RFP FOR ESTABLISHING FULL BRIDGE SIMULATOR

Specific Conditions of Contract – Tender No. NTCPWC/1/2018

National Technology Centre for Ports, Waterways and Coasts (NTCPWC)
IIT Madras

1. **Important Information**
   Date of release of RFQ : 1th Nov. 2018
   Date of Pre-bid meeting : 15th Nov. 2018
   Date of submission of bids and opening : 21st Nov. 2018
   Date of announcement of qualified bidders : 21st Nov. 2018
   Date of presentation of proposals and product demo : 29th Nov. 2018
   Date of opening of financial bid : 29th Nov. 2018

   The successful bidder shall complete the implementation within 6 weeks from the date of LoA / order. The space where the bridge will be commissioned is already equipped with HVAC, Electrical and Network services. During the pre-bid meeting, the interested bidders will be able to visit and see the space, and provide any requisite inputs.

2. **Duration of Project (DoP):** The duration of this project is termed as 5 years. This is duration of intended operation of the simulator with the vendor / collaborator.

3. **Duration of Agreement (DoA):**
   Under this RFP/Contract the agreement between NTCPWC & Bidder may be extended beyond DoP on mutual consent.

4. **Qualification of Bidders: The bidder should have**

   4.1 Installed and commissioned a minimum of 1 No. 360 degrees full bridge during the last 1 year.

   4.2 A proven track record of developing bridge simulators including capabilities of tugs, moorings etc.

   4.3 A proven track record of developing ports & ship models for feasibility studies including inland craft. Developed & commissioned an average of 5 simulators (of any configuration) during the last 5 years that must include Bridge integrated with Tug simulator and port Vessel Traffic Management System (VTMS) simulator.

   4.4 The Ship-Handling simulator shall be in compliance with the latest international standards / classification societies demonstrating its capability of fulfilling the required specifications for Ship Maneuvering Simulator.

   4.5 In order to prove 4.1, 4.2, 4.3 & 4.4 the bidder shall attach the necessary documentary evidence such as Letters of Award, Certificates of compliance to standards, & completion documents from the clients. The bidder shall highlight installations within India separately.
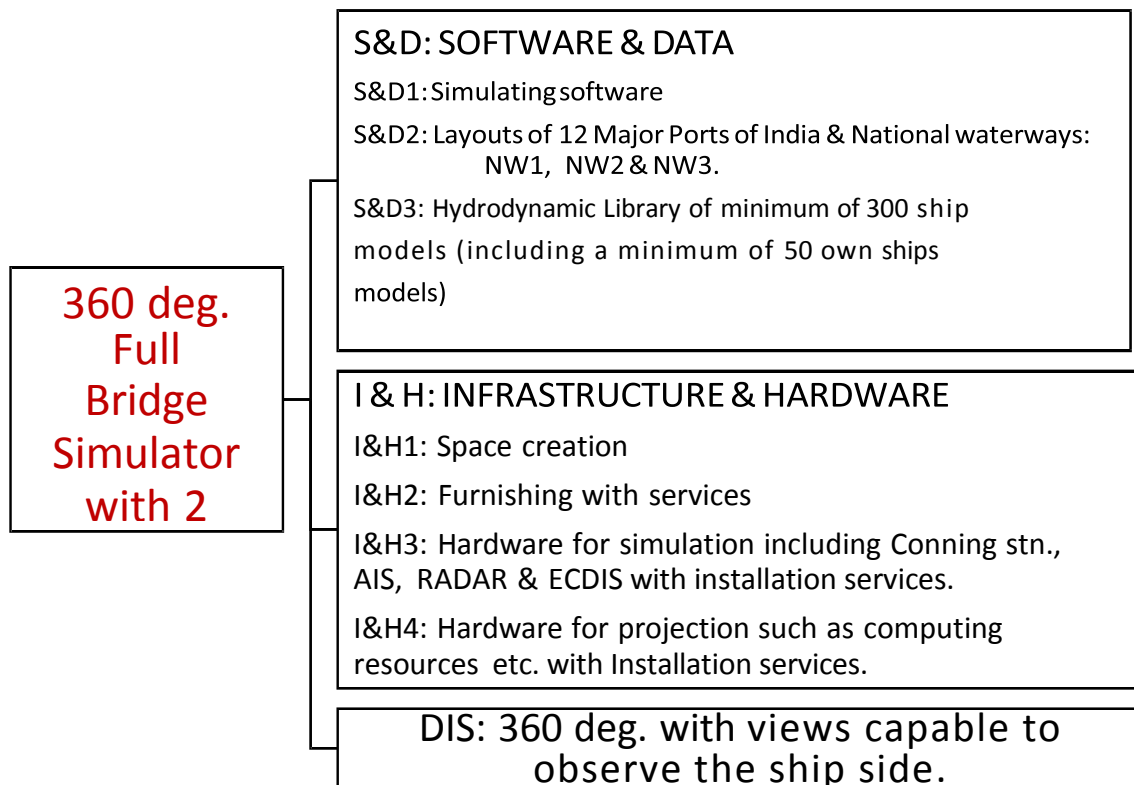
5.   Scope of execution

The bidder is responsible for procurement and installation of the hardware/software, unless otherwise specified and to maintain the facility for the period of 5 years. The bidder shall also provide any software upgrades which may be available from time to time.   The facility will be called as IITM- <bidder> Full bridge simulator.

The details of the major components of the system/procurement are provided below.

5.1 Major Components of the procurement

Illustration in Fig.1 describes a schematic overview of the proposed Ship/Tow Simulator facility envisaged to be setup at NTCPWC. The simulator shall be provided with 2 no. of tug stations. The hardware / software and other components of the 2 tug stations are also part of this tender.

Bidder shall provide design diagrams for the system integration and space utility to setup the simulators in our facility. The simulator will be setup in the interim space provided at IITM (Annexure-I) campus. Subsequently it will be moved to the permanent space at the IITM Discovery Campus (Annexure-II) which is along the fast developing Old Mahabalipuram road. The Annexure - I (the space is fixed) and Annexure -II (space can be flexible) shows the space available, the bidder should plan accordingly. The bidder shall target development of the system for the permanent space while also taking into consideration of its suitability to interim space. The quote should include the commissioning, decommissioning of the simulator at interim space and re-commissioning at permanent space. The transportation and   logistics will be provided by IITM.

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┌─────────────┐       ┌──────────────────────────────────────────────┐
│ 360 deg.    │       │ S&D: SOFTWARE & DATA                         │
│ Full        │       │ S&D1: Simulating software                    │
│ Bridge      │───────│ S&D2: Layouts of 12 Major Ports of India &   │
│ Simulator   │       │        National waterways: NW1, NW2 & NW3.   │
│ with 2      │       │ S&D3: Hydrodynamic Library of minimum of 300 │
│             │       │        ship models (including a minimum of   │
│             │       │        50 own ships models)                  │
│             │       └──────────────────────────────────────────────┘
│             │       ┌──────────────────────────────────────────────┐
│             │───────│ I & H: INFRASTRUCTURE & HARDWARE             │
│             │       │ I&H1: Space creation                         │
│             │       │ I&H2: Furnishing with services               │
│             │       │ I&H3: Hardware for simulation including       │
│             │       │        Conning stn., AIS, RADAR & ECDIS with │
│             │       │        installation services.                │
│             │       │ I&H4: Hardware for projection such as         │
│             │       │        computing resources etc. with          │
│             │       │        Installation services.                │
└─────────────┘       └──────────────────────────────────────────────┘
                      ┌──────────────────────────────────────────────┐
                      │ DIS: 360 deg. with views capable to          │
                      │       observe the ship side.                 │
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Fig.1. Layout of Bridge and Project Components.

The following are the minimum expectations of NTCPWC under this RFQ. This bidder is free to provide higher specifications. During technical evaluation the best technical specification will be given full marks if this aligns with the interests and goals of NTCPWC (www.ntcpwc.iitm.ac.in).

5.1.1. S&D1: The software should able to do the following minimumstudies/training.

5.1.1a. The ship and tug simulator can be used to do the following type of studies

- Navigation in open waters
- Coastal Navigation
- Navigation in high traffic density situations
- Approaching harbour
- Approaching berth
- Mooring
- Berthing and un-berthing
- Standard Maneuvering
- Passage planning and execution
- Collision regulations
- Radar operations
- Radar operations under conditions of blind navigation
- Electronic navigation systems
- Use of ECDIS in conjunction with Radar and other navigational aids
- Bridge watch keeping procedures
- Tug – barge system navigation in inland waterways.

5.1.1b. Simulator is suitable for use in emergency situational training including but not limited to:
- Various engine failures and breakdowns including slowdown and shutdown
- Rudder failure/breakdown
- Steering machinery failure/breakdown
- Gyro failure/breakdown or error
- Radar failure/breakdown
- Navigational aids and interfaces failure/breakdown

5.1.1c. Environment Navigation Training

Simulator is suitable for training use in exceptional environment including but not limited to:

- Night Time Navigation
- Navigation in poor visibility
- Navigation in heavy rain
- Navigation in strong wind and severe sea states
- Navigation in strong currents
- Navigation in areas of rapidly changing currents

5.1.1 d. Simulator can be used to conduct several kinds of courses including, but not
limited to:

- Ratings forming part of navigational watch
- Helmsman training
- Ship handling
- Navigating ships in open waters with increasing traffic density
- Navigating ships in straits and traffic separation schemes with varying traffic density
- Collision avoidance for watch-keeping officers
- Rules of the road – practical applications
- Collision avoidance
- Bridge simulator Instructor training
- Radar observation and plotting
- Radar simulator
- ECDIS training

5.1.1e.. The software should have provision for the following

- Ship to ship interactions
- Collision
- Multi-body dynamics
- Anchoring
- The simulator should able to present multiple target ships at the same time, where the instructor is able to program voyage routes for each target ship individually.
- The target ships are equipped with navigational lights, shapes and sound signals, according to "Rules of the road".
- The software model realistically simulates own ship dynamics in 6 degrees of freedom.
- The software model realistically simulates own ship hydrodynamics in open water conditions, including the effects of wind forces, wave forces, tidal stream and currents.
- The simulation includes the depth according to charts used.
- The model realistically simulates own ship hydrodynamics in restricted water-ways.

In the hydrodynamic models, the vessel model will account for forces and moments arising out of:

- Hydrostatics and stability conditions
- Hydrodynamics and aerodynamics
- Propulsion - propellers, pods and thrusters
- Control surfaces – rudders and fins
- External forces – environment wind, current, waves, narrow channels, low under keel clearance and conditional forces – e.g., mooring ropes, anchors, chains, wires, fenders, berths and quays, etc.

5.1.1.f . The software compulsorily needs to provide the custom interface for integration of IITM hydrodynamic module with the simulator. In this scenario the simulator software shall be capable of receiving all mathematical data related to the position and orientation updates of the vessel solely from the IITM Module when running in integrated mode. For this purpose, the bidder must provide an SDK to IITM & provide technical information in the bid proposal.

Further, in future, the simulator should have the capability to handle and link the real time experiments which will be carried out in the Shallow basin (70m x 100m x 1m) & Large Wave tank (500mx 5m x 8m). The details of these facilities are shown in the Annexure II. Thus, create NTCPWC as the state of the art testing facility in the world. An initial concept/ framework can be provided in the bid proposal.

5.1.1g. The software should be certified by latest classification body / international standard.

5.1.2. S&D2: NTCPWC has interest and goals related to simulation of 12 major ports and inland waterways. For this to be achieved input data related to port layouts, video or images, environment conditions from the 12 major ports and Inland waterways is required. The bidder can supply such data or maybe provided by NTCPWC. If NTCPWC provides any data then the bidder shall maintain confidentiality of such data unless this data is already available with the bidder, available in the public domain or sourced independently of NTCPWC. Considering the above the bidder may elaborate in the bid proposal on the overall approach and related costs.

5.1.3. S&D3: The bidder should provide minimum 50 own ships of varying size & load conditions usually applicable for port navigation and 250 target ships from its library with international standards. In case, NTCPWC may choose to develop ship models on their own, the bidder should propose the framework/ process and may elaborate in the bid proposal on the approach. Considering the above, the bidder may elaborate in the bid proposal on the overall approach and related costs.

5.1.4. S&D4: The environmental conditions such as waves, wind and currents should be easily interfaced and NTCPWC should able to provide this information externally. The bidder should propose the framework/ process and may elaborate in the bid proposal on the approach and related costs.

5.1.5. S&D5: With reference to S&D2, Simulation scenarios (Day and Night) related to 12 Major Ports and 3 National Waterways is envisaged. The bidder should propose the framework/ process for the simulation scenario creation and related cost. In case, NTCPWC may like to develop scenarios (day and night) on their own, the bidder may elaborate on the approach in the bid proposal.

5.1.6. I&H1 and I&H2: The interior and architectural plan for both the space should be provided by the bidder. This plan should be part of the proposal. However, NTCPWC will provide this at its cost.

5.1.7. I&H3: The minimum hardware for full bridge simulator and 2 tug station includes but not limited to,

- Instructor & Simulation Server applications
- Printer (optional)
- Instructor can Launch, Pause, Resume exercises including replays. Some of the available features for control and monitoring during exercises include:
  - Control and monitoring of the available environmental conditions such as current, visibility, wind, swell, precipitation, and clouds
  - Monitoring of the own-ship and target ship parameters
  - Start, stop, pause, and restart of exercises

- Control of the target ship shapes, signals, and lights
- Control for target ships' course and speed
- Creating of hazardous and challenging conditions for trainee by fault injection in navigational equipment and machineries
- Ship Handling Equipment should include
  - RADAR with international regulations
  - ECDIS with approved standards
  - CONNING AND MANOEUVRING CONSOLE includes,
    - Rudder controls and indicators
    - Rate of Turn indicator
    - Magnetic compass and Gyro compass repeaters
    - Engine controls including RPM and thruster control
    - Doppler Log
    - Time, wind, distance sailed, depth indicators
    - Own ship navigational lights display control
    - Own Ship Fog Horn (Auto/Manual) controls
    - Pilot card and maneuvering characteristics for own vessel
    - Engine Alarm Panel
    - Engine Telegraph control
    - View Control
    - Navigation Aids module

Note: This is only an indicative list, however, the vendor shall take into account all the required hardware components to match with their proposed methodology/design requirement and must include any software interfaces and services.

5.1.8. **I&H4:** The bidder should provide the hardware for the computational resources. There should be a provision for parallel streaming of the observation in the conference/discussion room that was provided adjacent to the bridge simulator room also. This must include any software interfaces and services.

5.1.9. **DIS:** The simulator should have a 360^0 view with additional views for observing the ship side. It should also have the projection on the floor, such a way that entire side and bottom should be covered to mimic as such in real sea state. It is up to the bidder to recommend projector or LED/ equivalent display based solutions and specify the cost for each scheme of implementations. Preferably, NTCPWC expects the configuration for n-polygon shape instead of pure cylindrical shape display.

5.2 Collaborative mode of execution between NTCPWC & Bidder

In this mode, NTCPWC welcomes proposals to supply on the basis of collaboration. IITM will provide the entire necessary infrastructure to run the simulator. The participating bidder need to provide the software and necessary manpower training for the DoP. The bidder may suggest ways of working together for future technical advancements and industry based requirements. Table 1 below highlights the expectations and responsibilities of NTCPWC & bidder.

Table. 1. Responsibility of parties in Collaborative mode of execution.

Component as per Fig.1	NTCPWC	Bidder
S&D1	-	Yes. Bidder shall provide and maintain for 5 years.
S&D2	To be provided by bidder on payment basis.	-
S&D3	Yes	
S&D4	Yes	-
S&D5	To be provided by bidder on payment basis.	-
I&H1	Yes	-
I&H2	Yes, on the basis of bidder's design. Bidder shall provide the requirement including the specifications. NTCPWC will provide this facility at its cost. Maintenance of these items will be under NTCPWC.	-
I&H3	Yes, on the basis of bidder's design. Bidder shall provide the specifications and cost for procurement and warranty for 5 years.	-
I&H4	Yes, on the basis of bidder's design. Bidder shall provide the specifications and cost for procurement and warranty for 5 years.	-
DIS	Yes, on the basis of bidder's design. Bidder shall provide the specifications and cost for procurement and warranty for 5 years.	-

a) Under partnership, the bidder can specify cost of the software, at will, for justifying the revenue sharing.
b) IITM will provide the necessary manpower for bridge operations.
c) All the necessary training will be provided by the collaborating bidder.
d) All the operations of the facility will be carried out by trained IITM personals only. This does not include the layout creations, exercise area, ship model and executions.
e) In this collaborative mode, the industry should ensure the joint R&D development for the new modules with IIT Madras. Any IP developed under this mode will be

shared between the parties under mutual consent / negotiation.

6. Method of Selection

The method of selection is based on the technical content, commercial and financial outcome of the project.

6.1. Technical Selection

The bidder should provide a best technical proposal with long term collaboration and highlighting their know-how in creating the facility at IIT Madras. The bidder will be evaluated in each component; the weightages are provided in Table 2.

Table. 2. Weightages for various components in evaluation of TP.

Component as per Fig.1	Weightage (%)
S&D1	50 • Physics part • Visualization part • Integration SDK • Future Adaptability & Approach to physical model integration • Certification to latest 2018 DNV Standards
S&D2	- NIL -
S&D3	10
S&D4	10
S&D5	- NIL -
I&H1	- NIL -
I&H2	5
I&H3	7.5
I&H4	7.5
DIS	10
Total	**100**

6.3. Techno-commercial Selection

This is a QCBS (Quality cum cost based selection) tender. The Technical Proposal (TP) has a weightage of 60%. The Financial Proposal (FP) has a weightage of 40%. TP is

evaluated as per 6.1 above. The FP is evaluated on the basis of Total Cash Outflow (TCO) from NTCPWC. This will be evaluated as given in Table 3.

The individual Bidder's commercial scores (CS) are normalized as per the formula $F_n=100*F_{min}/F_b$ (rounded off to 2 decimal places), where F_n=Normalized commercial score for the bidder under consideration; F_b=Absolute price quoted by the bidder under consideration & F_{min}=Minimum absolute financial quote.

Composite Score, $CS=TP*0.6+F_n*0.4$. The bidder with the highest composite score, CS, would be awarded the contract.

Table. 3. Definition of Total Cash Outflow (TCO) from NTCPWC

Cash component	Notation
Initial Cost	CaPex
Operation and Maintenance for 5 yrs to be paid by NTCPWC	O & M
Replacement costs at the end of 5 yrs	RC
Revenue share	RS

$TCO = CaPex + O \& M + RC + RS$

Table 4, can be used for the expected revenue from the projects with NTCPWC and therefore define RS for the above purpose. However, the project earnings below are not the commitment from the NTCPWC. Similarly, the bidder can propose their expected projects and cost that they can bring from India or abroad. The revenue shares for such projects are to be separately indicated by the bidder. However, this component will not be used for defining TCO.

Table.4. Expected Projects and Costs

Details	Expected Number of projects every year (NTCPWC)	Expected costs per year (USD)
Out of 12 Major ports (with each project costs about USD 43,470).	6	USD 260, 000
Inland waterways (with each project costs USD 28,000)	3	USD 85,000
Total		USD 345,000

7.   Other conditions

7.1. Prioritization on mutual consent between NTCPWC & Bidder: Based on the project and necessity the decision will be made by NTCPWC.

7.2. Project monitoring and logging mechanism: The bidder shall provide project monitoring and logging mechanism, it will be agreed upon on the mutual consent.

7.3. Academic use on FOC: The bidder shall agree to use the facility available free of costs for academic and research purposes to IIT Madras with suitable monitoring and logging mechanism.

7.4. IPR Sharing: On mutual consent.

Sample Template for the Technical bid

The bidder can prepare their own template. However, the following key points should be included under the proposal for evaluation purpose.

1. Plans and drawing for interim arrangement at IITM (I&H1 and I&H2). Annexure I will provide the space details. This space is fixed
2. Plans and drawing for permanent arrangement at IITM (I&H1 and I&H2). Annexure II will provide the space details and proposed master plan of the NTCPWC; however this space can be changed if required. Further, in the event bidder suggests some additional furnishing/requirement at the permanent facility for the betterment of the proposed system, NTCPWC will consider the same at appropriate time and facilitate the same.
3. Bidder Software capability in compliance with minimum tender documents
4. Bidder Hardware recommendations.
5. Proposals for manpower training – minimum 3 personnel.
6. Proposal for Collaborative model in operating the bridge. Express clearly your intension and expected projects, software developments and so on.

Sample Template for the Financial bid

The bidder can prepare their own template. However, it would be better if they include the item wise costs.

Give clear details for each cost as far as possible. Bidder may include any missing cost information, if deemed necessary.

Component as per Fig.1	NTCPWC Costs*	Bidder Costs
S&D1 Costs for each module should be specified.		
S&D2 and S&D5 Costs for each layout as per bidder.		
S&D3 Costs for minimum ship library.		
I&H3 Specification of each hardware and its cost for procurement with 5 years warranty		
I&H4 Specification of each hardware and its cost for procurement with 5 years warranty		
DIS Considering both interim and permanent locations, specification of each item and its cost with 5 years warranty		
Manpower training (minimum 3 person)		
O&M costs for 5 years		
Replacement cost at the end of 5 years		
Installation and commissioning costs		
Costs for shifting the simulator at the permanent facility		
Revenue share		

*Liability of the NTCPWC and the bidder will be limited to the amount indicated against each item, listed hereunder or actual cost incurred against each item, whichever is less.