

Annexure-A

Title	Fabrication, Supply, Installation, Testing and Commissioning of Fan-Filter Unit for Clean Room
Sub Title	Scope of Supply, Scope of Work & Technical Specifications

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1 Introduction

A clean room is planned inside the Cryogenic lab of ITER-India building located inside IPR campus. The purpose of the clean room is to maintain the controlled environment for storing and assembly of ultra-high vacuum facing systems and components. A floor-mounted crane installed inside the clean room for lifting and handling of equipments.

The complete clean room having side walls are made of acrylic sheets and top wall is made of checker plates supported on complete MS framed structure. The size and schematic of clean room is as shown in Fig.1. The external air conditions of clean room is maintained at temperature $24\pm 1^{\circ}\text{C}$ and $\text{RH}<60\%$. To maintain cleanliness, positive pressures and air circulation within the clean room, Fan Filter units (FFU) are required for operation. This particular tender document describes the requirement related to supply, fabrication, assembly, installation, testing and commissioning of FFUs for Clean Room.

The location of installation site/ clean room is follows:

Cryogenics lab, Ground floor,
ITER-India Building,
Institute for Plasma Research,
Bhat, Gandhinagar -382428

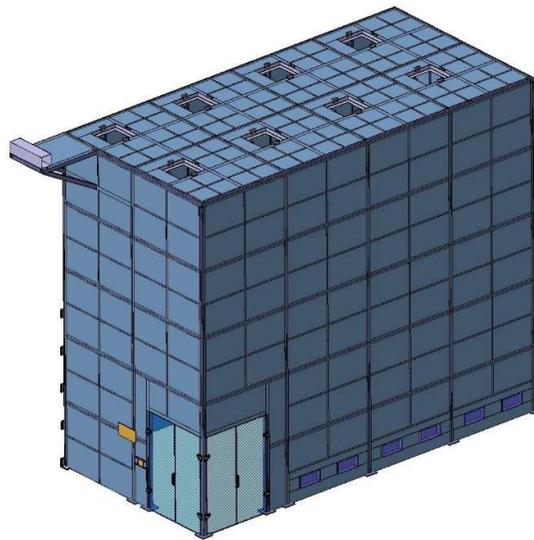


Figure 1: proposed clean room inside ITER-INDIA Lab at IPR

2 Scope of supply

Following are the items required to supply by the contractor. The list of equipments/items supplied shall meet the technical specification as per Section-5.

S.No	System/Equipment/Item	Quantity (Nos)
1	Fan Filter Unit	06
2	Electrical Panel unit with all electrical accessories* required for operation & control all FFUs	01
3	Ventilation Grills	06
4	Pressure gauge with alarm unit	01

*Along with necessary electrical accessories for operating 6 FFU, two additional provisions shall be provided

Note 1: Any tools or accessories which may not be specifically mentioned in the deliverables/specifications list but are necessary for proper and efficient functioning of the systems shall have to be considered as part of scope of supply.

Note 2: Wherever there is no specification mentioned but information sought, the contractors shall provide available/indicative information at the tender stage but the final technical details are to be submitted to ITER-India for final approval.

3 Scope of work

- a) The scope of work include supply, installation, testing & commissioning of Fan Filter Units (FFUs), electrical panel unit, ventilation grills for the clean room of size 10m x 5m x 8.5m and guarantee the efficient performance of the equipments.
- b) Contractor is responsible for electrical work and it include the supply, installation & testing of necessary items required for power, wiring, earthing and control of FFUs, which include power cables, control cables, incomer, Motor control centers with Direct On Line (DOL) starters and other accessories for power and control for each set, LED indicators, cable trays/conduits, etc.
- c) Routing and housing of the power cable to electrical panel unit from nearest power supply point available in the lab is within the scope of contract.
- d) Contractor is responsible to provide necessary accessories required for mounting of FFUs, grills, etc to the clean room to ensure interface requirements (as per drawings) and necessary isolations required to limit the vibration to ceiling. Maximum allowable vibration measured on the equipment (i.e., FFU) shall not beyond 2.3mm/s (RMS velocity) as per ASHRE handbook. The interface requirements as per the site condition. The requirements of angles/or any changes ,if required should be provided by vendor.
- e) Contractor is responsible for delivery, shifting, loading & unloading, transport and inside lab movement for all the components/ materials/ systems required during the execution of this contract. The contractor shall arrange any temporary structures required during

installation for “**working at height 8.5m**”. Contractor shall obey ITER-India/IPR safety rules/norms during site work.

- f) Contractor shall submit the documents to ITER-India as given in Section-8, during the execution phase for approvals.
- g) Contractor shall submit for Deviation Request or Non-conformance report for any deviations from technical specifications.

4 Clean Room Conditions for information only

Clean Room	
Area (Sq.Ft.)	548
Height (Ft.)	32.5
Volume (Cu.Ft.)	17810
Temperature (°C)	24 ± 1
RH	<60 %
Eqpt. Heat Dissipation (kW)	0.2
Occupancy (No of persons)	6
Lights (W/Sq.Ft)	1
Tonnage (TR)	15
Supply Air / Fresh air (CFM)	6000

5 Technical Specifications

The following sub sections contain the detailed technical specifications for individual systems/components/items. Contractor may also provide alternate proposal that will comply with objective of the contract. However, the final decision is subjected to approval of ITER-India.

Note: Wherever there is no specification mentioned but information sought, the contractors shall provide available/indicative information at the tender stage but the final technical details are to be submitted to ITER-India for final approval.

5.1 Fan Filter Unit

- Type: Factory made standard cataloged product, **mounted on the ceiling of clean room**. It consists of Pre-filters, HEPA filter, Ceiling SS-304 Grill, blower-motor assembly, pressure gauge and housing
- Material of Construction of housing: Made from Galvanized Iron 18 SWG sheet metal with polyurethane paint / Powder Coated finished Structure.
- Each FFU cutout provision (Size): 2 feet X 2 feet, height of FFU as per manufacturing standard.
- All the sections/chambers are properly sealed to make the joints airtight.
- Supply Air Fan & Drive
 - Type: Double Inlet Double Width (DIDW) backward curved centrifugal Fan.
 - The fan impeller assembly shall be statically and dynamically balanced.

- Minimum flow rate: 1000 CFM
- Sound level: <70 dBA at 1m
- A Totally Enclosed, Fan cooled (TEFC) electric motor shall be suitable for operation on 230V, single phase, 50 Hz, 1/3 to 1.0 HP
- Fan housing and motor shall be provided with isolation to limit the vibrations to adjacent components.
- Pre-filter (Combination Filter):
 - Media: Synthetic Media (washable)
 - Casing: Aluminum Powder Coated or better
 - Sealant: Epoxy based resin for bonding the filter pack with the frame Silicone Sealant for sealing gaps in the frame joints.
 - Separators: Aluminum separators
 - Retention: 5 μ (Class: F5), & 3 μ (Class: F7)
- HEPA filter:
 - Media: non-woven micro fine glass fibre media
 - Sealant: Epoxy based resin for bonding the filter pack with the frame Silicone Sealant for sealing gaps in the frame joints.
 - Retention: 0.3 μ (Class: H14)
 - Gasket: Soft Elastomeric Nitrile foam or expanded PE Foam
 - Cleanliness level at downstream side at HEPA:CLASS 100 as per ISO14644-1
- Pressure gauge:
 - Analog type Differential pressure Gauge of 0-100 mm will be provided to check the pressure for each unit

5.2 Electrical Panel unit

- Unless otherwise specified in the tender specifications, all equipments and materials for electrical works shall be suitable for continuous operations on 415 V / 240 V + 10% (3 phase/single phase), 50 Hz. AC system.
- All electrical works shall be carried out complying with the Indian Electricity Rules, 1956 as amended to date.
- Electrical work include the supply, installation & testing of necessary items required for power and control of FFUs, which include power cables, control cables, incomer, Motor control system with DOL starters and other accessories for power and control for each set, LED indicators, cable trays/conduits, etc.
- Electrical panel unit shall consists of two number of spares of Motor Control system with DOL starters for future needs.
- Work includes the routing of cables and necessary conduits and earthing of each FFU to one common point.
- The panel unit shall be mounted on the side wall of the clean room at workable height and supplied with the manufacturer's standard finish painting

5.3 Ventilation Grills

- SS304 Perforated grills with powder coated gravity damper of size 610 mm x 305 mm for ventilation. These grills shall be fixed to the side walls near the bottom side of clean room

5.4 Pressure gauge with alarm unit

- Alarm unit is to monitor the pressure inside the clean room w.r.t. ambient pressure.
- Digital Magnehelic Pressure Gauge with High / Low Pressure Alarm to be provided for Clean Room Pressure Differential.
- To be Supplied with Upstream & Down Steam Nozzle, Tubing with Mounting Box at Outside Clean Room Range: -10 to 10 mm WG

6 Testing & Inspection

6.1 At Factory:

The following testing and inspection works shall be carried out at the manufactures site in the presence of the purchaser and reports must be submitted to ITER-India for the approval before the shipment.

- a) Physical Inspection: All deliverable components shall be physical inspected for dimensions, materials configuration as per approved specifications/drawings/material certificates/data sheets.
- b) Integrity test of pre-filters as per agreed test procedure at manufactures site. The test procedure shall be mutually agreed one month before initiation of factory test.
- c) Integrity test, pressure drop test, velocity profile test, particle count test for of HEPA filters as per ISO/EN/IEST and results shall comply with the specifications/rated performance data sheets.

All the deliverable components shall be shipped to onsite only after the approval by ITER-India.

6.2 At ITER-India Lab Site:

The followings tests shall be carried out after complete installation of all the deliverable components at clean room site. Perform all the tests in the presence of the purchaser and reports must be submitted to ITER-India for the approval.

- a) Physical Inspection: All deliverable component shall be physical inspected for transportation damage.
- b) Particle Count Test at exit side of HEPA filter shall be carried out as per ISO standard and shall comply with the cleanliness as per specification.
- c) Vibration measurement on the FFU.

The following tests need to be done as an extended testing at ITER-India site. However, the outcome of these tests will not be part of acceptance criteria.

- a) Differential pressure test of clean room w.r.t. ambient.

b) Particle count test at five distinct location inside the clean room other than above measured points to estimate the cleanliness of clean room.

- Site acceptance is subject to satisfactory installation and the tests mentioned above with respect to contract specifications and technical data sheet provided by OEM.
- System can be accepted and taken-over by ITER-India for regular operation only after satisfactory performance in all Site-Acceptance tests in all respect as per specifications

7 General Instruction

- a) The contractor shall consider the proposed locations of installation of equipment's/ components as per Annexure-I for the base line preparation of preliminary layout of all FFUs.
- b) Current interface of the structure with FFU unit is based on the standard FFU unit of 2*2 feet. Any changes shall be in the support with existing structure should be considered by contractor.
- c) The Contractor shall arrange all labor, materials, equipment, tools & tackles, services, temporary work (like scaffolding for safe working at the height 8.5m) necessary for the proper execution of the contract.
- d) The job needs to be carried out in an in-house building structure, shall follow the safety procedures working all the time. Contractor shall arrange supervision for fabrication & erection activity. Contractor shall obey ITER-India/IPR safety rules/norms during site work.
- e) Contractor shall perform fabrication & installation as per good engineering practice.
- f) Contractor is responsible for cleaning up the work area after completion of the work on daily basis to the satisfaction of the ITER-India technical representative.
- g) Contractor shall arrange necessary shielding/protection to avoid contamination to the existing equipments in the 'working lab' while during installation/ commissioning of this project.
- h) Contractor may utilize existing internal overhead Crane of 15-Ton capacity and elevators for material movement & handling with prior approval from ITER-India.
- i) Nearest Electrical point for power supply details are as follows:
 - a. 3 Phase, Rating 415V, 32A, 50Hz - 4 pole MCB
 - b. Location: corner of the clean room, 1.3m from ground
- j) Electricity & water needed for carrying out the work shall be provided free of cost by ITER-India.
- k) Contractor shall ensure not to damage of pre-installed RCC structures, electrical cables and pre-installed facilities during erection work. If any damage happens, it will be contractor's responsibility and any expenditure towards the recovery shall be responsibility of contractor.

8 Document Deliverables by contractor

Table below shows the documents that are to be delivered during the execution of the contract phase by the contractor which need to be approved by ITER-India.

1	filter drawings, wiring diagram, bill of materials and Fan-filter Unit layout schematic
2	Technical data sheets/ Catalogues of equipments/components/ Rating charts for all equipment from OEM (Original Equipment Manufacturer)
3	Test Reports/ Test Certificates, Calibration Certificates for instruments/equipments/materials;
4	Manufacturer's Warranty certificates of all supplied materials/ Equipments
5	Installation/operation/maintenance manuals
6	Commissioning, testing and inspection reports of Factory/ Site Acceptance Test

9 Delivery Period

Contractor must complete the total work covered in the tender document within the 5 months from the effective date of contract.

Bidder Signature		
Name of the signatory & Title	Name	Title
Bidder's Official seal		
Place & Date	Place	DD-MM-YYYY

Annexure-I : Drawings

Following drawings shows the inside dimensions of clean Room

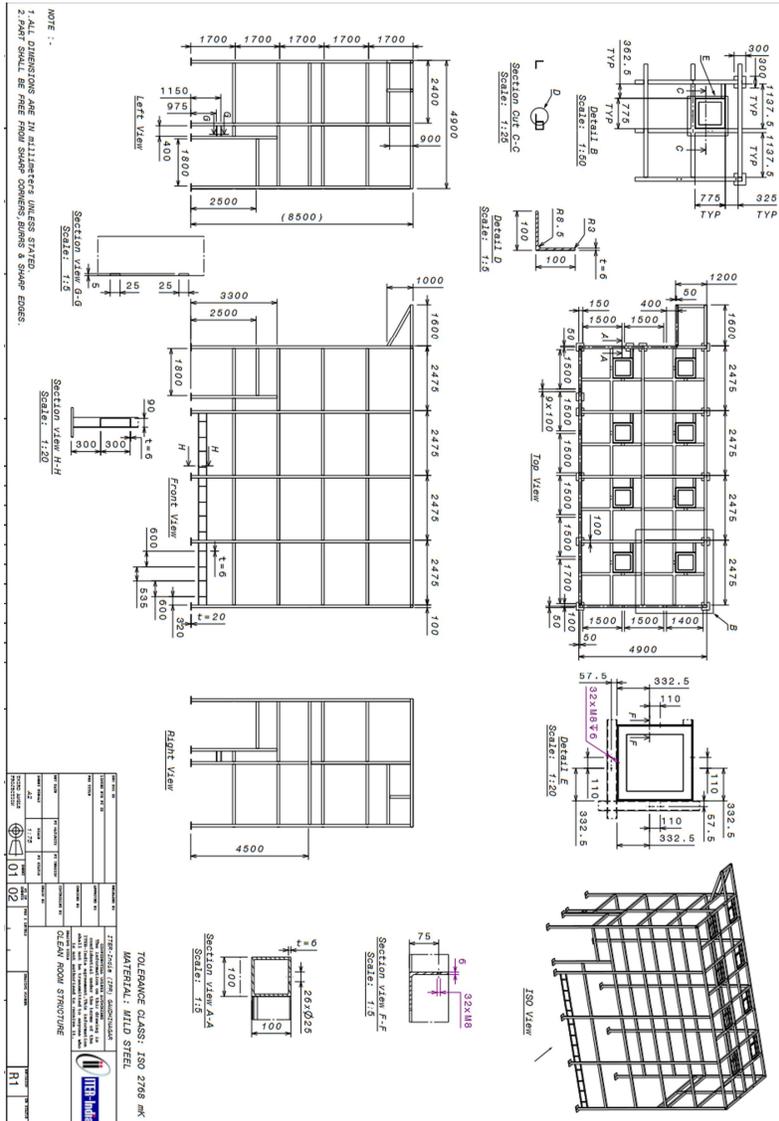


Figure 2 Clean Room Structure drawing overall dimensions

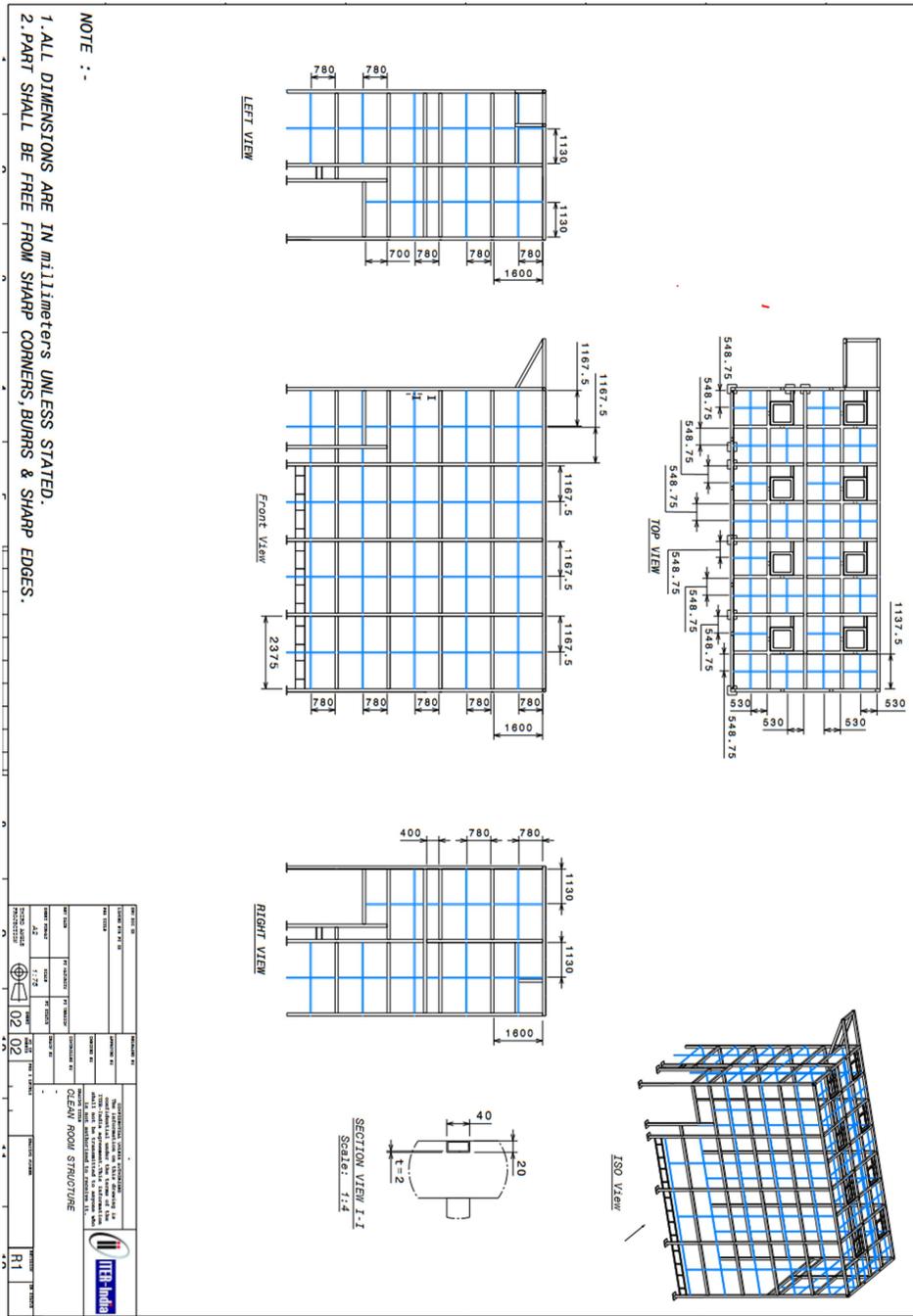


Figure 3 Clean room with FFU provisions (Square pockets) at top of the frame



Annexure-II : Site Visit Certificate

ITER-India, INSTITUTE FOR PLASMA RESEARCH

Date:

(To be attached with the quotation)

Enquiry No.	
Enquiry Date	
Enquiry Due Date	

This is to certify that

Mr.

of Messrs

has / have visited the Institute for Plasma Research on

2 0 2 3

to understand the work and get acquainted themselves with details of Fabrication, Supply, Installation, Testing and Commissioning of Fan-Filter Unit for Clean Room to enable them to quote against the enquiry for work order for the same.

(Engineer-In charge)
ITER-India, Gandhinagar