

SCOPE OF WORKS DESCRIPTION WAVE ABSORPTION SYSTEM SMB

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1107305 Ocean Space Centre

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PROJECT OCEAN SPACE CENTRE

SCOPE OF WORK DESCRIPTION

WAVE ABSORPTION SYSTEMS SMB

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1 Introduction

1.1 Objective

The purpose of this document is to define the Scope of Work for the design, detailed engineering, manufacturing, delivery, installation and commissioning of wave absorption systems of Seakeeping and Manoeuvring Basin at the hydrotechnical laboratories at Tyholt, Trondheim. The new wave absorption units shall be delivered complete, as well as local control system and interfaces to the centralized control system of the hydrodynamic laboratories.

1.2 Short introduction of delivery

The Seakeeping and Manoeuvring Basin shall be equipped with highly efficient wave absorption systems made by steel or suitable corrosion protected aluminum units integrated in the basin wall civil structure. The beach system will mainly consist of steel structures with a parabolic shaped perforated or non-perforated top plate followed by movable extensions into the water volume. The extensions are also used to provide a continuous transition between the beach and the movable bottom floor. On the long west side, the extensions must be able to be moved in vertical position to close of the basin wall if and only the wave generators on the short north side are in use. The beaches will consist of large prefabricated standing structures that will be transported to site and assembled together. The beach system at the long west side will have a basin length of ca. 168 m and consist of 56 large fixed units each tentative size L6.5 x W3 x H2.6 m and 56 movable flaps into the water volume each tentative size L3.5 x W3 m. The flaps will be operated with electric motors and mechanical propeller shafts. The beach system at the short south side will have a basin length of ca. 40 m and consist of 10 off large, fixed modules each tentative size L12.2 x W3.35 x H6 m, 1 off large movable module tentative size L12.2 x W6 x H6 m, 1 of large movable module tentative size L12.2 x W3 x H6 m and 1 off large fixed module tentative size L12.2 x W4.8 x H6 at the end corner of the beach. The movable beach modules will be installed in front of the trim docks attached to the The Seakeeping and Manoeuvring Basin and will be operated by water hydraulic cylinders or electric actuators.

1.3 Definitions and abbreviations

Definitions:

Company:	Statsbygg, which is the Norwegian government's key advisor in construction and property affairs, building commissioner, property manager and property developer.
Purchaser:	Company
Contractor:	The party named as such in the Form of Agreement
Subcontractor:	Third Party who has entered into an agreement with the Contractor for the supply of goods or services in connection with the Work.
EPC K202	EPC Contractor responsible for demolition works, ground works for building B and shortening of existing towing tank.
End-user:	Sintef Ocean and NTNU
Plant:	The machinery, apparatus, materials, articles, documentation, software and other products to be supplied by the Contractor under the Contract.
Works:	The plant, installation of the plant and any other work to be carried out by the Contractor under the contract.

Company Materials: Equipment, systems, and/or materials supplied by Company and which are to be incorporated in the Contract Object.

Abbreviations:

DFO	-	Documentation for Operation
HLCC	-	Hydro Laboratory Centralized Control
MC	-	Mechanical completion
MDP	-	Master Document Plan
MIS	-	Main Interlocking System
NS	-	Norwegian Standard
OB	-	Ocean Basin
OSC	-	Ocean Space Centre
SMB	-	Seakeeping and Manoeuvring Basin
JCP	-	Joint Collaboration Phase

2 The Works

The Works consists of the following main elements:

- a) Participation in joint collaboration phase
- b) Design, engineering, manufacturing, assembly, delivery
- c) Documentation
- d) On-site supervision and Installation work
- e) Mechanical completion and Commissioning work
- f) On-site system acceptance test
- g) Training Courses

2.1 Participation in Joint Collaboration Phase (JCP)

Contractor shall participate in a joint collaboration phase together with the EPC contractor for construction of building B (EPC K203) of the Ocean Space Centre Project. The JCP will be headed by Company. The End User will also be involved in the JCP.

The main purpose of the joint collaboration phase is to implement all requirements of the user equipment for the wet laboratories into the design and construction of building B. The purpose is also to investigate and resolve performance issues related to interaction between other equipment systems and to clarify interfaces to End User control systems. JCP will also include final review of the project's overall logistics plan and delivery schedule. Contractor shall also expect adjustments including value engineering of user equipment design and functionality as a result of the collaboration. Such adjustments shall be listed and be the basis for determination of fixed final Contract price. To meet the strict requirements for wave quality, the design of the wave absorption systems will be finalised in the JCP and must consider the interaction with other systems in the basin, e.g. the wavemakers, the current generation system and the movable floor systems.

During the collaboration phase, all interfaces between each user equipment supplier and EPC K203 shall be identified and agreed. Interface agreements shall be established.

Participation in the JCP will be on a reimbursable basis. As a guidance, Contractor shall anticipate the following:

- JCP duration in total: 50 weeks. Expected to be started in January/February 2023
- Contractor participation period in the JCP: 36 weeks
- Expected Contractor manpower load: Two persons, two days a week
- Main collaboration tool: Teams-meetings, and occasionally physical meeting in Trondheim or Oslo. Exchange of design documentation.

2.2 Design, engineering, manufacturing, assembly and delivery

The design, engineering, manufacturing, assembly and delivery comprise of such items as:

- Provision of own organisation including head office support services, administration and a project organisation to manage and control the execution of the Work including complying with all requirements of document OSC-80-SB-Q-SD-00001 Administrative Procedures.
- Provision of scientific and technical experts for the hydrodynamic design and optimisation of Contractor Material
- Optimisation of transportation, logistics and installation to be shown in a separate schedule for size of objects, travel distances, installation needs etc.

- Provision, maintenance, operation and demobilisation of all required facilities to complete the engineering, manufacturing, assembly and delivery.
- Contractor's system engineering and fabrication engineering
- Provision of materials for fabrication, manufacturing and assembly
- Fabrication, manufacturing, assembly of the complete wave generation units and electrical drives/control cabinets
- Programming
- Inhouse testing including witness tests
- Documentation of own equipment and functions
- Miscellaneous

Contractor shall perform the system engineering, fabrication engineering, design and documentation required for the manufacturing, fabrication, assembly, and completion of the Works. Contractor shall also produce all documentation required for the civil interfaces and interfaces to technical systems. Contractor's engineering shall include such as:

- System documentation and calculations for wave absorption systems
- Exchange of engineering data
- Engineering documentation
- Coordination of subcontractors and sub suppliers
- Tag numbering
- Identify necessary civil works, or any works by others required for the towing tank wave generation system.

Contractor shall in good time provide documentation of the expected and/or documented wave absorption coefficients for the proposed design.

Contractor shall in good time provide drawings and descriptions showing the manner in which the Plant is to be installed, together with all information required for preparing suitable foundations, for providing access for the Plant and any necessary equipment to the Site and for making all necessary connections to the Works. Contractor shall specify in detail requirements regarding electrical supply and communication network interfaces.

Equipment and main components shall be tagged according to requirements described in document OSC-80-SB-O-SD-00003, Tagging Requirements.

Inhouse testing including witness testing shall include Factory Acceptance Test (FAT) of assembled equipment, units and systems. Contractor shall prepare suitable test procedures for performance of the FAT. FAT shall contain a complete test of as many functions and signals as practical possible according to OSC-80-SB-O-SD-00008, Strategy for Systematic Completion of BUT

2.3 Documentation

Contractor shall provide all engineering and manufacturing documentation, including documentation provided by subcontractors, that are necessary to complete the Work in accordance with the requirements prescribed below:

- OSC-80-SB-O-SD-00001 Requirements for supplier documentation including DFO
- OSC-80-SB-Å-SD-00002 BIM requirements for special equipment
- OSC-80-SB-Å-SD-00003 SIMBA 2.0 General requirements

- OSC-SB-O-SD-00012 Action Plan for Digitization
- OSC-80-SB-Å-SD-00001 General attributes and properties in BIM models

2.4 Logistics and Transportation

The SMB Wave Absorption systems shall be fabricated in suitable sections that can be transported into the basin for assembly and further installation. The Contractor is responsible for transportation and shall perform transportation to the construction site.

The details of the optimisation of transportation, logistics and installation is to be shown in a separate schedule for size of objects, travel distances, installation needs etc.

2.5 On-site supervision and Installation work

Contractor shall perform desktop review of steel reinforcement documentation prior to casting to avoid clashes between support bracket bolts and the reinforcement steel. Relevant documentation will be provided by Company in due time prior to casting.

Contractor shall perform installation of the equipment attached. Before the Work starts, Contractor shall ensure that the installation site including foundations are ready for start of the installation work.

The installation work to be performed by Contractor will include the following main activities:

- Verification of construction tolerances of foundations
- Installation of specified equipment
- Installation of electrical drive control panels
- Electrical wiring between the specified objects and electrical drive control panel(s)

Necessary cranes, lifting equipment and equipment for transport on the Site will be provided by Company.

Company will provide the following:

- Cable supports, cabling and termination of electrical supply to the electrical drive control panel(s) from existing electrical local distribution board.
- Cabling and communication between HLCC, MCC(s) and Main Interlocking System (MIS). The fiber communication interface shall be located in a junction box placed in immediate vicinity of the equipment.

2.6 Mechanical completion and Commissioning work

Contractor shall perform mechanical completion activities and commissioning work according to the following requirements:

- OSC-80-SB-O-SD-00008, Strategy for Systematic Completion of BUT

All mechanical completion and commissioning activities shall be documented in Omega365.

The original Systematic Completion documentation shall be filed by Contractor. All documentation, which also shall include systematic completion documentation for Subcontractors, shall be compiled in systematic completion dossiers, kept in good order, continuously updated in Omega365 and available for Company before the activity take place. All works, inspections and tests shall be completed, and all punch items shall be identified and registered in Omega365. Any transfer of A-punch items at a phase transition must be approved by Company.

Contractor shall perform all commissioning of the Contract Object, including the provision of procedures, special tools, commissioning spares etc.

2.7 On-site system acceptance test

Based on input from end-user, Contractor shall prepare acceptance criteria for the *wave absorption system in SMB*.

Contractor shall prepare a detailed on-site acceptance test procedure, as well as a test schedule. The on-site acceptance test procedure shall be submitted to Company for approval.

Contractor shall perform the on-site acceptance test including interface to end-user's HLCC system. The on-site acceptance test shall be witnessed by representatives from Company and End-user. Contractor shall specify in writing his requirements concerning performance of the on-site acceptance test including any assistance needed at the latest one month prior to agreed date for starting the acceptance test.

2.8 Training Courses

Contractor shall provide professional training of End-user operators and service/maintenance personnel. Each type of course shall be described, including required equipment and facilities. Training documentation shall be presented latest 4 weeks prior to the training courses will take place. Training shall be held in Norwegian or English language.

3 References

- OSC-30-H004-M-SP-00045 Scope of Work description wave absorption systems SMB
- OSC-30-H004-M-SP-00046 Requirements for wave absorption systems SMB
- OSC-80-SB-O-SD-00001 Requirements for supplier documentation including DFO
- OSC-30-H004-S-SP-00001 Requirements for Automation Control and Safety Systems – User equipment
- B-01-M-663-60-002 System diagrams beach systems SMB
- OSC-30-H004-M-LI-00006 K663-03 Equipment list from dRofus wave absorption SMB
- OSC-80-SB-O-SD-00008 Strategy for Systematic Completion of BUT
- OSC-80-SB-Q-SD-00001 Administrative Procedures Suppliers
- OSC-30-H004-Z-RA-00004 Material selection report
- OSC-30-H004-Z-RA-00002 Requirements for corrosion protective coatings
- OSC-80-SB-O-DB-00001 Technical Design Basis
- OSC-30-SB-O-SD-00008 Interface description
- OSC-30-SB-O-SD-00004 Interface matrix