Name of organization CAMERI - Coastal and Marine Engineering Research Institute	**Year of information updating** 2021
Year established 1976	**Year of joining the ITTC** 2021
Address Technion City Haifa 32004 Israel	**Status in the ITTC** TBD
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Type of facility Wave Basin	**Year constructed/upgraded** Upgraded in 2020
Name of facility CAMERI's wave basin	**Location** (if different from the above address) Australia Building

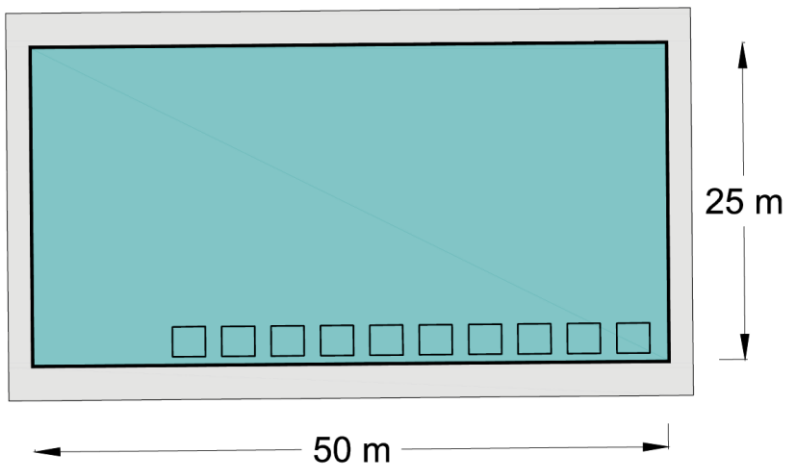
Main characteristics (dimensions of tank/basin/test section; for simulators: full mission, part task or desk top)

CAMERI's wave basin is a unique research and testing facility in Israel. It has an area of 50×25 meters where we run physical models for the Haifa Bay area (including the Haifa Port, the Kishon Port and The Mifrats Port).
A piston-type upgraded wave maker produces waves of up to 12 centimeters in a water depth of 60 centimeters and enables us to investigate many aspects of maritime design objects including breakwaters, quays, and agitation models for various circumstances.

Originally the 50*25 m basin were divided into two sections: Ashdod Port Physical Model and Haifa Bay Area Model (Haifa Port, the Kishon Port and The Mifrats Port).
The basin went through a dramatic upgrade in 2018; in 2019 and 2020.

Picture 1 and 2 provided below are from the pre-2018 period when there were in fact two different basins (Ashdod model and Haifa model). Picture 3 and 4 are from the post-2018 period.

Drawing of facility



Photos of facility

Picture 1: Physical Model Study to Assess Wave Conditions In A Staging Harbor For The Ashdod Port 2015

Picture 2: Physical model study to assess mooring conditions of ships along modeled Quay 21 at HAYOVEL, Ashdod

Picture 3: Wave bassin after major upgrade (post-2018)

Picture 4: Wave bassin after major upgrade (post-2018)

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

The basin is a wave tank which has a width and length of comparable magnitude, used for testing ships, offshore structures and three-dimensional models of Haifa and Ashdod and their breakwaters. A piston-type upgraded wave maker produces regular ad irregular waves of up to 12 centimeters in a water depth of 60 centimeters fitted with anti-reflecting compensation (ARC) and enables us to investigate many aspects of maritime design objects including breakwaters, quays, and agitation models for various circumstances.
Originally the 50*25 m basin were divided into two sections: Ashdod Port Physical Model and Haifa Bay Area Model (Haifa Port, the Kishon Port and The Mifrats Port).

Beach type and length (2021): A complete model of Haifa Port with scaled bathymetry and port morphology
Current generation (2021): A complete model of Haifa Port scaled 1:120.

Instrumentations:
Mooring loads sensors
Wave height transducers
Six components load balances
Pressure sensors
Acceleration sensors
Photo, video, including underwater
Model tracking capabilities: Optical tracking

Applications (Tests performed)

Wave basin applications include the following 3D Models:

1. Wave conditions assessments
2. Breakwaters, and port morphology
3. Wave agitation tests
4. Mooring conditions tests
5. Seakeeping

Examples of past applications:

Yam Energy – Wave energy harvesting model testing (2021)

A prototype device for harvesting wave energy was developed by Yam Energy and would be tested in CAMERI's wave fume facility for proof of concept (POC) starting January 2021. CAMERI will perform this study on a test model in distorted scale, where only the floats are scaled 1:10 to understand and analyze model kinematics in actual waves. As the wave energy harvesting device delivered for the experiment is not on scale, all the test runs will be performed in monochromatic wave pattern, as statistical wave data is not required.
The Main body is composed of the center frame, the "capsule", the mechanical device and 2 weights (flywheels) (2 sets of cylindrical floats and 2 sets of trapezoid floats).
The main test variables are the flywheel weight, and the wave data (height and direction).
A series of runs will be carried out on the fully configured device to ensure it is well-suited to the flume experiments. Position and fastening (load and stability), Mechanical slack (empty amplitudes) and Instruments will be investigated. The test runs, and the stability of the testing environment, will be used to determine the wave heights for the three amplitudes stipulated in the actual test runs (H1, H2 and H3) - wave heights gradually increase in increments of 5 cm). The simulation will be run 24 times (n=250 waves, T=3s, Duration=13 minutes) on four different testing configurations.

Assessment of wave conditions in development of the Ashdod Port (2015)

1/ New designed Staging Harbor which includes extension of the main breakwater by about 600m, a new lee breakwater about 1500m and new quays.
2/ HaDarom Port: 2D Hydraulic Model Studies of a Quay-revetment Stability and an Upper Platform Pressure measurement.

Three-dimensional physical model study for the Ashdod North port development project - ordered by the Israel Ports and Railways Authority: wave conditions in the Staging Harbor and its possible influence on the Existing Ashdod port and on the surrounding area.

The physical model study was carried out in parallel with a numerical model. The two models of different approaches complement each other and enable comparison for verification of both.
The physical model study included different stages of the Ashdod North port development. It started from the existing port layout, afterwards it tested the sea wall, the staging berth and the Ashdod North "A" development stage.
The physical model study included a wave agitation test and a ship mooring test, that were done for different chosen storms and four types of ships (models of the following types of ships: Container ships 30000 dwt, 70000 dwt and 9000 dwt and bulk carrier 60000 dwt). Elastic properties of mooring lines and fender units were simulated using calibrated springs, mooring lines were approximated by a bilinear system of two calibrated springs. The basic ship mooring tests were done for all 16 storms (five wave directions) with three configurations of berthed ships. Special tests and analyses related to determination of gravel stone size for the permeable breakwater of the Staging Harbor model.
Wave agitation tests for the sea wall and staging berth were carried out after completion of the tests for the Existing port. Experiments were done for two stages of the sea wall erection: The intermediate stage 450 m long and the final stage 800 m long.

HAYOVEL Port (2008)

A physical model study to assess mooring conditions of ships along Quay 21 at HAYOVEL new basin of the Ashdod port, regarding all mooring aspects including cargo handling. Several ship models and mooring systems were examined, methods of representation of storms in the model and technique of measurement and processing of waves were applied to measure the vessel's movements and the mooring forces.

Published description (Publications on this facility)

Physical Model Study to Assess Wave Conditions in A Staging Harbor for The Ashdod Port 2009
Development Project, P.N. 685/09. February 2009, Technion City, Haifa

Physical Model Study to Assess Mooring Conditions of Containers Ships along Quay 21 and Quay 22 for the Ashdod Port 2007
Development Project, P.N. 657/07. June 2007, Technion City, Haifa

Link: http://www.cameri-eng.com/CAMERI/Templates/showpage.asp?DBID=1&LNGID=1&TMID=84&FID=1157