

Technical Specifications (In-Cash Procurement)

**Technical specifications for engineering support - NB
injector assembly documentation**

The technical specification describes need for engineering resources regarding documentaion fot NBI assembly

Table of Contents

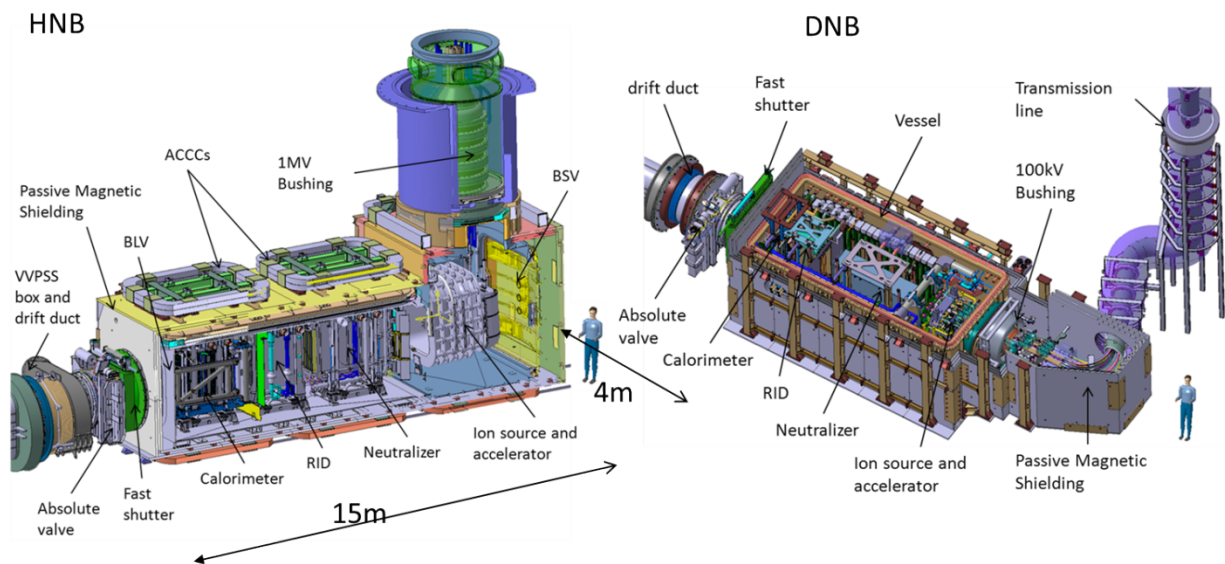
1	PURPOSE	2
2	SCOPE	2
3	DEFINITIONS	4
4	REFERENCES.....	4
5	ESTIMATED DURATION.....	4
6	WORK DESCRIPTION.....	5
7	RESPONSIBILITIES	5
8	LIST OF DELIVERABLES AND DUE DATES	5
9	ACCEPTANCE CRITERIA.....	5
10	SPECIFIC REQUIREMENTS AND CONDITIONS.....	6
11	WORK MONITORING / MEETING SCHEDULE	6
12	DELIVERY TIME BREAKDOWN.....	6
13	QUALITY ASSURANCE (QA) REQUIREMENTS	6
14	CAD DESIGN REQUIREMENTS (IF APPLICABLE)	7
15	SAFETY REQUIREMENTS	7

1 Purpose

This document describes technical needs of Neutral Beam Heating and Current Drive (NB H&CD) section in engineering support in assembly sequence definition and documentation of the Neutral Beam Injectors (NBI).

2 Scope

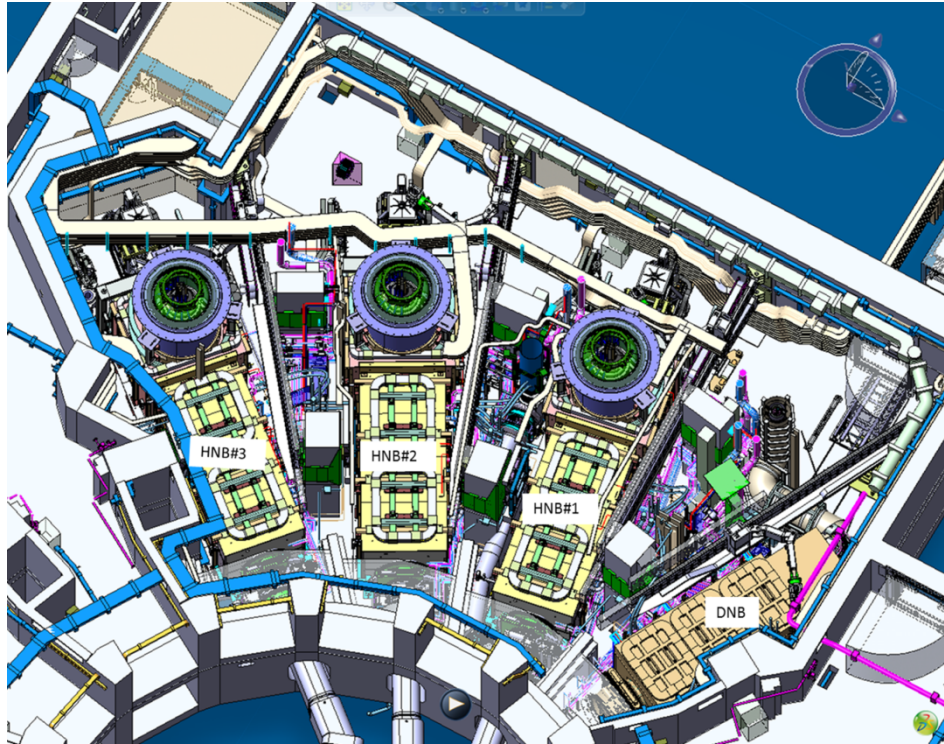
The H&CD NB system consists of two injectors (see below a view of one injector). Space is available in the building and on the tokamak for a third system. Each H&CD injector will deliver an atomic deuterium beam of 16.5 MW, with an energy of 1 MeV (provided via High Voltage lines coming from dedicated power supply area), and will be able to operate for long pulses (up to 3,600 s for “steady state” operation). A system based on negative (D-) ions is used.



3D view of heating and diagnostic neutral beam injectors

The NB cell is a 11000m³ space in the ITER tokamak building where the three Heating Neutral Beam Injectors and one Diagnostic Neutral Beam Injector are to be located (see picture below). The room where the HV lines will be integrated is above the NB cell. This room is named HV deck room.

The Power supply parts of the NBI installation are located on a dedicated area on the ITER site called Area 37.



3D view of the NB cell

The assembly sequence for injectors has been studied and 3D models, 2D drawings have been created as well as tooling necessary to perform it. These CAD models and drawings describe the sequence, the routing and how the tools are used and interfaced with the NB components.

The main objective of this engineering contract is to support the NB H&CD team and progress construction process description document describing assembly of NBI components in NB cell and HV Deck room at L3.

The existing construction process document (CPDs) for PBS 53, integrated CPD-09 for NB cell and the technical studies on the assembly will be available as a well detailed starting point.

This document will be used to give an overview on assembly procedure, technical and schedule constraints for the placement of NBI components.

To describe each component assembly the document shall contain the following information:

- Overall description of the task
- Environment at the beginning of the assembly task
- Sequence diagram
- Description of the assembly task
- Final configuration after the assembly
- In process verifications and inspections
- Final inspections
- Description of tooling and services required.
- Estimation of resources to perform the tasks
- Assumptions taken, risk, threats and opportunity

The associated objectives of the tasks are the following:

- Support NBI team in technical, design choice related to assembly
- Interface with DAs related to NB assembly activities.
- Support NBI team in the tasks relevant to the assembly cost estimate.
- Prepare and drive design task performed on site through DWO related to assembly proposals and drawings.
- Ensure interface link between NBI group and RH group for tasks where similar interfaces and/or tools are foreseen.
- Check of deliverables (technical specifications, drawings, analysis report, and documentation) and ensure traceability of modifications.
- Organize necessary meeting/discussion with other involved parties when necessary and ensure traceability of the discussions/choices made (Writing of minutes, memo and storage in IDM of all relevant documents)
- Ensure compliance with ITER needs and requirements and constraints (design choices done at ITER, codes and standards, maintenance scheme foreseen).
- Ensure quality of deliverables as defined by ITER and maintain it all along the progress of the task.
- Report activities progress to NB section leader and interact with NB team.

3 Definitions

CAD = Computer Aided Design

CPD = Construction Process Description

DA = Domestic Agency

DCIF = Design Collaboration Implementation Form

DRD = Design Requirement Document

DWO = Design Work Order

H&CD = Heating and Current Drive

ICD = Interface control document

IDM = ITER Document Management [software]

IS = Interface Sheet

ISO = International Organization for Standardization

LS = Load Specification

NB = Neutral Beam

NBI = Neutral Beam Injector

PBS = Plant Breakdown Structure

QA = Quality Assurance

RH = Remote Handling

4 References

Not applicable.

5 Estimated Duration

The duration shall be 12 months from the starting date of the contract, will be fully based at IO. Participation to meetings outside the IO could be envisaged.

6 Work Description

- Prepare/update construction process description (CPD) related to NBI (PBS 53) assembly for NB cell and HV deck room at L3.
- Update integrated CPD-09 with inputs from respective system CPDs authored by system's responsible officer.
- Support to NB team about topics related to RH interfaces/design
- Support NB team in technical choices.
- Ensure feedback to NBI group in case of technical/design inconsistency.
- Driving design task performed through NB DWOs related to assembly
- Participation to meetings/presentation on behalf of NBI
- Report tasks progress to NB section leader and NB responsible engineer

7 Responsibilities

Not applicable.

8 List of deliverables and due dates

The table below identifies the preliminary timetable for the completions of deliverables. The intermediate deliverables will be discussed with the engineer before their commencement and their scope and due dates agreed each month.

Number	Deliverable description	Date
1	Report 1 on NB assembly task activity	TO + 3 months
2	Report 2 on NB assembly task activity	TO + 6 months
3	Report 3 on NB assembly task activity	TO + 9 months
4	Report 4 on NB assembly task activity and updated CPD	TO + 12 months

9 Acceptance Criteria

These criteria shall be the basis of acceptance by IO following the successful completion of the services. These will be in the form of progress reports in accordance with section 7 "List of deliverables" of the technical specification.

Report and Document Review criteria:

- Reports as deliverables shall be stored in the ITER Organization's document management system, IDM by the Contractor for acceptance.
- A named ITER Organization's Contract Technical Responsible Officer is the Approver of the delivered documents.
- The Approver can name one or more Reviewers(s) in the area of the report's expertise.
- The Reviewer(s) can ask modifications to the report in which case the Contractor must submit a new version.

The acceptance of the document by the Approver is the acceptance criterion.

10 Specific requirements and conditions

The required resource is mechanical engineer (master degree) with at least 5 years of working experience in mechanical design.

The engineer shall have experience in the following activities:

- English fluent (written and spoken),
- Catia V5 (mechanical design software used in ITER),
- Experience in design activities follow up
- Knowledge of ITER NBI systems and services is an advantage,
- Knowledge of ITER internal procedures is an advantage,
- Written of technical documentation,
- Capacity to work in a multi-cultural environment.

11 Work Monitoring / Meeting Schedule

The work will be managed by means of Progress Meetings and/or formal exchange of documents transmitted by emails which provide detailed progress. Progress Meetings will be called by the ITER Organization, to review the progress of the work, the technical problems, the interfaces and the planning.

The main purpose of the Progress Meetings is to allow the ITER Organization/Neutral beam section and the Contractor Technical Responsible Officers to:

- a) Allow early detection and correction of issues that may cause delays;
- b) Review the completed and planned activities and asses the progress made;
- c) Permit fast and consensual resolution of unexpected problems;

Clarify doubts and prevent misinterpretations of the specifications.

12 Delivery time breakdown

Interim payments may be processed quarterly upon the satisfactory completion of the work in accordance with the deliverables in section 7 on the technical specification “Deliverables and due dates”.

Four equal payments will be made by IO upon submission and IO approval of the corresponding quarterly report in accordance with the deliverables in section 7 on the technical specification and upon receipt of a correctly rendered invoice.

13 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 \(ITER_D_258LKL\)](#).

14 CAD Design Requirements (if applicable)

For the contracts where CAD design tasks are involved, the following shall apply:

The Supplier shall provide a Design Plan to be approved by the IO. Such plan shall identify all design activities and design deliverables to be provided by the Contractor as part of the contract.

The Supplier shall ensure that all designs, CAD data and drawings delivered to IO comply with the Procedure for the Usage of the ITER CAD Manual ([2F6FTX](#)), and with the Procedure for the Management of CAD Work & CAD Data (Models and Drawings [2DWU2M](#)).

The reference scheme is for the Supplier to work in a fully synchronous manner on the ITER CAD platform (see detailed information about synchronous collaboration in the ITER [GNJX6A](#) - Specification for CAD data production in ITER Contracts.). This implies the usage of the CAD software versions as indicated in CAD Manual 07 - CAD Fact Sheet ([249WUL](#)) and the connection to one of the ITER project CAD data-bases. Any deviation against this requirement shall be defined in a Design Collaboration Implementation Form (DCIF) prepared and approved by DO and included in the call-for-tender package. Any cost or labour resulting from a deviation or non-conformance of the Supplier with regards to the CAD collaboration requirement shall be incurred by the Supplier.

15 Safety requirements

ITER is a Nuclear Facility identified in France by the number-INB-174 (“Installation Nucléaire de Base”).

For Protection Important Components and in particular Safety Important Class components (SIC), the French Nuclear Regulation must be observed, in application of the Article 14 of the ITER Agreement.

In such case the Suppliers and Subcontractors must be informed that:

- The Order 7th February 2012 applies to all the components important for the protection (PIC) and the activities important for the protection (PIA).
- The compliance with the INB-order must be demonstrated in the chain of external contractors.
- In application of article II.2.5.4 of the Order 7th February 2012, contracted activities for supervision purposes are also subject to a supervision done by the Nuclear Operator.

For the Protection Important Components, structures and systems of the nuclear facility, and Protection Important Activities the contractor shall ensure that a specific management system is implemented for his own activities and for the activities done by any Supplier and Subcontractor following the requirements of the Order 7th February 2012 [20].