Enquiry Document

for

Purchase of: SUPPLY AND COMISSIONING OF WAVEMAKER WITH ACTIVE WAVE ABSORBPTION SYSTEM AND PASSIVE BEACH FOR DEEP AND SHALLOW WATER SEAKEEPING AND MANEUVERING BASIN (DSW-SMB)

DETAILED TECHNICAL SPECIFICATIONS

Quantity – 01 UNIT

Introduction:

Centre for Inland and Coastal Maritime Technology (CICMT), IIT Kharagpur is building a Deep and Shallow Water Seakeeping and Manoeuvring Basin (DSW-SMB). The basin will be 112 m long x 16 m wide x 4 m deep and it will be operated at different water depths, from 0.5 m to 3.5 m. The facility will comprise a state-of-the-art wave generation with an active and a passive wave absorption systems. The wave generator will be operated only for water depths from 2.5 to 3.5 m. The wavemaker will be used only for 2 Dimensional waves. Wavemaker will be required for conducting resistance, maneuvering and seakeeping tests of model ship in captive/free running mode in the DSW-SMB.

The vendor supplying the wavemaker device should have solid experience in the design and supply of special test systems to private companies and public institutions alike. The vendor should have supplied at least 3 similar wave generators to other towing tanks/ Basins.

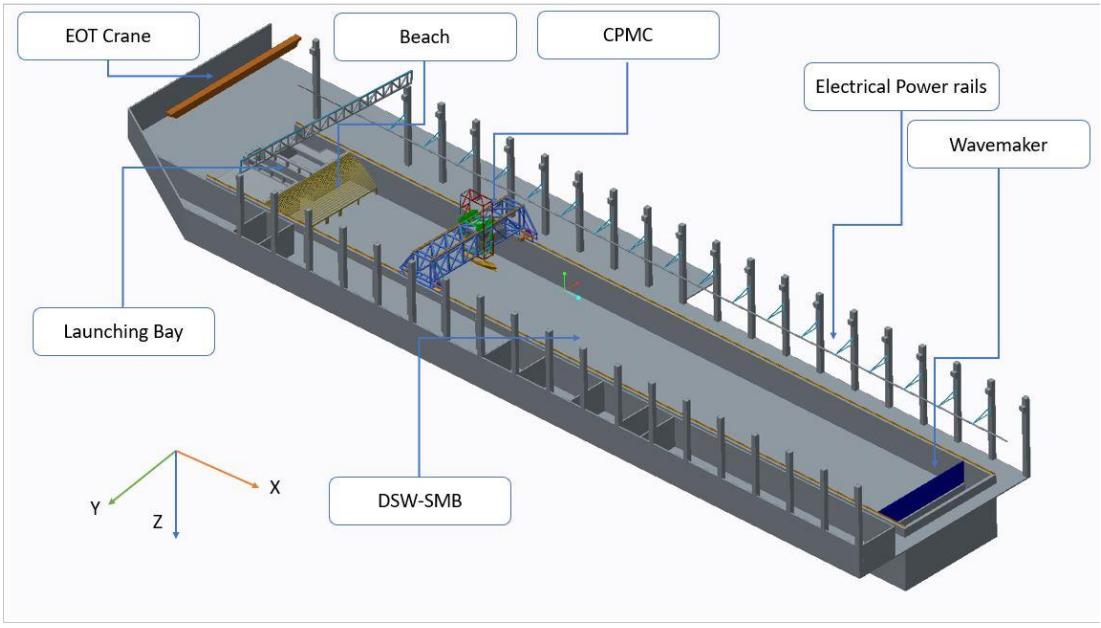

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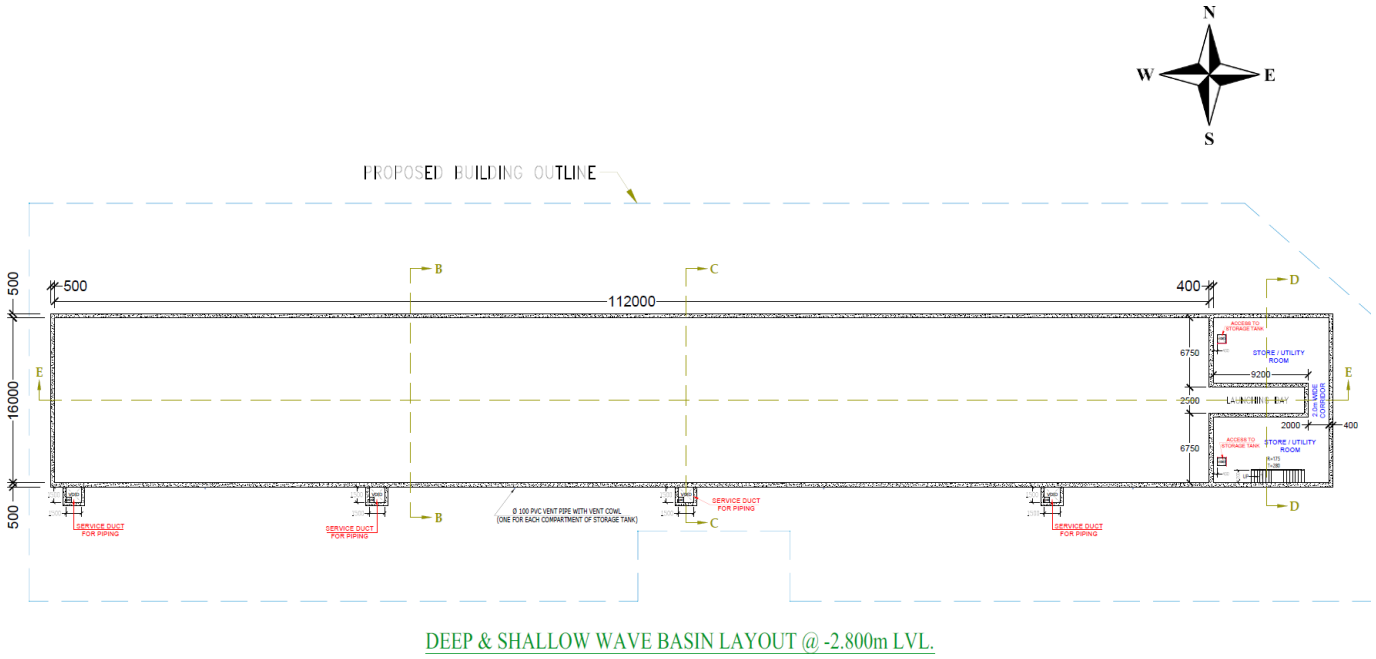
Figure 1: General arrangement of CICMT's DSW-SMB and CPMC.



DEEP & SHALLOW WAVE BASIN LAYOUT @ -2.800m LVL.

Figure 2: DSW-SMB Layout

Technical Specification

1. **Dimensions of the DSW-SMB**
   - 1.1. Length: 112 m
   - 1.2. Width: 16 m
   - 1.3. Depth of the Basin wall: 4 m
   - 1.4. Range of operational water depth: 0.5 m to 3.5 m
2. **Wave specification**
   - 2.1. Maximum wave height: 0.5 m
   - 2.2. Maximum time period: 2.5 sec
   - 2.3. Range of water depth for which wave shall be capable of being generated: 2.5 - 3.5 m
   - 2.4. Wave type:
     - 2.4.1. The system shall be capable of generating random deep water waves corresponding to internationally recognised sea spectrum such as Pierson-Moskowitz (ITTC-81), Bretschneider (ISSC), Bretschneider-Mitsuyasu, Modified Bretschneider-Mitsuyasu, JONSWAP, Generalised Γ, TMA, FRF, Top-Hat, Gaussian Swell, Torsethaugen, Ochi-Hubble 1P and Ochi-Hubble 2P.
     - 2.4.2. Only unidirectional waves needs to be generated.

3. **Wavemaker Type:** Wet Back
4. **Control system:**

4.1. A close loop control system which will control the position of the paddle and monitor the same in real time by means of an absolute digital position sensor and enable the recording of many system parameters.

5. Wave generation software:

5.1. The wavemaker should come with a wave generation software with easy to understand GUI to control the wavemaker. The wave generation software should run on a dedicated computer running on Windows 11.

6. Active wave absorption system:

6.1. It should compensate the wave reflections and eliminate the re-reflections towards the basin.

7. **Power requirement:**

7.1. All the electrical system shall be capable of working with AC 440 V, 50 Hz, 3 phase power supply. Each phase will be 220 V.

7.2. The technical specification submitted by the supplier in the tender document should specify the energy requirement in the technical document.

8. **Material of the wave maker:**

8.1. All the material used for making wavemaker should be durable and corrosion resistant in marine environment.

8.2. The wave paddles frame and its other structural members should be made with stainless steel grade 304 and paddle panels should be made of glass fibre reinforced plastic/equivalent material.

9. Wave paddles:

9.1. Eight number of wave paddles on the short and West side of the basin to be provided.

9.2. Each paddle should be 2 m wide so that it can be accommodated in 16 m width of the basin.

9.3. The paddles should move synchronously to generate 2D waves in the basin.

9.4. The wavemaker paddles to be hinged at the bottom of the basin.

9.5. Any civil work needed for installation of the wave maker in the scope of the supplier.

10. Active wave absorption system:

1.1 The wave paddles shall also be capable of working as active wave absorber during normal model testing.

1.2 Suitable number of wave gauges shall be provided on the wave paddle and other location of the tank, which will give feedback signal to the system for efficient working.

2. **Passive wave absorption system (beach):**

2.1 The wave maker manufacturer needs to supply the passive wave absorption system (beach). The beach will be installed at the opposite end of the tank to the wave maker.

2.2 The beach shall be capable of being lifted and lowered into the tank bottom to increase the effective length available for testing.

2.3 The DSW-SMB has a launching bay on the East side of the facility as shown in figure-1 of the facility. In order to tow out the ship model from the launching bay to the basin area, the

beach shall have a dismountable/sliding type centre portion (2.5 m wide) , which can be easily removed.

2.4 The all the material used to construct the beach should be made up of stainless steel of grade 304.

2.5 All civil work related to installation of the beach in the scope of the supplier.

3. **Wave absorber behind the wavemaker should be made of Stainless steel of grade 304.**

4. **Control unit:**

4.1 One cabin shall be provided on the outside for housing all the control equipment of the wave maker unit. The specification of the cabin needs to be provided by the supplier in the tender document.

5. **Other features:**

5.1 Very accurate position tracking, including records of real motion and set-point values.

5.2 Easily configurable digital active wave absorption.

5.3 Multiple safety features, such as real-time supervision of position, speed and acceleration limits, or setpoint signal attenuation in exceptional cases.

5.4 System self-check and calibration routines directly implemented in software.

5.5 Electrical motors and panels shall be capable of working in heavy duty/ industrial type environment having relative humidity more than (90%). Suitable insulation/ protection (IP68 protection, provision for panel heating/ dehumidifying, etc) shall be provided by the manufacturer.

5.6 Safety mechanism and emergency shut-off should be provided.

5.7 The entire wavemaker system should have compliance with relevant safety and environmental standards.

5.8 Manufacturer shall specify the maximum time limit for continuous working of the system for generating random wave.

6. **Documents to be provided with the wave maker:**

6.1 Technical Specifications and Data Sheets:

- Detailed specifications of the wavemaker, including dimensions, materials, performance capabilities, and tolerances.
- As built drawings.
- Data sheets for all major components and subsystems.
- Theoretical performance map for 1st order regular waves.

6.2 Installation Manual:

- Step-by-step instructions for installing the wavemaker, including site preparation, electrical and mechanical connections, and required tools.

- Diagrams and illustrations to support the installation process.

6.3 Operation Manual:

- Detailed instructions on operating the wavemaker, including start-up, shut-down, and normal operating procedures.
- User interface guide for the control software.
- Information on how to create and modify wave patterns.

6.4 Maintenance and Service Manual:

- Routine maintenance schedules and procedures.
- Troubleshooting guide for common issues.
- Instructions for servicing and replacing parts.

6.5 Control System Documentation:

- Detailed description of the control system, including software and hardware components.
- Programming guide for customizing wave patterns.
- Network and communication protocols, if applicable.

6.6 Safety Manual:

- Safety procedures and precautions for installation, operation, and maintenance.
- Emergency shut-off instructions and safety mechanism details.
- Compliance with safety standards and regulations.

6.7 Calibration and Testing Certificates:

- Calibration certificates for sensors and measuring instruments.
- Test reports demonstrating the performance of the wavemaker under specified conditions.

6.8 Warranty Information:

- Detailed warranty terms and conditions, including coverage for parts and labour.
- Contact information for warranty claims and service support.

6.9 Compliance Certificates:

- Certificates of compliance with relevant industry standards and regulations (e.g., ISO, CE, UL).
- Environmental compliance certificates, if applicable.

6.10 Spare Parts List:

- Comprehensive list of spare parts with part numbers, descriptions, and recommended quantities to be kept in stock.

6.11 Training and Training Materials:

- Training to lab personal for operation and maintenance.
- Training manuals or guides for operators and maintenance personnel in digital and hard copy.

- Information on available training programs or sessions provided by the supplier.

6.12 Technical Support Contacts:

- Contact information for technical support, including phone numbers, email addresses, and online resources.

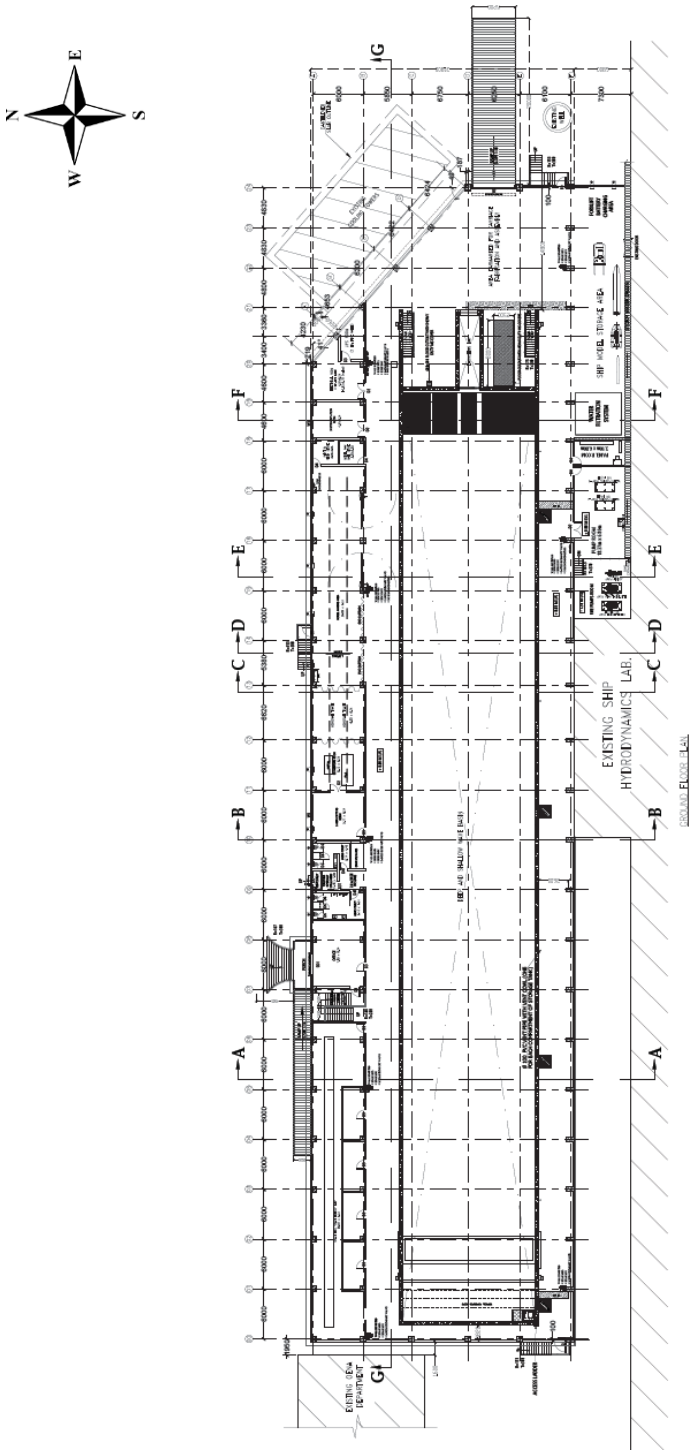


Figure3: Ground floor plan showing principal general arrangement of the tank