

Technical Specifications (In-Cash Procurement)

Technical Summary - Engineering Services Framework Contracts

This document summarizes the general activities that the Engineering Services Department (ESD) intends to tender to provide services to its clients.

Namely the Construction Project (CP), the Safety and Quality Department (SQD) and the Central Integration Division (CID).

Phase: Call for Nominations

Technical Summary for

Engineering Services Framework Contracts

Call for Nomination

Abstract.

This Technical Summary covers the supply of standard engineering and technical support services to the ITER Organization's Engineering Services Department (ESD).

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1. BACKGROUND AND OBJECTIVE

The Engineering Services Department (ESD) of the ITER Organization (IO) provides and manages the engineering and design capabilities for the ITER Organization and supports the missions of its internal clients: Construction Project Department (CP), Science and Integration Department (SID) and the Safety and Quality Department (SQD).

The implementation of all scope and services below, is carried out in collaboration with ITER's Domestic Agencies and other technical partners.

The objective of this Call for Tender is to select qualified companies or consortia with extensive experience and proven track records, in the following fields of work:

- Engineering design of different systems and components;
- Technical Specification of components, material, manufacturing, handling, storage and transportation, qualification and testing procedures;
- Site supervision and coordination, field design support including, management of non-conformities;
- Metrology and Reverse engineering analysis;
- Commissioning support and operating procedures;
- Safety and radioprotection analysis.

The aim of the tender is to award framework contracts to cover each of the following areas of expertise:

- Assembly, commissioning and operation including maintenance;
- Design Engineering, Computer Aided Design (CAD) and Configuration management;
- Electrical Engineering;
- Fusion Technology;
- Instrumentation & Control;
- Mechanical Structures Engineering;
- Plant & Process Engineering;
- Civil Engineering;
- Nuclear Safety Engineering.

These framework contracts will provide standard Engineering and Computer Aided Design services for the ITER Project from 2026 to Dec. 2033.

The IO will request potential suppliers to cover a wide range of disciplines to qualify. However, it is not expected that all disciplines will be covered equally. The goal is to award multiple Framework Contracts, ensuring that all the above nine disciplines are collectively covered.

A market survey (Annex I) is attached to this document to aid IO to understand the current industrial environment. This survey will be used to determine the selection and award criteria of the later steps (Pre-qualification and Tendering Stages).

General information on the scope and design of the ITER machine is described in the www.iter.org website.

2. REQUIRED EXPERIENCE

The potential candidates should demonstrate capabilities and knowledge across the full lifecycle of an Engineering, Procurement, and Construction (EPC) project applying a System Engineering approach, with expertise in detailed engineering, safety engineering, manufacturing specification, qualification and testing, construction, commission and operation.

The specific experience and qualities sought by IO include:

- Proven track record of delivering projects on schedule and within budget;
- Value engineering experience on large construction projects.
- Implementation of large, multi-disciplinary projects, in an international environment;
- Capability to mobilise and manage centralised, site-based, and remote (off-site and off-shore as detailed in section 14) resources and services;
- Ability to respond rapidly and flexibly to changing resource requirements, to accommodate peak demands, and to provide specific expertise;
- Design and engineering support;
- Design and systems integration;
- Experience in writing technical documentation, technical specification, QA/QC documents;
- Experience of internationally recognized Quality Assurance / Quality Control (QA/QC) and safety standards, preferably in a nuclear environment;
- Experience of international construction codes;

3. SOFTWARE REQUIREMENTS

The ITER Project has selected specific software applications to perform all the engineering related activities. The services provided under the framework contracts must be executed using these software applications. Therefore, tenderers must demonstrate their capability in implementing and applying the relevant software applications in their proposed areas of work. Only qualified and validate software packages shall be used:

Other software packages not listed below, may be proposed:

- Based on the IO's evolution and needs during the implementation of these services – the selected suppliers will be informed in due time to assess the impact on the services and pricing structures or
- As the suppliers' request, subject to IO's acceptance, on the condition that the software is fully qualified or certified at contractor's cost and responsibility during the full execution of the services.

<u>Software</u>
CAD: CATIA V5 Mechanical
CAD: CATIA V5 Equipment and Systems
CAD: AVEVA E3D
CAD Mechanical Catalogues: CADENAS
CAD Plant Catalogues: AVEVA Suite
CAD Plant Catalogues: SmartPlant
CAD Data Base: ENOVIA LCA – VPM 5
CAD Data Base: AVEVA Engineering
Assembly & maintenance simulation: DELMIA V5; DELMIA Process Engineer
Assembly & maintenance simulation: Synchro
3D Illustration: CATIA Composer

2D: AutoCAD
2D Diagrams: See System Design (SSD)
2D Diagrams: AVEVA Diagrams
2D Electrical diagrams: See Electrical Expert (SXP)
CAD quality checking: Q-CHECKER / Q- PLM
Isometrics: ISOGEN
Isometrics: Isodraft under AVEVA E3D
Visualisation: NAVISWORKS
Remote Connection: RDS or VPN for ENOVIA. <u>If the distance with IO exceeds 1000-1500 km, the Company will connect to the closest Domestic Agency (DA approval being a pre-requisite)</u>
Remote Connection: AVEVA Global, RDS or VPN for AVEVA suit
Remote Connection: Remote Desktop Services (RDS)for SSD
Remote connection: Web based for IO's intranet (ICP,IDM, EDB, ...)
Computational Fluid Dynamics (CFD): ANSYS Fluent, ANSYS CFX , OpenFoam, COMSOL (only software recommended to calculate water hammer loads in conduits)
Structural (ie. steel beam structures): SAP2000, GT Strudl, Staad.Pro, RSTAB, ROBOT Structural Analysis, Idea Statica
Structural – EP and Post Drilled Anchors: Hilti Profis
Piping: Caesar II, Pipestress
Mechanical (implicit solvers): ANSYS APDL, ANSYS Workbench, Abaqus/Standard
Fast transient mechanical (explicit solvers): Europlexus, Abaqus/Explicit, LS-DYNA, ANSYS Explicit
Electrical Power Distribution: ETAP, Caneco BT
Power Electronics, Power Conversion and Power Systems: EMTP-RV or equivalent, PSIM, Matlab-Simulink-Simscape Power Systems
Electromagnetics (low Frequency): ANSYS EMAG, ANSYS Maxwell
Electromagnetics (high frequency): ANSYS HFSS
Magnet modelling: SuperMagnet / Cryosoft suite (THEA, HEATER, FLOWER), Venecia
Optics: Zemax, FRED, LightTools
System level codes (0D/1D fluid systems): EcosimPro, ControlBuild, Dymola, Arrow, AFT Fathom , Flownex SE
Nuclear analyses: MCNP, DIS-UNED, SRC-UNED, FISPACT, ACAB, OSCAR Fusion V1.4, CERES, RESRAD-BUILD, MELCOR, ASTEC, MERCURAD, DOSIMEX
Fire: FDS, CFAST
Magnet modelling: SuperMagnet / Cryosoft suite, Venezia, REIMS
General mathematical software: Mathcad, Matlab-Simulink
Requirements Management: DOORS, for requirements documentation
Electrical Power Distribution: ETAP and Caneco BT
Power Conversion: PSIM, EMTDC-RV or equivalent, Matlab-Simulink-Simscape Power System
Design Integration: 3DCS, for 3-d tolerance analysis
Systems Integration: DYMOLA, for modelling and simulation
Other: CAMEO, for model-Based Systems Engineering
Proprietary/Home made: Data management tools, such as System for Management of Drawings & Diagrams (SMDD), EDB, Replication Manager...
Autodesk Robot Structural Analysis Professional
SeismoArtif by Seismosoft Ltd to generate artificial accelerograms

4. SCOPE OF WORK - ASSEMBLY AND COMMISSIONING SUPPORT

Introduction

IO is responsible to assemble the machine, install the different systems of the plant, commission these systems and eventually operate and maintain the complete plant.

ITER plants is constituted of the following main systems:

- The Vacuum-Vessel including the Internal Components (Divertor, Blanket, first wall)
- The Magnet systems
- The Cryostat
- The Thermal Shield
- The Diagnostics systems
- Plasma Heating systems (Electron Cyclotron, Ion Cyclotron, Neutral Beam)
- Fuelling and wall conditioning systems
- Test Breeding Blanket Systems
- Heating, Ventilation, and Air Conditioning (HVAC)
- Cooling Water Systems
- Ultra-High Vacuum system
- Cryogenics system
- Instrumentation & Control
- Fluids processing system
- Power supply systems

And the systems used for assembly and maintenance

- Remote maintenance & robotics
- Component transport & assembly

Main area of work

In order to support IO in its missions related to assembly and commissioning, the candidates may be asked to provide services in the main foreseen tasks:

- Preparation of Construction Work Packages
- Site assembly supervision and coordination
- Field engineering
- Completion dossier compilation and verification
- Preparation of commissioning procedures for the different systems mentioned above
- Preparation of integrated commissioning procedures at plant level
- Operating instructions for the different systems mentioned above or at plant level
- Review Gates preparation
- Commissioning tasks on site
- Review of Maintenance and inspection plans
- RAMI analysis
- Hazard and Operation (HAZOP) analysis
- Integrated maintenance and inspection plans
- Supervision and coordination of maintenance activities
- Support to develop different tools for assembly and maintenance, including remote handling tools
- Metrology
- Reverse engineering to analyse the metrology data and define the proper alignment target for the sensitive components

The candidates shall be able to provide technical expertise in transverse topics such as welding, non-destructive testing, material science and corrosion, preservation of components and systems, water chemistry,

All the tasks will be deliverable based.

5. SCOPE OF WORK – ENGINEERING DESIGN, COMPUTER AIDED DESIGN (CAD) AND CONFIGURATION MANAGEMENT

The Candidate will provide support to the IO in the fields of design engineering and integration, Computer Aided Design (CAD), configuration management and document & records Management

The three main areas of work will be:

Area 1): Engineering and CAD - Mechanical Systems.

Area 2): Engineering and CAD - Plant Systems.

Area 3) General Configuration and Document Management

Mechanical Production

The mechanical systems of ITER comprise large, heavy, complex and precise components.

The main scope of activities is to support the CAD design in the production and integration of systems within the Tokamak machine's In-Cryostat Systems Area and the Tokamak complex.

The main systems in this area include:

- The Internal Components (Divertor, Blanket)
- The Vacuum-Vessel (including the Port systems)
- The Magnet system
- The Cryostat
- The Thermal Shield
- The Remote Handling system
- The Diagnostics systems
- Plasma Heating systems (Electron Cyclotron, Ion Cyclotron, Neutral Beam)
- Fuelling and wall conditioning systems
- Test Breeding Blanket Systems

Typical tasks and deliverables in the scope of the Mechanical area include the production of the following deliverables:

- Design description: Process Flow Diagram (PFD); System Design Description (DD); 3D Detailed Models (DM); 3D Configuration Model (CM); 3D Neutral Format / Analysis Models Piping and Instrumentation Diagram (P&ID); Single Line Diagram (SLD); Cabling Diagrams; Routing diagram; Other diagrams (fault tree, interlock, sequence, block diagrams); Design definition (Bill Of Materials); Assembly drawings (2D); Component drawings (2D); As-Built drawings (2D); Execution drawings (2D); Component/subsystem specifications; Foundation/support drawings (Bird-eye / cutaway, etc.); As - built Drawings; Other Engineering & general arrangement drawings (2D/3D); Instrumentation & Control documents (I&C); production of Catalogues.

Plant Production

The ITER plant systems comprise large, complex, and technologically advanced process equipment. such as:

- Heating, Ventilation, and Air Conditioning (HVAC)
- Cooling Water Systems
- Ultra-High Vacuum
- Cryogenics
- Instrumentation & Control

- Control & Data Acquisition (CODAC)
- Fluids processing
- Power supplies
- Remote maintenance & robotics
- Active handling and processing facilities
- Component transport & assembly

Typical tasks and deliverables in the scope of the Plant area include the production of the following deliverables:

- Design description: Design Base Document & Drawings (DBD); Process Flow Diagram (PFD); System Design Description (DD); Detailed Models (DM); Piping and Instrumentation Diagram (P&ID); Single Line Diagram (SLD); Cabling Diagrams; Routing diagram; Other diagrams (fault tree, interlock, sequence, block diagrams); Design definition (Bill Of Materials); Assembly drawings (2D); Component drawings (2D); As-Built drawings (2D); Execution drawings (2D); Component/subsystem specifications; Foundation/support drawings (Bird-eye / cutaway, etc.); As - built Drawings; Other Engineering & general arrangement drawings (2D/3D); Instrumentation & Control documents (I&C); production of Catalogues.

General Configuration and Document Management

- **Configuration Management and verification**: Design Justification Document (DJD); Design justification plans; Design Compliance Matrix (DCM), Design Verification Matrix (DVM); System functional analysis; Commissioning reports; Engineering Work Packages (EWPs), Requirements management; support establishing processes, procedures for the design control, configuration management, documents & records, items identification, and monitor their implementation; support establishing the project baseline and maintenance ensuring the implementation of the design control and configuration management processes.
- Documents and Records:
 - **Construction related Documentation**: Shipping and Logistic Records; Field Change Request documentation; Construction Work Package; Installation Work
 - **Project wide Documentation**: control and preservation of documents and records, management of related information services (Library, digitalisation, archives, management of Publications, Intellectual Property and maintenance of specialized databases, Knowledge Management).

The missions and tasks executed under these framework contracts shall be carried out in compliance with the ITER CAD Manual, and the IO Quality Requirements (to be provided at Prequalification and tendering stages).

6. SCOPE OF WORK – - ELECTRICAL ENGINEERING,

Introduction

This area of expertise has a relatively broad scope and includes the following major components and systems:

- Electrical Power Distribution in AC at High, Medium and Low voltage and in DC (50-110V)
- Emergency Power Supplies base on Diesel Generators, Electrochemical batteries and Uninterruptible Power Supplies (UPS)
- Electromechanical components and systems such as busbars, transformers and circuit breakers and motors

- Thyristor Power Converters, Voltage Source Power Converters, Variable Frequency Drives for ac motors, Static Var Compensators, and STATCOM.

The electrical components and systems in the scope of Electrical Engineering can be categorized as follows:

- Commercial Off-the-Shelf (COTS) components such as circuit breakers, cables, distribution transformers, protective relays, etc. for Medium and Low Voltage AC Power Distribution Systems; the key facts and figures includes voltage levels from 110 V to 400 kV and rated power from 10 kW to 500 MW.
- Custom-made and One-Of-Its-Kind components, such as high-power converters based on power electronic devices and special protective switches for interruption of DC current up to 70 kA; the key facts and figures includes DC output voltage from 50 V to 1000 kV, rated power from 10 kW to 100 MW, rated DC output currents up to 70 kA continuous duty.

Main areas of work

The associated main areas of work are as follows:

- 1) Support to the engineering activities for production of technical documentation required for the following lifecycle phases of electrical components or system:
 - Feasibility studies, supported by feedback from manufacturers/supplies of electrical components and systems
 - Engineering Design and Design reviews
 - Call For Tender supporting documents
 - Monitoring/following up manufacturing process and supply contracts
 - Qualification Tests, Type Tests, Factory Acceptance Tests
 - Installation
 - Commissioning and Site Acceptance Tests
 - Operation and maintenance.

The technical documentation to be produced will depend on the lifecycle phase and project needs. The contractor shall be able to provide qualified staff and have the required engineering tools to produce at least the following technical documents:

- Design reports
 - Electrical one-line diagrams
 - Detailed wiring diagrams
 - Cable diagrams
 - Calculation notes
 - Steady State and Transient Analyses of electrical components and systems
 - Magnetic and electrical Finite Element Analyses
 - Procedures and acceptance criteria for tests
 - Commissioning procedures
 - Test and inspection reports.
- 2) Engineering support to the infield inspection and support activities for the following lifecycle phases of electrical components or system:
 - Monitoring/following up manufacturing process and supply contracts
 - Qualification Tests, Type Tests, Factory Acceptance Tests
 - Installation
 - Commissioning and Site Acceptance Tests
 - Operation and maintenance.

The required engineering support will depend on the lifecycle phase and project needs. The contractor shall be able to provide qualified staff at least for the following activities:

- Installation instruction and procedures
- Procedures for quality control during installation
- Procedures and acceptance criteria for tests
- Commissioning procedures
- infield inspection and supervision at the premises of the components suppliers and at the ITER site
- Production of inspection and test witnessing reports.

Typical tasks

Depending on the Customer's needs, the requested tasks can be of various types, always in a deliverable based manner within quality & schedule, such as:

- Single electrical engineering task (see lists in the section above)
- A coherent set of electrical engineering tasks (see lists in the section above) aimed at reaching a clear milestone. For example: a feasibility study including research of design concepts, recommendation, calculation notes analysis justification, input to CAD integration activities and report
- A coherent set of mechanical engineering tasks (see previous lists) performed in a multi-discipline condition thus involving engineering competencies outside pure mechanical ones aimed at reaching a clear milestone. For example: the feasibility study of a test facility involving a vacuum vessel, vacuum & cryogenic circuits, electrical power supply, actuators, sensors and I&C.

7. SCOPE OF WORK – FUSION TECHNOLOGY

Introduction

Fusion Technology focuses on the engineering design and development of critical components essential for ITER's success and operation. This includes cutting-edge design, engineering development, and realization of key technical elements such as high heat-flux components, composite materials, high-voltage transmission lines, high-vacuum materials and processes, irradiated assemblies, and specialized manufacturing techniques. These systems are integral to the ITER device and must meet extreme operational conditions.

Additionally, this area covers research, design, development, physics modelling, integration, and commissioning of scientific and engineering systems essential for fusion operation.

Main areas of work

Fusion Technology encompasses most aspects of a working Tokamak, with particular focus on:

- Neutral beams
- ECRH (Electron Cyclotron Resonant Heating)
- ICRH (Ion Cyclotron Resonant Heating)
- Blankets and divertors
- Fuelling and wall conditioning
- Disruption mitigation
- Diagnostics
- Operational systems
- Boundary systems

- Test blankets and other specialized systems outside conventional industrial engineering
- Materials and Component Testing
- System Integration with ITER's Overall Infrastructure

Typical tasks

- Design and engineering of specific systems
- Support system design phases to achieve manufacturing readiness
- Overseeing manufacturing follow-up
- Installation and integration of components and systems
- Testing, Commissioning and validation of systems

These services may be performed as individual tasks or as part of an integrated set of services. The services can be executed in full or in discrete phases, requiring both on-site and remote work.

8. SCOPE OF WORK – INSTRUMENTATION & CONTROL (I&C)

Introduction

The Instrumentation and Control (I&C) discipline is responsible for all aspects of control and monitoring at ITER. When fully operational, this will be one of the largest and most complex I&C systems in the world. It is structured into three tiers: **conventional**, **interlock**, and **safety**.

Main Areas of Work

I&C activities span from conceptual design to operational deployment. Key areas include:

- Control networks and communication systems
- Systems control and automation
- Application and software development
- Implementation and compliance with the *Plant Control Design Handbook* (PCDH)
- Maintenance, upgrades, and obsolescence management of I&C hardware and software
- Integration of control instrumentation and measurement systems
- Real-Time Plasma Control & Machine Protection
- Cybersecurity & Data Management
- Interoperability & Standardization

Typical Tasks

- Control system engineering: design, development, installation, and commissioning
- Instrumentation development, integration, and commissioning
- Network architecture design, installation, and maintenance
- Application software development and deployment
- Security and surveillance camera systems
- Ensuring compliance with nuclear safety and operational requirements

9. SCOPE OF WORK – MECHANICAL STRUCTURES ENGINEERING

Introduction:

The Mechanical Structures Engineering activities are aimed at supporting:

- The mechanical design and analysis of mechanical structures, follow-up of manufacturing along the full engineering lifecycle
- The mechanical engineering including not only mechanical design and manufacturing of structures, but also the overall component architecture and integration of functions / technologies others than purely mechanical ones, requesting a level of generalist approach over the full lifecycle (for example related, piping engineering, seismic analysis, configuration, interface management/integration, transverse functions, component specific knowledge...).

The associated components and services are as follows:

- The Internal Components (Divertor, Blanket)
- The Vacuum-Vessel (including the Port systems)
- The Magnet system
- The Cryostat
- The Thermal Shield
- The piping supports
- The penetrations
- The platforms
- Some mechanical aspects of:
 - The Remote Handling system
 - The Diagnostics systems
 - The Plasma Heating systems (Electron Cyclotron, Ion Cyclotron, Neutral Beam)
 - The Fuelling and wall conditioning systems
 - The Test Breeding Blanket Systems
 - The electrical systems
 - The buildings
 - The tritium plant
 - The assembly tools
- Some general services in the mechanical structure engineering area:
 - Global analysis to the ITER facility
 - Applicability of Codes & Standards
 - Enhancement of the design quality standards and associated Quality Control / Check Lists

Main areas of work

The associated main areas of work are as follows:

- Support to the engineering design activities required to meet the gates: Conceptual Design Review (CDR), Preliminary Design Review (PDR), Final Design Review (FDR), Manufacturing Readiness Review (MRR), including:
 - The mechanical engineering:
 - Requirement definition
 - Research of solutions, preliminary sizing, comparison & recommendation
 - Applicability of Codes & Standards
 - Implementation of transverse functions
 - Functional & geometrical interfaces
 - Detailed input for the CAD activities
 - Design documentation production including Design Justification and Verification
 - Contribution to the production of Engineering Work packages (EWP) & Construction Work packages (CWP)
 - Contribution to the implementation of Project Change Requests (PCR) and Field Change Requests (FCR)

- Contribution to Quality Control (tasks performed by Domestic Agencies within Task Agreements and Procurement Arrangements...);
- The associated supportive / justificative analysis – calculations such as (see list of software in section 3):
 - Computational Fluid Dynamics (CFD):
 - Structural
 - Piping
 - Mechanical (implicit solvers)
 - Fast transient mechanical (explicit solvers)
 - Electromagnetics (low frequency)
 - Electromagnetics (high frequency)
 - System level codes (0D/1D fluid systems)
 - Nuclear analyses
 - Fire
 - Magnet modelling
- Support to the tasks performed within external manufacturing contracts and Procurement Arrangements (PA):
 - To contribute to follow-up activities
 - To contribute to the review of technical documentation including analysis
 - To contribute to issue fixing

Typical tasks

The requested tasks can be of various types, always in a deliverable based manner within quality & schedule, such as:

- Single mechanical engineering task (see previous lists). For example: a structure analysis
- A coherent set of mechanical engineering tasks (see previous lists) aimed at reaching a clear milestone. For example: a feasibility study including research of design concepts, recommendation, analysis justification, input to CAD activities and report
- A coherent set of mechanical engineering tasks (see previous lists) performed in a multi-discipline condition thus involving engineering competencies outside pure mechanical ones aimed at reaching a clear milestone. For example: the feasibility study of a test facility involving a vacuum vessel, vacuum & cryogenic circuits, electrical power supply, actuators, sensors and I&C.

10. SCOPE OF WORK – PLANT AND PROCESS ENGINEERING

Introduction

This part is an overview of the scope of work to be considered by engineering services framework contractor for information. The exact scope of work to be done by contractor as well as the detailed deliverables will be identified in each task order later case by case.

The Plant and Process Engineering activities will support following area at ITER site.

Plant Engineering:

- Tritium Plant
- Hot Cell Facility
- Radwaste Facility
- Access Control to Security Area
- Other plant areas not covered by other disciplines

Process Engineering:

- Cooling Water System including Tokamak Cooling Water System
- Vacuum System and Vacuum Vessel Pressure Suppression System
- HVAC, Liquid & Gas distribution system
- Auxiliary systems included building services
- Other additional process lines not covered by other disciplines

Main areas of work

Plant Engineering support:

- Support of design and engineering activities to pass Conceptual Design Review, Preliminary Design Review, Final Design Review and Manufacturing Readiness Review gates
- Support for Engineering Work Packages and Construction Work Packages production
- Support of Field Change Request, Project Change Request, Non-Conformity Report resolution and analysis
- Plant design with space reservation by system
- Design of steel framed structures for pipe supports and whip-restraints
 - Design of Platforms, walkways and structural analysis
 - Valves access / maintenance platform, ladder, handrails design
- Design of Openings and Penetration Sealing, Backfilling/Infilling
- Fire protection and fire fighting system detail design and analysis
- Radiation monitoring and access control design and analysis

Process Engineering support:

- Support of design and engineering activities to pass Conceptual Design Review, Preliminary Design Review, Final Design Review and Manufacturing Readiness Review gates
- Support for Engineering Work Packages and Construction Work Packages production
- Support of Field Change Request, Project Change Request, Non-Conformity Report resolution and analysis
- Piping and Instrumentation Diagram (P&ID) and process lines routing design and analysis
- Pipe stress analysis, vibration and hammering analysis etc.
- Vacuum System
- Vacuum Vessel Pressure Suppression System
- Heating, Ventilation, and Air Conditioning (HVAC) design, analysis and test
- Liquid & Gas distribution system design, design review
- Auxiliary systems included in building services

Typical tasks

Typical deliverables from the contractor are as follows:

- **Design Deliverables:**
 - Design Description
 - Design Base Document and Drawings (DBD)
 - Calculation Note
 - Input data for 3D CAD design model
 - P&ID
 - Interface Data sheets
- **Construction Documents:**
 - Technical Specifications (Materials, Manufacturing, Procurement, Handling / Storage / Transportation, Assembly & Installation, etc.)
 - Start-up and Commissioning Manual
 - Operation and Maintenance Manual
- Owner Support Services

11. SCOPE OF WORK – CIVIL ENGINEERING

Introduction

Technical support for Engineering, construction technical supervision, commissioning and testing activities for Civil Works associated to the ITER Site and Buildings.

The Civil Engineering section (CES) within ESD is responsible for providing resources to key clients within the ITER Project for scope relating to the design, construction, commissioning and operation of the ITER buildings and site infrastructure.

Those key clients include currently

- The Buildings & Site Management (BSM) Program and
- The Central Integration Division (CID).

These client entities assume the roles on behalf of the ITER Organization as the Nuclear Operator for the Site & Buildings Scope and undertake the role in accordance with requirements of French Legislation and all IO policies, procedures, working instructions and other applicable documentation.

It is further highlighted that a large proportion of the Civil Engineering Site & Buildings scope on the ITER project are implemented in close cooperation with the European Domestic Agency (F4E).

Main areas of work

The scope will primarily concern provision of technical support for Engineering, construction technical supervision, commissioning and testing activities for Civil Works associated with the following main areas of the ITER Project;

- Tokamak Complex
- Auxiliary Buildings including, inter alia, EPS Buildings, FD & SN Resistor Buildings, NB Power Supplies Buildings, New RF Heating Buildings, Control Buildings
- Site Infrastructure including Service Bridges
- Hot Cell Building (inc. Extension) and Personal Access Control Building
- Miscellaneous Storage, Office and other Site Support buildings and infrastructure,

Note: The list above is indicative only and is not exhaustive nor is it limiting – there may be additional buildings/ infrastructure included and/ or removed for this list.

Typical tasks

Support to Requirements Management Activities:

- Draft and/ or maintain System Requirements Documentation: the Contractor shall maintain and update the existing System Requirements Documents (SRD). These require creation for new buildings/ infrastructure and/ or updating as and when they are affected by a Project Change. This activity includes the reconciliation/ propagation exercise to ensure compliance of the Site and Buildings SRDs with the overall Project Requirements (PR) document via the generation of Requirements Propagation Matrices (RPMs).
- Draft and/ or maintain Interface Control Documents and Interface Sheets/Data: These interface documents contain the raw interface data (loads, sizes, temperature requirements etc.). These “live” documents are updated to reflect data maturity levels. This data is currently stored in text documents, Excel spreadsheets and/ or appropriate Engineering Databases and the Contractor may be requested to use some or all applicable systems for the data management.

Support to Design Activities:

- Draft and/ or maintain Bespoke Technical Documentation such as Loads Reports, Design Codes: the Contractor shall prepare and maintain other reference documents such as Load Specifications and design codes that have been developed specifically for the ITER buildings and site infrastructure.
- Participate in and follow-up Technical Meetings: The Contractor shall play a lead role in regular meetings which are a forum for interaction between the Designers and Users of the facilities. The Contractor shall prepare a concise written report after each meeting (minutes of Meetings/ Records of Decisions/ Action Lists). The Contractor shall report the outcomes of the meeting to the Client Technical Responsible Officer(s) (TRO) as appropriate.
- Design reviews participation (Concept/ Preliminary/ Final Design Reviews (CDR/ PDR/ FDR), Design Integration Reviews (DIRs), Manufacturing Readiness Reviews (MRRs), Commissioning Certification Reviews (CCRs), As-Built package acceptance): Different roles can be given to the Contractor depending on the organization in place. This can be technical secretary (close out reports and follow up of review sheets resolution) or acting as expert in one particular discipline to review a package of documents. This task may include the drafting, on behalf of the ITER TROs; the Design Review/ Acceptance Plans and/ or Final Reports as appropriate. The task also includes follow up of resolution actions plans.

Support to Technical Supervision of Site & Buildings Construction Activities

The Contractor will be required to undertake the support to technical supervision and/ or support to surveillance of activities relating to the construction of the buildings and site infrastructure located within the ITER Nuclear Island (termed INB perimeter at ITER) most of which perform a nuclear safety function and which are therefore subject to a specific and rigorous Quality Assurance regime. As almost all the major buildings have a nuclear safety related function, the Contractor resources shall have experience of working in the construction of nuclear facilities. Note this does not preclude the likelihood that the Contractor may also be required to participate in support to the supervision of construction of auxiliary buildings or infrastructure not part of the INB.

The support to the supervision/ surveillance of construction activities will include, inter alia:

- Review and mark-ups intervention points within the Contractors control plans
- Production of inspection plans, records and reports
- Assessment of Non-Conformances and Deviation Requests
- Follow-up of Buildings modifications on site

Support to Technical Supervision/ Surveillance of Testing and Commissioning activities

The Contractor may be requested to participate/ support in the technical supervision and/ or support to surveillance for the commissioning and testing of assorted Site and Building components including; Elevators, Doors, Bearings, Cranes, Earthing & Lightning protection.

The supervision/ surveillance support of testing and commissioning activities will include, inter alia:

- Production of commissioning plans, records and reports
- Review and mark-ups intervention points within the Contractors control plans
- Assessment of Non-Conformances and Deviation Requests

Support to Taking Over/ Turnover and Operation “Completion” Activities

The support for the various “Completion activities will include inter alia:

- Attendance at on-site inspections and support in generation of defects lists
- Assessment of Non-Conformances and Deviation Requests

- Drafting of Taking-Over Documentation including Contractor Release Notes (CRNs) for Taking-Over
- Coordination and follow up of close-out and removal of defects before and after Taking-Over
- Participation to walk-downs and meetings
- Drafting of Concept of Operations and Maintenance and Inspection Plan Documents
- Drafting of Scope Definition Documents for Commissioning Certificate Readiness (CCR)
- Compilation of Turnover (TOP) packages for Commissioning Certificate Readiness (CCR)
- Supervision and actions to correct and update as-built documentation/ drawings/ diagrams for Commissioning Certificate Readiness (CCR)

Support with Miscellaneous Technical/ Design/ Analysis Activities

Where requested for time to time, the Contractor shall undertake specific technical tasks as directed by the IO team. These will relate to the general scope of Site and Buildings and will require the technical expertise of the Contractor. Where tasks relate to design or calculations, the services requested may comprise execution of design/ or checking and review of design/ calculations or performing the role of technical independent expert in performing independent reviews of designs/ calculations. Such tasks may include items such as:

- Design tasks (potentially including civil and/or geotechnical structural analysis, detailed drawings)
- Design or verification of embedment or anchors to concrete structure including post-drilled fixings
- Design or verification of (complex) service penetrations through confinement/ shielding rated concrete elements including backfilling of openings and infill around service penetrations
- Provision of “Technical Expert” advisory services: conducting structural/ seismic analysis and issue of technical reports relating to specific issues which may arise (technical, nuclear safety, etc)
- Support for ASN inspections including preparation of input materials and/ or supporting IO team in formulation of responses to actions from inspections

12. SCOPE OF WORK –NUCLEAR SAFETY ENGINEERING

Introduction

The Nuclear Safety Engineering activities cover the following general items:

- Support to the design and construction teams in the application of nuclear safety requirements arising from the analyses (safety engineering),
- Support to the assessment of changes and deviations arising from design, manufacturing, construction, or assembly activities, on a Nuclear Safety point of view,
- Surveillance of the good propagation of safety requirements during the whole lifecycle of the project (design, manufacturing, construction, commissioning, dismantling),
- Preparation of the documentation in support of ITER licensing process (e.g. safety reports);

Main areas of work

The work will consist of support activities for the Project such as:

- Supporting the review of Safety documents by verifying the compliance of PIC with their defined Nuclear Safety requirements issued from the licensing process;
- Performing Safety analyses regarding internal and external hazards, and postulated initiating events and develops the documentation associated with these Nuclear Safety analyses;

- Drafting licensing documentation.

Typical tasks

The contractor will be asked to support the IO SRO (Safety Responsible Officers) in performing reviews and verifications for the following technical fields in order to check the good implementation of the nuclear safety requirements:

- Building systems (Civil Works, Ventilation, Mechanical system...),
- Confinement systems, including detritiation,
- Tokamak Machine,
- Cooling Water Systems,
- Instrumentation & control,
- Diagnostics,
- Port plug Test Facility,
- Remote Handling equipment (transfer cask, remote handling tools...),
- Solid and Liquid radwaste processes (tritium recovery system, cutting workstation, packaging...).

In addition, the contractor can be asked to perform safety analyses and to draft documents on subjects such as:

- Accident scenario,
- Fire, (prevention, detection, extinguishing means)
- Explosion (dust and hydrogen isotope explosion),
- Lightning (protection measures, impact of magnetic field, etc),
- Flooding (analysis of the systems and vessels containing fluids, detection measures, impact reduction, etc),
- Overpressure, missile, and pipe whip effects (identification of pipe or component under high pressure, prevention, impact on PIC/SIC, etc), and mechanical risks (load drop...)
- External hazards including Airplane crashes,
- Radioprotection analysis (Occupational Radiation Exposure assessment, Radiological zoning, Ventilation zoning, shielding design optimization...)
- Waste management (waste study, waste zoning, waste management).

13. QUALITY ASSURANCE REQUIREMENTS

As a Nuclear Operator, IO requires that for the entire duration of the framework contracts, Contractors shall hold, and maintain, as a mandatory requirement a valid ISO 9001 (or equivalent) and shall have the duty to verify and document the equivalent quality level of all its subcontractors and consultants.

Failure to comply with this requirement may result in disqualification from the tendering process or potential termination of the contract during its execution.

Additionally, the candidates shall be aware that the IO may require ISO 14001 for the implementation of some services related to environmental management systems.

14. CONTRACT BASIS AND EXECUTION

The services will be implemented via framework contracts. Multiple framework contracts will be awarded covering the full array of the ESD disciplines listed in Section 1 and detailed in sections (0 – 12).

Following Contract award, Task Orders will be issued by either Single Discipline, or Multi Discipline or Service Center (catalogue of tasks) on a deliverable basis following a direct assignment or via mini-competition called a Task Request (TRs).

The IO will award the Framework Contracts for an initial period of 4 years, which may be extended twice for 2 additional years. The first batch of Task Orders will commence in Q2-Q3, 2026.

Resource Estimates

Time dependent resource profiles, and uncertainties related to Project scope over the potential 8-year timespan of the framework contracts preclude the accurate prediction of resource requirements. **The estimated levels of resources required over the first 4 years of implementation will be shared with the candidates at the Pre-Qualification stage of the tender.**

IO may require the contractor to perform the work either on the ITER site, at a close support locations to be established and maintained by the contractors within easy reach of the ITER site, and at remote locations such as the contractor's usual place of business. In the case of remote services, the contractor may need to provide their own licenses and connect to the IO's servers (remote connection specification to be provided at future stages of the tendering process).

Some examples of the remote / off-shore work envisaged could be:

- Completion dossier compilation and verification
- Layout CAD drawings and models
- Structural analysis and Calculation notes;
- Assessment of Non-Conformances and Deviation Requests
- Preparation of large 2D packages / mass production of drawings based on frozen 3D data;
- Production of Catalogues;
- Production of Commissioning Diagrams;
- Review of Engineering Documentation based on IO requirements

The activities mentioned above indicate the IO's intention to perform remote activities. However, depending on the schedule, technical means, and/ or criticality, IO may determine the location(s) for some services under a Task Order.

The working language of ITER is English, and a fluent professional level is required (spoken and written) by all staff working under the Framework Contracts and Task Orders

15. PREQUALIFICATION REQUIREMENTS

The selection criteria for this Call for Tender shall include, but shall not necessarily be limited to the following requirements, supported by appropriate references:

- Established company with demonstrated experience in providing similar services to large, complex international projects, and preferably covering the design, construction and commissioning phases.
- Proven track record of delivering projects on time and within budget.
- Experience in remote collaboration techniques, and implementation of database sharing schemes based on the software packages listed in section 3.
- Company's QA system and engineering processes acceptable to ITER (ISO 9001)

16. TENDER TIMETABLE

The tentative schedule for this tender process is as follows:

Call for Nomination (C4N)	22 nd April, 2025
Invitation to Pre-qualification of Companies	31 st of May, 2025
List of Pre-qualified companies	31 st of July, 2025
Invitation for Call for Tender	1 st of September, 2025
Tender Submission	30 th of November, 2025
Contract Award	30 th of April, 2026
Contract Signature	31 st of May, 2026
First Task Orders signature	June – July 2026

17. CANDIDATURE

Candidature is open to all companies participating either individually or in a grouping (consortium) which is established in an ITER Member State. A consortium may be a permanent, legally-established grouping or a grouping, which has been constituted informally -- but formalized with engagement letters -- for a specific tender procedure. All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization.

The consortia shall be presented at the pre-qualification stage, where they will be assessed as a whole. Consortia cannot be modified later without the prior approval of the ITER Organization.

In the event of a consortium, a draft of the Consortium Agreement, or letter of intent and Power of Attorney signed by all the consortium members shall be submitted together with the tender.

Legal entities belonging to the same legal grouping are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Bidders' (individual or consortium) must comply with the selection criteria. IO reserves the right to disregard duplicated references and may exclude such legal entities from the tender procedure.

18. REFERENCE

Further information on the ITER Organization procurement can be found at:
<http://www.iter.org/org/team/adm/proc/overview>

ANNEX I – MARKET SURVEY QUESTIONNAIRE

Question	Yes	No	Additional information
Supplier's Capacity			
Are you able to cover all mentioned 9 Engineering disciplines in Section 1?			
If yes, as a single company or as part of a consortium? (please complement additional information)			
Are you able to cover at least 5 Engineering disciplines in Section 1?			
If yes, as a single company or as part of a consortium? (please complement additional information)			
Are you able to provide at least 100 resources within the first 3 months of Contract / TO award? (If no, please indicate your entity's capacity).			
Do you have capabilities to provide services on remote basis? Please specify if Off-Site and/or Off-Shore or both			
Do you have experience in a project similar as ITER in terms of complexity and magnitude?			
Do you have experience in the nuclear industry?			
Do you have a valid ISO 9001 certificate?			
Do you have experience applying international constructions codes and standards? If yes, please complement additional information.			
Please complete the Disciplines you are most interested in submitting an offer			
Assembly, commissioning and operation including maintenance;			
Design Engineering, Computer Aided Design (CAD) and Configuration management;			
Electrical Engineering			
Fusion Technology			
Instrumentation & Control;			
Mechanical Structures Engineering;			
Plant & Process Engineering;			
Civil Engineering;			
Nuclear Safety Engineering			
Challenges			
Which of the listed Disciplines would be the biggest challenge for your entity to supply services for?			
Do you comply with the list of software in Section 3? If not, which of them would be the most challenging?			
Would it be a challenge for you to provide licenses if they are not supplied by the ITER Organization?			