Technical Specifications (In-Cash Procurement)

Technical Specifications_Engineering expertise for structural integrity

This document describes technical needs on engineering structural integrity justification for diagnostic attachments to the ITER VV and Finite Element Analysis for the PPD Division.

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1 Purpose

This document describes technical needs on engineering structural integrity justification for diagnostic attachments to the ITER VV and Finite Element Analysis for the PPD Division.

2 Scope

The work comprises pre-processing, analysis setting-up and post-processing of FE structural analyses required for the justification of the structural soundness of standardized attachment schemes for diagnostic components to the VV pressure barrier required to develop the common approach for attachments design.

3 Definitions

APDL: ANSYS Parametric Design Language

CPPE: Common Port Plug Engineering

FEA: Finite Element Analysis

IO: ITER Organization

IO-TRO: ITER Organization Technical Responsible Officer

SLS: System Load Specification

StIR: Structural Integrity Report

VV: Vacuum Vessel

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

4 References

Links inserted in text (where applicable). Also, the current guidelines and descriptive documents to for the production of Structural Integrity Reports and System Load Specifications would be applicable references for the proper execution of works:

- Building good Load Specifications *(ITER_D_SNT6NX v1.0)*
- Building Good Structural Integrity Reports *(ITER_D_SNTA78 v1.0)*
- 3D VV Global FE model description and analysis for the specification of interface loads in diagnostic systems *(ITER_D_QALKZZ v2.0)*
- Common understanding between PBS15 and PBS55 for the fatigue assessment of diagnostic attachments to VV walls welds *(ITER_D_TF5E4F v1.0)*
- Guideline for the fatigue assessment of Diagnostic attachments to VV welds *(ITER_D_QDYK2R v1.3)*

5 Estimated Duration

The duration shall be for 6 months from the starting date of the task order. Services may be provided off-site under the full supervision of PPD/CPPE staff.

Eventual travels to the IO premises for works organization may be required.

6 Work Description

The work involves technical involvement on the analysis activities aimed to justify standardized solutions of attachment to the VV pressure barrier of diagnostic components. That includes:

- Post-processing of results of the 3D VV Global FE model to define envelope conditions of interface loads and transients that occur between the VV and the diagnostic attachments.
- To develop the FE sub models that reproduce in a detailed way, the 3D VV boundaries, its load definitions and the VV interfacing geometry in consistency with the sub modelling technique.
- To carry out the sub modelling (thermal-structural) analyses in support of the VV integrity justification.
- To perform the detailed structural assessments (in special, fatigue) of the standardized attachment schemes for diagnostic components to the VV walls following EN 13445-3 Standard.
- To produce explicative presentations and reports explaining the analyses details, the quality tests that guarantee the correctness of the analyses, the analysis results and the conclusions reached.
- Support the structural integrity justification of diagnostic to VV attachments catalogue under development towards a standardized solution for the problem of welded attachments to the VV,

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

The main deliverables are provided in the table below.

D #	Description	Due Dates
D01	Development FE submodels production (minimum 8 cases) and definition-interpolation of interface loads post-processed from the Global VV 3D model/analysis (minimum 4 conditions per case) for the local submodelling analyses of the standardized attachment solution based of bosses. A descriptive presentation and report of the work to be integrated in the final catalogue is also part of this deliverable.	T0 + 3 months
D02	Post-processing and fatigue assessment (8 cases) following the EN 13445-3 fatigue analysis method described in the guideline (ITER_D_QDYK2R v1.3) of submodelling analyses completed in D01 (minimum 4 conditions per case). A descriptive presentation and report of the work to be integrated in the final catalogue is also part of this deliverable	T0 + 6 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, Table of deliverables.

10 Specific requirements and conditions

Good and demonstrable skills in structural (linear/non-linear, static/transient) analysis using ANSYS (classic and workbench): analysis pre-processing, solution setting-up and advanced post-processing procedures.

Demonstrable experience in ANSYS APDL programming and use of advanced analysis features (contact interactions, sub modelling…).

Demonstrable experience on mechanical (pressure vessel) Codes assessment procedures applied to FEA results (design by analysis) like stress linearization and fatigue.

Experience in nuclear Codes (RCC-MR 2007 / ASME III) is highly desirable.

Experience in Mechanical Engineering.

Monitoring and reporting of status of projects.

Generation of technical, administrative, and managerial documents.

Communication with international local and remote teams in context of nuclear fusion research or similarly complex research and engineering environment.

Organization, taking minutes and action tracking of international meetings.

11 Work Monitoring / Meeting Schedule

Work is monitored through quarterly reports (see List of Deliverables section).

12 Delivery time breakdown

See Section 8 "List Deliverables section 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 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 (PRELIMINARY ANALYSIS OF THE IMPACT OF THE INB ORDER - 7TH FEBRUARY 2012 (AW6JSB v1.0)).