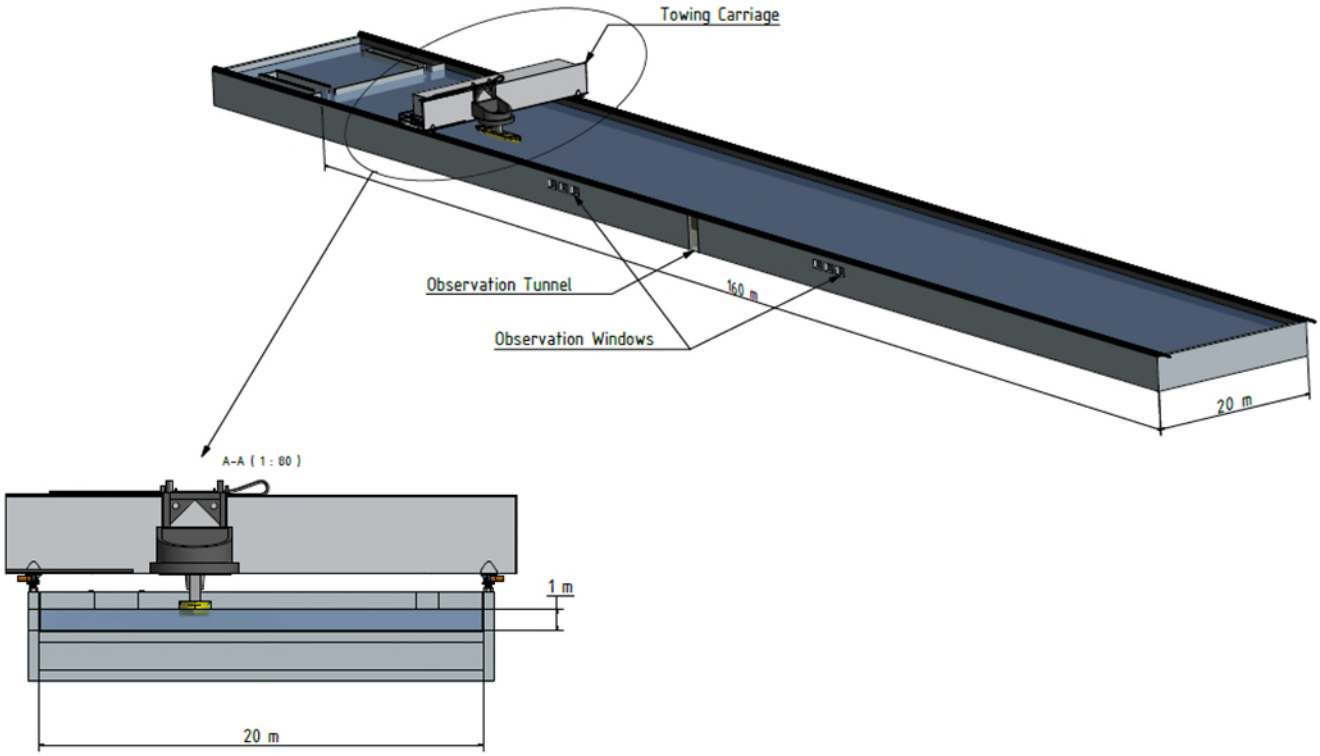
Name of organization Flanders Maritime Laboratory (Flanders Hydraulics (FH) – Ghent University (UGent))	**Year of information updating** 2023
Year established 1992	**Year of joining the ITTC** 1993
Address Wetenschapspark 8, 8400 Ostend, Belgium	**Status in the ITTC** member
Contact details (phone, fax, e-mail) FH +32 59 51 29 00 UGent +32 9 264 55 55 info@shallowwater.be	**Website** FH+UGent FH UGent

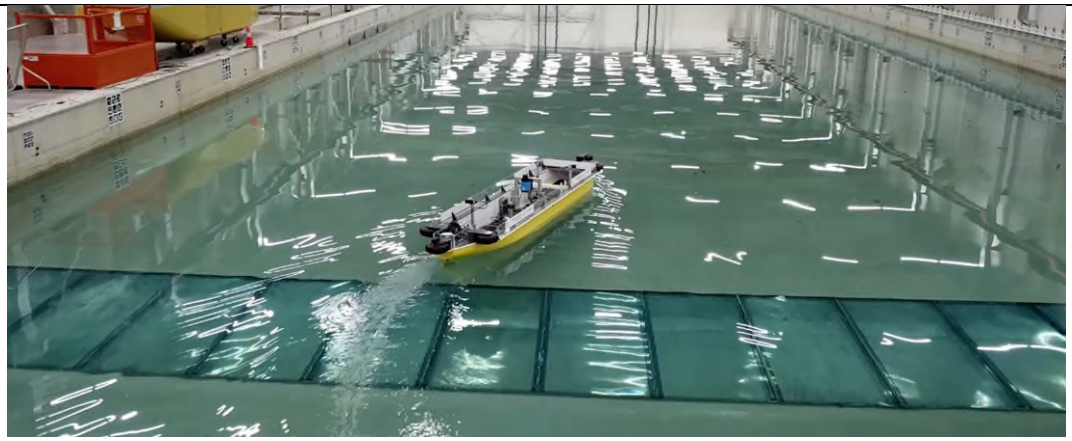
Type of facility Shallow Water Towing Tank	**Year constructed/upgraded** 2023
Name of facility Towing Tank for Manoeuvres in Shallow Water	**Location** (if different from the above address)

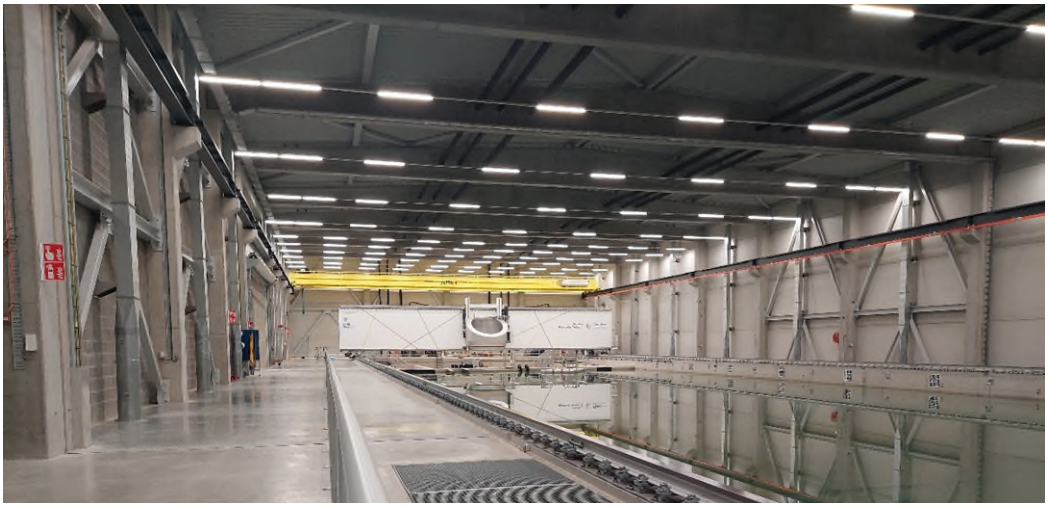
Main characteristics (dimensions of tank/basin/test section; for simulators: full mission, part task or desktop)

Total length	[m]	174.0
Useful length	[m]	161.6
Width	[m]	20.0
Maximum water depth	[m]	1.0
Length of the ship models	[m]	3.5 – 8.0

Drawings of facility







Detailed characteristics (carriages, wave/current/wind generators, instrumentations, etc.)

General

Site Acceptance Tests Towing Carriage June 2023, stepwise development towards fully automated testing
Shallow water testing in line with ITTC 7.5-02-06-02; vertical variations of the bottom are less than 10% of the UKC.
A stand-alone free running system is used to perform free running experiments – autonomous shipping.

Technical information carriage

Special design (high stiffness) deliver eigenfrequencies above 12 Hz -> Guaranteed no machine induced vibrations.
Carriage consists of four sub-systems:

- Longitudinal (main) carriage, v_{max} = 3.0 m/s ; a_{max} = 0.4 m/s² ; 161.6 m running distance
- Lateral carriage , v_{max} = 1.3 m/s ; a_{max} = 0.7 m/s² ; 19.5 m running distance (y = ± 9.75 m)
- Vertical carriage , v_{max} = 0.7 m/s ; a_{max} = 0.7 m/s² ; 2.0 m running distance
- Yawing table , v_{max} = 16.0 °/s ; a_{max} = 8.0 °/s² ; 720°

Ship model can be attached to roll engine to steer up to 5 DOF.

Technical information stand-alone free running system

Ship position measurement and control (rudder, propeller) within ROS-environment,

- Three devices for position measurement available: LIDAR, IMU, camera; sensor-fusion using Kalman filter,
- Manual control using control panel; autonomous control using communication with control system libraries,
- Integration of multiple ships and communication with carriage feasible within towing tank network.

Technical information measurement gauges

Equipment is renewed at regular times and in-house technical team is available to perform customization upon project requirement. Equipment from Towing Tank for Manoeuvres in Confined Water, with scaled specs, will be made available:

- Force dynamometers; Vertical motion at up to four positions,
- Propeller rotation, thrust and torque measurement; testing of L-drives, Z-drives, lateral thrusters,…
- Rudder forces (long., trans., moment) and angle measurement,
- Wave height measurement devices; Pressure cells (hull attachment).

Applications (Tests performed)

Ship models range 3.5 m to 8.0 m.

- Smaller models can perform versatile manoeuvres (e.g. turning circle, obstacle avoidance).
- Larger models are used to focus on digital twins and resistance and propulsion.

Captive test matrix (variation of water depth, draft, speed...) -> digital twin ship for shallow and confined conditions

Resistance and propulsion tests in shallow and confined conditions.

Specialised programs in shallow and confined water for ship-ship interaction, bank effects, etc.

Tuning (captive, free running) and validation (free running) of track controls for autonomous shipping.

Published description (Publications on this facility)

Delefortrie, G.; Geerts, S.; Lataire, E.; Troch, P.; Monbaliu, J. (2019). Coastal & ocean basin and towing tank for manoeuvres in shallow water at Flanders Maritime Laboratory, in: The Sixth International Conference on Advanced Model Measurement Technology for the Maritime Industry (AMT'19): proceedings.