

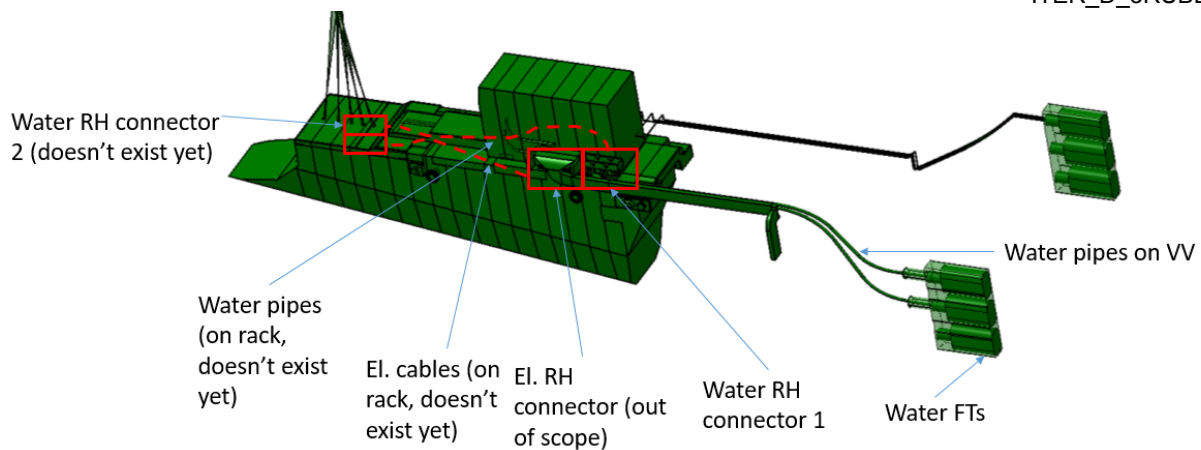


Figure 2: water and electrical services for diagnostic racks

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;
- Provide monthly schedule updates for the tasks being worked on by the Contractor;
- 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 rules.

7.2 IO's Responsibilities

The IO shall:

- Nominate a Responsible Officer to manage the Contract;
- Organise a monthly meeting(s) on work performed;
- Provide offices at IO premises;
- Review documents in a timely fashion

8 List of Deliverables and due dates

Discrete deliverables are listed in **Error! Reference source not found.**, grouped by due dates. Some scope exists for re-ordering the dates of specific deliverables if priorities and scheduling requirements change.

D #	Description	Due Dates
-----	-------------	-----------

D #	Description	Due Dates
D1	Review market and other ITER related options for pipe cut/weld tooling inside VV for water and gas pipe connection points between rack and VV mounted pipes. Select tooling if available, taking into account tooling space requirement. Identify space reservations and work out sequence of operations (i.e which side of the pipe is moved, etc). Determine time required for operations. Justify with simple engineering calculations, if necessary (i.e if pipe is forced, where to put the support so that stresses are acceptable). Output is CAD data with explanation PPT	T0 +2 months
D2	Pipe routing and attachment from FT to rack connection, including water and gas pipes for all 3 lower ports. Include attachment structures, definition of boss placement. Attachment of RH connector for electrical systems. Output is Enovia CAD data.	T0 + 3 months
D3	Prepare all related documentation for PDR (presentation, reports, supporting calculations, interfaces, etc).	T0 + 4 months
D4	Pipe (water and gas) and electrical cable routing within rack for all 3 racks. Identify interface points between tenants and PI taking into account integration scheme, specifics of tenants, and their RH classification and HC handling tools. Work out attachment to rack structure. If necessary, justify with simple calculations. Output is Enovia CAD data.	T0 + 6 months
D5	Work out future mock-up plan to validate concept. Update all studies based on PDR output. Answer relevant chits with documents if necessary.	T0 + 10 months
D6	Final report	T0 + 11 months

9 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 8.

10 Specific requirements and conditions

The personnel proposed by the Contractor to carry out the work described in Section 6 must have:

- A professional qualification in engineering with relevant experience in engineering design in a complex technical environment; Experience in cabling and piping
- Facility and proven competence with modern 3D CAD design packages and related software;
- Good technical writing skills;
- Good inter-personal skills;
- The ability to be consistent and work well under pressure with good attention to detail;

- Capability to work in English language, both verbally and written;
- Able to work with partners and the ITER host to define critical needs;
- Ability to align work priorities with overall project schedule;

Experience in any or all of the following areas is required:

- Knowledge of ITER diagnostic systems;
- Design of mechanical or electrical components for vacuum environments;
- Experience of working with mineral insulated cabling, knowledge of attachment method for piping, and cabling
- Previous experience of working on an international project;
- Experience in working with CATIA v5.0/ ENOVIA and adaptation of models for analysis in ANSYS workbench;
- Experience in applying ITER-applicable codes and standards (e.g. ASME VIII Div. 2, ASME III, RCC-MR) to the structural assessment of systems and components in large mechanical engineering structures that have significant electromagnetic loads;
- Experience in following French nuclear safety regulations (see Section 15)

11 Work Monitoring / Meeting Schedule

As summary progress report shall be provided on a monthly basis for acceptance by the IO Responsible Officer.

The progress report shall include the detailed status of each Deliverable.

12 Delivery time breakdown

See Section 8, “List of Deliverables and due dates”.

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 Software qualification policy ([Software Qualification Policy \(ITER_D_KTU8HH\)](#)).

14 CAD Design Requirements

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 ([ITER_D_2F6FTX](#)), and with the Procedure for the Management of CAD Work & CAD Data (Models and Drawings [ITER_D_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_D_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 ([ITER_D_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 ([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 \(28B39L v5.2\)](#) is mandatory.

NOTE: There are no Protection Important Activities (PIAs) within the scope of this work but there is monitoring/oversight of Third Parties performing PIAs as part of Work Package A tasks.

Appendix 1

Scope of the gas, water and electrical services for Diagnostic racks

