

CONTRACT TECHNICAL SPECIFICATION

**Technical Support in Monitoring Manufacture of
Superconducting Strands for the ITER Magnets
System**

Technical Specification

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Revision history

Date	Rev.	Note
30 Nov 2010	1.0	First issue
03 Feb 2011	1.1	Duration changed, work conditions clarified, links to PAs removed, timetable updated

1 Abstract

This technical specification describes engineering support services to follow up manufacturing of superconducting strands for the ITER Magnets.

The superconducting magnets inside the ITER Tokamak are the largest ever designed and built in terms of size and stored energy. The coils are wound using high-current cable-in-conduit conductors composed of a superconducting cable in a stainless steel jacket. Different conductor geometry and cabling patterns are used for the different coils and feeders. Two types of superconducting material are also used, NbTi or Nb₃Sn, depending on the magnetic field requirements. The conductors are manufactured by suppliers all around the world while under contract to their respective Domestic Agency (DA). Six of the seven ITER DAs are involved in conductor procurement as specified in corresponding Procurement Arrangements (PA).

The scope of this contract is to provide engineering services in monitoring strand production through documentation review and site visits.

2 Background and Objectives

ITER superconducting magnet system consists of 18 TF coils, 6 PF coils, a Central Solenoid (CS), 18 Correction Coils (CC) and a Feeder System.

The entire procurement package for the ITER Magnet conductors (coils and feeders) includes a total of about 190 km of conductor, containing 550 t of Nb₃Sn and about 250 t of NbTi strands. This represents the largest procurement of superconducting material in history. Multiple manufacturing steps are needed in the fabrication of the ITER conductors, from the superconducting material processing, billet drawing to form strands, cabling and jacketing operations. The superconducting strand represents the most critical and costly subcomponent of the ITER conductors. Therefore, the manufacturing process needs to be followed with exacting quality assurance and SPC (statistical process control) to guarantee the required level of quality. Due to the fact that 6 different DAs with 9 different strand suppliers are involved in the procurement of ITER conductors, proper Quality Control is difficult and requires extensive manpower and travelling.

The objective of this contract is to support the IO in the strand production monitoring through review of reports and site visits to ensure the fabrication processes are being followed in accordance to the specifications and quality standards specified in the PA.

3 Work Description

The work required in this technical specification includes engineering support and manufacturing monitoring of the superconducting strands for the ITER Magnets System. Monitoring of manufacturing progress is accomplished through the review of manufacturing reports as well as regular site visits to the strand suppliers, and if needed, their sub-suppliers.

The scope of work described below is expected to entail a time commitment of 25% over the contract duration on the part of the expert.

Work is organized over a two-year period, with specific tasks and deliverables defined on a quarterly basis (every three months).

Scope of work:

This section describes the scope of work to be performed under the present contract.

Since the contract is for engineering services, technical support, and provision of expertise in monitoring of manufacturing activities related to the strands, the exact tasks and site visits will be agreed between IO and the expert (or company providing the expertise) on a quarterly basis. At the beginning of each three-month period, and based on the priorities of IO and the conductor manufacturing schedule, a work plan will be agreed upon, including deliverables and visits for the

period. On rare occasions, and based on problems encountered by specific suppliers, it may be necessary to schedule site visits on a relatively short notice.

The overall scope includes:

- Evaluation of the suppliers' quality program and identification of areas where improvements are needed.
- Verification if the approved MIP is properly applied and all quality checks are done.
- Monitoring of the production at regular intervals.
- Verification if SPC is properly applied.

4 Duration

The contract duration shall be two years. The IO, or the company supplying the expertise, may exercise the option to terminate the contract during the period of execution. The IO may exercise the option to extend these services for a maximum of one additional year beyond the original contract. ITER Organization shall establish the request for services on ad hoc basis and relative to the respective work plan, with specific tasks and deliverables defined on a quarterly basis (every three months).

5 Deliverables and Time Schedule

The specific work to be carried out as part of the scope given above is to be established quarterly (every three months). The IO will, in mutual agreement with the expert, establish tasks and priorities, along with the written reports to be produced, documentation to be reviewed, or travel needed. These will be part of a work plan for the three-month period. Specific deliverables are:

- Reports from the review of manufacturing or quality assurance documents provided by the suppliers
- Trip reports from site visits to the suppliers, including observations on manufacturing conditions, adherence to quality plans, and any discussions the expert may have had with the suppliers
- Bi-monthly reports with a summary of activities during the reporting period, including approximate time spent on each activity

6 Acceptance Criteria (including rules and criteria)

The acceptance of the work is based on completion of the tasks and goals set on the work plan for each trimester, as well as on the completion of reports and documents specified in the work plan.

7 Payment schedule / Cost and delivery time breakdown

The payments shall be granted on a monthly basis following invoicing for actual work performed. No payment shall be made before the report corresponding to the invoiced work is delivered to IO. In case of travel needed to conduct site visits to suppliers, the IO shall reimburse all travel costs including transportation, accommodation, and meals within the IO guidelines that apply for travel missions.

8 Experience

The expert proposed by the bidder to carry out the work described in Section 3 must have proven experience in the following areas:

- Long term (>10 years) industrial experience in the manufacture of Nb3Sn and NbTi strands
- International working experience in related industry

- Ability to communicate fluently and write reports in English
- Experience in developing and executing a Quality Management System in industry
- Able to travel to conduct on-site visits to strand suppliers and sub-suppliers all around the world
- Practical experience in working with Chinese industry (knowledge of Chinese is advantageous)

Curriculum Vitae, CV showing evidence above is required.

9 Work conditions

- Work plan for every three months is established and agreed by IO and the expert. Travelling and missions shall be only upon an agreement with IO. A tentative planning/distribution of the place of work is given as follows:
 - IO site: 10 %
 - Home: 10 %
 - China: 60 %
 - EU, Russian Federation, United States of America, Korea and Japan: 20 %
- This contract shall be executed by one staff. Split it into parts for sharing is not acceptable.
- The contractor shall have its own office and computer resources. The contractor will be given access to the necessary data and documents either in paper or in computer files form at Cadarache ITER site. The contractor will also be allowed accessing to the necessary folders in the computer server at Cadarache ITER site via internet.
- Travel to certain suppliers may involve obtaining visas. It is the responsibility of the contractor (with IO's support) to obtain travel visas. Any delay in obtaining visas is not the responsibility of the IO.
- Given the fact suppliers hold trade secrets in the manufacture of the strands and some of their components, and that competitive considerations are at play, the expert is expected to disclose any and all conflicts of interest in the conduct of this contract, and sign non-disclosure agreements as directed by the IO.

10 Timetable

The tentative timetable is as follows:

Call for Expertise	February 2011
Tender submission	March 2011
Start of Contract	April 2011

11 Candidature

Participation is open to all individuals, companies or consortia which are legally registered in one or more of the ITER Member States. A consortium may be either 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 groupings shall be presented at the tender submission stage. The consortium cannot be modified later without the approval of the ITER Organization.