



# Seakeeping of open-top vessels

Hydrodynamic advice

**Open-top vessels refer to ships with at least one cargo hold not fitted with hatch covers. Such a characteristic makes them particularly vulnerable to water ingress when sailing in severe seas, which can considerably influence their stability. In the course of many projects MARIN has developed a model test procedure to assess the risk of water ingress for open-top vessels.**

## Compliance with IMO circular relative to water ingress

Open top ships have to comply by law with the IMO circular “Interim Guidelines for Open Top Containerships” (IMO MSC/Circ. 608/Rev.1 dated 5 July 1994).

Among the requirements defined in the circular, the volume of water entering the hold per hour should not exceed a given limit. This requirement is verified by means of a series of model tests performed in transit and at zero speed in irregular waves from various directions.



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MARIN procedure to verify compliance with IMO circular

Over the years a standard approach has evolved at MARIN. It consists of initial seakeeping calculations followed by model tests. From initial seakeeping calculations a first advice for the reduction of the risk of water ingress is made and the final test conditions are determined. Following the calculations the model tests are performed. The tests are usually performed in the 160 m long by 40 m wide Seakeeping and Manoeuvring Basin of MARIN. This basin turns out to be particularly suited as it is possible to conduct tests in transit not only in head and following waves but also oblique waves. All tests are performed with a free-sailing, self-propelled model. Particular attention is brought to the modelling of the superstructure and hold arrangement as they play a significant role in the observed water ingress. The compliance to the IMO circular is checked by measuring the amount of water that entered the open hold after each test run and comparing the total amount after each test to the limit provided by the IMO.

A few past projects realised with open top-ships

- Royal Boskalis Westminster nv, 158 m rock-dumping fall pipe vessel
- Abis Shipping, 85 m and 99 m windmill transportation vessels
- Hartman Marine, 93 m general cargo ship
- Rolldock Shipping B.V., 139 m heavy cargo vessel
- Create3S project, 159 m container vessel
- Yangtze project, 118 m sea-river ship
- Werkendam Shipping Company / ASD Ship Design, 104 m precious cargo vessel

Published literature

Abeil, B. and Dallinga, R.P.; “On the Assessment of the Ingress of Water in Open-Top Ships”, PRADS 2010.