
4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

BWM.2/Circ.33/Rev.1
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**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT
OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

Guidance on scaling of ballast water management systems

- 1 The Marine Environment Protection Committee (MEPC), at its sixty-second session (11 to 15 July 2011), approved the *Guidance on scaling of ballast water management systems* developed by the Sub-Committee on Bulk Liquids and Gases (BLG) at its fifteenth session (7 to 11 February 2011), disseminated as BWM.2/Circ.33.
- 2 MEPC 72 (9 to 13 April 2018) considered and approved a revision of the Guidance in order to reflect the requirements of the *Code for Approval of Ballast Water Management Systems* (resolution MEPC.300(72)),¹ as set out in the annex.
- 3 Member Governments and international organizations are invited to bring the annexed Guidance to the attention of all parties concerned.
- 4 This circular supersedes BWM.2/Circ.33.¹

¹ As per paragraph 1.13 of the BWMS Code, the revised Guidance is also applicable to ballast water management systems approved taking into account the 2016 Guidelines (G8) (resolution MEPC.279(70)). Reference may be made to BWM.2/Circ.33 for ballast water management systems approved not later than 28 October 2018 under Guidelines (G8) (resolution MEPC.174(58)), taking into account the revised Guidance as appropriate.

ANNEX

GUIDANCE ON SCALING OF BALLAST WATER MANAGEMENT SYSTEMS

1 REFERENCE IN THE CODE FOR APPROVAL OF BWMS

1.1 In addition to the definitions given in the BWMS Code, the following terms are defined:

- .1 *Base model* is a model of a ballast water management system that has successfully completed land-based testing as defined in the BWMS Code.
- .2 *Scaled model* is the ballast water management system model that is based on the base model but has been modified to accommodate a higher or lower capacity.
- .3 *Most vulnerable model* is the model of a series (i.e. the models to which the type approval certificate referenced in section 7 will apply) that is most prone to fail the requirements of the BWMS Code (safe, environmentally acceptable, practicable and biologically effective) within its series. This may be the case due to its specifications in comparison with other models of the series, e.g. because it provides the lowest tolerance regarding deviations of internal and/or external parameters. When identifying the least robust model of the series technical/operational parameters as well as environmental/water quality parameters and possible deviations should be taken into consideration.
- .4 *Mathematical modelling and/or calculations* may include computational fluid dynamics.

2 DOCUMENTS TO BE SUBMITTED

2.1 The following documents should be submitted to the Administration, prior to performance of testing that may be required as part of the verification of scaled models:

- .1 test plan for verification of the scaling proposed;
- .2 mathematical modelling and/or calculations demonstrating that any parameters of the scaled models that would affect system performance are equivalent to those of the base model;
- .3 validation plan for mathematical modelling and/or calculations;
- .4 identification of operating limitations or System Design Limitations (SDL) for each scaled model;
- .5 the documentation should identify the key internal and external performance parameters (e.g. dosage concentration, UV dose, filter flux density, etc.) required to achieve the system's efficacy, and also specify the physical/environmental conditions and design parameters that affect these; and
- .6 documentation and drawings of base and scaled models.

3 REFERENCE IN THE PROCEDURE FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS THAT MAKE USE OF ACTIVE SUBSTANCES (G9)

When scaling from systems that have received Basic and Final Approval from the Committee according to the Procedure (G9), the manufacturer and the Administration should ensure that any conditions on Final Approval of the base unit are still met for the scaled system or systems.

4 TESTING REQUIREMENTS

4.1 Experimental validation

4.1.1 The mathematical modelling and/or calculations should be experimentally validated to the satisfaction of the Administration:

- .1 Experimental validation should be suitable for the technology.
- .2 Experimental validation should demonstrate the accuracy of the mathematical model and/or calculation relative to those parameters that impact the performance of the technology (see paragraph 2.1.5).
- .3 Experimental validation of the mathematical model and/or calculations may be undertaken in conjunction with land-based, shipboard or laboratory testing, as appropriate.

4.1.2 The validation should establish that the mathematical modelling and/or calculations accurately describes the parameters of all scaled models, including the largest and smallest models.

4.2 Land-based testing for purposes of scaling

Land-based testing for purposes of scaling may be used, e.g. to validate claims for the scaled models beyond the tested limitations of the base model.

4.3 Shipboard testing for purposes of scaling

- .1 Shipboard testing for purposes of scaling is intended to demonstrate the long-term operational robustness, safety and practicability of the models during normal ship operations.
- .2 The most vulnerable model of a series should be tested according to the requirements for shipboard tests required by the BWMS Code. This would then allow for verification testing of the scaling models, as necessary and appropriate, on the same ship.

3 The model required to be tested under paragraph 4.16 of the BWMS Code may not necessarily be the most vulnerable model.

4.4 Environmental tests

The results of the environmental tests specified in part 3 of the annex to the BWMS Code, for each configuration of scaled models, should be provided if required by the Administration.

4.5 Other tests

Test results from additional laboratory testing or operational tests on-shore or onboard may be used to demonstrate relevant parameters of scaled models.

5 REFERENCE TO BWM.2/CIRC.8

Multiple models (referred to as units in BWM.2/Circ.8) of an approved BWMS installed in parallel fall within the scope of BWM.2/Circ.8.

6 REPORTING

A report on the validation of the mathematical modelling and/or calculations, as well as any other testing conducted in accordance with scaling, should be submitted to the Administration. The report should include at least the information identified in paragraph 2.57 of the annex to the BWMS Code. The Administration should annex this report to the type approval report submitted to the Organization in accordance with paragraph 6.10 of the BWMS Code.

7 ISSUING OF TYPE APPROVAL CERTIFICATE FOR SYSTEMS USING SCALED MODELS

The Type Approval Certificate issued by the Administration should include configurations of each and every scaled model if the scaling is done according to these procedures.

8 APPLICATION TO EXISTING TYPE APPROVALS INVOLVING SCALED MODELS

Administrations are encouraged to apply this Guidance to systems having received type approval involving scaled models prior to the adoption of this Guidance to the greatest extent possible.
