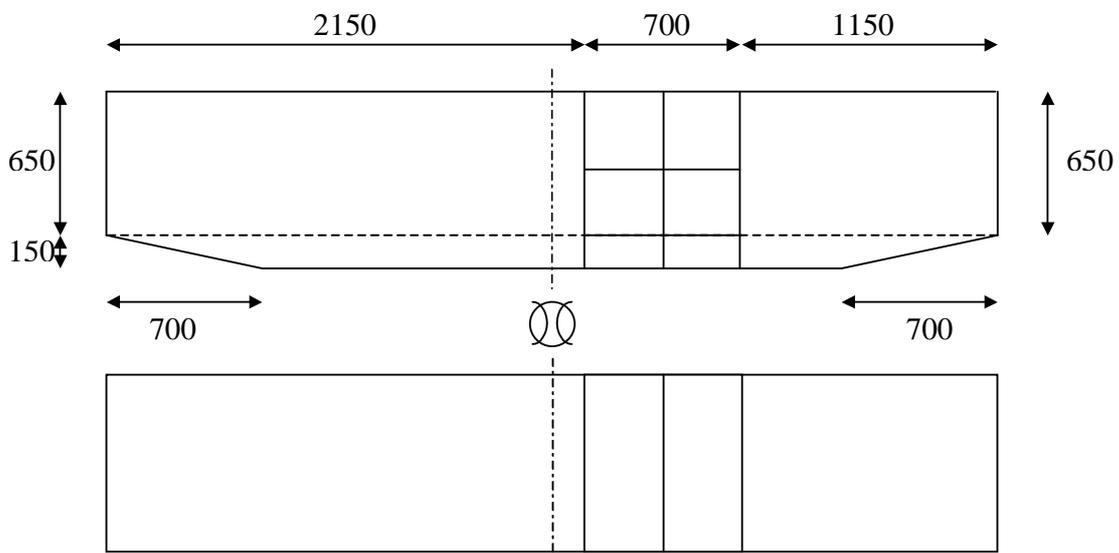


Input Data for the ITTC Benchmark Study

Geometry

Hull Form and Principal Dimensions

See the model test report (Ruponen, 2006) and NAPA database for more details.



Length over all:	4.000 m
Breadth:	0.800 m
Height (excluding the “backbone” structure):	0.800 m
Design draft:	0.500 m
Block coefficient at design draft:	0.906
Volume of buoyancy:	1.450 m ³



Flooded Compartments

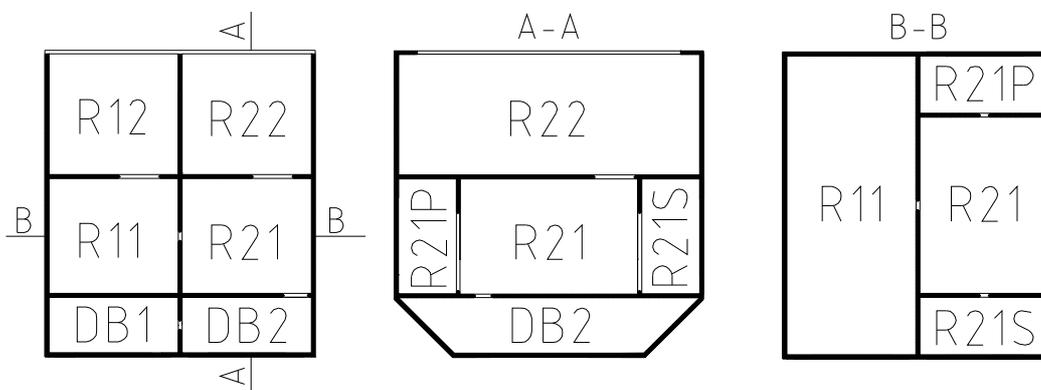
The limits of the flooded compartments are given in the table below. A general arrangement plan with the room IDs is presented in the appendix.

Applied co-ordinate system: origin in the center of the model in the base level. X is positive towards the bow, Y is positive towards port and Z is positive upwards.

Name	X _{min} [m]	X _{max} [m]	Y _{min} [m]	Y _{max} [m]	Z _{min} [m]	Z _{max} [m]	Vol [m ³]
DB1	0.160	0.495	(-0.245) -0.390	(0.245) 0.390	0.010	0.155	0.030845
DB2	0.505	0.840	(-0.245) -0.390	(0.245) 0.390	0.010	0.155	0.030845
R11	0.160	0.495	-0.390	0.390	0.165	0.465	0.078390
R21	0.505	0.840	-0.230	0.230	0.165	0.465	0.046230
R21S	0.505	0.840	-0.390	-0.240	0.165	0.465	0.015075
R21P	0.505	0.840	0.240	0.390	0.165	0.465	0.015075
R12	0.160	0.495	-0.390	0.390	0.475	0.790	0.015075
R22	0.505	0.840	-0.390	0.390	0.475	0.790	0.015075

Permeability in all compartments can be taken as 1.0.

Thickness of the plexiglass plates is 10 mm, and this should be taken into account in the modelling.





Openings

In the following table, the co-ordinates of the opening corners are listed along with the evaluated average discharge coefficients. For circular openings, the co-ordinate of the center is given. Note, that the given co-ordinate points are in the center of the bulhead.

Connect	Size [mm]	Co-ordinates [m]	Cd
SEA-DB1	60 mm x 40 mm	(0.308, 0.030, 0.005) (0.308, -0.030, 0.005) (0.348, 0.030, 0.005) (0.348, -0.030, 0.005)	0.78
SEA-DB2	25 mm x 25 mm	(0.660, 0.0125, 0.005) (0.660, -0.0125, 0.005) (0.685, 0.0125, 0.005) (0.685, -0.0125, 0.005)	0.83
SEA-R21S	60 mm x 40 mm	(0.645, -0.395, 0.295) (0.705, -0.395, 0.295) (0.705, -0.395, 0.335) (0.645, -0.395, 0.335)	0.78
DB1-DB2	D = 20 mm	(0.500, 0.000, 0.0825)	0.80
DB2-R21	60 mm x 40 mm	(0.770, -0.150, 0.160) (0.770, -0.190, 0.160) (0.830, -0.190, 0.160) (0.830, -0.150, 0.160)	0.78
R21-R21S	20 mm x 200 mm	(0.665, -0.235, 0.175) (0.685, -0.235, 0.175) (0.665, -0.235, 0.375) (0.685, -0.235, 0.375)	0.75
R21-R21P	20 mm x 200 mm	(0.665, 0.235, 0.175) (0.685, 0.235, 0.175) (0.665, 0.235, 0.375) (0.685, 0.235, 0.375)	0.75
R21-R11	D = 20 mm	(0.500, 0.000, 0.315)	0.80
R21-R22	100 mm x 100 mm	(0.690, 0.130, 0.470) (0.790, 0.130, 0.470) (0.790, 0.230, 0.470) (0.690, 0.230, 0.470)	0.72
R11-R12	100 mm x 100 mm	(0.345, 0.130, 0.470) (0.445, 0.130, 0.470) (0.445, 0.230, 0.470) (0.345, 0.230, 0.470)	0.72
R12-R22	80 mm x 200 mm	(0.500, 0.040, 0.485) (0.500, -0.040, 0.485) (0.500, 0.040, 0.685) (0.500, -0.040, 0.685)	(0.72)
R21S-ATM	Vent.pipe D=7 mm	Inlet: (0.520, -0.370, 0.465)	
R21P-ATM	Vent.pipe D=7 mm	Inlet: (0.520, 0.370, 0.465)	

Intact Condition

Same intact condition is used for all tests. All compartments are dry, i.e. no free surfaces.

Draft, T	0.500 m
Heel, ϕ	0.0°
Trim, θ	0.0°
Vertical center of buoyancy, \overline{KB}_0	0.270 m
Initial metacentric radius, $\overline{B_0M_0}$	0.118 m
Initial metacentric height, \overline{GM}_0	0.110 m
Vertical center of gravity, \overline{KG}	0.278 m

Damage Cases:

Test01 – Fixed Floating Position

- Damage hole (25 mm x 25 mm) is in the bottom of the forward compartment (DB2)
- The WT-door on the upper deck is closed.

Test03 – Down Flooding

- Damage like in Test01, but the model floats freely
- The WT-door, connecting R12 and R22, is open, allowing down-flooding from R12 to R11.

Test05 – Slow Progressive Flooding

- Damage hole (40 mm x 60 mm) is in the bottom of the aft compartment (DB1)
- The WT-door on the upper deck is closed.

Test06 – Side Damage

- Damage hole (40 mm x 60 mm) is in the side of the forward compartment (R21S)
- The WT-door on the upper deck is closed
- The double bottom (DB1 and DB2) remains dry, i.e. the opening between R21 and DB1 is closed.

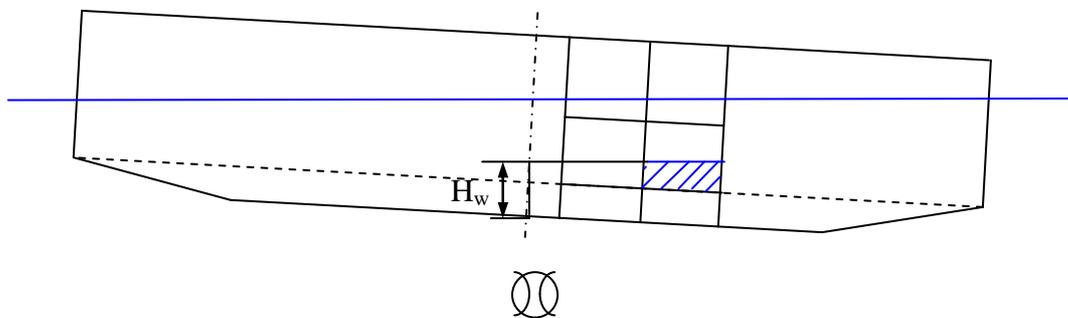
Representation of the Results

Floating Position

Heel and trim angles are presented in degrees. The draft is presented as the vertical motion of the intact center of gravity.

Water Heights

The water heights are presented as a vertical distance [mm] between the keel point and the water level, see the figure below.



Air Pressures

In the double bottom (DB1 and DB2), as over pressure, relative to the atmospheric pressure in Pa.

Reference

Ruponen, P. 2006. Model Tests for the Progressive Flooding of a Box-Shaped Barge, HUT Ship Laboratory Report M-292, 88 p.



APPENDIX: General Arrangement

