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Technical Specifications (In-Cash Procurement)

Technical Summary for the Tokamak Assembly Works-A0

The purpose of this document is to provide a high level definition of the scope of works and required Contractor competences for the Tokamak Assembly Works – Sequence A0 Contract (TAW-A0).

The document describes the overall configuration of the Tokamak device, summarises the scope of the TAW-A0 Contract, and identifies the essential expertise, experience and skills required of the performing Contractor. The document also provides a brief description of the works organisation.

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1 Purpose

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2 Background

2.1 The ITER Project

For a complete description of the ITER Project, covering both organizational and technical aspects of the Project, visit www.iter.org.

2.2 The ITER Facility

The ITER facility is currently under construction in Cadarache, Southern France.

Central to the facility is the Tokamak Complex, a nuclear rated structure in reinforced concrete that comprises three integrated buildings, Figure 1. The Complex has a footprint of 118 x 81 m, extends vertically from -15 m to +40 m relative to ground level, and contains the plant systems that service (power, heat, cool, condition, fuel, monitor and control) the Tokamak.

To support the assembly of the Tokamak machine there is a steel-framed Assembly Building and Cleaning Facility, arranged to form a continuous working space.

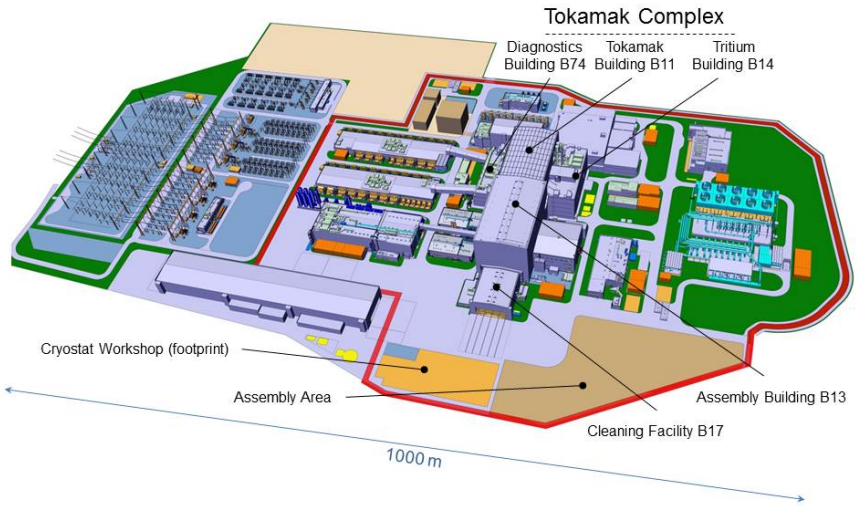

Figure 1: Layout of the ITER Site

2.3 The ITER Tokamak

The Tokamak consists of a toroidal Vacuum Vessel (VV), four Superconducting Magnet Systems, and Thermal Shields (TS), all contained in, and structurally supported by a Cryostat, see Figure 2.

The Tokamak machine is enveloped by a cylindrical concrete bio-shield of 30 m diameter and 30 m height, located at the centre of the Tokamak Building. The volume inside the bioshield is known as the tokamak PIT, and at the lower level the civil structures include the massive support for the tokamak machine termed the crown. Connections between the metallic machine supports and components are made via steel plates embedded in the concrete; globally the Tokamak building complex is provided with about 100 000 embedded plates.

The bio-shield and the surrounding building structure support the Cryostat, and provide the radiation shielding.

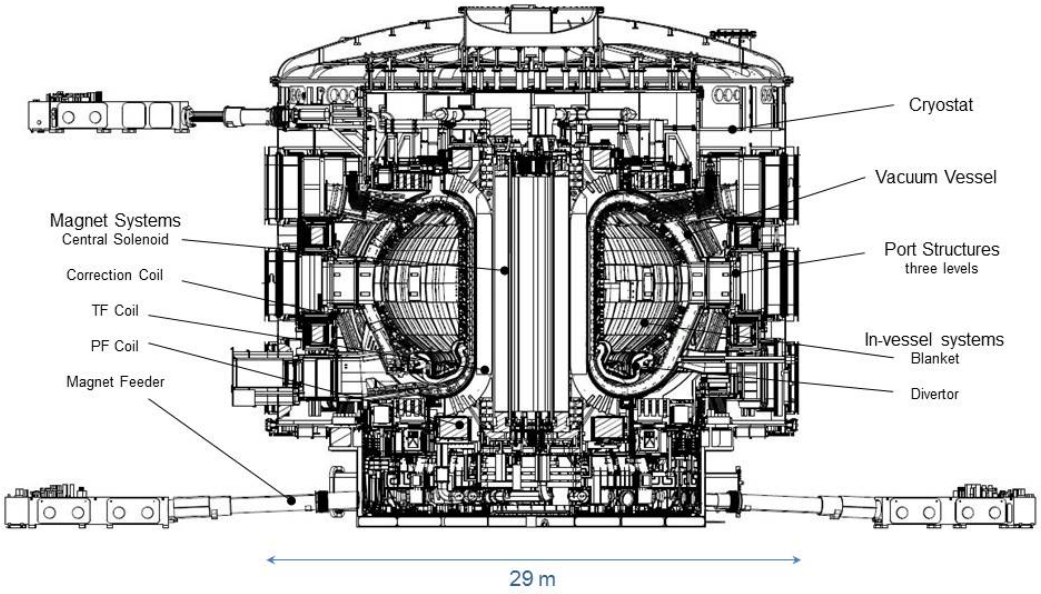

Figure 2: Major Tokamak Systems

The purpose of the Cryostat, the largest of the Tokamak components at 29m diameter and 29m height, is to provide a high vacuum environment to thermally isolate the components operating at cryogenic temperatures. It contains and supports the Tokamak components, and transfers their loads to the Tokamak building, and for installation the Cryostat will be site fabricated into the four large sections shown in figure 4.

The Cryostat is a fully welded structure in SS 304/304L, designed and constructed in accordance with ASME VIII, Div. 2.

3 Scope of the Contract

3.1 Physical scope

The scope of this Contract covers the Tokamak assembly works to be completed prior to the installation of the first major Cryostat component, the Cryostat base, and includes: the Cryostat supports; the attachment plates for the optical metrology targets used to define the alignment network; the components that become trapped below the Cryostat base once it is installed, and; access equipment and services.

The location of the majority of the installation work to be performed will be the lower part of the Tokamak PIT, i.e. the internal volume of the bioshield, see section 2.3 and figure 3. A limited scope associated with the preparation of the Cryostat base, will be completed in the Cryostat Workshop, where the main Cryostat components will be fabricated by others, see Figure 1.

The components to be installed, or laid down in the PIT are identified in Figure 3 (in red colour).

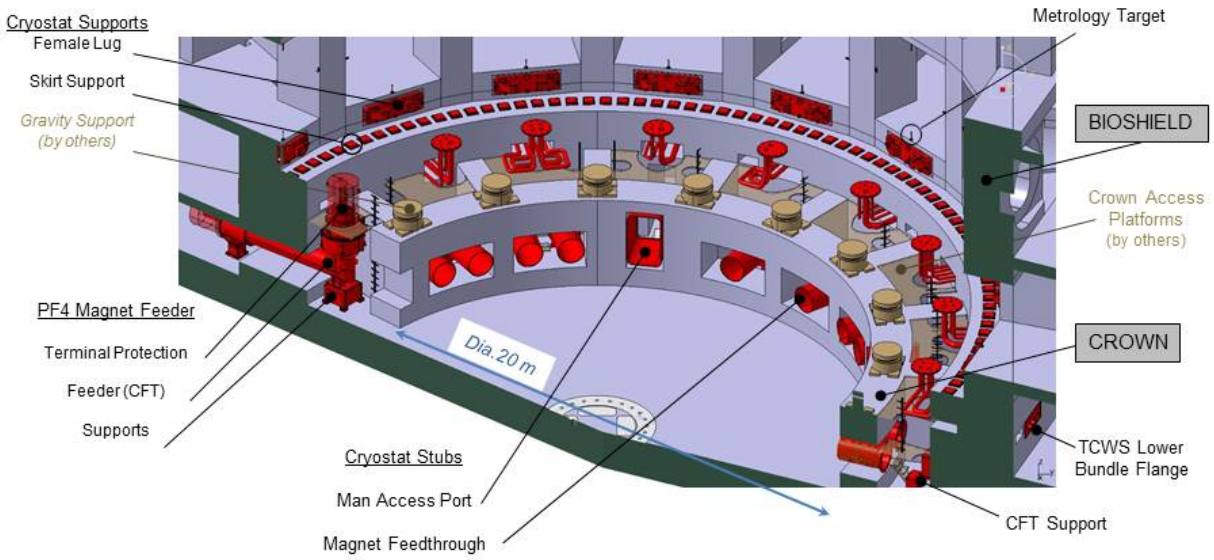

Figure 3: TAW-A0 components to be installed inside the Tokamak PIT

The scope of work to be completed in the Cryostat Workshop covers the items to be installed on the cryostat base, prior to its eventual transport and installation by others. The components are identified in Figure 4 (in red colour).

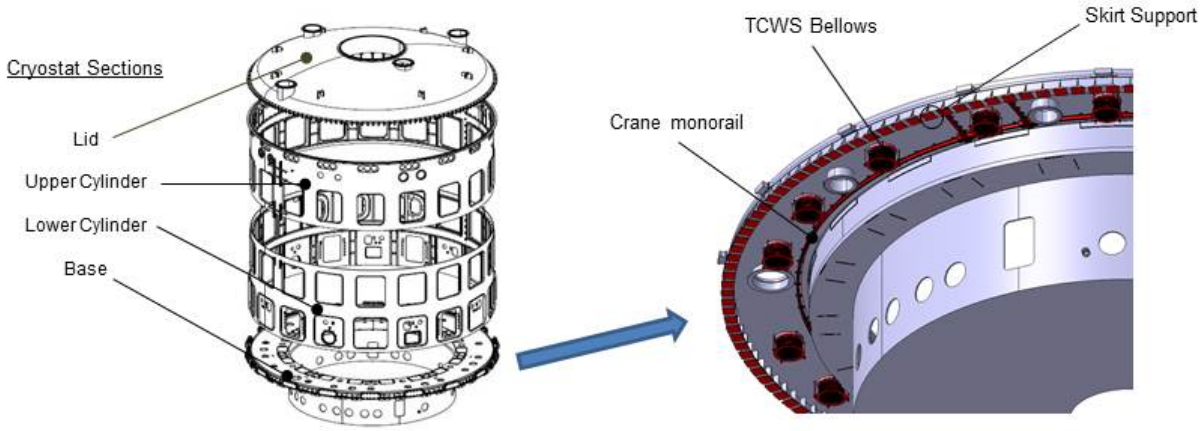

Figure 4: TAW-A0 Components to be installed on the Cryostat Base

A high level description of the preliminary scope of work, broken down by Construction Work Package (CWP), is provided in Tables 1 and 2 for the PIT and cryostat workshop respectively.

3.2 Scope of Work

In terms of Scope of Work, the scope will generally consist of the preparation, execution, control and documentation of the permanent works, plus any temporary works required to achieve the permanent works.

The site works will be executed under the management of the Construction Management as Agent (CMA), and IO has appointed MOMENTUM SNC as CMA for the Construction Project.

The Scope of Works of this Contract includes:

- development of Installation Work Packages (IWPs) from the Construction Work Packages (CWPs), and associated documentation provided by IO and the CMA;
- identification, definition and provision of any required temporary works required to complete the permanent works, such as HVAC, lighting, protection, temporary access, safety equipment, standard tooling, etc.;
- provision of offsite, precision machining facilities; custom machining of IO supplied components;
- provision of all consumables and accessories required to complete the works;
- execution of the permanent works in accordance with the Project schedule;
- performance, and documentation of all required installation tests and verifications;
- preparation and issue of detailed as-built drawings, specifying dimensions achieved.

The Contractor's personnel shall have access to the ITER facilities as allowed by the IO Responsible Officer.

4 Required Competences

In addition to integrating an extensive variety of high technologies in its design, the ITER Tokamak will be the first nuclear fusion device to be constructed as a Nuclear Installation. To successfully execute the TAW-A0 scope of work will require specific experience, competencies and skills, including:

- ISO 9001, OSHAH 18001, and ISO 14001 certification is required;
- management and execution of site works in highly regulated, complex industrial / nuclear projects;
- experienced in, or ability to comply with, the French Order of 7 February 2012, establishing the general rules for Basic Nuclear Installations;
- experience of construction codes and standards, in particular ASME VIII, Div.2;
- works preparation including QA, execution studies, workshop drawings, installation drawings and procedures, safety files;
- clean conditions working;
- vacuum technology,
- inspection and non-destructive examination, including vacuum leak testing;
- precision custom machining of mechanical parts;
- fitting, bolting and welding of mechanical parts;
- high quality, coded welding of stainless steels;
- lifting and handling in restricted areas, and accurate positioning;
- dimensional survey before and after the works;
- as-built documentation.

In addition, a clear, uncompromising commitment to safety and excellent track record, demonstrating the practical and consistent application of best-practice principles to ensure a safe working culture is required.

5 Timetable

The tentative timetable is as follows:

Milestone	Date
Call for Nomination	Q1 2017
Issue of Pre-qualification	Q1 2017
Deadline for receipt of Pre-qualification Applications	Q2 2017
Issue of the Call for Tender	Q2 2017
Tender Submission Date	Q3 2017
Contract Commencement Date	Q4 2017
Start of Site Works (Provisional)	Q1 2018

The estimated duration of the contract is 18 months.

6 Candidature

Participation is open to all legal persons participating either individually or in a grouping (consortium) which is established in an ITER Member State. A legal person cannot participate individually or as a consortium partner in more than one application or tender of the same contract. A consortium may be a permanent, legally-established grouping or a grouping, which has been constituted informally 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 consortium grouping shall be presented at the Pre-Qualification stage. The Candidate's composition cannot be modified without the approval of the ITER Organization after the Pre-Qualification.

Legal entities belonging to the same legal group are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Candidates (individual or consortium) must comply with the selection criteria. The IO reserves the right to disregard duplicated reference projects and may exclude such legal entities from the Pre-Qualification procedure.

7 Subcontracting Rules

Sub-contracting is allowed but it is limited to 1 level, and its cumulated volume is limited to 30% of the total contract value.

Table 1. Preliminary list of CWP included in TAW-A0 Scope of Work for tokamak PIT

CWP No. (abbreviated)	CWP Description	Principal Activities	Responsibility
…04.01.01.01	Establish Pit Survey Network & Datum	Marking out	Others (IO)
		Tack-welding of qty. 204 Metrology Target Mounting Plates to embedded plates (including qualifications, WPS, procedures, records, etc.)	TAW-A0
		Bonding (gluing) of qty. 8 Mounting Plates on concrete structure	TAW-A0
…05.62.01.01	Installation of General Access & Scaffolding	Installation of access and scaffolding needed to complete TAW-A0 scope (to be determined by TAW-A0 contractor)	TAW-A0
…05.62.01.02	Installation of Backing gas, Helium, electricity, lighting, HVAC supplies, etc.	Installation of temporary supplies TAW-A0 needed to complete TAW-A0 scope (needs and means to be determined by TAW-A0 contractor)	TAW-A0
…04.01.01.04	Installation of the PF4 CFT Feeder	Transport CFT Feeder and lay down, together with installation tools, on base of Tokamak PIT	Others (F4E)
		Preparation and supervision of the PF4 CFT Feeder in-PIT lifting and handling. In-PIT jib crane and operator provided by others (F4E).	TAW-A0
		Lifting, handling, positioning and welding of gravity supports (qty. 2 supports with 4 interfacing pads each + 1 pad for U-shaped support) on embedded plates. Special lifting and handling means provided by others (IO).	TAW-A0
		Lifting, handling, positioning of bellows. Special lifting and handling means provided by others (IO).	TAW-A0
		Supply and installation of protection around the bellows.	TAW-A0
…04.01.01.05	2nd Phase Pouring of Crown	Close the temporary opening in the crown provided for the installation of the PF4 CFT (civil works)	Others (F4E)

CWP No. (abbreviated)	CWP Description	Principal Activities	Responsibility
…04.01.01.01	Install Cryostat Supports	Install qty. 18 spherical bearing supports on crown	Others (F4E)
...04.01.01.06	Installation of Female Toroidal Lugs & Cryostat Vertical Support Shims	Alignment of qty. 18 Female Toroidal Lugs, at ~2.25 tonne each on embedded plates. Co-machining (drilling and tapping) of lugs and embedded plates. Installation (bolting and dowelling) of Female Toroidal Lugs. Purpose-built tooling by others (IO)	TAW-A0
		Installation (bolting and dowelling) of Female Toroidal Lugs. Purpose-built tooling by others (IO)	TAW-A0
		Custom machining of qty. 144 Cryostat Vertical Support Shims in stainless steel. Mass of individual shim ~45 kg. Customisation defined by others (IO)	TAW-A0
		Installation (alignment) and welding of qty. 144 shims on embedded plates.	TAW-A0
		Installation of low friction plates (on shims). Design and/or procurement and installation of protection.	TAW-A0
...04.01.01.07	Placement of Lower Cryostat Stubs and CFT Feeder Supports	Transfer and temporary positioning of qty. 4 Cryostat Man-access Stubs in PIT crown. Purpose built tooling and special lifting means by others (IO)	TAW-A0
		Transfer and temporary positioning of qty. 20 Cryostat Feed Through (CFT) Stubs for magnet feeders in PIT crown. Purpose built tooling and special lifting means by others (IO)	TAW-A0
		Transfer and positioning of CFT supports for magnet feeders, and welding to embedded plates. Purpose built tooling and special lifting means by others (IO)	TAW-A0
WBS to be assigned	Installation of Lower Tokamak Cooling Water System (TCWS) Containment Ducts & Pipes	Transfer and positioning of qty. 18 TCWS horizontal pipe bundles in bioshield penetrations and welding of bundle flange to embedded plates.	TAW-A0

Table 2. Preliminary list of CWP included in TAW-A0 Scope of Work for Cryostat Workshop

CWP No. (abbreviated)	CWP Description	Principal Activities	Responsibility
...04.01.02.10	Onsite Handling Cryostat Base Equipment & Sub-Assembly of Monorail Crane	Positioning and welding of attachment studs below Cryostat Base. Installation of monorail crane rail (bolting of supports).	TAW-A0
…02.05.24.07	Preparation of Cryostat Base support systems	Custom machining of qty. 144 Cryostat Vertical Support Shims in stainless steel. Mass of individual shim ~45 kg. Customisation defined by others (IO)	TAW-A0
		Installation (alignment) and welding of qty. 144 shims on underside of cryostat base.	TAW-A0
		Installation of qty. 35 penetration covers from diameter 700 to 1220mm, including custom machining (rebating penetrations) on the cryostat base.	TAW-A0
...02.05.26.01	Install Bellows for Tokamak Cooling Water System (TCWS) Feedthrough below Cryostat Base	Positioning and installation (welding) of qty. 18, Dia. 925mm bellows below cryostat base	TAW-A0