SCOPE OF WORK DESCRIPTION
OCEAN BASIN CURRENT SYSTEM PUMPS
OSC-30-H004-M-SP-00001

1107305 OCEAN SPACE CENTRE

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PROJECT OCEAN SPACE CENTRE

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OCEAN BASIN CURRENT SYSTEM PUMPS

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1 Introduction

1.1 Objective

The purpose of this document is to define the Scope of Work for the manufacturing, delivery, installation, and commissioning of the ocean basin current system pumps with required accessories (hereafter denoted as **CS Pumps**) at the hydrodynamic laboratories at Tyholt, Trondheim. The complete supply should be fit for purpose and is expected to include installation frames, inlet sections, diffusors, motor control centers with local control, necessary tools for operation and maintenance and required spare parts as well as any other parts the supplier deems necessary to fulfill the functional requirements. Spare units can be proposed in case Supplier deems it is the most viable alternative

1.2 Description of delivery

Pumps in the return channels adds momentum to drive the current system. The conceptual design involves a number of submerged, axial pumps (currently 48). An alternative configuration with dry-mounted pumps is also being considered. To ensure adequate control of the flow field, the speed of the pumps shall be controlled individual. The flow passage is divided into separate channels. The motor control centres and frequency converters are placed along the walls along the east and west side of the basin.

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.
EPC K203	EPC contractor for construction of building B of the Ocean Space Centre Project
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:

CS	-	Current System
DFO	-	Documentation for Operation
HLCC	-	Hydrodynamic Laboratory Centralized Control
JCP	-	Joint Collaboration Phase
MC	-	Mechanical completion
MCC	-	Motor Control Center
MDP	-	Master Document Plan
MIS	-	Main Interlocking System
NS	-	Norwegian Standard
OB	-	Ocean Basin
OSC	-	Ocean Space Centre
SMB	-	Seakeeping and Manoeuvring Basin
VFD	-	Variable Frequncy Drive

2 The Works

The Works consists of the following main elements:

a) Participation in Joint Collaboration Phase (JCP)

b) 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) Operator training Courses

The new CS Pumps shall fulfil the requirements described herein and in the following documents:

- OSC-30-H004-M-SP-00002 for Requirements CS Pumps
- OSC-30-H004-S-SP-00001 Requirements for Automation Control – and Safety Systems – User equipment

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.

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 Engineering, manufacturing, assembly, and delivery

The 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, including, but not limited to OSC-30-H004-M-SP-00002 Requirements CS- Pumps and OSC-80-SB-Q-SD-00001 Administrative Procedures.

- Provision of scientific and technical experts to hydrodynamic design and optimisation of Contractor Material
- Provision, maintenance, operation and demobilisation of all required facilities to complete the engineering, manufacturing, assembly and delivery.
- Contractor's systems engineering and fabrication engineering
- Provision of materials for fabrication, manufacturing and assembly
- Fabrication, manufacturing, assembly of the CS Pumps and electrical drives/control cabinets
- Programming
- Inhouse testing including witness tests
- Documentation of own equipment and functions
- Miscellaneous

Contractor shall perform the systems 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:

- CS Pumps, including inlet pipe, outlet diffusor, installation frames, motor control centre (MCC), variable-frequency drive (VFD) and electric drive/control cabinets. Necessary cabling between pumps and electric drive/control cabinets
- Exchange of engineering data, including, but not limited to, forces to be supported by the concrete structure, necessary foundation plates and construction requirements needed to ensure structural integrity of the Works.
- Engineering documentation
- Coordination of subcontractors and sub suppliers
- Tag numbering
- Identify necessary civil works, or any works by others required for the CS Pumps

Contractor shall in good time provide documentation of the expected and/or documented current and flow quality 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-SB-O-SD-00004, 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-SB-O-SD-00008, Project Completion Requirements.

2.3 Documentation

Contractor shall provide all engineering and manufacturing documentation necessary to compete the Work in accordance with the requirements prescribed below:

- OSC-SB-O-SD-00003, Requirements for supplier documentation including DFO
- BIM requirements for special equipment
- SIMBA 2.0 General requirements
- Action plan for digitalization
- General attributes and properties in BIM models

The DFO shall be delivered in English and Norwegian language. The DFO shall enable the End-user to operate, calibrate, and maintain the Plant throughout its intended lifetime. The DFO shall specify in detail all maintenance activities necessary to be performed in order to fulfil the guaranteed requirements.

2.4 Logistics and Transportation

The Current System shall be fabricated in suitable modules/elements 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 Plant in the Ocean Basin (OB). 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, support brackets etc.
- Submit all necessary static and dynamic loads expected to ensure structural integrity of all foundations and supports.
- Installation of CS Pumps stationary components, including inlet pipe, outlet diffusor, guides or rails or similar for CS Pumps frames/racks.
- CS Pumps frames/rack with pumps
- Installation of MCC, VFD and electrical drive control panel(s)
- Electrical wiring between CS Pumps, MCC, VFD and electrical drive control panel(s)

Necessary cranes, lifting equipment and equipment for transport on the Site will be provided by Company. The maximum lifting capacity of the overhead crane is 10 tonnes. Temporary construction hoists will have a limit that will be clarified in the JCP. Any necessary lifts exceeding this capacity must be planned for and arranged by the Contractor.

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 Current System Pumps in the new Ocean Basin.

Contractor shall prepare a detailed on-site acceptance test procedure, as well as a test schedule for. 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-00002 Requirements CS Pumps
- OSC-30-H004-S-SP-00001 Requirements for Automation Control – and Safety Systems User equipment
- OSC-80-SB-O-SD-00001 Requirements for supplier documentation including DFO
- OSC-80-SB-O-SD-00008 Strategy for Systematic Competion of BUT
- B-01-M-661-60-001 System diagram CS Pumps
- OSC-30-H004-M-LI-00005 K661-03 Equipment list from dRofus Current system pumps OB
- OSC-80-SB-Q-SD-00001 Administration 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