

Request for Proposal (RFP)

For

Design, Manufacture, Supply, Installation and
Commissioning of Thermal Chamber for India-TMT

August 2018

India TMT Coordination Centre

Indian Institute of Astrophysics

Bangalore – 560 034

INDIA

1.0 Introduction

The Thirty Meter Telescope (TMT) International Observatory (TIO) is a joint venture of scientific institutions in Canada, China, India, Japan and the US to build a 30 m diameter optical-infra-red telescope. TMT has 30m diameter primary mirror (M1) composed of 492 hexagonal shaped segments made of low expansion glass material. Each hexagonal segment has an approximate size of 1.44m across the corners and an approximate thickness of 45mm. All these segments are non-axial asymmetric hyperbolic in shape with asphericity ranging from few micrometers to 220um. The segments are produced from a CLEARCERAM-Z blank of 1520mm diameter with meniscus shape. The bottom surface, S2 (Convex), is ground and polished into spherical shape. After polishing the S2 surface, S1 (Concave) surface is ground and polished into required aspherical shape. S1 aspherical surface polishing is achieved by Stress Mirror Polishing (SMP) technology with full tool polishing. Once the S1 surface polishing is completed, the polished roundel glass blank will be cropped into hexagonal shape. Once the hexagonal shape is obtained, the S2 surface will undergo milling/grinding to have central pocket required to hold the segment to the structure and then edge pockets to mount edge sensors for the segment alignments in the telescope structure.

As a part of the Stressed Mirror Polishing (SMP), grinding/polishing tools have to be prepared, for which the thermal chamber will be used. The pitch is melted in a big pot on a stove, and poured onto the lap with a dam around the edges. After melting the pitch in the thermal chamber, its surface is either grooved or attached with certain ceramic tiles to make the grinding/polishing tool. Figure 1 shows the

process flow of the tool preparation. The block depicted in dashed lines indicates the process where thermal chamber is needed.

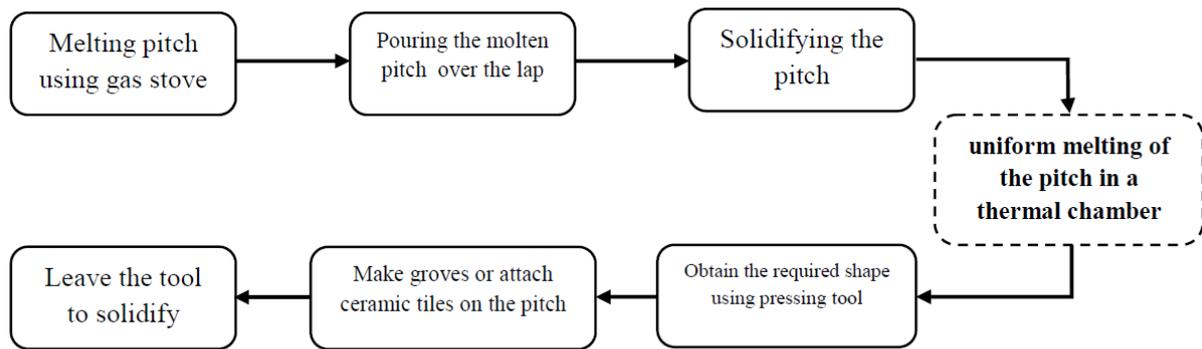


Figure 1. The process flow of tool preparation for grinding and polishing glass roundels.

Figure 1. The process flow of tool preparation for grinding and polishing glass roundels. Note: The scope of work is to build the thermal chamber for the uniform melting of pitch for making the Grinding and polishing tool is shown in the dotted part of the Figure 1.

2.0 Scope of Work

Design, manufacture, supply, installation and commissioning of the thermal chamber required for softening the high quality tar (job) to be used for making the optics grinding and polishing tool. This should meet all the requirements as given in section 3.0.

The draft of the design with required specifications needs to be put forth in the technical bid. Fabrication of the thermal chamber will happen only after evaluating the final design from the qualified vendor.

3.0 Specification:

Thermal chamber will be used to melt and soften the pitch over a lap of diameter ~1500 mm and thickness about 400 mm. The overall weight of the will be around 400kg. There should be a sliding mechanism for the ease of movement of the job into/from the thermal chamber. **A trolley and rail mechanism is to be used for moving the job in and out of the chamber and is to be provided by the supplier along with the chamber.** Associated handling fixtures and mechanical tools and spare for five years must be supplied along with the chamber. The specifications are given in the table below.

Sl.No	Specification	Description
1	Chamber size	To accommodate and handle the job size of diameter 1520 mm and thickness 400mm (the proposed inner dimension of the chamber is 2m× 2m ×1m approximately).
2	Nature of opening	Double door. Provision to permit loading/unloading of job from front side, without tilting the job.
3	Sealant for Door	Materials like Silicon, Sigriflex tend to produce outgassing, and hence not allowed inside the laboratory. Therefore low outgassing material like Viton can be used as a sealant for the door.
3	Operation of unit	Unit should be able to work in manual mode as well as in auto mode with programmable heating cycles.
4	Operating Temperature	Room temperature (20 degree) to 180 degree

		C .
5	Maximum Temperature	200 degree C
6	Rate of heating/cooling	Rate of increase/decrease in temperature should be adjustable from a minimum of 1 degree C per minute to 5 degree C per minute (maximum), when total load of job inside the chamber is 400 kg (approx) . The rate of the heating should work for the load ranging from 0Kg (no load condition) to 400Kg. Programmable PID may be used to control the rate of heating and cooling
7	Stabilization	Once the chamber is thermally stabilized, the temperature gradient inside the chamber volume should be less than ± 1 degree Celsius. This should be indicated with the help of multiple sensors.
8	Temperature sensitivity	Temperature inside the oven should be controlled within ± 5 degree C of the set temperature. For a given temperature setting the uniformity of the temperature inside the chamber volume would be within ± 1 Degree C.
9	Heat Source	Electrical heater (tubular type- specially designed for flame-proof) Heating mechanism needs to be designed in such a way that they can be easily replaced in case of failure with a

		minimal down time.
10	Type of construction	Double wall convection heat dissipation control mechanism. (heat dissipation to the surrounding needs to be controlled in such a way that it should not contaminate the laboratory). Typical ambient temperature inside the laboratory ~ 25 deg C.
11	Exhaust mechanism	Chamber should have provision for proper exhausting the fumes generated during the melting tar inside the chamber. The proposed way of connecting the exhaust root is as shown in Figure 2). The exhaust has to be taken to the height of 2.5 meter from the ground and then taken to the side wall. Hole will be provided on the side wall with the required size as per design. The proposed location of the chamber inside the laboratory is shown in Figure 3.
12	Chamber Venting	Proper venting (in and out) provision must be provided in the chamber to allow appropriate gas to be used in the chamber in case of safety. The thermal chamber must also be equipped with a pressure sensor to measure the pressure accumulation inside it.
13	Viewing Window	A viewing window (view port) on the door and a provision for lighting inside the chamber, for viewing purpose is required. Proper shutter must be used in the viewing port, to avoid vapor deposition on the window.
14	Inner wall material	14-18 swg, SS304L sheets angles, Plates T”

		angles etc
15	Type of insulation	Thermal insulation material like foams or ceramic beads, etc. can be used. Glass wool must be avoided.
16	Size of the insulation	Thermal insulation has to be designed to have minimal heat dissipation to the laboratory. The outer wall temperature of the thermal chamber should not exceed 35degree C at any point of the time. The ambient temperature in the laboratory will be ~25degreeC. Atleast 100 mm thickness of double wall must be considered on all sides (or as per the thermal requirement).
17	Time measurement	3 digit delay of digital timer.
18	Safety	<p>a. Unit should have an adjustable thermostat and an auto switch-off mechanism for the heater in case of the temperature rise by 10 degree C beyond the set point.</p> <p>b. Fire safety mechanism must be provided in the chamber. ITCC/IIA requires water based fire safety measures (like water sprinklers.) In this case, the vendor must work out the water quality requirement and mention in their technical specification bid.</p>
19	Other safety requirements	a. The door should have an interlock mechanism when the temperature inside the chamber is more than 35 degree Celsius.

		<p>b. However, the door should have a manual override to open the door in case of an emergency.</p>
20	Alarm	<p>Should have audio-visual alarm with an adjustable alarm limits. Heat achieve identification alarm-30 sq meter coverage area.</p>
21	Electrical Requirement	<p>Three phase 415V main supply will be available at the laboratory for the thermal chamber. Vendor must design the thermal chamber for the given main supply and the current rating has to be provided by the vendor at the design stage.</p>
22	Location of the chamber	<p>a. The location of the chamber in the laboratory is provided in Figure 3. The vendor can design the door/exhaust and other peripherals as per the space available in the laboratory.</p> <p>b. The vendor must visit the laboratory before submitting the bids.</p>

4.0 Deliverables:

1. Thermal chamber meeting the requirements as specified in section 3.0.
2. Associated tools, spares and fixtures.
3. Manuals:
 - 3.1. Operation and instruction manuals should be provided for oven and other OEM equipments like blower, temperature controller etc.
 - 3.2. Calibration & protocol documentation.

5.0 Acceptance Criteria:

#	Description	Requirement	Remarks
Functional requirements			
1	Mode	Manual & Auto	
2	Operating temperature	Room temperature to 180 degree C	
3	Maximum temperature	200 degree C	
4	Rate of heating/cooling	1 degree C per minute to 5 degree C per minute (maximum)	
5	Temperature sensitivity	±5 degree C of set temperature	
6	Temperature uniformity inside chamber	<+/-1Degree C	
7	Safety mechanism	Emergency shut off, Venting, Water sprinkling, etc.,	
8	Alarm		
Construction requirements			
9	Internal chamber dimension	Well enough to accommodate and handle the job size of diameter 1520 mm and thickness 400mm.	
10	Exhaust mechanism	Designed and mounted from the side of the oven with centrifugal fan.	

11	Double wall convection mechanism		
12	Insulation type	Thermal insulation foams	
13	Door type	Hinged, graphite rope arrangement	
14	Trolley	With railing arrangement	
15	Power requirement		
16	Documentation		

6.0. Schedule / Timeline

#	Description	Due Date
1	Date of Announcement	9 Aug 2018
2	Pre Bid technical discussion	30 Aug 2018
3	Last date for receipt of the bids	11 Sep 2018
4	Opening of Technical bids	11 Sep 2018
5	Opening of Price bids	19 Sep 2018
6	Award of Contact / issue of purchase order	01 Oct 2018
7	Pre design discussion	01 Nov2018
8	Design evaluation	10 Nov 2018
9	Fabrication completion	28 Feb 2019
10	Installation & commissioning	29 Mar 2019

Section-B

7.0 METHODOLOGY AND SUBMISSION OF THE BIDS

Sealed bids are invited from reputed manufacturers with proven technical expertise, track record and experience in Design, Manufacture, Supply, Installation and Commissioning of Thermal Chamber for India-TMT

Submission of bids in two parts:

- (a) Technical Bid: including commercial terms and conditions,
- (b) Price Bid

7.1 Contacts:

(a) Technical Clarifications:

Shri S.Sriram,
Engineer 'E'
Indian Institute of Astrophysics,
Bengaluru, India-560034
(ssr@iiap.res.in)

(b) Administrative Clarifications:

K.P.Vishnu Vardhan
Stores and Purchase Officer
Indian Institute of Astrophysics
Koramangala, Bengaluru-560 034
(Vishnu.vardhan@iiap.res.in)

C.H.Basavaraju
Consultant, Administration,
Indian Institute of Astrophysics/ITCC,
Koramangala, Bengaluru, India-560 034
(basavaraju@iiap.res.in)

8.0 Technical Bid should contain the following:-

- 1) Profile of the company;
- 2) Details of manufacturing plants and equipment of the company;
- 3) Company's Quality Policy and Programme, organizational set up for quality surveillance and quality assurance, quality audit programme, non-conformity control and reporting and testing and inspection facilities;
- 4) The Company should have a minimum average annual turnover of INR 1 crore or equivalent during the last five years and should be of sound financial status (supporting documents must be included);
- 5) Delivery time schedule for the project;
- 6) Documentation;
- 7) Name of the Indian companies/government organization where similar kind of chambers supplied in the last Five years;
- 8) Audited balance sheets for the last three years;
- 9) Copy of Registration, LST/CST/WCT No., PAN No. and TIN No. allotted by concerned authorities.
- 10) Appreciation/Reward letters from clients
- 11) Details of the resources, infrastructure or data expected to be provided by IIA/ITCC to the successful bidder for undertaking the project.
- 12) Risk identification and mitigation plans.
- 13) Commercial terms and conditions.
- 14) Acceptance criteria and test plan
- 15) A copy of the Price Bid without indicating the quoted Price
- 16) Any other information relevant to the bid
- 17) Earnest Money Deposit for Rs.50000/- (Rupees Fifty thousand only) by way of demand draft/bank guarantee drawn on a Nationalized/Scheduled Banks in favour of Director, IIA
- 18) Details of the resources, infrastructure or data expected to be provided by IIA/ITCC to the successful bidder for undertaking the project.

8.1 Price Bid should contain the following

- 1) The quote should be complete to indicate that all products and services asked for are quoted.

- 2) A separate quotation for essential spare parts and accessories is to be submitted.
- 3) Price bid for shall be valid for a period of 180 days from the date of opening of bids. IIA/ITCC may ask for the bidder's consent to extend the period of validity. Such request and the response shall be made in writing only. A bidder agreeing to the request of IIA/ITCC for extension of the bid will not be permitted to modify the bid.
- 4) The envelopes must bear the following: Design, Manufacture, Supply, Installation and Commissioning of Thermal Chamber for India-TMT with name and address of the vendor and it shall be addressed to:

The Director
Indian Institute of Astrophysics
Koramangala, Bengaluru-560 034, India

8.2 Submission of Technical and Price Bids – Part 1:

General Terms

- 1) The Bidder shall prepare original and a copy of the Bid, clearly marking each as "Original Bid" and "Copy of Bid," as appropriate. In the event of any discrepancy between them, the Original shall govern.
- 2) Either the Original or the Copies of the Bid shall be signed by the Bidder or a person or persons duly authorized by the Bidder. The latter's authorization shall be indicated by written Power of Attorney accompanying the Bid.
- 3) The bid must be submitted in an organized and structured manner. No brochures/leaflets etc. should be submitted in loose form. Please indicate page nos. on your quotations. For e.g., if the quotation is containing 25 pages, please indicate as 1/25, 2/25, 3/25,.... 25/25.
- 4) The contents must be clearly typed without any cancellation/corrections or overwriting. Each page of the bid and cutting/corrections (if any) shall be duly signed and stamped by the bidder. Failure to comply with this requirement may result in the bid being rejected.
- 5) All pages of the Bid (except for un-amended printed literature) shall be initialled by the person or persons signing the Bid. The Bidder's name stated on the proposal shall be the exact legal name of the firm.

- 6) The Technical and Price Bids shall be sealed in separate envelopes. The envelopes shall bear the "Design, Manufacture, Supply, Installation and Commissioning of Thermal Chamber for India-TMT". The envelopes shall bear the name and address of the vendor and shall be addressed to:

THE DIRECTOR,
INDIAN INSTITUTE OF ASTROPHYSICS
KORAMANGALA, BENGALURU-560 034

- 7) If the envelopes are not sealed and marked as required, IIA/ITCC will not take any responsibility for the bid's misplacement or premature opening, whatsoever the reason may be.
- 8) The bidder has the option of sending the bid by registered post or submitting the bid in person so as to reach IIA/ITCC by the date and time indicated. IIA/ITCC will not be responsible for late, delayed bids and loss of bids in transit, whatsoever the reason may be.
- 9) IIA/ITCC reserves the right to accept/reject any or all bids without assigning any reasons.
- 10) Any other condition or guideline for submission of the bids shall be notified by IIA/ITCC, if it finds necessary.
- 11) IIA/ITCC may, at its discretion, extend the deadline for the submission of bids by amending the Bidding Documents, in which case all rights and obligations of IIA/ITCC and Bidder previously subject to the deadline will thereafter be subject to the deadline as extended.
- 12) At any time prior to the deadline for submission of Bids, IIA/ITCC may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, notify changes in the bidding documents through an amendment.
- 13) In order to allow reasonable time for the prospective bidders for taking the amendment into account in preparation of their bids, IIA/ITCC may, at its discretion, extend the deadline for the submission of the bids.
- 14) The amendments, if any, shall be notified in writing at IIA/ITCC website and the amendments shall be binding on all the bidders. Hence the bidders shall view the notification in complete before submitting their bids.

- 15) The company responding to announcement shall be deemed to have read and understood the documents in complete. Where counter terms and conditions have been offered by the company, the same shall not be deemed to have been accepted by IIA/ITCC, unless a specific written acceptance thereof is obtained.
- 16) Any effort by a bidder to influence IIA/ITCC in the bid Evaluation, bid Comparison or contract award decisions may result in the rejection of their bid.
- 17) Any clarifications pertaining to this document may be obtained from IIA/ITCC by the bidders by writing at the following address at least fifteen days prior to the due date for submission of bids.
- 18) IIA/ITCC may organize a pre-bid meeting; approximately two weeks prior to the last date of submission of the bids. All the parties who have submitted the bids may attend the meeting and obtain clarifications regarding the technical/commercial and price bid terms and conditions.
- 19) Technical Bid shall be opened on the date specified by IIA/ITCC. Bidders or their authorized agents may be present at their own interest when the Bids are being opened.
- 20) The Technical Bids shall be evaluated by an Expert Committee and the shortlisted Bidders may have to make presentations on their detailed proposals to the Committee.
- 21) To assist in the evaluation of bids, IIA/ITCC may at its discretion ask the bidder for a clarification of its bid. IIA/ITCC may call for meetings with bidders to seek clarification at appropriate times in its premises in Bengaluru. The bidders shall attend the meeting at their own cost. The request for clarification and the response shall be in writing.
- 22) Following the evaluation of technical bids, the price bids of technically qualified bidders shall be opened to choose the bidder to execute the Project. Bidders should be advised that, price bid will be opened only in respect of technically qualified bids. And, the lowest price bid (L1) shall be chosen to execute the work.

Section C

9.0 Terms and Conditions

The successful Vendor who is awarded the contract shall be subjected to the following terms and conditions, which are part of the contract:-

9.1 Subcontracts

- 1) The contractor is an independent and original manufacturer of Thermal Chamber
- 2) The contractor shall provide as an independent contractor and provide all necessary personnel, materials, equipment and facilities to Supply of Thermal Chamber, Commissioning, Demonstration and imparting training.
- 3) The Vendor shall not assign its rights or obligations to a third party without the prior written approval of IIA/ITCC.
- 4) Notwithstanding any subcontract under this Agreement, whether approved by IIA/ITCC or not, the Contractor shall remain fully liable and responsible for the satisfactory and timely completion of the Work.

9.2 Payment

- 1) IIA/ITCC shall pay the Contractor the price in accordance with a milestone schedule.
- 2) Upon completion of each milestone, the contractor shall submit to IIA/ITCC an Invoice for the amount corresponding to that milestone in Schedule.
- 3) The contractor shall submit reasonable documentary evidence, including but not limited to inspection reports, photographs and illustrations, as verification of completion of each Milestone. IIA/ITCC may at its own discretion verify and substantiate that the milestone has indeed been performed or completed as invoiced by the contractor. Such verification may require contractor to submit to IIA/ITCC, additional documentation with regard to quality control normally expected during process of inspection, by IIA/ITCC representatives. Any request for substantiation under this clause shall be made by IIA/ITCC within fourteen (14) days of its receipt of the corresponding Invoice.

9.3 Testing and documentation

Vendor should offer the machine for inspection by IIA/ITCC Engineers at its works before dispatch of the same to IIA/ITCC works. Vendor should indicate probable duration required for carrying out Pre-Dispatch inspection.

9.4 Transportation, Insurance and Delivery

The Vendor is responsible for its delivery at IIA/ITCC Crest Facility at Hosakote, Bangalore, India including transportation charges and transit insurance.

9.5 Access to work

- 1) Work in progress and data and documentation related to work/supply it may be necessary to present to understand the ability of the work to meet the specifications are subject to examination, evaluation, and inspection by IIA/ITCC, on behalf of TMT-India, at reasonable times and with reasonable notice to the Vendor.
- 2) The Contractor shall provide IIA/ITCC, access to such documentation and to those of its premises where work on or in connection with the subject of this contract is being performed during normal business hours and subject to prior arrangement.
- 3) IIA/ITCC may depute Engineers/Scientists of its choice from time to time who will be allowed by the Contractor to participate in the process in respect of the disciplines in which they are specialized.

9.6 Vesting of Title and Assumption of risk

- 1) On each item to be delivered by the Contractor, including an item of work in progress, in respect of which payments have been made, ITCC shall have a security interest in such items which shall be deemed to be released only at the time when the applicable deliverable Item is finally accepted by ITCC/ and delivered at Indian Institute of Astrophysics/India TMT Co-Ordination Centre, Koramangala, Bengaluru.

- 2) Risk for loss or damage to deliverable inspected Items provided by the manufacturer shall rest with the Contractor, until final acceptance by IIA/ITCC and delivery to manufacturers place.
- 3) Title to all deliverable inspected Items provided by the Contractor shall pass from the Contractor to IIA//ITCC upon final acceptance or the final payment, whichever last occurs.
- 4) IIA/ITCC shall not accept any liability for the Contractor and its subcontractors, their subsidiaries and/or their officers, employees or agents, servants, and assignees, or any of them or for their property. The Contractor shall indemnify and keep harmless IIA/ITCC, its officers, employees consultants, servants, agents and assignees, or any of them, against any loss or liability, costs or claims, action or proceedings which they or any of them may incur by reasons of damage to property or injury, including death, caused to the employees of the Contractor, its subsidiaries and/or their officers, employees or agents, servants and assignees, or any of them in connection with the performance of Work under this Agreement, and caused by an act of commission or omission by the Contractor, its subsidiaries and/or their officers, employees or agents, servants and assignees, or all or any of them.

9.7 Deliverable documentation and Standards

The Deliverable Documentation shall include a complete inspection reports, Testing procedures, (both in-process and final. All documentation shall be written in clear and concise English language. The author should also adhere to consistent terminology and use acronyms that are well defined in the document.

9.8 Progress reports

The Contractor shall provide IIA/ITCC with detailed reports on progress of the Work and notify any deviations on the schedule, at least monthly highlights and bi-monthly detailed reports on the progress of the work, up to the delivery date.

9.9 Warranty

The Thermal chamber inclusive of all systems / accessories should be warranted for 12 months from the date of installation / commissioning against all the design, material or manufacturing

- 1) All deliverable Items that are inspected by the Vendor or its subcontractors shall conform in grade and quality to all the requirements of the contract; where the grade or quality is not specifically defined therein; they shall be of a grade or quality suitable for their intended use;
- 2) All workmanship employed in the inspection of deliverable Items shall be of good quality, free from faults and defects, and shall conform to the relevant specifications applicable to the said inspection; and
- 3) All deliverable Items shall be free from defects arising out of the use of inspection that would result in a total or partial failure of any deliverable item or which would render a deliverable item unsafe for its intended use.

9.10 Performance guarantee:

To ensure due performance of the contract, performance security (or Performance Bank Guarantee (PBG) or Security Deposit (SD)) will be obtained from the successful bidder awarded the contract at the time of releasing the Purchase Order or entering into a contract. Performance Security should be for an amount equivalent five per cent of the value of the contract. Performance Security shall be furnished in the form of an account payee demand draft or fixed deposit receipt from a commercial bank or bank guarantee from any of the commercial bank in India in an acceptable form, safeguarding the purchaser's interest in all respects.

The performance guarantee should remain valid for a period of 60 (sixty) days beyond the date of completion of all contractual obligations of the contractor, including warranty obligations. The Performance Security will be forfeited and credited to the Purchasers account in the event of a breach of contract by the contractor. It will be refunded to the contractor without interest, after he duly performs and completes the contract in all respects but not later than 60 (sixty) days of completion of all such obligations including the warranty under the contract.

10.0 Other Terms and Conditions (Part-II)

The successful Vendor who is awarded the contract shall be subjected to the Terms and Conditions that include, but not limited to the following. A detailed Contract Agreement will be drawn and signed by both the parties before the award of the contract.

10.1 Intellectual Property rights

- 1) All Intellectual Property Rights existing in a party prior to the Contract (“**Existing Intellectual Property Rights**”) shall remain with that party. Except to the extent necessary to complete the Work or expressly stated otherwise, neither party grants any rights in its Existing Intellectual Property Rights to the other party.
- 2) All Intellectual Property Rights arising directly from the Work (“**Work Intellectual Property Rights**”) shall, upon completion of the Work, vest in IIA/ITCC and TMT project.

10.2 Confidential Information

- 1) The Receiving Party shall protect the confidential information and keep it secure, and shall not at any time (except with the prior written consent of the disclosing Party):
- 2) Directly or indirectly disclose or distribute the confidential information to a representative, employee, agent or advisor of the receiving party except where such disclosure is necessary for the purpose of the Work.
- 3) Use or copy the confidential information except for the purpose of the work.
- 4) Where the receiving party discloses confidential information to a representative, employee, agent or advisor, the receiving party shall ensure that such person is aware of the confidential nature of that confidential information and is bound by suitable obligations of confidentiality to ensure that that person protects and keeps secure that confidential information and does not use the confidential information for any reason other than the purpose of the Work.
- 5) The receiving party shall, on demand by the disclosing party, or where the purpose of this agreement has been served, promptly return to the disclosing

party all confidential information (including copies or reproductions of the same) which is reasonably capable of being returned which is in the possession or control of the receiving party.

- 6) This agreement is not intended to restrict the use or disclosure of confidential information by the receiving party to the extent that it is required to be disclosed by law provided that the receiving party has taken such steps as are available under law (but not the institution of legal action) to protect such confidential information and notifies the disclosing party hereunder of its obligation to make such disclosure prior to the time such disclosure is made.
- 7) The provisions of this Clause 5.2(1) are subject to the provisions of Clause 5.2 (4).

10.3 Settlement of disputes

- 1) All disputes arising in connection with the interpretation or implementation of the contract shall be amicably settled by IIA/ITCC and the Vendor, by direct discussion.
- 2) If IIA/ITCC and the Vendor are unable to resolve a dispute within 30 working days of the dispute being referred to them in accordance with Clause 5.3 (1), the parties may agree to refer the dispute to mediation.
- 3) ITCC and the Vendor appoint a mediation committee comprising of two nominees by IIA/ITCC and two nominees by the Vendor. IIA/ITCC and the Vendor will seek the opinion of this mediation committee to amicably settle the disputes.
- 4) In the event of a dispute or difference which cannot be resolved by mediation, the same shall be referred to an Arbitration Tribunal consisting of three members. Either party shall give notice to the other regarding its decision to refer the matter to arbitration. Within 30 days of such notice, one Arbitrator shall be nominated by each party and the third Arbitrator shall be nominated by agreement between the parties to this agreement. The venue of the arbitration will be Bengaluru, India. Subject to the aforesaid, the Indian Arbitration and Conciliation Act, 1996 and the rules there under and any statutory modification thereof for the time being in force shall be deemed to apply to the Arbitration proceedings.

10.4 Force Majeure:

- 1) Neither party shall be held responsible for any losses, if the fulfillment of any terms and conditions of this contract are delayed or prevented by acts of lawful Government, revolutions and other disorders, wars (declared or undeclared), acts of enemies, strikes, fires, floods, acts of God and, without limiting the foregoing, any other cause not within the control of the party whose performance is interfered with and which, by the exercise of reasonable diligence, they are unable to prevent.
- 2) Each party will promptly notify the other in writing when condition of Force Majeure described in Clause 10.4 (1) arises. Neither party will be liable for any failure to perform its obligations hereunder if prevented from doing so by reason of Force Majeure, provided that it will have used all reasonable endeavours to perform its obligations notwithstanding such situation or event.
- 3) As soon as practicable after the lodging of such notice the Vendor and IIA/ITCC shall jointly determine whether the situation constitutes Force Majeure and if so the appropriate measures to meet the situation. Either party shall not be liable for any penalty or damage resulting in delays to perform its obligations as a consequence of Force Majeure.

10.5 Termination

- 1) IIA/ITCC may terminate the Work with sixty (60) days prior written notice any time without assigning any reason or cause by notifying the Vendor in writing. In the event that the Work is so terminated by IIA/ITCC then ITCC shall pay the Vendor total amount of the costs and liabilities incurred by the Vendor up to the date of termination.
- 2) IIA/ITCC may at any time terminate the contract by giving written notice with immediate effect in any of the following cases.
- 3) If the Contractor is adjudged insolvent or if its financial position is such that within the framework of its national law, legal action leading towards bankruptcy is taken against it by its creditors or its Government, or
- 4) If it is determined through appropriate proceedings that the Contractor has resorted to fraudulent or corrupt practices in connection with its securing or implementation of this Agreement.

10.6 Patents, Copyrights and other Proprietary rights

The Contractor warrants that any deliverable Item provided to IIA/ITCC shall to the best of its knowledge and belief be free of any rightful claim of any third party for infringement of patent, copyright, or other proprietary right.

10.7 Liquidated damages:

- 1) If the vendor fails to deliver, as per Delivery schedule, within the stipulated time specified or any extension thereof, there will no liability for the first 30 (thirty) days of delay. Thereafter, for each completed calendar month of such failure, the IIA/ITCC will be entitled to claim from the party as liquidated damages, a sum of one-half of one per cent (0.5%) per week of the contract price relating to that portion of the delay up to a maximum value of ten per cent (10%) of the contract price of the portion of delay. The work or part thereof will be deemed to have been delivered/completed only when all its component parts are accepted by IIA/ITCC.
- 2) The detailed statement of liquidated damages will be notified to the party who will be entitled to submit the reasons against levy of liquidated damages to IIA/ITCC within 30 (thirty) days from the date of notification of the statement. Beyond this thirty (30) days period, the party is deemed to have accepted the liquidated damages claimed to have to be paid. This clause is not applicable when the delay is due to a failure on the part of the IIA/ITCC.

11.0 Governing law

The Agreement shall be governed by, and construed in accordance with, the law for the time being in force in India.

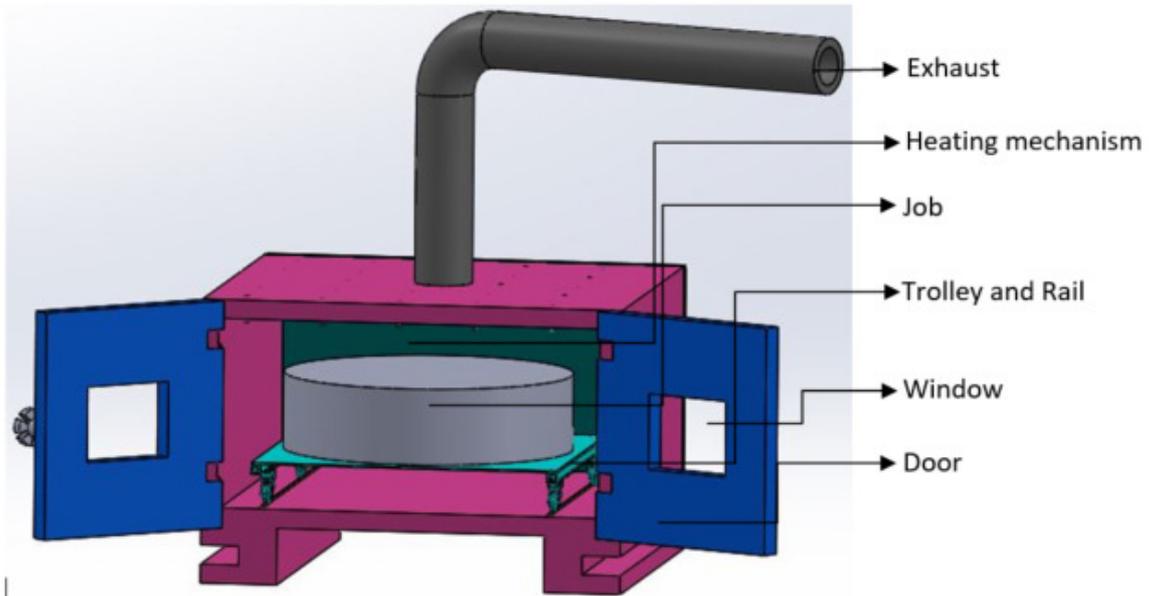


Figure 2: Proposed schematic of Thermal chamber shows: the job, exhaust, trolley

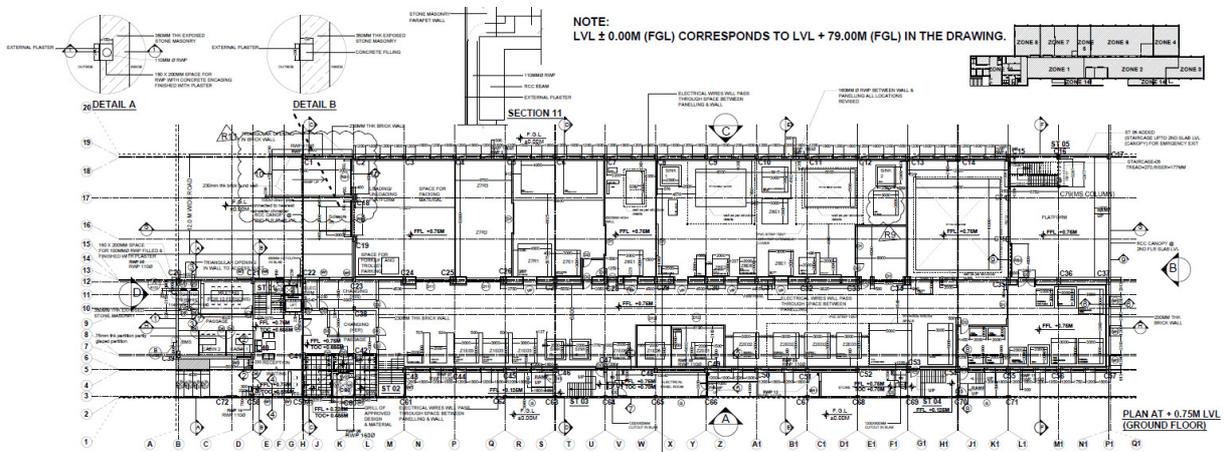


Figure 3a: Location of thermal chamber in the laboratory

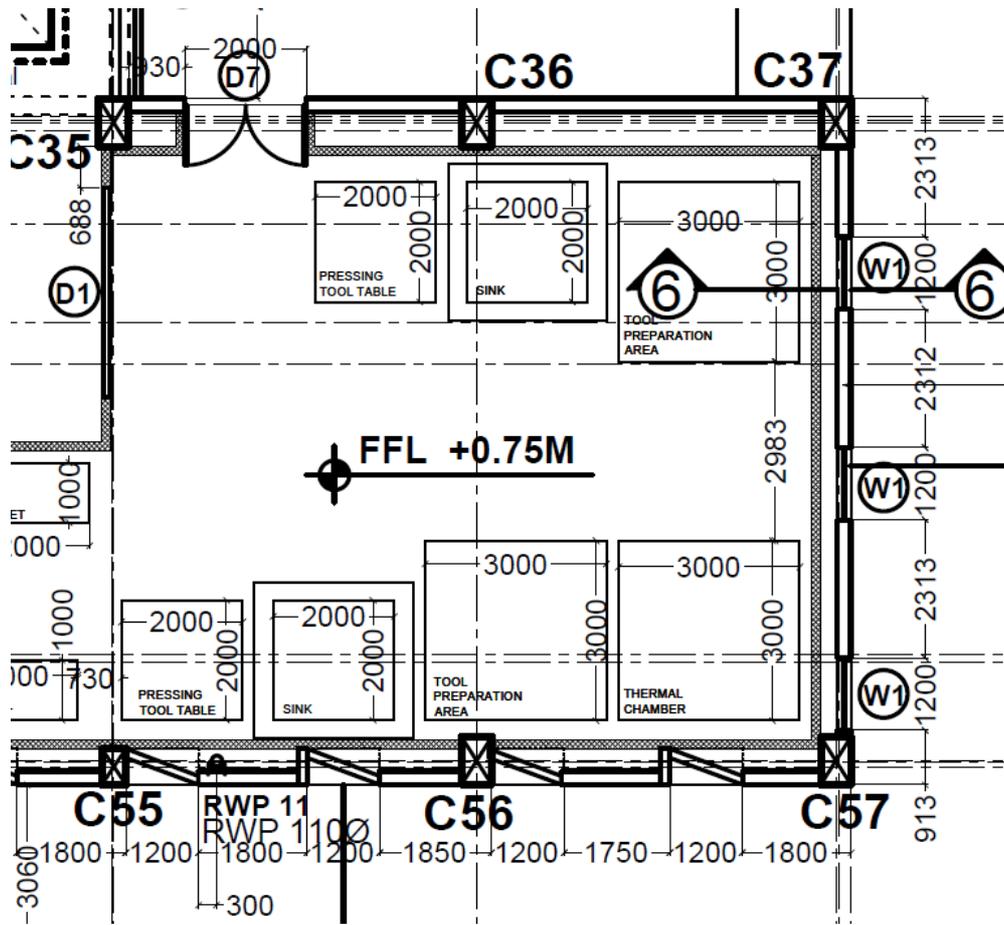


Figure 3b: Zoomed in sketch of thermal chamber area