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SUMMARY

Call For Nomination ITER/C4N/11/7-0002/JTR

Framework Service contract for Window Assembly Manufacture and Testing

Purpose

Many of ITER's diagnostics will be provided with viewing lines (optical, microwave, spectroscopic) for the monitoring of key characteristics of the plasma or for the achievement of physical measurements inside the vacuum vessel. For many of them, the nature of the physical signal transmitted through the viewing lines requires the implementation of window assemblies incorporating non-metallic window (ceramic or ceramic / glass material).

ITER's window assemblies will obviously benefit from the experience gained on the other Tokamak or fusion machines. However, in comparison with previous Tokamaks, they will have to overcome some particular challenges. The existing concepts of window assemblies shall in particular demonstrate their ability to withstand high radiation levels, mechanicals shocks, pressure inversion in the Vacuum Vessel, and accidental design basis scenarios. Novel concepts shall also be examined and fully tested and qualified.

For the above reasons, manufacture studies and manufacture of prototypes with elementary tests will be needed to examine the feasibility of novel concepts, and to provide samples for complete qualification, before manufacturing the equipment which will be installed around the Tokamak machine.

The purpose of this tender process is to establish a framework contract with a capable and qualified supplier for manufacturing support required by ITER. The diagnostic team in charge of PBS-55-NW requires manufacturing support for helping with the design of novel concepts for window assemblies, manufacturing samples for qualification, performing basic testing before complete qualification campaign, supplying window assemblies fully qualified for the ITER machine. Each task order under the framework contract will be free standing engineering activity with its own budget.

Background

The first requirement of a diagnostic window assembly is the transmission of the signal used by the diagnostic. The attenuation and disturbances induced by the window assembly shall therefore be within the limits prescribed by the specific requirements of each diagnostic system.

Placed at the vacuum boundary, the window assembly shall also ensure the vacuum integrity required for the plasma. The design of the window assembly shall demonstrate that it can operate and remain He leak tight to $1x10^{-10}$ $Pa.m^3.s^{-1}$, whatever the conditions including all loads combinations.

Moreover the diagnostic window assemblies form part of the ITER first confinement boundary. Their integrity is consequently of prime importance in containing the reactant materials such as tritium in the inside of the vacuum vessel. For the first confinement boundary, the basic concept relies on a system of two discrete window elements made of glass / ceramic materials with monitored conditions of the interspace volume between these two elements. The materials which are foreseen for the windows are : Fused Silica, Crystalline Quartz (synthetic or natural), Sapphire, CVD diamond, Zinc Selenide, Silicone Nitride, Barium Fluoride. SF57 might also be contemplated, although its radiation hardness has not been fully investigated yet.

Scope of work

The scope of the work covers the services of experienced manufacturers for the detailed design of window assemblies to support the ITER Organization in the development of the window assemblies, the supply of prototypes for specific testing and the basic testing of prototypes with the final aim of providing fully qualified window assemblies for ITER machine, including spare parts for the whole lifetime of ITER machine.

Past experiences related to the supplying of similar Safety Important Components for fusion machine or nuclear installation are required for tendering. Other experiences areas (space, aerospace, high energy physics inertial confinement) are acceptable provided that they are relevant to the main ITER's issues.

While tendering, the manufacturer shall prove its capability to guarantee the specifications, in terms of procurement, manufacturing, testing, quality assurance. Documentary evidence of successful production of long-lived windows is also required. As the supplying of window assemblies requires the mastering of several manufacturing techniques, knowledge and experience in the following areas are required for:

- Assembling a glass / ceramic window on a metallic ferrule by diffusion bonding or by brazing,
- Machining stainless steel, (SS 316 LN, Hastelloy, Inconel, ..),
- Forming thin ferrules made of stainless steel (SS 316 LN, Hastelloy, Inconel, Titanium, Tantalum,..),
- Assembling the internal parts of a window assembly by e-beam welding,
- Assembling by fuseless vacuum brazing,
- Ensuring quality control and tests during the production, included during the manufacture of prototypes of partial or complete window assemblies,
- Production proof testing.

While tendering the manufacturer shall prove its capability to perform the basic tests for the integrity assessment of the metallic seal between the window and the ferrule by:

- Thermal Cycling, (20°C → 200°C min)
- Helium Leak Testing, ($1x10^{-10}$ $Pa.m^3.s^{-1}$)
- Pressure Testing (0.4 MPa),
- Destructive tests of the metallic seal between the window and the ferrule by push out tests.

While tendering, the supplier shall also describe the specific facilities, which will enable to perform the following environmental tests:

- Rapid Pressurization Tests, (ΔP Increase from ~ 10 Pa to 0.05 MPa in a few fractions of second), for the primary window located at the atmosphere size.
- Thermal Shock. Water at 20°C splashed on the primary window (atmosphere size) at 150°C.
- Vibrations. (140 $m.s^{-2}$ - sinus 15 Hz – 1000 cycles).

Duration of services

The Contract is scheduled to come into force in mid 2012 with a duration of five (5) years. IO may exercise the option to extend these services for a maximum of two additional periods each of one year. Such option shall be exercised by written notice to the Contractor no later than 30 days before the expiration of the initial term of the contract or of the additional period.

Procurement Time table

A tentative time table is outlined as follows:-

Call for Nomination release	End Nov 2011
Receipt of nominations	Early January 2012
Issuance of Call for Tender incl Pre-qualification	Mid January 2012
Clarification questions related to this Call for Tender	End January 2012
Response to Questions from ITER Organization	Early February 2012
IO Receipt of the pre-qualification questionnaire	Mid/End February 2012
Notification of Pre- qualification results	Early March 2012
Tender Proposals Due Date:	**Mid April 2012**
Estimated Contract Award Date:	May 2012
Estimated Contract Start Date:	JUNE 2012

Experience

The acceptance criteria for the selection of the tender are listed below.

- Past experiences related to the supplying of similar Safety Important Components,
- Expertise in the assemblies between glass / ceramic windows and metallic ferrules, by using diffusion bonding or brazing,
- Expertise in the metallic assemblies using e-beam welding and brazing,
- Capability to suggest design evolutions in order to meet the technical requirements,
- Manufacture facilities,
- Tests facilities,
- Inspection facilities,
- Organization,
- Quality plan,
- Works sub-contracted by the tender and description of the sub-contractors,
- Quotation for an optical window assembly, as requested in ITER_D_4EQ9NM - Technical Specification and Statement of Work for Window Assembly Manufacture and Testing,
- Quotation for a microwave window assembly as requested in ITER_D_4EQ9NM - Technical Specification and Statement of Work for Window Assembly Manufacture and Testing.

The CV of the key-persons, who will be later involved in the execution of the task orders, shall be provided by the tender.

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. 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 cannot be modified later without the approval of the ITER Organization.

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's (individual or consortium) must comply with the selection criteria. IO reserves the right to disregard duplicated references and may exclude such legal entities form the tender procedure.

Reference

ITER_D_4EQ9NM - Technical Specification and Statement of Work for Window Assembly Manufacture and Testing.

Further information on the ITER Organization procurement can be found at:

HTTP://WWW.ITER.ORG/ORG/TEAM/ADM/PROC/PAGES/WELCOME