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Technical Specification

BRN I-15-759 Cost Engineers

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1 Purpose

The objective of this Contract is to provide the IO Technical Responsible Officer or deputy (hereafter known as the IO-TRO) with two [2] Construction Cost Engineering experts for the major Site Construction (assembly & installation) contracts during preparation of the tenders, and the tendering process (up to award), and for controlling and managing, and reporting changes to the Site Construction Cost Estimate.

The scope of work to be performed will be carried out in close liaison with the IO-TRO, engineers and planners of the Assembly and Operations (AOP) Division, and with procurement staff from the Procurement and Contracts (PCD) Division as necessary.

2 Scope

2.1 The ITER Project

The ITER project aims to demonstrate the scientific and technological feasibility of fusion power for peaceful purposes and to gain the knowledge necessary for the design of the next-stage device, DEMO, or the DEMONstration fusion power plant.

Receiving 50MW of input power, the ITER Machine is designed to produce 500 MW of fusion power for extended periods of time. This represents ten times more than the input power needed to keep the plasma at temperature. It will therefore be the first fusion experiment to produce net energy. It will also test a number of key technologies, including heating, control, and the diagnostics and remote maintenance that will be needed for DEMO.

The main regulatory documents pertaining to the mechanical components for ITER are:

- The Quality Order dated 7 February 2012 relating to the general technical regulations applicable to INB – EN updating:
 - Order of 10 August 1984 relating to the quality of design, construction, operation and decommissioning of nuclear installations (so called quality order);
 - Order of 26 November 1999 setting general technical stipulations concerning limits and modalities of the samples and releases subject to authorization, carried out by the INB; and
 - Order of 31 December 1999 setting the general technical regulatory controls intended to prevent and limit external nuisances and risks resulting from the operating of INB.
- Decree No. 99-1046 dated 13th December 1999 concerning pressure equipment – Introduction of the pressure Equipment Directive in France (French acronym ESP/PED)

Further information can be found on the ITER website (<http://www.iter.org>) and also at the web pages of the ITER Parties that can be accessed via the ITER website.

2.2 The ITER Organization

ITER is a joint international research and development project for which initial construction activities have recently started.

The seven Members of the ITER Organization are the European Union (represented by EURATOM), Japan, The People's Republic of China, India, the Republic of Korea, the

Russian Federation and the USA. ITER will be constructed in Europe, at Cadarache, in southern France, where the ITER Organization (IO) has its headquarters.

The Members of the ITER Organization will bear the cost of the project through its 10-year construction phase, and its 20-year operational phase before decommissioning. With respect to the construction of the ITER machine, most of the components will be contributed by the Members as in-kind contributions. The remaining investment will be via cash contributions from the members.

2.3 Assembly and Operations – The Mission

The scope of the Assembly and Operations (AOP) Division is to provide construction support for:

- The assembly of the ITER machine;
- The installation and functional testing of IO Plant Systems in Buildings and Areas on the ITER Site.

Specify requirements for special (custom) tools used in assembly and installation of the Machine and IO Plant Systems. Tools are defined and approved by PBS 22 Machine Assembly and Tooling Section and are supplied either by DA or from IO Fund.

Undertake role and responsibilities of the **Construction Manager** ⁽¹⁾ during assembly, installation and testing at the ITER site. Specific site construction activities include materials management (site reception, offloading, unpacking, storage, handover to Constructor), execution of works (assembly, handling, installation) and testing (installation, component, performance).

Undertake role and responsibilities of the **Start-up and Testing, and Integrated Commissioning Manager** ⁽²⁾ subsequent to assembly, installation and testing at the ITER site.

Undertake role and responsibilities of the Operator, following the Handover of Structures, Systems and Components (SSCs) for the ITER Facility.

Provide support to Transport and Logistics associated with the delivery of components to the ITER Site.

⁽¹⁾ **Construction Manager** is the unit within the Operator for the oversight, planning and coordination of all Assembly and Installation activities. The Construction Manager takes overall responsibility for the coordination of safety of assembly and installation activities and reports to the IO Site Safety Coordinator. The Construction Manager is responsible for issuing work permits on the worksite.

⁽²⁾ **Start-up and Testing and Integrated Commissioning Manager** is the unit within the Operator for the oversight, planning and coordination of all testing and commissioning activities. The Start-up and Testing and Integrated Commissioning Manager is responsible for ensuring that the overall sequence of commissioning activities is planned, prepared and performed.

3 Definitions

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

Acronym	Description
AACE	American Association of Cost Engineers

AOP	Assembly and Operations Division
BoE	Basis of Estimate
CPD	Construction Process Description
CWP	Construction Work Package
DA	Domestic Agency
EVM	Earned Value Management
IO	ITER Organization
IO-TRO	IO Technical Responsible Officer
INB	Basic Nuclear Installation
PBS	Plant Breakdown Structure
RFI	Requests for Information
SSC	Structures, Systems and Components

4 References

- [1] [ITER Policy on Authority and Responsibilities during Assembly, Installation and Testing at the ITER Site \(A5TUQN\)](#)
- [2] [ITER Site Construction Project Management Plan \(ECBZWE\)](#)
- [3] [ITER Site Construction Requirements Management Plan \(DZHMAK\)](#)
- [4] [ITER Site Construction Scope Management Plan \(DZL8VL\)](#)
- [5] [ITER Site Construction Engineering Management Plan \(EH5ET3\)](#)
- [6] [ITER Site Construction Schedule Management Plan \(E38VRM\)](#)
- [7] [ITER Site Construction Cost Management Plan \(EBUTK5\)](#)
- [8] [ITER Site Construction Field Quality Management Plan \(FCYR7F\)](#)
- [9] [ITER Site Construction Field Configuration Management Plan \(EBUK3B\)](#)
- [10] [ITER Site Construction Resource Management Plan \(ECEFE6\)](#)
- [11] [ITER Site Construction Communication Management Plan \(EBQA66\)](#)
- [12] [ITER Site Construction Risk and Opportunity Management Plan \(ECH4AK\)](#)
- [13] [ITER Site Construction Materials Management Plan \(92VZ3G\)](#)
- [14] [ITER Site Construction Works Management Plan \(ECCBR2\)](#)
- [15] [ITER Site Construction Health, Safety and Environmental Management Plan \(EC8ALD\)](#)
- [16] [ITER Site Construction Procurement and Contracts Management Plan \(JPDBFC\)](#)
- [17] [ITER Site Construction Documentation and Data Management Plan \(JQGTVR\)](#)
- [18] [ITER Site Construction Start up, Testing and Turnover Management Plan \(LX96CK\)](#)

5 Estimated Duration

The duration of this Contract shall be 12 months (fixed part), plus 2 options to extend by 6 months each.

6 Overview and Work Description

1. During 2013-2014 a comprehensive **contracts strategy** has been prepared comprising the following Site Construction contracts:
 - Construction Management Services Contract
 - Machine Assembly Works Contract

- Mechanical & Piping Works Contract
- Electrical, Cabling, Instrumentation & Control Works Contract
- Specialised Works Contract
- Field Quality, Testing & Surveillance Support Contract
- Welfare Premises Support Contract
- Finishing/Civil Works Support Contract
- Site Materials & Logistics Support Contract
- Scaffolding and Access Equipment Support Contract
- Tools and Plant Hire Support Contract

Preparation of specifications for the above contracts commenced in Q4 2014 and contract tenders, evaluations, and award are anticipated to continue into Q2-Q3 2016.

2. During 2014-2015 a comprehensive **Site Construction Project Management Plan** is being developed and ‘implemented’ defining how the construction phase of the ITER project (including the preparation for construction and machine operations) will be initiated, planned, executed, monitored, controlled, and closed:
- How management process will be developed, used and integrated
 - How work will be executed
 - How changes will be controlled
 - How communication will be managed
 - How assembly baselines, procedures and instruction documents will be managed

Each plan identifies the basic principles and conventions for the subject matter

Deliverables are identified within project lifecycle phases i.e. during preparation, mobilisation, execution etc..,

Introduce new terminology not commonly used in the project up to now

The Site Construction Project Management Plan volumes are listed below and these will be ‘underpinned’ by more detailed Working Instructions and templates covering the following areas:

0. Project Management
1. Requirements Management
2. Scope Management
3. Engineering Management
4. Schedule Management
5. Cost Management
6. Field Quality Management
7. Field Configuration Management
8. Resource Management
9. Communication Management
10. Risk Management
11. Site Materials Management
12. Site Construction Works Management
13. Health, Safety and Environment Management
14. Procurement & Contracts Management
15. Documentation & Data Management
16. Start-up, Testing, and Turnover Management

3. During 2014-2015 a comprehensive **performance baseline** for Site Construction is being developed, comprising:

- **Primavera schedule** including contracts preparation, engineering, project management, materials management, works, testing and commissioning related tasks, this is used for managing the performance of work and for forward planning:
 - Preparation for Construction
 - Site Materials
 - Construction (Assembly and Installation works)
 - Start-up and Testing
 - Integrated Commissioning
 - **Statements of the work scope** consistent with the approved ITER detailed WBS using a web based application:
 - Description of the scope
 - Technical Pre-Conditions
 - Exclusions
 - Process for execution
 - Completions and Acceptance Criteria
 - **Cost Estimate** for the Site Construction scope of work to include all IO scope including Management, Surveillance, and Assembly, and Testing activities on the ITER platform.
 - The Cost Estimate is being prepared at an overall Class 3¹ (budgetary) level and is being produced in the Cleopatra Enterprise Cost Estimating software with deviations in the estimate quality for discrete work packages i.e. to Class 2 or Class 4 level.
 - The Cost Estimate is being prepared using European industrial Labor rates contained within the IO Cleopatra Enterprise software and using industry best practices for Cost Estimation.
 - The Basis of Estimate (BoE) is being prepared in Microsoft Office software.
4. During 2014-2015 a comprehensive **constructability/engineering study** is being documented for the site construction scope comprising:
- Construction Process Descriptions (CPD), a non-contractual description of the assembly and installation of components within a Construction Work Package (CWP)² containing information sufficient to describe and demonstrate a feasible methodology for Assembly and Installation purposes. The CPD will be developed as the system design matures and technical details are finalised:
 - Configuration of SSC upon Delivery to Worksite
 - Assumptions
 - Exclusions
 - Technical and Schedule Constraints
 - Planning Basis

¹ American Association of Cost Engineers (AACE) 17R-97: Cost Estimate Classification System

² A Construction Work Package (CWP) is an executable construction deliverable that defines in detail a specific scope of authorised work and which includes a budget and schedule that can be compared with actual performance. The scope of work in a CWP is such that it does not overlap another CWP. Nominally a CWP is therefore a discrete element of the ITER Plant Breakdown Structure (PBS) or other significant work scope such as the preparation of a facility or area.

- Sequence Diagram
- Preparation
- Construction
- In-Process Verifications and Inspections
- Completion and Final Inspections
- Identification of risks and opportunities in the design
- Tooling and Equipment

Construction Cost Engineering is thus a critical activity in the area of Site Construction and two [2] Construction Cost Engineering experts are required to support these activities and the management and control of the performance baseline and associated systems, and documentation.

The objective of this contract is to provide specialist Cost Engineering support for the major Site Construction contracts and for the Construction Worksite Baseline:

- Tender preparation
- Tender evaluations/analysis and reports (up to award)
- Ongoing control of the site construction cost baseline
- Preparing time phased cost simulations
- Support to process development
- Preparing cost estimates for Project change Requests (PCRs)
- Support to monthly cost performance reporting

7 List of Deliverables and Due Dates

The table below identifies the preliminary listing of deliverables.

Del.	Description
1	Support to tender preparation for the assembly contracts
2	Tender evaluations/analysis and reports (up to award)
3	Ongoing control of the cost related configuration items in the Construction Worksite Baseline
4	Preparing time-phased cost simulations
5	Support to the development of cost management processes
6	Preparing cost estimates for Project Change Requests (PCRs) affecting the Construction Worksite Baseline
7	Preparing time phased cost simulations for changes to the baseline during tender and for PCRs
8	Support to monthly cost performance reporting by the AOP Division

A bi-weekly report shall be provided, reflecting the status of the specified deliverables for that month.

8 Acceptance Criteria

All deliverables and bi-weekly reports will be subject to the approval of the IO-TRO mentioned in the Contract or his authorized deputy.

9 Specific requirements and conditions

The contractor shall use the ITER software's, aided by plans and procedures that are being implemented by the IO:

- Reports, analysis, and simulations shall be prepared consistently with the IO Cost Breakdown Structures and the IO Site Construction contracts structure.
- Studies and Cost Estimates for Project Change Requests shall be prepared consistently with the ITER Project Change procedures.
- Performance reports shall be prepared using ITER standards and templates.
- Scheduling shall be performed in the ITER Construction Primavera database

ITER has chosen:

- *Primavera* as its scheduling tool.
- *Intergraph SmartPlant Materials, SmartPlant Construction, and SmartPlant for Owner Operators* as the system to support the execution phases of the work.
- *Cleopatra* for Site Construction cost estimating

The work will require detailed investigation and review of existing documentation, industry standards and best practices.

Briefing materials will be prepared as necessary to explain results of analysis, progress etc., to the IO-TRO.

The IO-TRO will provide necessary support to the Contractor in the form of input materials, access to existing documentation, and access to subject matter experts.

Each work task will be individually discussed in consultation with the IO-TRO and a deliverable date will be agreed.

10 Work Monitoring / Meeting Schedule

Completion of work items will be confirmed by the IO-TRO or his authorized deputy. For longer tasks an interim monitoring point may be defined.

Additional deliverables, or changes to the list of deliverables, shall be discussed and agreed in advance.

The work can be performed through a combination of on-site (50%) and off-site (50%) working.

Bi-weekly progress meetings shall be held between the Contractor and the IO-TRO, or his deputy, along with other relevant staff. The Contractor shall be responsible for producing minutes of these meetings and tracking actions and for preparing a report including the actual number of days worked.

The official language of the ITER project is English.

11 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 \(ITER_D_258LKL\)](#).

12 Required Qualifications and Experience

The Contractor shall provide the following skills:

- Cost Estimators with a minimum of 7 years in Cost Estimating.
- Fully familiar with industry Cost Estimating best practices.
- Fully familiar with the Cleopatra Enterprise Cost Estimating software.
- Knowledge of plant systems and processes and their practical application.
- Fluent in English both written and oral.
- Ability to communicate effectively and to write clear and concise reports in English.
- Good interpersonal, communication and organizational skills.
- Ability to work effectively in a multi-cultural environment.

The Contractor is expected to prepare well written documents in high quality English, checked by a native speaker for clarity, grammar and spelling, which are suitable for senior management approval and use by ITER, Domestic Agencies and Contractors.