

GeM Bid No.	GeM Bid No. GEM/2026/B/7597529 dated 29/05/2026 for Fabrication, Supply and Installation of Neutron Moderator and its Support Structure
Title	PART-A(II): Scope of Supply & Work, Technical Specifications and Drawings

ITER-India, Institute for Plasma Research
Block A, Sangath Skyz, Bhat-Motera Road, Koteswar,
Ahmedabad 380005, Gujarat, India





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1. Introduction:

ITER-India, Institute for Plasma Research (IPR) is in the process of developing a neutron Moderator for irradiation of instruments. This moderator will be used to moderate the 14 MeV neutrons and will facilitate neutron irradiation experiments across a broad spectrum of neutron energies, ranging from thermal to 14 MeV.

To achieve this, a moderator assembly has been designed with overall dimensions of 900 mm × 900 mm × 700 mm. The moderator is constructed using a combination of materials including graphite, steel, copper, lead, tungsten, and aluminum, each selected for specific neutron moderation, shielding, and structural purposes.

The moderator also includes a rectangular cut section that houses the irradiating materials/instruments. Additionally, a support structure is integrated into the system to maintain mechanical stability and facilitate safe handling. The typical assembly of Moderator has shown in Figure 1. The material of construction of sub-assemblies/assemblies/components/parts are mentioned in the attached engineering drawings. Test certificates of critical material: Graphite and Lead shall be taken from the supplier of the same. The nominal dimensions/sizes are mentioned/given in the engineering drawings. After assembly and commissioning of Moderator and support structure at Purchaser site (Neutron and ion irradiation Facility –IPR-Gandhinagar), the measurement of central axis of the moderator from the base of the floor shall be within the tolerances as given in the engineering drawings. The quantity to be supplied is 1 unit.

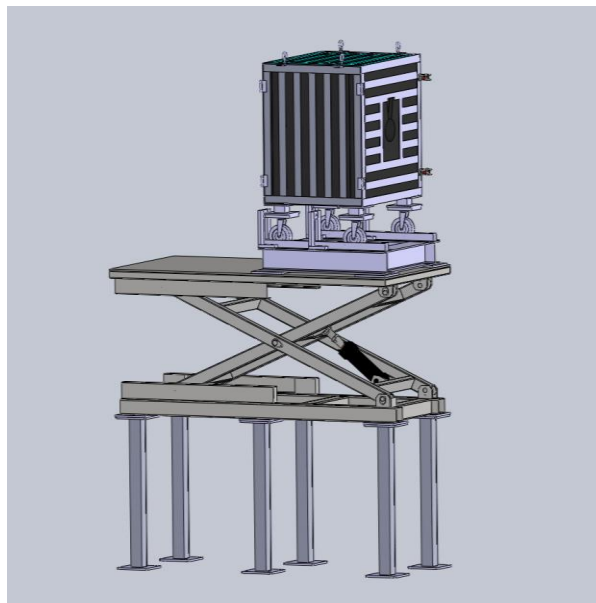




Figure 1: Assembly of Neutron Moderator and its Support Structure

2. Scope of Work of the vendor:

1. Purchaser shall provide a soft copy of 3D Model in SLDAM or .STEP file (s) (these 3D model files have been used in preparation of the engineering drawings to facilitate the vendor for quick preparation of fabrication drawings that are to be submitted to the Purchaser for the review and approval within 10 days from Purchase order).

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2. Vendor shall study the 3D Model and engineering drawings for the assessment of tolerances for easy assembly of lead, graphite, copper, stainless steel, mild steel, tungsten aluminum sheets etc.
3. **Vendor shall also work out the design for converting the large block of material in the drawing into smaller manageable chuck/block (depending up on commercial availability) with an interlocking structure** to enable smooth assembly and disassembly. The interlocking arrangement shall ensure **proper alignment of mating components** without requiring complex positioning procedures. The design shall also facilitate easy removal and reinstallation of segments for maintenance, inspection, and repairs during breakdowns.
4. Preparation of fabrication/manufacturing drawings based on the technical specifications and attached engineering drawings of Neutron Moderator & support structure sheets indicating all the dimensions with tolerances for all the individual components, sub-assemblies, and final assemblies etc. to meet the functional requirement. These engineering/fabrication/manufacturing drawings here onwards referred as “drawings” unless otherwise specifically mentioned.
5. Off the shelf Items eg. Castor wheels have the capacity of 1 Ton and Scissor lift assembly of 3 Ton.
6. Vendor shall submit all the fabrication drawings and Bill Of Material (BOM) to Purchaser for approval with proper documentation. Purchaser shall review the drawings and provides the comments/ suggestion within 10 days from the date of submission by vendor.
7. Vendor shall make required modification in fabrication drawings as per the Purchaser’s comments and submit the same to Purchaser for the review/approval of the same.
8. Vendor shall submit the Material Test Certificate (MTC) for raw material of Graphite and Lead to Purchaser for the approval. Test certificate shall contain chemical composition and purity as per ASME BPVC Section VIII or IS EN 10204 standard. Testing agencies/Laboratories must be approved by National Accreditation Board of Laboratories (NABL). The details for material properties and standards specifications are provided in the Annexure-2. Vendor shall commence the fabrication only after approval of MTC.
9. Procurement of all the materials required for the fabrication as per BOM including bought out items like castor wheels, fasteners, eye bolts and hinges etc. by the vendor as per the approved fabrication engineering drawings.
10. Vendor shall design and procure the required tools, jigs & fixtures and tooling required for all manufacturing activities, handling, surface treatment, assembly, inspection, testing, packing, loading, unloading, transportation and installation.
11. Vendor must use virgin material in the fabrication/manufacturing of parts/components whose MTCs are approved by the Purchaser.
12. Fabrication/manufacturing/machining of components, assembly with placing/stacking of the Lead/Graphite etc. blocks/plates, installation, validation of all items/components as per the approved fabrication drawings at vendor site and Purchaser’s site.
13. Vendor shall ensure the assembly of graphite blocks lead, etc. within the respective support structure assembly shall be carried out such that the gap between adjacent blocks does not exceed **1 mm**.
14. Surface finish/roughness grade of Graphite blocks, lead blocks, tungsten and other metal plates by machining process as mentioned in the engineering drawings.
15. All the sharp edges/corners of all the parts/sub-assemblies and components shall be ground to prevent/avoid injuries to the human beings while handling.
16. Complete erection of entire moderator & support structure System and assembly/installation.

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17. The vendor shall intimate Purchaser for out pre-dispatch inspection and Factory Acceptance test. Purchaser's representative will visit the vendor site for carrying out pre-dispatch inspection and Factory Acceptance test.
18. Vendor shall arrange inspection/testing facilities like surface finish measurement instrument, Vernier calipers, engineering squares, V-block, spirit level, standard measurement tape and one meter steel ruler etc. sufficient to carry out the factory acceptance tests.
19. Completion of all Factory Acceptance Tests (FAT) as listed in section 3.
20. The vendor will submit a report on FAT for issuance of Dispatch Clearance letter from the Purchaser or his authorized representative after successful completion of FAT.
21. After approval of the FAT reports, Purchaser will issue dispatch clearance for delivery of the assembly. Upon receipt of dispatch clearance from Purchaser, the vendor shall arrange for delivery of the assembly to Purchaser with suitable packing and protection to ensure that no damage occurs during handling, loading, unloading, and transportation
22. All Structural Steels (IS:2062 structural steel materials) parts shall be painted with two coats of epoxy painting and two coat of primer painting on Cage assembly and support structure at vendor location and if required at Purchaser site. The color will be decided by the Purchaser at later stage.
23. Proper packing, loading, safe delivery, transportation, unloading & movement to the place of erection.
24. Vendor shall transport moderator & support structure in dis-assembled in parts due to space constraint during the movement of the same in the Neutron and ion irradiation Facility – IPR. As the entry and passage of the facility is 2.0 m (W) X 2.5 m (H). Vendor has to complete all the activity related proper functioning of system i.e. mechanical, civil in nature (grouting of anchoring bolts with chemical). Vendor has to arrange manpower, tools, tackles, lifting and shifting arrangement of the system and structures.
25. Assembly and installation of moderator & support structure shall be carried out by the vendor at Purchaser's site. The facilities available at Purchaser's site are given in Section 7.
26. Completion of all Site Acceptance Tests (SAT) as listed in section 4. Final acceptance will be given only after successfully completion of SAT
27. General guidelines to be followed in the execution of the contract/purchase order are listed in Annexure-3.

3. Factory acceptance tests (FAT) at vendor's site

The following tests shall be performed by the vendor in presence of Purchaser representative on the system as per the technical specifications mentioned below. Vendor shall have proper and adequate space for erection and assembly of the system for FAT. The vendor will carry out the full assembly of the system for FAT.

- a) Visual inspection for any physical damages, finish and weld joints etc.
- b) Verification of dimensional of individual parts and integrated assembly of moderator & support structure as per the given engineering drawings and/or approved fabrication drawings
- c) The complete system alignment and to & fro movement of moveable parts to the specified accuracy shall also be inspected.
- d) Working of the Scissor lift assembly and verification of its lifting height with moderator assembly placed on it.

Vendor shall submit a FAT report to Purchaser for review and approval after successful completion of the test/ inspection mentioned above. Based on these report a Dispatch clearance will be issued. **Vendor will ship the system only after receiving of dispatch clearance.**

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4. Site acceptance tests (SAT) at Purchaser site:

The vendor shall undertake assembly activity at the Purchaser site (Neutron and ion irradiation Facility). Purchaser will provide the facility listed in section 7 for onsite activities. Tools and instruments required for the assembly and installation are in the scope of vendor.

1. The shipment shall be visually inspected for damages during packing and transportation.
2. The critical height of the integrated system with intended application will be checked at Purchaser.
3. Critical/main dimensions of moderator & support structure shall be measured and verified with the pre-dispatch inspection reports.
4. The complete system alignment and to & fro movement of moveable parts to the specified accuracy shall also be checked.
5. Working of the Scissor lift assembly and verification of its lifting height with moderator assembly placed on it.

Final acceptance will be given only after successful completion of Site Acceptance test.

5. Delivery period (Work Completion Duration):

Refer to clause No. 6.2 of Part-A(III) of the tender.

6. Site clearing and cleaning:

The vendor shall clear the assembly site and clean the debris and packing waste etc. to meet the satisfactory level as needed by the Purchaser. Site clearance by vendor within one week after successful completion of installation and commissioning of moderator & support structure as per the Purchase Order.


7. Facilities available during the installation and commissioning of moderator & support structure in the Neutron and ion irradiation Facility –IPR:

1. Gantry crane of lifting capacity 1000 kg is available with the span of 7 m length inside the facility.
2. Pallet truck of capacity 2000 kg loading is available for the material movement from entry of facility to place of assembly site (within the facility).
3. 230/240 V 50 Hz single-phase and 415 V 50 Hz, three-phase Electric power supply

8. Additional Technical information of the Moderator Assembly

The details of each layer and assembly requirements in the moderator is as follows:

1. Outer Structure:
Fabricated from Mild steel in a cage-type configuration.
Designed to bear the full load of the system and ensure structural stability.
2. Inner Structure:
Made from Graphite blocks. (as per Approved drawings.)
Has to be made using small manageable chunk/sheets (depending up on commercial availability) with an **interlocking structure** to enable smooth assembly and disassembly.
3. Third Layer:
Composed Stainless steel sheet. (as per Approved drawings.)
4. Innermost Layer:
Consists of Copper, graphite, lead, tungsten, Stainless steel Aluminium of varying sizes as detailed in the design drawings.

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Annexure-1


List of documents to be submitted by vendor in phase-wise manner

Sr. No.	Description	
1.	Fabrication drawings, bill of material (BOM) and Manufacturing.	Before Procurement of Raw material and within 10 days from purchase order.
2.	Material Test Certificate (MTC) for raw material	Before starting of fabrication
3.	Test report of FAT	Before shipment of material

Annexure-2:

All raw, semi-finished, and finished material specifications and standards to be followed by the vendor during procurement shall be in accordance with the following:


Sr.No.	Material	Material Standard
1	Mild Steel (MS)	IS 2062:2011 Grade E250 ,ASTM A36:2008
2	Stainless Steels (SS)	SS304 (ASTM 240)
3	Aluminum	SB209, 6061 T6 or equivalent
4	Copper	Electrolytic tough pitch (ETP) copper with copper purity $\geq 99\%$
5	Lead	<ul style="list-style-type: none"> Grade: Grade B/Grade C Purity 99% (or higher) Bulk Density 11 – 12 g/cm³ Comp. Strength:4 MPa (Min)
6	Graphite	<ul style="list-style-type: none"> Grade: Isostatic High Density Graphite, As per IS 7328:2020 Purity: 99% (or higher) Bulk Density 1.75–1.91g/cm³ Comp. Strength:120 MPa (Min)
7	Tungsten	<ul style="list-style-type: none"> Grade :ASTM B760 or equivalent Purity : 99% (or higher) Bulk Density :18.5 g/cm³ (or higher)
8	Galvanized Iron Anchor Bolts	<ul style="list-style-type: none"> EN 8.8 Grade Foundation Bolt, Property Class 8.8 (per ISO 898-1:2013)

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Annexure-3:

General guidelines to be followed in the execution of the contract/purchase order:


1. Prior to dispatch of the delivery at Purchaser, moderator & support structure shall be cleaned.
2. The supplier shall ensure that all the system parts / assemblies / surfaces of the material are protected by proper covering against any corrosion or damage during all stages of manufacture, inspection, handling, storage and transport. The packing shall be suitable and rigid enough to ensure safety of system during all stages of shipping by road to site, loading, stacking and storage at installation site.
3. All the openings shall be protected to prevent entrance of dirt and moisture during shipment, storage at site and erection.
4. TIG or Shielded Metal Arc Welding (SMAW) shall be carried out for all the welded joints with fillet sizes that are mentioned in the engineering drawings. Throat thickness of Weld Fillet leg/size shall be equal to that of smaller thickness of the parts being welded all around joints wherever possible, if not specifically mentioned. Welding (either Arc welding or TIG welding) shall be performed by a qualified welder in compliance to ASME BPVC section IX or IS 7310 and relevant provisions of IS 817. All welding consumables shall conform to AWS A5.1, E6013 or equivalent/higher grade suitable for structural mild steel (IS 2062 Grade E250). The electrode selected shall be appropriate for the welding position and joint configuration.
5. While welding, proper jigs and fixtures shall be used to prevent welding distortions and to achieve perpendicular, alignment and assembly parts to meet the tolerances. Hence, welding shall be done in more number of pass to reduce heat input at the joints to reduce welding deformations.
6. Vendor shall ensure perpendicular tolerance with reference to the datum defined in the fabrication/engineering drawings.
7. Assembly: Will be shipped out in dis-assembled condition due to space constraint and installation, assembly and commissioning of moderator & support structure shall be carried out by vendor at Purchaser site designed for the same.
8. While machining of plates for the required flatness, proper care shall be taken to prevent distortions/deformations.
9. Holes shall be drilled in the box sections to escape hot gases while welding of the plates.
10. For safe handling of the components/sub-assemblies, vendor shall provide lifting provisions as required for lifting during assembly of parts/sub-assemblies and assemblies.
11. Dimensions of parts/components of moderator & support structure in the engineering drawings without any tolerances have to be assumed as general tolerances that are listed/mentioned in the title block of each engineering drawings provided by Purchaser unless otherwise mentioned separately for the same.
12. Apart from the mentioned in the engineering drawings and deliverables, any other items required for/during testing, assembly to maintain mechanical integrity and to meet the requirements for fabrication of moderator & support structure are part of the scope of work.
13. All material shall be free from all the kinds of defects like porosity, cracks, fissures, dents, pits, lamination or any other defects.
14. The hollow rectangular channel/section shall be supplied either in finish straightened or mill straightened condition

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Annexure-4

Technical Compliance: Fabrication, supply and commissioning of Neutron Moderator and its Support Structure

Sr. No.	Description	Tender specification	Vendor's Specification/response/Comment
1.	Preparation of fabrication/manufacturing drawings and Bill of Material	Vendor will prepare and submit the detailed fabrication drawings and bill of material according to point 1 to 7 of section-2 (scope of work) of technical specification for the approval of Purchaser. Within 10 days from Purchase order.	
2.	Submission of MTC documents	Vendor shall provide Material Test Certificates (MTC) of Graphite and Lead (shall contain chemical composition and purity) as per Section VIII or IS EN 10204 standard, according to point 8 of section-2 (scope of work) of technical specification for the approval of Purchaser.	
3.	Procurement of materials	Vendor shall procure all materials as per approved bill of material (BOM), including bought out items like castor wheels capacity 1 ton each, fasteners, Eye bolts, Hinges etc. According to point 9 and 11 of section-2 (scope of work) of technical specification	
4.	Scissor lift assembly	Castor Wheels capacity of 1 Ton Scissor lift assembly capacity of 3 Ton with lifting height of 1000mm (minimum) as per drawing and point no. 5 of section-2 (scope of work) of Technical specifications	
5.	Material grade	According to annexure 2 of technical specification	
6.	Fabrication and stacking	Fabrication, according to point 10 to 22 of section-2 (scope of work) of technical specification. Vendor shall also work out the design for converting the large block of material in the drawing into smaller manageable chunk/block	


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		(depending up on commercial availability) with an interlocking structure.	
7.	Factory acceptance tests (FAT) at vendor's site	According to Section 3 of technical specification. Vendor will carry out the full assembly of the system for FAT	
8.	submitting of FAT report	Vendor shall submit a FAT report to Purchaser for review and approval after successful completion FAT. Based on these report a Dispatch clearance will be issued only. Vendor will ship the system only after dispatch clearance	
9.	Painting	All Structural Steels (IS:2062 structural steel materials) parts shall be painted with Two coats of epoxy painting and Two coat of primer painting, according to point 22 of section-2 (scope of work) of technical specification	
10.	Handling and movement	Handling and movement to the place of erection from place of unloading, handling at Neutron and ion irradiation Facility –IPR will be carried by vendor. According to point 24 of section-2 (scope of work) of technical specification	
11.	List of documents to be submitted by vendor/supplier in phase-wise manner	According to annexure 1 of technical specification	
12.	General guideline to be followed	General guidelines to be followed in the execution of the contract/purchase order according to annexure 3 of technical specification	
13.	Delivery at Purchaser's Site	Packing, marking, forwarding, safe delivery and unloading at Purchaser's site, Gandhinagar site. according to point 23 and 24 of section-2 (scope of work) of technical specification	
14.	Delivery period	Vendor shall complete the preparation of fabrication drawings, procurement of raw materials as per approved Bill of material in fabrication drawings, fabrication, inspection, testing, FAT, supply, in the total duration of 95 days from the date of release of purchase order.	

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15.	Installation period	Installation and SAT of moderator & support structure shall be completed in 05 days after delivery	
16.	Complete erection	Complete erection of entire System Neutron Moderator and its Support Structure at Neutron and ion irradiation Facility IPR Gandhinagar according to point 25 and 26 of section-2 (scope of work) of technical specification.	
17.	Site clearing and cleaning:	The vendor shall clear the assembly site and clean the debris and packing waste etc According to section-6 of technical specification	
18.	Site acceptance tests (SAT) at Purchaser's site	According to Section 4 of technical specification	
19.	Acceptance criteria (at Purchaser's site)	Final acceptance will be given only after successful completion of Site Acceptance test as per section -4 of technical specification	
20.	Warranty	Vendor shall provide warranty for the Moderator assembly for at least twelve months (12 Months) from the date of final site acceptance. This warranty shall cover free repairs or replacement of parts, which have failed during normal operation within the warranty period due to bad/defective material of construction or workmanship etc.	

Bidder's sign with official Stamp

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Annexure-5 List of drawings

Sr. No.	Title	Description	Drawing No.	Page number
1.	Neutron Moderator and its support Structure	Full Assembly of the system with all of its components and sub assembly	MAS-1	1
2.	Support Structure	Support structure assembly with scissor lift	SS-1	2
3.	Scissor Lift	scissor lift	SS-2	3
4.	Top Support Structure and Base Column	Support structure component like caster wheels etc.	SS-3	4
5.	I beam structure and Stopper Assembly	Support structure component	SS-4	5
6.	Cage Assembly	Outer covering of moderator material	CAS-1, CAS-2 and CAS-3	6 to 8
7.	Moderator Assembly	Assembly of moderator material	MA-1	9
8.	graphite outer wall assembly	moderator material	MA-2	10
9.	ss wall	moderator material	MA-3	11
10.	graphite back irradiation channel	moderator material	MA-4	12
11.	Lead,Copper Plate and Tungsten Block	moderator material	MA-5	13
12.	Aluminium and Graphite block	moderator material	MA-6	14
13.	Back Plug assembly	Plug for closing moderator assembly	PA-1	15
14.	Graphite back wall2 and graphite back irradiation block2	Plug material	PA-2	16
15.	mild steel parts and tungsten sheet	Plug material	PA-3	17
16.	Hinge assembly	Hinge for opening of Back Plug assembly	HA-1	18
17.	Part 1 and part 2	Parts of Hinge assembly	HA-2	19
18.	Part 3 and part 4	Parts of Hinge assembly	HA-3	20