INDIAN INSTITUTE OF TECHNOLOGY MADRAS
Chennai 600 036

Telephone : [044] 2257 8356/9760 FAX : [044] 22570545/8366
E-mail: arpp@iitm.ac.in

V. Rajendran
Assistant Registrar (Project Purchase)

Ref: OEC/PKRS/004/2015
Date: 23rd February, 2015

Tender No: OEC/PKRS/004/2015

Due Date: 27.03.2015, 3:30pm

Pre-Bid meeting on 06.03.2015 at 2.30 p.m.

Dear Sir/Madam,

On behalf of the Indian Institute of Technology Madras, offers are invited for the supply of **"Planner Motion Mechanism Equipment"** conforming to the specifications given in Annexure.

Instructions to the Bidder

(i) **Preparation of Bids:** - The tenders should be submitted under two-bid system (i.e.) Technical bid and Financial bid.

(ii) **Pre-bid meeting –** The pre-bid meeting is scheduled on **06th March 2015 at 2.30 p.m.** in the conference room of the Department of Ocean Engineering. All the bidders MUST visit the site before the date of the Pre-Bid meeting and prepare a technical design, and present the design aspects (technical) of the solution they intend to bid at the pre-bid meeting. The final specifications will be released after the pre-bid meeting. The Appendix below gives a brief explanation about the "Planner Motion Mechanism Equipment" and approximate skeleton specification.

(iii) **Delivery of the tender:** - The tender shall be sent to the below-mentioned addresses either by post or by courier so as to reach our office before the due date and time specified in our Schedule. The offer/bid can also be dropped in the tender box on or before the due date and time specified in the schedule. The tender box is kept in the office of the "Special Officer, Project Purchase" IC & SR Building 2nd floor, I.I.T. Madras, Chennai – 600 036.

(iv) **Opening of the tender:** - The offer/Bids will be opened by a committee duly constituted for this purpose. The technical bids will be opened first and it will be examined by a technical committee which will decide the suitability of the bid as per our specifications

and requirements. The bidders will be invited for opening of Technical bids. In respect of opening of financial bid, those bidders who are technically qualified only will be called for.

(v) **Prices:** - The price should be quoted in nett per unit (after breakup) and must include all packing and delivery charges to various Departments/Centres/Institutions. The offer/bid should be exclusive of taxes and duties, which will be paid by the purchaser as applicable. However the percentage of tax & duties should be clearly indicated.

The price should be quoted without custom duty and excise duty, since I.I.T. Madras is exempt from payment of excise duty, and the custom duty will be paid at concessional rate against duty exemption certificate.

In case of import supply, the price should be quoted on EX-WORKS and CIP basis indicating the mode of shipment.

(v) **Agency Commission**: - Agency commission, if any, will be paid to the Indian agents in Rupees on receipt of the equipment and after satisfactory installation. Agency Commission will not be paid in foreign currency under any circumstances. The details should be explicitly shown in Tender even in the case of 'Nil' commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent. The foreign Principal should indicate about the percentage of payment and it should be included in the originally quoted basic price, if any.

(vi) **Terms of Delivery**: - The item should be supplied to our various Departments/Institutions as per Purchase Order. In case of import supply, the item should be delivered at the cost of the supplier to our Institution. The Installation/Commissioning should be completed as specified in our important conditions.

(vii) **Technical Bid Opening:** The technical bid will be opened on 31st March 2015 at 2.30 p.m at the Conference room, Department of Ocean Engineering, IIT Madras and the financial bids of those tenders who are technically qualified will be opened at a later date under intimation to them.

(viii) IIT Madras reserves the full right to accept / reject any tender at stage without assigning any reason.

Yours sincerely,

V. Rajendran
Assistant Registrar (Project Purchase)
IC&SR, I.I.T. Madras

SCHEDULE

Important Conditions of the tender

1. The due date for the submission of the tender is **27.03.2015, 3:30pm.**

2. The offers / bids should be submitted in two bids systems (i.e.) Technical bid and Financial bid. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes, transportation, packing & forwarding, installation, guarantee, payment terms, pricing terms etc. The Technical bid and Financial bid should be put in separate covers and sealed. Both the sealed covers should be put in a bigger cover. The Open Tender for supply of "_____" should be written on the left side of the Outer bigger cover and sealed.

3. **EMD: -**EMD should be at 2% (two percent) of the tender value quoted by the bidder. The EMD should be included in the Financial bid which will not be opened for Technical evaluation. Enclosing the EMD in the Technical bid will automatically disqualify the tenderer. EMD should be in the form of DD in favour of "The Registrar, Indian Institute of Technology Madras" and payable at Chennai. The tender without EMD would be considered as UNRESPONSIVE and REJECTED. Photo/FAX copies of the Demand Draft/Banker's pay orders will not be accepted. No interest will be paid for the EMD and the EMD (Bid Security) will be refunded to the successful bidder on receipt of Performance Security.

4. **Performance Security:-**The successful bidder should submit Performance Security for an amount of 5% of the value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt from the commercial bank, Bank Guarantee from any nationalized bank of India will be an acceptable.

   Only after submission of Performance Security, Purchase Order/Work Order will be released / L.C will be opened.

   Performance Security in the form of Bank Guarantee:- Incase the successful bidder wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed through the Beneficiary Bank to the end user bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee from a Nationalized Bank of India.

   The Bank Guarantee should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.

5. If an Indian agent is involved, the following documents must be enclosed:
   Foreign principal's proforma invoice indicating the commission payable to the Indian Agent and nature of after-sales service to be rendered by the Indian Agent.
   - ✓ Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.
   - ✓ The enlistment of the Indian agent with Director General of Supplies & Disposals under the Compulsory Registration Scheme of Ministry of Finance.

6. The offer/bids should be sent only for a machine that is available in the market and supplied to a number of customers. A list of customers in India and abroad with details must accompany the quotations. Quotations for a prototype machine will not be accepted.

7. Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid. No prices should ever be included in the Technical bid.

8. Documentary proof for the claimed position and repetition accuracies must be obtained from the principals and submitted along with the relevant pages of the standards.

9. Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal.

10. **Validity:** Validity of Quotation not less than 90 days from the due date of tender.

11. **Delivery Schedule**:- The tenderer should indicate clearly the time required for delivery of the item. In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.

12. **Risk Purchase Clause**:- In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.

13. **Payment**:- No Advance payment will be made for Indigenous purchase. However 90% Payment against Delivery and 10% after installation are agreed to wherever the installation is involved. In case of import supplies the payment will be made only through 100% Letter of Credit i.e. (90% payment will be released against shipping documents and 10% after successful installation wherever the installation is being done).

14. **Advance Payment:-**No advance payment is generally admissible. In case of specific percentage of advance payment is required, the Foreign Vendor has to submit a Bank Guarantee equal to the amount of advance payment and it should be routed through the

Beneficiary Bank to the end user Bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee through a Nationalized Bank of India.

15. **On-site Installation**: - The equipment or machinery has to be installed or commissioned by the successful bidder within 15 to 20 days from the date of receipt of the item at site of IIT Madras.

16. **Warranty/Guarantee**: - The entire system must be under warranty for a minimum period of 2 years from the final date of acceptance, after commissioning. The bidders MUST also quote AMC for further period of 3 years. IIT Madras may or may not exercise the AMC (for more details please refer our Technical Specifications).

17. **Late offer**: - The offers received after the due date and time will not be considered. The Institute shall not be responsible for the late receipt of Tender on account of Postal, Courier or any other delay.

18. **Acceptance and Rejection**: - The equipment should meet the technical specifications as shown in the Appendix below. I.I.T. Madras has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.

19. **Do not quote the optional items or additional items unless otherwise mentioned in the Tender documents / Specifications.**

20. **Disputes and Jurisdiction**: - Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.

21. All Amendments, time extension, clarifications etc., will be uploaded on the website only and will not be published in newspapers. Bidders should regularly visit the above website to keep themselves updated. No extension in the bid due date/ time shall be considered on account of delay in receipt of any document by mail.

Acknowledgement:- It is hereby acknowledged that the tenderer has gone through all the conditions mentioned above and agrees to abide by them.

SIGNATURE OF TENDERER
ALONG WITH SEAL OF THE
COMPANY WITH DATE

Pre-Bid meeting on 06.03.2015 at 2.30 p.m. (please refer point No. ii)
Technical Bid opening meeting on 31.03.2015 at 2.30 p.m. (please refer point No. vii)

APPENDIX
Planar Motion Mechanism (PMM) Equipment

The Department of Ocean Engineering, IIT Madras is planning to install a PMM facility in its existing towing tank facility. Details of the PMM facility are explained below. Technically competent firms involved in the design, development and commissioning of a PMM and interested in this project may please participate in the tender. Thesefirms MUST visit the towing tank at the Department of Ocean Engineering, IIT Madras and prepare a conceptual design. A pre-bid meeting will be arranged subsequently. Those who have expressed interest should attend the pre-bid meeting and present their conceptual design of the PMM with proper preliminary specifications and other technical details. Only those who attend and present the preliminary design and found technically competent will be invited for further process (bidding).

The following material presented here is a guideline to make a preliminary design of the PMM, including its operation, expected components, technical requirements, data acquisition and processing aspects. Those who participate in the pre-bid meeting and had made a presentation will be informed about the final specifications, terms and conditions for bidding.

About Planar Motion Mechanism (PMM)

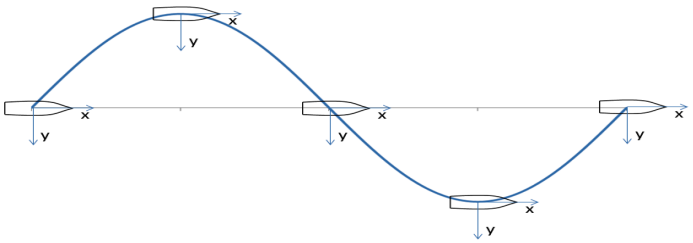
Planar Motion Mechanism (PMM) Equipment is a facility provided in a Towing Tank to perform experimental studies with ship models to determine the manoeuvring characteristics of a ship. The experiment is conducted in the towing tank where the PMM setup is attached with the carriage. The ship model is oscillated, at prescribed frequency and amplitude, in different modes of motion in the horizontal plane while it is towed along the tank at a pre-determined speed. The hydrodynamic forces and moments acting on the ship model are measured, recorded and processed to get the hydrodynamic derivatives appearing in the ship manoeuvring equations of motion.

The proposed PMM can have two electric actuators which are used in a controlled manner to produce transverse oscillations while the model is towed by the towing tank carriage at the required speed (upto 3.0m/s). The ship model will be subject to pure sway motion (translatory motion along the breadthwise direction of the model), pure yaw motion (rotary motion about the vertical axis) and the combined sway & yaw motion. The following figures show these modes of motion. Three videos are also provided to depict the operation of PMM in different modes. The first and second videos (files PMM1 & PMM2) are animations showing pure sway and pure yaw motions, respectively. The third video (PMM3) is an experimental one, showing the different modes of motion of the PMM, which can be viewed also at https://www.youtube.com/watch?v=iHGGSdGM7Xk

In PMM, these modes of motion are achieved by adjusting the phase difference between the two actuators, where such concepts are used. PMM setup will impart sinusoidal motion to the model in the desired degree of freedom. Forces will be measured using force sensors attached with the model setup, usually at the two points where the struts connect the PMM to the ship model. The model should have mechanical connections/links in the struts to provide freedom of motion for the model in the vertical plane. That is, the model should be free to heave and pitch while the experiments are performed. The PMM facility should have the data acquisition and recording system, preferred to be done using a dedicated laptop computer, feedback arrangements to check and verify the imparted oscillation displacement and frequency/period of oscillation. The PMM facility is preferred to be on a separated trolley which could be rigidly attached to the existing carriage in the towing tank. The whole system should be free from vibration so as to avoid spurious data due to it, which might vitiate the force data measured from the tests.

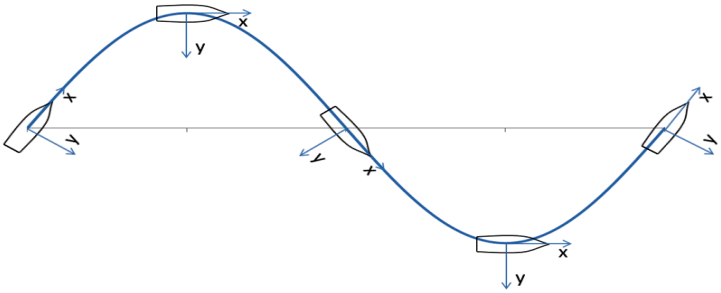
Modes of Operation in PMM

1. **Pure sway**



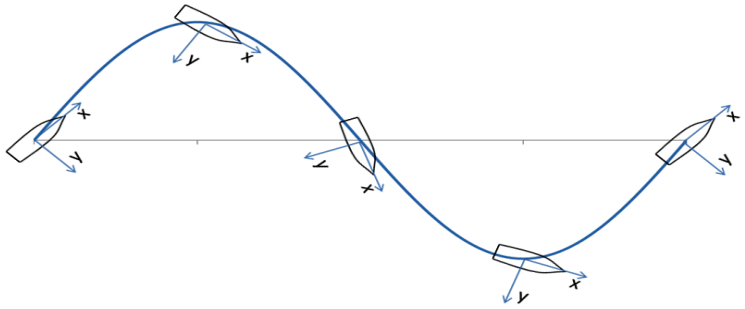
In pure sway mode of operation, the model is oscillated sinusoidally in the lateral direction with its axis always parallel to the axis of the towing tank. Here, both the struts move at the same phase.

2. **Pure yaw**



In pure yaw mode of operation, the model is oscillated sinusoidally in the lateral direction with its axis always tangential to the sinusoidal path. Here, the struts move out of phase.

3. **Combined Sway and Yaw**



In the combined sway and yaw mode of operation, the model is oscillated sinusoidally in the lateral direction with its axis always having a drift angle with its sinusoidal path. Here also, the struts move out of phase, but different from the pure yaw mode.

Towing Tank Dimensions and Cycles

- Length – 82.5 m
- Breadth – 3.2 m
- Depth – 2.8 m
- Tank length available for testing - 50 m (steady speed condition)
- 50 meter tank length, which is available for steady speed condition is divided into 5 equal parts to get 5 cycles of run.
- Time to complete one cycle (10 m) minimum – 10seconds

Estimated Power Calculations (Approximate)

Sway Motion

- Sway motion amplitude – 0.4 m
- Sway Velocity - 0.5 m/s
- Sway Acceleration – 0.63 m/s^2

- Expected mass of the ship model – 300 kg
- Expected Force required to move the ship model – 800 N

Yaw Motion

- Yaw amplitude - 15^0
- Yaw angular velocity – 1,25 rad/s
- Yaw angular acceleration- 0.4 rad/s^2
- Expected yaw moment – 300 Nm

Major Components in PMM mechanism and Approximate Specifications

1. **Actuators**

   Actuators are used to move the model in the prescribed path. Depending on the mode of operation these actuators will be working either in phase or out of phase. One will be fitted in the bow (forward) part of the model and the other will be fitted in stern (rear) part through long struts and with the help of mechanical links.

   - Type – Electrically operated
   - Number of actuators required - 2
   - Actuator Stroke length required – 800 mm
   - Translational velocity required – 0.5 m/s
   - Translational acceleration – 0.63 m/s^2
   - Actuator Force – 1000 N
   - Positioning repeatability - ± 0.03mm

2. **Force Sensors**

   Sensors are used to find the forces in the respective axis. Two sensors will be fitted, one at the bow part and another at the stern part. They will be attached to the ship model through struts and mechanical linkages.
   - Number of sensors – 2
   - Components to be measured – Single direction (Fx)
   - Force range minimum requirement - ± 1000 N

3. Supporting frames and struts
4. Mechanical links
5. Guide rails
6. Sway trolley
7. Display and processing unit.

For further details, please contact : Prof.P. Krishnankutty, Department of Ocean Engineering, IIT Madras, Chennai-600036, India; Tel: +91 44 22574820; Mob:+91 9884707672
Email: pkrishnankutty@iitm.ac.in