

CCS 技术通告

Technical Information

(2018) Technical notice No.28/Total No.422

12/07/2019 (Total pages:10+111)

To: CCS' relevant departments of the headquarters, CCS surveyors, plan approval centers, relevant ship owners, shipyards, product manufacturers and designers

Technical Information on Implementation of Amendments to BWM Convention, associated IMO Resolutions and Circulars

The Marine Environment Protection Committee of the International Maritime Organization (IMO), at its seventy-second and seventy-third sessions, adopted a series of Amendments to BWM Convention, associated IMO Resolutions and Circulars, the background and main contents as well as the implementation requirements are hereby described as follows.

I. MEPC.306(73), the Amendments to *the Guidance for ballast water management and development of ballast water management plan* (G4)

The Amendments to the *Guidance for ballast water management and development of ballast water management plan* (G4) was approved at its 73rd session and disseminated as MEPC.306(73), and the amendment is as follow:

1. The sentence of "The ballast water management plan may include contingency measures developed taking into account guidelines developed by the Organization" is added in G4.
2. In MEPC.306(73) it is required that the detail requirements for contingency measures please refer to the BWM.2/CIRC.62, *Guidance on Contingency Measures under the BWM Convention* (for more details please refer to CCS 2018 Technical notice No.34/Total No.360).

For the understanding and application of the new amendments, CCS will further develop the corresponding revised CCS *Guidelines for Development of Ship's Ballast Water Management Plan*.

II. MEPC.300(72), *Code for Approval of Ballast Water Management Systems*

The Marine Environment Protection Committee under the IMO adopted, at its 72nd session, *Code for Approval of Ballast Water Management Systems* by MEPC.300(72) (hereinafter referred to as BWMS Code), to make the Guidelines for Approval of Ballast Water Management Systems (G8) mandatory under the BWM Convention.

1. The BWMS Code will take effect on 13 October 2019.
2. The *2016 Guidelines for Approval of Ballast Water Management Systems* (G8) adopted by resolution MEPC.279(70) will be revoked when the BWMS Code takes effect.
3. References to the Guidelines (G8) and 2016 Guidelines (G8) in existing IMO instruments should be read to mean references to the BWMS Code.
4. Ballast water management systems approved not later than 28 October 2018, taking into account the Guidelines (G8) adopted by resolution MEPC.174(58), may be installed on board ships before 28 October 2020; "installed" means the contractual date of delivery of the ballast water management system to the ship. In the absence of such a date, the word "installed" means the actual date of delivery of the ballast water management system to the ship.
5. BWMS approved taking into account the 2016 Guidelines (G8) adopted by resolution MEPC.279(70) shall be deemed to be in accordance with the BWMS Code.

III. MEPC.299(72), *Amendments to regulations E-1 and E-5 of the BWM Convention*

Since Endorsements on IBWMC certificates are not needed for additional surveys but are necessary for annual and intermediate surveys, regulations E-1 and E-5 are amended as follows:

1. The last sentence in regulation E-1.1.5 and the existing paragraph E-5.9.1 are deleted.
2. In the chapeau of paragraph E-5.8 and in paragraph 8.3, the words "annual survey" are replaced by "annual or intermediate survey".

IV. MEPC.298(72), *Determination of the survey referred to in regulation B-3 of the BWM Convention*

A unified interpretation for the renewal survey referred to in regulation B-3 of the BWM

Convention was approved by resolution MEPC.298 (72) to determine that the renewal survey is the renewal survey for the ship associated with the IOPP Certificate pursuant to MARPOL Annex I.

V. MEPC.297(72), *Amendments to regulation B-3 of the BWM Convention*

The *amendments to regulation B-3 of the BWM Convention* regarding the implementation schedule of the D-2 standard were adopted by MEPC.297(72) at MEPC 72. The revised implementation schedule of the D-2 standard are as follows:

1. A ship constructed on or after 8 September 2017 shall meet D-2 standard on the delivery date of the ship;
2. A ship that has completed its renewal survey on or after 8 September 2014 but prior to 8 September 2017 shall meet D-2 standard from the date of its first renewal survey on or after 8 September 2017;
3. A ship that has completed its first renewal survey on or after 8 September 2017 but prior to 8 September 2019 (other than a ship mentioned in point 1 above) shall meet D-2 standard from the date of its second renewal survey on or after 8 September 2017;
4. A ship that has completed its first renewal survey on or after 8 September 2019 (other than a ship mentioned in point 1 above) shall meet D-2 standard from the date of its first renewal survey on or after 8 September 2019;
5. A ship constructed before 8 September 2017 to which the renewal survey does not apply, shall meet D-2 from the date decided by the Administration, but not later than 8 September 2024.

The following matters should be taken into consideration in implementing the requirements of the above-mentioned amendments to the BWM Convention:

1. The code for approval of ballast water management systems (BWMS Code) adopted by MEPC.300(72) will take effect on 13 October 2019 upon entry into force of the associated amendments to the BWM Convention. The type approval of BWMS from the date of entry into force shall be carried out in accordance with the BWMS Code. BWMS approved taking into account the 2016 Guidelines (G8) adopted by resolution MEPC.279(70) prior to this date shall be deemed to be in accordance with the BWMS Code, and therefore can be accepted for installation on board on or after 28 October 2020.
2. In spite of the date of entry into force of the Amendment to regulation B-3 of the BWM Convention (MEPC.297(72)) which is 13 October 2009, the

Implementation of the BWM Convention, adopted by resolution MEPC.287 (71), has explicitly requested the Parties to implement the amended regulation B-3 immediately after entry into force of the Convention (i.e. 8 September 2017).

VI. Circular BWM.2/Circ.70, *Guidance for the commissioning testing of ballast water management systems*

With the entry into force of the ballast water management convention (the BWM Convention), the requirements for survey and certification of the BWM Convention (referred to BWM.2/Circ.7) were incorporated into the 2017 version of the Survey Guidelines under the Harmonized System of Survey and Certification (HSSC) which were adopted by A 30 through resolution A.1120(30). Resolution A.1120(30) required that, the survey item (BI) 1.1.2.19 requests that an operational test of the BWMS should be carried out based on the installation commissioning procedures and that documented evidence should be provided which shows compliance of the treated discharge ballast water during the operational test with D-2 standard through sampling and analysis based on applicable guidelines developed by the Organization (i.e., IMO).

Therefore the Circular BWM.2/Circ.70 was developed to provide guidance on the operational test during the installation commissioning of the BWMS on board the ship (either new or existing ships) to verify the compliance of the D-2 standard. The key points are as follows:

1. The purpose of commissioning testing is to validate a ballast water management system (BWMS) is installed on board the ship properly, but not intended to validate the design of the BWMS.
2. In order to carry out the commissioning testing, the ambient water should be accepted, and the representative samples should be analyzed for all size classes included in the D-2 standard using indicative analysis methods given in BWM.2/Circ.42/Rev.1.
3. A sample should be collected during the corresponding ballast water discharge after the full treatment has been applied, in accordance with the Guidelines on ballast water sampling (G2).
4. The validation is successful if the analysis indicates that the discharge sample does not exceed the D-2 standard.
5. A written report including methods and detailed results of the commissioning testing should be provided to the Administration.

This Guidance is non-mandatory and the detailed requirements for installation commissioning testing of BWMS on board are ultimately based on the decision of the Administration. However, the testing to verify the compliance of D-2 standard during the

installation commissioning process of BWMS is mandatory.

Sampling and analysis during commissioning testing described in this Guidance and when to start the implementation should be carried out in accordance with the decisions of the Administrations.

VII. Circular BWM.2/Circ.69, *Guidance on System Design Limitations of ballast water management systems and their monitoring*

The Marine Environment Protection Committee under the IMO approved, at its 73rd session, the *Guidance on System Design Limitations of ballast water management systems and their monitoring* (the Guidance) and disseminated as BWM.2/Circ.69. The Guidance is to expand on the information provided in the *Code for Approval of Ballast Water Management Systems* (BWMS Code) concerning the inclusion of System Design Limitations (SDL) on the Type Approval Certificates of ballast water management systems (BWMS).

1. An approved BWMS might not be appropriate for all ships or all situations. Also, some ships need assurances that BWMS will be capable of operating in conditions that are more challenging than those included in the standardized tests. The SDL approach is intended to complement the standardized tests in the BWMS Code by providing validated information on the conditions for which an individual BWMS is designed. The Guidance elaborates on System Design Limitations approach and System Design Limitations identification (see Annex 7).
2. With a view to increasing global consistency in the application of SDL and the implementation of self-monitoring, the Guidance also provides the Table: List of potential System Design Limitations and related self-monitoring parameters (see Annex 7). The table is a living document and is to be updated based on experience gained.

VIII. Circular BWM.2/Circ.67/Rev.1, *Data gathering and analysis plan for the experience-building phase associated with the BWM Convention*

Resolution MEPC.290(71) established the experience-building phase (EBP) associated with the BWM Convention. The Annex to resolution MEPC.290(71) sets out the structure of the EBP, whose purpose is to allow the Marine Environment Protection Committee (the Committee) under the IMO to monitor and improve the BWM Convention. The Committee under the IMO, at its 72nd session, considered and approved the *Data gathering and analysis plan for the experience-building phase associated with the BWM Convention*, at its 74th session it was further revised in order to include a link to standard operating procedures for collection of treated ballast water samples, and disseminated as

BWM.2/Circ.67/Rev.1 to replace BWM.2/Circ.67.

This data gathering and analysis plan for the experience-building phase associated with the BWM Convention (DGAP) supplements the Annex to resolution MEPC.290(71) by setting out the specific arrangements for data gathering during the EBP.

The EBP consists of a data gathering stage, a data analysis stage and a Convention review stage. Aside from the non-penalization set out in resolution MEPC.290(71), the EBP does not alter the basic roles, responsibilities, obligations and recommendations under the Convention, its guidelines and relevant guidance.

For detailed requirements on data gathering, please refer to the Annex 8.

IX. Circular BWM.2/Circ.67, *Data gathering and analysis plan for the experience-building phase associated with the BWM Convention*

With the *Code for Approval of Ballast Water Management Systems* (BWMS Code) (MEPC.300(72)) was adopted at MEPC 72 to make the Guidelines(G8) mandatory, in order to make provisions of the BWMS Code mandatory under the BWM Convention, the related provisions A-1 and D-3 were amended as follows:

1. The definition of "BWMS Code" was added in regulation A-1 as follows:

"BWMS Code" means the Code for Approval of Ballast Water Management Systems adopted by resolution MEPC.300(72), as may be amended by the Organization, provided that such amendments are adopted and brought into force in accordance with article 19 of the present Convention relating to amendment procedures applicable to the Annex.

2. The approval requirements for BWMS installed on board ship are specified in regulation D-3 regarding Approval requirements for ballast water management systems:

(1) BWMSs installed on or after 28 October 2020 shall be approved in accordance with the BWMS Code; and

(2) BWMSs installed before 28 October 2020 shall be approved taking into account the guidelines (G8) (MEPC.125(53), MEPC.174(58) or MEPC.279(70)) developed by the Organization or the BWMS Code.

3. Circular BWM.2/Circ.67, *Data gathering and analysis plan for the experience-building phase associated with the BWM Convention*, is approved at MEPC74, and this circular revokes BWM.2/Circ.66 from 13 October 2019. The term "installed" as mentioned in point 2 above is referred to the Unified interpretation contained in BWM.2/Circ.66/Rev.1:

The word "installed" means the contractual date of delivery of the BWMS to the ship. In the absence of such a date, the word "installed" means the actual date of delivery of

the BWMS to the ship.

However, for the "Date installed" in the Form of the International Ballast Water Management Certificate in Appendix I of the BWM Convention, the date when commissioning has been completed should be used.

X. Circular BWM.2/Circ.66/Rev.1, *Unified Interpretation of Appendix I (Form of the International Ballast Water Management Certificate) of the BWM Convention*

With the *Code for Approval of Ballast Water Management Systems* (BWMS Code) (MEPC.300(72)) was adopted at MEPC 72 to make the Guidelines(G8) mandatory, in order to make provisions of the BWMS Code mandatory under the BWM Convention, the related provisions A-1 and D-3 were amended as follows:

1. The definition of "BWMS Code" was added in regulation A-1 as follows:

"BWMS Code" means the Code for Approval of Ballast Water Management Systems adopted by resolution MEPC.300 (72), as may be amended by the Organization, provided that such amendments are adopted and brought into force in accordance with article 19 of the present Convention relating to amendment procedures applicable to the Annex.

2. The approval requirements for BWMS installed on board ship are specified in regulation D-3 regarding Approval requirements for ballast water management systems:

- (1) BWMSs installed on or after 28 October 2020 shall be approved in accordance with the BWMS Code; and
- (2) BWMSs installed before 28 October 2020 shall be approved taking into account the guidelines (G8) (MEPC.125(53), MEPC.174(58) or MEPC.279(70)) developed by the Organization or the BWMS Code.

Circular BWM.2/Circ.66/Rev.1 (please refer Annex 10), *Unified Interpretation of Appendix I (Form of the International Ballast Water Management Certificate) of the BWM Convention*, was approved at MEPC 74 and this circular will revoke BWM.2/Circ.66 from 13 October 2019. The term "installed" as mentioned in point 2 above is referred to the Unified interpretation contained in BWM.2/Circ.66/Rev.1:

The word "installed" means the contractual date of delivery of the BWMS to the ship. In the absence of such a date, the word "installed" means the actual date of delivery of the BWMS to the ship.

However, for the "Date installed" in the Form of the International Ballast Water Management Certificate in Appendix I of the BWM Convention, the date when

commissioning has been completed should be used.

XI. Circular BWM.2/Circ.66, *Unified interpretation of Appendix I (Form of the International Ballast Water Management Certificate) of the BWM Convention*

Compared with BWM.2/Circ.66/Rev.1, the terms of "BWMS Code (MEPC.300(72))" is replaced by "G8 Guidelines (MEPC.279(70))" in BWM.2/Circ.66 (approved at MEPC72), and the other clauses are consistent. This circular will be revoked by BWM.2/Circ.66/Rev.1 from 13 October 2019.

XII. Circular BWM.2/Circ.43/Rev.1, *Guidance for Administrations on the type approval process for ballast water management systems*

Circular BWM.2/Circ.43/Rev.1 issued the revised "*Guidance for Administrations on the type approval process for ballast water management systems*" to reflect the requirements of the *Code for Approval of Ballast Water Management Systems* (resolution MEPC.300(72)). This circular supersedes BWM.2/Circ.43 which was approved at the 65th session of MEPC under IMO.

According to MEPC.300(72), references to the Guidelines for type approval of ballast water management system (G8) in existing IMO instruments should be read to mean references to the BWMS Code. For this purpose, the original references to Guidelines for type approval of ballast water management system (G8) in this circular were replaced with the "BWMS Code".

For more details, please see the Annex 12.

XIII. Circular BWM.2/Circ.33/Rev.1, *Guidance on scaling of ballast water management systems*

Circular BWM.2/Circ.33/Rev.1 issued the revised "*Guidance on scaling of ballast water management systems*" to reflect the requirements of the *Code for Approval of Ballast Water Management Systems* (resolution MEPC.300(72)). This circular supersedes BWM.2/Circ.33 which was approved at the 62nd session of MEPC under IMO. The main amendments are as follows:

1. The original references to guidelines for type approval of ballast water management system (G8) were replaced with the "BWMS Code".
2. Documentation requirements to be submitted were newly added.
3. Added reporting requirements that 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.

For more details, please see the Annex 13.

This technical information is made public on CCS website (www.ccs.org.cn), and is to be distributed to relevant ship owners, ship management companies, shipyards, product suppliers and ship designers by CCS branches within their responsible areas. Please contact Technology & Information Department of CCS for any inquiry. E-mail address: ti@ccs.org.cn

Annex 1: Resolution MEPC.306(73) - the Amendments to the Guidance for ballast water management and development of ballast water management plan (G4)

Annex 2: Resolution MEPC.300(72) - Code for Approval of Ballast Water Management Systems

Annex 3: Resolution MEPC.299(72) - Amendments to regulations E-1 and E-5 of the BWM Convention

Annex 4: Resolution MEPC.298(72) - Determination of the survey referred to in regulation B-3 of the BWM Convention

Annex 5: Resolution MEPC.297(72) - Amendments to regulation B-3 of the BWM Convention

Annex 6: Circular BWM.2/Circ.70 - Guidance for the commissioning testing of ballast water management systems

Annex 7: Circular BWM.2/Circ.69 - Guidance on System Design Limitations of ballast water management systems and their monitoring

Annex 8: Circular BWM.2/Circ.67/Rev.1 - Data gathering and analysis plan for the experience-building phase associated with the BWM Convention

Annex 9: Circular BWM.2/Circ.67 - Data gathering and analysis plan for the experience-building phase associated with the BWM Convention

Annex 10: Circular BWM.2/Circ.66/Rev.1 - Unified interpretation of Appendix I (Form of the International Ballast Water Management Certificate) of the BWM Convention

Annex 11: Circular BWM.2/Circ.66 - Unified interpretation of Appendix I (Form of the International Ballast Water Management Certificate) of the BWM Convention

Annex 12: Circular BWM.2/Circ.43/Rev.1 - Guidance for Administrations on the type approval process for ballast water management systems

Annex 13: Circular BWM.2/Circ.33/Rev.1 - Guidance on scaling of ballast water management systems

ANNEX 2

**RESOLUTION MEPC.306(73)
(adopted on 26 October 2018)**

**AMENDMENTS TO THE GUIDELINES FOR BALLAST WATER MANAGEMENT AND
DEVELOPMENT OF BALLAST WATER MANAGEMENT PLANS (G4)
(RESOLUTION MEPC.127(53))**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that the International Conference on Ballast Water Management for Ships held in February 2004 adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Ballast Water Management Convention) together with four Conference resolutions,

NOTING that regulation A-2 of the Ballast Water Management Convention requires that discharge of ballast water shall only be conducted through ballast water management in accordance with the provisions of the Annex to the Convention,

NOTING FURTHER that regulation B-1 of the Annex to the Ballast Water Management Convention provides that each ship shall have on board and implement a ballast water management plan approved by the Administration, taking into account Guidelines developed by the Organization,

NOTING FURTHER that, at its fifty-third session, the Committee adopted, by resolution MEPC.127(53), the *Guidelines for ballast water management and development of ballast water management plans* (G4),

HAVING CONSIDERED, at its seventy-third session, proposed amendments to the Guidelines (G4),

- 1 ADOPTS amendments to the *Guidelines for ballast water management and development of ballast water management plans*, as set out in the annex to the present resolution;
- 2 INVITES Governments to apply the Guidelines, as amended, as soon as possible;
- 3 AGREES to keep the Guidelines, as amended, under review.

ANNEX

**AMENDMENTS TO THE GUIDELINES FOR BALLAST WATER MANAGEMENT AND
DEVELOPMENT OF BALLAST WATER MANAGEMENT PLANS (G4)**

1 Paragraph 4.3 is added in part B:

"4.3 The ballast water management plan may include contingency measures developed taking into account guidelines developed by the Organization*."

* Refer to the *Guidance on contingency measures under the BWM Convention* (BWM.2/Circ.62, as may be amended).

ANNEX 5

**RESOLUTION MEPC.300(72)
(adopted on 13 April 2018)**

**CODE FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS
(BWMS CODE)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

NOTING that regulation D-3 of the Annex to the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the BWM Convention), provides that ballast water management systems used to comply with the Convention must be approved by the Administration,

NOTING ALSO that it adopted, by resolution MEPC.125(53), *Guidelines for approval of ballast water management systems* (Guidelines (G8)), and by resolutions MEPC.174(58) and MEPC.279(70) revisions thereof,

DESIRING to make the Guidelines (G8) mandatory under the BWM Convention in the form of a code for approval of ballast water management systems,

NOTING resolution MEPC.296(72), by which it adopted amendments to regulations A-1 and D-3 of the BWM Convention to make the provisions of the Code for Approval of Ballast Water Management Systems referred to above mandatory,

RECALLING that it agreed, at its sixty-eighth session, to provisions for non-penalization of early movers that have installed ballast water management systems approved taking into account resolutions MEPC.125(53) and MEPC.174(58), as contained in the Roadmap for the implementation of the BWM Convention,

BEARING IN MIND the Organization's established practice with regard to the validity of type approval certification for marine products (MSC.1/Circ.1221), which is that the Type Approval Certificate itself has no influence on the operational validity of existing ballast water management systems approved and installed on board a ship and manufactured during the period of validity of the relevant Type Approval Certificate, meaning that the system need not be renewed or replaced due to expiration of such Certificate,

HAVING CONSIDERED, at its seventy-second session, the draft Code for Approval of Ballast Water Management Systems,

1 ADOPTS the *Code for Approval of Ballast Water Management Systems (BWMS Code)*, as set out in the annex to the present resolution;

2 INVITES Parties to the BWM Convention to note that the BWMS Code will take effect on 13 October 2019 upon entry into force of the associated amendments to the BWM Convention;

3 AGREES to keep the BWMS Code under review in the light of experience gained with its application and to amend it as necessary;

4 DECIDES that ballast water management systems approved not later than 28 October 2018, taking into account the Guidelines (G8) adopted by resolution MEPC.174(58), may be installed on board ships before 28 October 2020;

5 RESOLVES that, for the purpose of operative paragraph 4 of this resolution, the word "installed" means the contractual date of delivery of the ballast water management system to the ship. In the absence of such a date, the word "installed" means the actual date of delivery of the ballast water management system to the ship;

6 RESOLVES that references to the Guidelines (G8) and 2016 Guidelines (G8) in existing IMO instruments should be read to mean references to the BWMS Code;

7 AGREES that the dates referenced in this resolution will be considered in any reviews carried out in accordance with regulation D-5 of the BWM Convention, to determine whether a sufficient number of appropriate technologies are approved and available;

8 RESOLVES to revoke the *2016 Guidelines for approval of ballast water management systems* (G8) adopted by resolution MEPC.279(70) when the BWMS Code takes effect;

9 REQUESTS the Secretary-General to transmit certified copies of the present resolution and the text of the BWMS Code contained in the annex to all Parties to the BWM Convention;

10 REQUESTS FURTHER the Secretary-General to transmit copies of the present resolution and the text of the BWMS Code contained in the annex to the Members of the Organization which are not Parties to the BWM Convention.

ANNEX

**CODE FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS
(BWMS CODE)**

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1 INTRODUCTION

General

1.1 The Code for Approval of Ballast Water Management Systems (BWMS Code) is aimed primarily at Administrations, or their designated bodies, in order to assess whether ballast water management systems (BWMS) meet the standard set out in regulation D-2 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention). In addition, the Code is intended for manufacturers and shipowners as a reference on the evaluation procedure that equipment will undergo and the requirements placed on BWMS. The Code should be applied in an objective, consistent and transparent way and its application should be evaluated periodically by the Organization.

1.2 Articles and regulations referred to in this Code are those contained in the Convention.

1.3 The Code includes general requirements concerning the design, installation, performance, testing, environmental acceptability, technical procedures for evaluation and procedures for issuance of Type Approval Certificates of BWMS and reporting to the Organization.

1.4 The Code is intended to fit within an overall framework for evaluating the performance of systems that includes the experimental shipboard evaluation of prototype systems under the provisions of regulation D-4, approval of BWMS and associated systems that comply fully with the requirements of the Convention, and port State control sampling for compliance under the provisions of article 9 of the Convention.

1.5 The approval requirements of regulation D-3 stipulate that BWMS used to comply with the Convention must be approved by the Administration, in accordance with this Code. In addition to such BWMS approval, as set forth in regulation A-2 and regulation B-3, the Convention requires that discharges of ballast water from ships must meet the regulation D-2 performance standard on an on-going basis. Approval of a system is intended to screen out BWMS that would fail to meet the standards prescribed in regulation D-2 of the Convention. Approval of a system, however, does not ensure that a given system will work on all ships or in all situations. To satisfy the Convention, a discharge must comply with the D-2 standard throughout the life of the ship.

1.6 BWMS shall be designed to not impair the health and safety of the ship or personnel, nor to present any unacceptable harm to the environment or to public health.

1.7 BWMS shall meet the standards of regulation D-2 and the conditions established in regulation D-3 of the Convention. The Code serves to evaluate the safety, environmental acceptability, practicability and biological effectiveness of the systems designed to meet these standards and conditions. The cost effectiveness of type-approved equipment will be used in determining the need for revisions of the Code.

1.8 To achieve consistency in its application, the approval procedure requires that a uniform manner of testing, analysis of samples, and evaluation of results is developed and applied. Amendments to this Code shall be duly circulated by the Secretary-General. Due consideration shall be given to the practicability of the BWMS.

Goal and purpose

1.9 The goal of the Code is to ensure uniform and proper application of the standards contained in the Convention. As such the Code should be updated as the state of knowledge and technology may require.

1.10 The purpose of the Code is to provide a uniform interpretation and application of the requirements of regulation D-3 and to:

- .1 define test and performance requirements for the approval of BWMS;
- .2 set out appropriate design, construction and operational parameters necessary for the approval of BWMS;
- .3 provide direction to Administrations, equipment manufacturers and shipowners in determining the suitability of equipment to meet the requirements of the Convention and of the environmental acceptability of treated water; and
- .4 ensure that BWMS approved by Administrations are capable of achieving the standard of regulation D-2 in land-based and shipboard evaluations and do not cause unacceptable harm to the ship, the crew, the environment or public health.

Applicability

1.11 This Code applies to the approval of BWMS in accordance with the Convention.

1.12 This Code applies to BWMS intended for installation on board all ships required to comply with regulation D-2.

1.13 BWMS approved taking into account the 2016 Guidelines (G8) adopted by resolution MEPC.279(70) shall be deemed to be in accordance with the BWMS Code.

2 BACKGROUND

2.1 The requirements of the Convention relating to approval of BWMS used by ships are set out in regulation D-3.

2.2 Regulation D-2 stipulates that ships conducting ballast water management in accordance with the ballast water performance standard of the Convention shall discharge:

- .1 less than 10 viable organisms per cubic metre greater than or equal to 50 µm in minimum dimension;
- .2 less than 10 viable organisms per millilitre less than 50 µm in minimum dimension and greater than or equal to 10 µm in minimum dimension; and

- .3 less than the following concentrations of indicator microbes, as a human health standard:
 - .1 Toxicogenic *Vibrio cholerae* (serotypes O1 and O139) with less than 1 colony forming unit (cfu) per 100 mL or less than 1 cfu per 1 g (wet weight) of zooplankton samples;
 - .2 *Escherichia coli* less than 250 cfu per 100 mL; and
 - .3 Intestinal Enterococci less than 100 cfu per 100 mL.

3 DEFINITIONS

For the purpose of this Code:

3.1 *Active Substance* means a substance or organism, including a virus or a fungus, that has a general or specific action on or against harmful aquatic organisms and pathogens.

3.2 *Ballast water management system* (BWMS) means any system which processes ballast water such that it meets or exceeds the ballast water performance standard in regulation D-2. The BWMS includes ballast water treatment equipment, all associated control equipment, piping arrangements as specified by the manufacturer, control and monitoring equipment and sampling facilities. For the purpose of this Code, BWMS does not include the ship's ballast water fittings, which may include piping, valves, pumps, etc., that would be required if the BWMS was not fitted.

3.3 *Ballast water management plan* means the plan referred to in regulation B-1 of the Convention describing the ballast water management process and procedures implemented on board individual ships.

3.4 *Control and monitoring equipment* means the equipment installed for the effective operation and control of the BWMS and the assessment of its effective operation.

3.5 *Convention* means the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004.

3.6 *Failed test cycle* is a valid test cycle in which the performance of the BWMS resulted in treated water that is determined to be non-compliant with the standard set within regulation D-2. A failed test cycle interrupts the required consecutive test cycles and terminates the test.

3.7 *Invalid test cycle* is a test cycle in which, due to circumstances outside the control of the BWMS, the requirements for a valid test cycle are not met. When a test cycle is invalid, it does not count as one of the required consecutive test cycles in a test and the test can be continued.

3.8 *Land-based testing* means a test of the BWMS carried out in a laboratory, equipment factory or pilot plant including a moored test barge or test ship, according to Parts 2 and 3 of the annex to this Code, to confirm that the BWMS meets the ballast water performance standard described in regulation D-2 of the Convention.

3.9 *Major components* means those components that directly affect the ability of the system to meet the ballast water performance standard described in regulation D-2.

3.10 *Representative sampling* means sampling that reflects the relative concentrations (chemicals) and numbers and composition of the populations (organisms) in the volume of interest. Samples shall be taken in a time-integrated manner and the sampling facility shall be installed, taking into account guidelines developed by the Organization.¹

3.11 *Sampling facilities* refers to the means provided for sampling treated or untreated ballast water as needed in this Code and in the guidelines developed by the Organization.¹

3.12 *Shipboard testing* means a full-scale test of a complete BWMS carried out on board a ship according to part 2 of the annex to this Code, to confirm that the system meets the standards set by regulation D-2 of the Convention.

3.13 *Successful test cycle* means a valid test cycle where the BWMS functions to its specifications and treated water is determined to meet the ballast water performance standard described in regulation D-2.

3.14 *System Design Limitations (SDL)* of a BWMS means the water quality and operational parameters, determined in addition to the required type approval testing parameters, that are important to its operation, and, for each such parameter, a low and/or a high value for which the BWMS is designed to achieve the performance standard of regulation D-2. The SDL should be specific to the processes being employed by the BWMS and should not be limited to parameters otherwise assessed as part of the type approval process. The SDL should be identified by the manufacturer and validated under the supervision of the Administration, taking into account Guidance developed by the Organization, and in accordance with this Code.

3.15 *Test cycle* refers to one testing iteration (to include uptake, treatment, holding and discharge as appropriate) under a given set of requirements used to establish the ability of a BWMS to meet the set standards.

3.16 *Test* means the set of required test cycles.

3.17 *Treatment Rated Capacity (TRC)* means the maximum continuous capacity expressed in cubic metres per hour for which the BWMS is type-approved. It states the amount of ballast water that can be treated per unit time by the BWMS to meet the ballast water performance standard in regulation D-2. The TRC is measured at the inlet of the BWMS.

3.18 *Valid test cycle* means a test cycle in which all the required test conditions and arrangements, including challenge conditions, test control, and monitoring arrangements (including piping, mechanical and electrical provisions) and test analytical procedures were achieved by the test organization.

3.19 *Viable organisms* means organisms that have the ability to successfully generate new individuals in order to reproduce the species.

¹ Refer to the *Guidelines for ballast water sampling (G2)* (resolution MEPC.173(58)).

4 TECHNICAL SPECIFICATIONS

4.1 This section details the general technical requirements which a BWMS shall meet in order to obtain type approval.

General principles for operation

4.2 A BWMS shall be effective in meeting the D-2 standard on short voyages and long voyages (i.e. short and long intervals between treatment and discharge), regardless of temperature, unless the system is intentionally constructed for use in specific waters.

4.3 Ballast water discharged following treatment shall be safe for the environment on short voyages and long voyages (i.e. short and long intervals between treatment and discharge), regardless of temperature.

4.4 The design of the BWMS shall account for the fact that, regardless of the BWMS technology employed, viable organisms remaining after treatment may reproduce in the interval between treatment and discharge.

Ballast water management systems

4.5 The BWMS shall be designed and constructed:

- .1 for robust and suitable operation in the shipboard environment;
- .2 for the service for which it is intended;
- .3 to mitigate any danger to persons on board when installed. Equipment that could emit dangerous gases/liquids shall have at least two independent means of detection and shutdown of the BWMS (i.e. hazardous gas level reaching lower explosive limits (LEL) or level of toxic concentrations that can result in severe effects on human health); and
- .4 with materials compatible with: the substances used; the purpose for which it is intended; the working conditions to which it will be subjected; and the environmental conditions on board.

4.6 The BWMS shall not contain or use any substance of a dangerous nature, unless adequate risk mitigation measures are incorporated for storage, application, installation and safe handling, acceptable to the Administration.

4.7 In case of any failure compromising the proper operation of the BWMS, audible and visual alarm signals shall be given in all stations from which ballast water operations are controlled.

4.8 All working parts of the BWMS that are liable to wear or to be damaged shall be easily accessible for maintenance. The routine maintenance of the BWMS and troubleshooting procedures shall be clearly defined by the manufacturer in the operation, maintenance and safety manual. All maintenance and repairs shall be recorded.

4.9 To avoid interference with the BWMS, the following items shall be included:

- .1 every access of the BWMS beyond the essential requirements of paragraph 4.8 shall require the breaking of a seal;

- .2 if applicable, the BWMS shall be so constructed that a visual indication is always activated whenever the BWMS is in operation for purposes of cleaning, calibration or repair, and these events shall be recorded by the control and monitoring equipment; and
- .3 the BWMS shall be provided with the necessary connections to ensure that any bypass of the BWMS will activate an alarm, and that the bypass event is recorded by the control and monitoring equipment.

4.10 Facilities shall be provided for checking, at the renewal surveys and according to the manufacturer's instructions, the performance of the BWMS components that take measurements. A calibration certificate certifying the date of the last calibration check shall be retained on board for inspection purposes. Only the manufacturer or persons authorized by the manufacturer shall perform the accuracy checks.

4.11 The BWMS shall be provided with simple and effective means for its operation and control. It shall be provided with a control system that shall be such that the services needed for the proper operation of the BWMS are ensured through the necessary arrangements.

4.12 The BWMS shall, if intended to be fitted in hazardous area locations, comply with the relevant safety regulations for such spaces. Any electrical equipment that is part of the BWMS shall be based in a non-hazardous area, or shall be certified by the Administration as safe for use in a hazardous area. Any moving parts, which are fitted in hazardous areas, shall be arranged so as to avoid the formation of static electricity.

4.13 The BWMS shall be designed so as not to endanger the health and safety of the crew, interact negatively with the ship's systems and cargo or produce any adverse environmental effects. The BWMS shall not create long-term impacts on the safety of the ship and crew through corrosive effects in the ballast system and other spaces.

4.14 It shall be demonstrated, by using mathematical modelling and/or calculations, that any up or down scaling of the BWMS will not affect the functioning and effectiveness on board a ship of the type and size for which the equipment will be certified. In doing so, the manufacturer of the equipment shall take into account the relevant guidance developed by the Organization.

4.15 Scaling information shall allow the Administration to verify that any scaled model is at least as robust as the land-based-tested model. It is the responsibility of the Administration to verify that the scaling used is appropriate for the operational design of the BWMS.

4.16 At a minimum, the shipboard test unit shall be of a capacity that allows for further validation of the mathematical modelling and/or calculations for scaling, and preferably selected at the upper limit of the rated capacity of the BWMS, unless otherwise approved by the Administration.

Control and monitoring equipment

4.17 Administrations shall ensure that type-approved BWMS have a suitable control and monitoring system that will automatically monitor and record sufficient data to verify correct operation of the system. The control and monitoring equipment shall record the proper functioning or failure of the BWMS. Where practical, SDL parameters should be monitored and recorded by the BWMS to ensure proper operation.

4.18 The BWMS shall incorporate control equipment that automatically monitors and adjusts necessary treatment dosages or intensities or other aspects of the BWMS of the ship, which while not directly affecting treatment, are nonetheless required for proper administration of the necessary treatment.

4.19 The equipment shall be able to produce (e.g. display, print or export) a report of the applicable self-monitoring parameters in accordance with part 5 of the annex for official inspections or maintenance, as required.

4.20 To facilitate compliance with regulation B-2, the control and monitoring equipment shall also be able to store data for at least 24 months. In the event that the control and monitoring equipment is replaced, means shall be provided to ensure the data recorded prior to replacement remains available on board for 24 months.

4.21 For BWMS that could emit dangerous gases, a means of gas detection by redundant safety systems shall be fitted in the space of the BWMS, and an audible and visual alarm shall be activated at a local area and at a manned BWMS control station in case of leakage. The gas detection device shall be designed and tested in accordance with IEC 60079-29-1 or other recognized standards acceptable to the Administration. Monitoring measures for dangerous gases with independent shutdown shall be provided on the BWMS.

4.22 All software changes introduced to the system after the pre-test evaluation shall be done according to a change handling procedure ensuring traceability.

5 TYPE APPROVAL PROCESS

5.1 The type approval requirements for BWMS are as described below.

5.2 The manufacturer of the equipment shall submit information regarding the design, construction, operation and functioning of the BWMS in accordance with Part 1 of the annex, including information regarding the water quality and operational parameters that are important to the operation of the system. This information shall be the basis for a first evaluation of suitability by the Administration.

5.3 Following the Administration's pre-test evaluation, the BWMS shall undergo land-based, shipboard and other tests in accordance with the procedures described in Parts 2 and 3 of the annex. The BWMS tested for type approval shall be a final and complete product that meets the requirements of section 4 and it shall be constructed using the same materials and procedures that will be used to construct production units.

5.4 Successful fulfilment of the requirements and procedures outlined in Parts 2 and 3 of the annex, as well as all other requirements of this Code, shall lead to the issuance of a Type Approval Certificate by the Administration in accordance with section 6.

5.5 The limitations of the BWMS, in addition to the required type approval testing parameters identified in paragraphs 2.29 and 2.46 of the annex, as submitted by its manufacturer and validated by the Administration, shall be documented on the Type Approval Certificate. These design limitations do not determine if the equipment may be type-approved or not, but provide information on the conditions beyond the type approval testing parameters under which proper functioning of the equipment can be expected.

5.6 When a type-approved BWMS is installed on board, an installation survey according to section 8 shall be carried out.

5.7 The documentation submitted for approval shall include at least the following:

- .1 a description and diagrammatic drawings of the BWMS;
- .2 the operation, maintenance and safety manual;
- .3 hazard identification;
- .4 environmental and public health impacts; and
- .5 System Design Limitations.

6 APPROVAL AND CERTIFICATION PROCEDURES

6.1 A BWMS which in every respect fulfils the requirements of this Code may be approved by the Administration for fitting on board ships. The approval shall take the form of a Type Approval Certificate of BWMS, specifying the main particulars of the BWMS and validated SDL. Such certificates shall be issued in accordance with Part 7 of the annex in the format shown in the appendix.

6.2 A BWMS that in every respect fulfils the requirements of this Code except that it has not been tested at all the temperatures and salinities set out in Part 2 of the annex shall only be approved by the Administration if corresponding limiting operating conditions are clearly stated on the issued Type Approval Certificate with the description "Limiting Operating Conditions". For the limiting values, the SDL shall be consulted.

6.3 A Type Approval Certificate of a BWMS shall be issued for the specific application for which the BWMS is approved, e.g. for specific ballast water capacities, flow rates, salinity or temperature regimes, or other limiting operating conditions or circumstances as appropriate.

6.4 A Type Approval Certificate of a BWMS shall be issued by the Administration based on satisfactory compliance with all the requirements described in Parts 1, 2, 3 and 4 of the annex.

6.5 The SDL shall be specified on the Type Approval Certificate in a table that identifies each water quality and operational parameter together with the validated low and/or high parameter values for which the BWMS is designed to achieve the ballast water performance standard described in regulation D-2.

6.6 An Administration may issue a Type Approval Certificate of a BWMS based on testing already carried out under supervision by another Administration. In cases where the approval of a BWMS by an Administration for installation on a ship operating under its authority is to be granted on the basis of testing carried out by another Administration, the approval may be conveyed through the issuance of the International Ballast Water Management Certificate.

6.7 A Type Approval Certificate shall only be issued to a BWMS that has been determined by the Administration to make use of an Active Substance after it has been approved by the Organization in accordance with regulation D-3.2. In addition, the Administration shall ensure that any recommendations that accompanied the Organization's approval have been taken into account before issuing the Type Approval Certificate.

6.8 The Type Approval Certificate shall be issued taking into account guidance developed by the Organization.²

² Refer to *Validity of type approval certification for marine products* (MSC.1/Circ.1221).

6.9 An approved BWMS may be type approved by other Administrations for use on their ships. Should a BWMS approved by one country fail type approval in another country, then the two countries concerned shall consult one another with a view to reaching a mutually acceptable agreement.

6.10 An Administration approving a BWMS shall promptly provide a type-approval report to the Organization in accordance with part 6 of the annex. Upon receipt of a type-approval report, the Organization shall promptly make it available to the public and Member States by appropriate means.

6.11 In the case of a type approval based entirely on testing already carried out under supervision by another Administration, the type-approval report shall be prepared and kept on file and the Organization shall be informed of the approval.

6.12 In the case of a BWMS that was previously type-approved by an Administration taking into account the revised Guidelines (G8) adopted by resolution MEPC.174(58), the manufacturer, in seeking a new type approval under this Code, shall only be requested to submit to the Administration the additional test reports and documentation set out in this Code.

7 INSTALLATION REQUIREMENTS FOLLOWING TYPE APPROVAL

7.1 The BWMS shall be accompanied by sampling facilities installed taking into account guidelines developed by the Organization,³ so arranged in order to collect representative samples of the ship's ballast water discharge.

7.2 Suitable bypasses or overrides to protect the safety of the ship and personnel shall be installed and used in the event of an emergency and these shall be connected to the BWMS so that any bypass of the BWMS shall activate an alarm. The bypass event shall be recorded by the control and monitoring equipment and within the ballast water record book.

7.3 The requirement in paragraph 7.2 does not apply to internal transfer of ballast water within the ship (e.g. anti-heeling operations). For BWMS that transfer water internally which may affect compliance by the ship with the standard described in regulation D-2 (i.e. circulation or in-tank treatment) the recording in paragraph 7.2 shall identify such internal transfer operations.

8 INSTALLATION SURVEY AND COMMISSIONING PROCEDURES FOLLOWING TYPE APPROVAL

8.1 The additional information outlined in the paragraphs below is intended to facilitate ship operations and inspections and assist ships and Administrations in preparing for the procedures set out in the *Survey Guidelines for the purpose of the International Convention for the Control and Management of Ships' Ballast Water and Sediments under the Harmonized System of Survey and Certification*,⁴ developed by the Organization, which describe the examination of plans and designs and the various surveys required under regulation E-1.

³ Refer to the *Guidelines for ballast water sampling (G2)* (resolution MEPC.173(58)).

⁴ Refer to the *Survey Guidelines under the Harmonized System of Survey and Certification (HSSC)*, 2017 (resolution A.1120(30)).

8.2 The Administration issuing the International Ballast Water Management Certificate shall verify that the following documentation is on board in a suitable format:

- .1 for the purpose of information, a copy of the Type Approval Certificate of the BWMS;
- .2 the operation, maintenance and safety manual of the BWMS;
- .3 the ballast water management plan of the ship;
- .4 installation specifications, e.g. installation drawing, piping and instrumentation diagrams, etc.; and
- .5 installation commissioning procedures.

8.3 Prior to the issuance of the International Ballast Water Management Certificate, following the installation of a BWMS, the Administration should verify that:

- .1 the BWMS installation has been carried out in accordance with the technical installation specification referred to in paragraph 8.2.4;
- .2 the BWMS is in conformity with the relevant Type Approval Certificate BWMS;
- .3 the installation of the complete BWMS has been carried out in accordance with the manufacturer's equipment specification;
- .4 any operational inlets and outlets are located in the positions indicated on the drawing of the pumping and piping arrangements;
- .5 the workmanship of the installation is satisfactory and, in particular, that any bulkhead penetrations or penetrations of the ballast system piping are to the relevant approved standards; and
- .6 the installation commissioning procedures have been completed.

Annex

PART 1 – SPECIFICATIONS FOR PRE-TEST EVALUATION OF SYSTEM DOCUMENTATION

1.1 Adequate documentation shall be prepared and submitted to the Administration and be shared with the test organization as part of the approval process well in advance of the intended approval testing of a BWMS. Approval of the submitted documentation shall be a prerequisite for carrying out independent approval tests.

1.2 Documentation shall be provided by the manufacturer/developer for two primary purposes: evaluating the readiness of the BWMS for undergoing approval testing and evaluating the manufacturer's proposed SDL and validation procedures.

Documentation

1.3 The documentation to be submitted as a part of the readiness evaluation shall include at least the following:

- .1 a BWMS technical specification, including at least:
 - .1 a description of the BWMS, treatment processes it employs and details of any required permits;
 - .2 adequate information including descriptions and diagrammatic drawings of the pumping and piping arrangements, electrical/electronic wiring, monitoring system, waste streams and sampling points. Such information should enable fault finding;
 - .3 details of major components and materials used (including certificates where appropriate);
 - .4 an equipment list showing all components subject to testing including specifications, materials and serial numbers;
 - .5 an installation specification in accordance with manufacturers installation criteria requirements for the location and mounting of components, arrangements for maintaining the integrity of the boundary between safe and hazardous spaces and the arrangement of the sample piping;
 - .6 information regarding the characteristics and arrangements in which the system is to be installed, including scope of the ships (sizes, types and operation) for which the system is intended. This information may form the link between the system and the ship's ballast water management plan; and
 - .7 a description of BWMS side streams (e.g. filtered material, centrifugal concentrate, waste or residual chemicals) including a description of the actions planned to properly manage and dispose of such wastes;

- .2 the operation, maintenance and safety manual, including at least:
 - .1 instructions for the correct operation of the BWMS, including procedures for the discharge of untreated water in the event of malfunction of the ballast water treatment equipment;
 - .2 instructions for the correct arrangement of the BWMS;
 - .3 maintenance and safety instructions and the need to keep records;
 - .4 troubleshooting procedures;
 - .5 emergency procedures necessary for securing the ship;
 - .6 any supplementary information considered necessary for the safe and efficient operation of the BWMS, e.g. documentation provided for approval under the *Procedure for approval of ballast water management systems that make use of Active Substances (G9)* (resolution MEPC.169(57)); and
 - .7 calibration procedures;
- .3 information on any hazard identification conducted to identify potential hazards and define appropriate control measures, if the BWMS or the storage tanks for processing chemicals could emit dangerous gases or liquids;
- .4 information regarding environmental and public health impacts including:
 - .1 identification of potential hazards to the environment based on environmental studies performed to the extent necessary to assure that no harmful effects are to be expected;
 - .2 in the case of BWMS that make use of Active Substances or Preparations containing one or more Active Substances, the dosage of any Active Substances used and the maximum allowable discharge concentrations;
 - .3 in the case of BWMS that do not make use of Active Substances or preparations, but which could reasonably be expected to result in changes to the chemical composition of the treated water such that adverse impacts to receiving waters might occur upon discharge, the documentation shall include results of toxicity tests of treated water as described in paragraph 2.19 of this annex; and
 - .4 sufficient information to enable the test organization to identify any potential health or environmental safety problems, unusual operating requirements (labour or materials), and any issues related to the disposal of treatment by-products or waste streams;
- .5 information regarding SDL including:
 - .1 the identification of all known parameters to which the design of the BWMS is sensitive;

- .2 for each parameter the manufacturer shall claim a low and/or a high value for which the BWMS is capable of achieving the Performance Standard of regulation D-2; and
- .3 the proposed method for validating each claimed SDL shall be set out, together with information on the source, suitability and reliability of the method;
- .6 a software change handling and revision control document including all software changes introduced to the system after the pre-test evaluation. These shall be done according to a change handling procedure ensuring traceability. Therefore, the manufacturer shall present a procedure describing how changes are to be handled and how revision control is maintained. As a minimum for a modification request, the following types of information shall be produced and logged:
 - .1 reason for modification;
 - .2 specification of the proposed change;
 - .3 authorization of modification; and
 - .4 test record;
- .7 functional description including a textual description with necessary supporting drawings, diagrams and figures to cover:
 - .1 system configuration and arrangement;
 - .2 scope of supply;
 - .3 system functionality covering control, monitoring, alarm and safety functions;
 - .4 self-diagnostics and alarming functionalities; and
 - .5 safe states for each function implemented.

1.4 The documentation may include specific information relevant to the test set-up to be used for land-based testing according to this Code. Such information should include the sampling needed to ensure proper functioning and any other relevant information needed to ensure proper evaluation of the efficacy and effects of the equipment. The information provided should also address general compliance with applicable environment, health and safety standards during the type-approval procedure.

Readiness evaluation

1.5 During the readiness evaluation, the Administration shall ensure that each technical specification set out in section 4 of this Code has been met, other than those that will be assessed during later testing.

1.6 The readiness evaluation shall examine the design and construction of the BWMS to determine whether there are any fundamental problems that might constrain the ability of the BWMS to manage ballast water as proposed by the manufacturer, or to operate safely, on board ships.

1.7 Administrations shall ensure adequate risk assessments including the implementation of preventative actions have been undertaken relating to the safe operation of BWMS.

1.8 As a first step the manufacturer shall provide information regarding the requirements and procedures for installing, calibrating and operating (including maintenance requirements) the BWMS during a test. This evaluation should help the test organization to identify any potential health or environmental safety problems, unusual operating requirements (labour or materials), and any issues related to the disposal of treatment by-products or waste streams.

1.9 The test facility shall have a procedure to deal with deviations that occur prior to testing and an evaluation process which includes an assessment and validation process to address any unforeseen deviations that may occur during testing. Deviations from the testing procedure shall be fully reported.

1.10 During the readiness evaluation the major components of the BWMS shall be identified. Major components are considered to be those components that directly affect the ability of the system to meet the performance standard described in regulation D-2. Upgrades or changes to major components shall not take place during type approval testing. A change to a major component requires a new submission of the test proposal and shall involve a new evaluation and repeating of the land-based and shipboard tests.

1.11 The Administration may allow replacements of non-major components of equivalent specification (independently approved to a recognized and equal operational standard) during type approval. Replacements of non-major components during testing shall be reported.

1.12 Upgrades of the BWMS that relate to the safe operation of that system may be allowed during and after type approval and shall be reported. If such safety upgrades directly affect the ability of the system to meet the standard described in regulation D-2, it shall be treated as a change of a major component, as per paragraph 1.10 above.

1.13 The evaluation shall identify consumable components in the BWMS. The Administration may allow replacement of like-for-like consumable components during type approval testing and all replacements shall be reported.

System Design Limitation evaluation

1.14 The SDL evaluation shall be undertaken by the Administration. It shall assess the basis for the manufacturer's claim that the SDL include all known water quality and operational parameters to which the design of the BWMS is sensitive and that are important to its ability to achieve the performance standard described in regulation D-2.

1.15 The Administration shall also evaluate the suitability and reliability of the methods proposed for validating the claimed low and/or high values for each SDL. These methods may include tests to be undertaken during land-based, shipboard or bench-scale testing and/or the use of appropriate existing data and/or models.

PART 2 –TEST AND PERFORMANCE SPECIFICATIONS FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS

2.1 The Administration decides the sequence of land-based and shipboard testing. The BWMS used for testing must be verified by the Administration to be the same as the BWMS described under Part 1 of the annex with major components as described in the documentation submitted in accordance with paragraphs 1.3.1.3 and 1.3.1.4 of this annex.

Quality assurance and quality control procedures

2.2 The test facility shall demonstrate its competency in conducting valid type approval tests in two ways:

- .1 by having implemented a rigorous quality control/quality assurance programme, approved, certified and audited by an independent accreditation body, or to the satisfaction of the Administration; and
- .2 by demonstrating its ability to conduct valid test cycles with appropriate challenge water, sample collection, sample analysis and method detection limits.

It is the responsibility of the Administration, or its authorized delegate, to determine the acceptability of the test facility.

2.3 The test facility's quality control/quality assurance programme shall consist of:

- .1 a Quality Management Plan (QMP), which addresses the quality control management structure and policies of the testing body (including subcontractors and outside laboratories);
- .2 a Quality Assurance Project Plan (QAPP), which defines the methods, procedures, and quality assurance and quality control (QA/QC) protocols used by the test facility for testing BWMS in general. It identifies the test team members, and it includes all relevant standard operating procedures (SOPs), typically as appendices; and
- .3 a Test/Quality Assurance Plan (TQAP), that provides specific details for conducting a test of a given BWMS at a given site and time. The TQAP includes detailed plans for commissioning the BWMS, the experimental plan, decommissioning, and reporting the results. The TQAP identifies all organizations involved in the test and includes the BWMS manufacturer's documentation and performance claims. The TQAP also identifies the data to be recorded, operational and challenge parameters that define a valid test cycle, data analyses to be presented in the verification report and a schedule for testing. Appropriate statistical distributions shall be considered and used to analyse data.

2.4 The test facility performing the BWMS tests shall be independent. It shall not be owned by or affiliated with the manufacturer or vendor of any BWMS, or by the manufacturer or supplier of the major components of that equipment.

Avoiding sampling bias

2.5 The sampling protocol must ensure organism mortality is minimized, e.g. by using appropriate valves and flow rates for flow control in the sampling facility, submerging nets during sampling collection, using appropriate sampling duration and handling times, and appropriate concentrating methodology. All methods to avoid sampling bias shall be validated to the satisfaction of the Administration.

Shipboard tests

2.6 A shipboard test cycle includes:

- .1 the uptake of ballast water of the ship;
- .2 treatment of the ballast water in accordance with paragraph 2.8.4 of this annex by the BWMS;
- .3 the storage of ballast water on the ship during a voyage; and
- .4 the discharge of ballast water from the ship.

2.7 Shipboard testing of BWMS shall be conducted by the test facility, independent of the BWMS manufacturer, with the system being operated and maintained by the ships' crew as per the operation, maintenance and safety manual.

Success criteria for shipboard testing

2.8 In evaluating the performance of BWMS installation(s) on a ship or ships, the following information and results shall be supplied to the satisfaction of the Administration:

- .1 test plan to be provided prior to testing;
- .2 documentation that an in-line BWMS is of a capacity to reflect the flow rate of the ballast water pump for the TRC of the BWMS;
- .3 documentation that an in-tank BWMS is of a capacity to reflect the ballast water volume that it is intended to treat within a specified period of time;
- .4 the amount of ballast water tested in the test cycle on board shall be consistent with the normal ballast operations of the ship and the BWMS shall be operated at the TRC for which it is intended to be approved;
- .5 documentation showing that the discharge of each valid test cycle was in compliance with regulation D-2. For a test to be valid, the uptake water for the ballast water to be treated shall contain a density of viable organisms exceeding 10 times the maximum permitted values in regulation D-2.1;
- .6 sampling regime and volumes for analysis:
 - .1 for the enumeration of viable organisms greater than or equal to 50 µm or more in minimum dimension:
 - .1 influent water shall be collected over the duration of uptake as one time-integrated sample. The sample shall be collected as a single, continuous sample or a composite of

- sequential samples, e.g. collected at intervals during the beginning, middle and end of the operation. The total sample volume shall be at least 1 m³. If a smaller volume is validated to ensure representative sampling of organisms, it may be used;
- .2 treated discharged water shall be collected as one time-integrated sample over the duration of discharge from the tank(s). The sample may be collected as a single, continuous sample or a composite of sequential samples, e.g. collected throughout the beginning, middle and end of the operation. The total sample volume shall be at least 3 m³;
 - .3 if samples are concentrated for enumeration, the organisms shall be concentrated using a mesh with holes no greater than 50 µm in the diagonal dimension. Only organisms greater than 50 µm in minimum dimension shall be enumerated; and
 - .4 the full volume of the sample shall be analysed unless the total number of organisms is high, e.g. 100. In this case, the average density may be extrapolated based on a well-mixed subsample using a validated method;
- .2 for the enumeration of viable organisms greater than or equal to 10 µm and less than 50 µm in minimum dimension:
- .1 influent water shall be collected over the duration of uptake as one, time-integrated sample. The sample shall be collected as a single, continuous sample or a composite of sequential samples, e.g. collected at intervals during the beginning, middle and end of the operation. A sample of at least 10 L shall be collected, and a fraction may be subsampled for transport to the laboratory, provided it is representative of the sample and is a minimum of 1 L. A minimum of three 1 mL subsamples shall be analysed in full to enumerate organisms;
 - .2 treated discharged water shall be collected as one time-integrated sample over the duration of discharge from the tank(s). The sample may be collected as a single, continuous sample or a composite of sequential samples, e.g. collected throughout the beginning, middle and end of the operation. A sample of at least 10 L shall be collected, and a fraction may be subsampled for transport to the laboratory, provided it is representative of the sample and is a minimum of 1 L. A minimum of six 1 mL subsamples shall be analysed in full to enumerate organisms;
 - .3 the sample may not be concentrated for analysis unless the procedure is validated. Only organisms greater than 10 µm and less than 50 µm in minimum dimension shall be enumerated; and

- .4 the full volume of the sample shall be analysed unless the total number of organisms is high, e.g. 100. In this case, the average density may be extrapolated based on a well-mixed subsample using a validated method;
- .3 for the evaluation of bacteria:
 - .1 for the influent and discharge samples, the minimum 10 L sample referred to in paragraphs 2.8.6.2.1 and 2.8.6.2.2, or another sample at least 10 L in volume and collected in a similar manner should be used, a subsample of minimum 1 L may be transferred to a sterile container for analysis;
 - .2 a minimum of three subsamples of appropriate volume taken from the 1 L subsample described above shall be analysed for colony forming units of bacteria listed in regulation D-2; and
 - .3 the toxicogenic test requirements shall be conducted in an appropriately approved laboratory. If no approved laboratory is available, the analysis method may be validated to the satisfaction of the Administration.
- .7 the test cycles including invalid test cycles shall span a period of not less than six months;
- .8 three consecutive test cycles in compliance with regulation D-2 are to be performed. Any invalid test cycle does not affect the consecutive sequence;
- .9 the six-month shipboard test period starts and ends with the completion of a successful test cycle or invalid test cycle that meets the D-2 standard. The three consecutive and valid test cycles that are required in paragraph 2.8.8 above must be suitably separated across the six-month period;
- .10 the source water for test cycles shall be characterized by measurement of salinity, temperature, particulate organic carbon, total suspended solids and dissolved organic carbon; and
- .11 for system operation throughout the test period, the following information shall also be provided:
 - .1 documentation of all ballast water operations including volumes and locations of uptake and discharge, and if heavy weather was encountered and where;
 - .2 documentation that the BWMS was operated continuously throughout the test period for all ballasting and deballasting of the ship;
 - .3 documentation detailing water quality parameters identified by the test organization that should be provided as appropriate and practicable;

- .4 the possible reasons for an invalid test cycle, or a test cycle discharge failing the D-2 standard, which shall be investigated and reported to the Administration;
- .5 documentation of scheduled maintenance performed on the system during the test period;
- .6 documentation of unscheduled maintenance and repair performed on the system during the test period;
- .7 documentation of engineering parameters, monitored as appropriate to the specific system; and
- .8 a report detailing the functioning of the control and monitoring equipment.

Land-based testing

2.9 The land-based testing provides data to determine the biological efficacy and environmental acceptability of the BWMS under consideration for type approval. The approval testing aims to ensure replicability and comparability to other treatment equipment.

2.10 Any limitations imposed by the BWMS on the testing procedure described here shall be duly noted and evaluated by the Administration.

2.11 The test set-up including the BWMS shall operate as described in the provided operation, maintenance and safety manual during at least five consecutive successful test cycles in each salinity.

2.12 A land-based test cycle shall include the uptake of ballast water by pumping, the storage of ballast water, treatment of ballast water within the BWMS (except in control tanks), and the discharge of ballast water by pumping. The order will be dependent on the BWMS.

2.13 At least two test cycles in each salinity tested shall be conducted in order to evaluate compliance with the D-2 standard at the minimum holding time specified by the BWMS manufacturer.

2.14 Test facilities carrying out identification of Relevant Chemicals and toxicity testing of the treated ballast water from test cycles with a storage time which is shorter or longer than five days shall ensure that sufficient volumes of treated water are collected after five days or are reserved after the efficacy testing to permit the requirements of guidelines⁵ developed by the Organization, for approval of BWMS making use of Active Substances, to be assessed for at least one test cycle per salinity.

2.15 Land-based testing of BWMS shall be independent of the system manufacturer.

2.16 Testing shall occur using different water conditions sequentially as provided for in paragraphs 2.29 and 2.31 of this annex.

2.17 The BWMS shall be tested at its TRC or as given in paragraphs 2.25 to 2.28 of this annex for each test cycle. The equipment shall function to specifications during this test.

⁵ Refer to the *Procedure for approval of ballast water management systems that make use of Active Substances (G9)* (resolution MEPC.169(57)).

2.18 The analysis of treated water discharge from each test cycle shall determine if the treated discharge meets regulation D-2.

2.19 The analysis of treated water discharge from the relevant test cycle(s) shall also be used to evaluate the formation of Relevant Chemicals as well as the toxicity of the discharged water for BWMS that make use of Active Substances. The same evaluation shall be conducted for those BWMS that do not make use of Active Substances or Preparations but which could reasonably be expected to result in changes to the chemical composition of the treated water such that adverse impacts to receiving waters might occur upon discharge. Toxicity tests of the treated water discharge shall be conducted, taking into account guidelines developed by the Organization.⁶

Land-based testing set-up

2.20 The test set-up for approval tests shall be representative of the characteristics and arrangements of the types of ships in which the equipment is intended to be installed. The test set-up shall therefore include at least the following:

- .1 the complete BWMS to be tested;
- .2 piping and pumping arrangements; and
- .3 the storage tank that simulates a ballast tank, constructed such that the water in the tank shall be completely shielded from light.

2.21 The control and treated simulated ballast tanks shall each include:

- .1 a minimum capacity of 200 m³;
- .2 the use of standard industry practices for design and construction for ships; surface coatings shall be in accordance with the *Performance standard for protective coatings of dedicated seawater ballast tanks on all new ships and of double-sided skin spaces of bulk carriers* (PSPC) (resolution MSC.215(82)); and
- .3 the minimum modifications required for structural integrity on land.

2.22 The control and treated simulated ballast tanks should include normal internal structures, including lightening and drainage holes.

2.23 The test set-up shall be pressure-washed with tap water, dried and swept to remove loose debris, organisms and other matter before starting testing procedures, and between test cycles.

2.24 The test set-up shall include facilities to allow sampling as described in paragraphs 2.40 and 2.41 of this annex and provisions to supply influents to the system, as specified in paragraphs 2.29, 2.30, 2.33 and 2.34 of this annex. The installation arrangements shall conform in each case with those specified and approved under the procedure outlined in section 7 of this Code.

⁶ Refer to paragraphs 5.2.3 to 5.2.7 of the *Procedure for approval of ballast water management systems that make use of Active Substances (G9)* (resolution MEPC.169(57)).

Ballast water management system scaling

2.25 Scaling of the BWMS should take into account guidance developed by the Organization.⁷ The Administration shall verify that the scaling used is appropriate for the operational design of the BWMS.

2.26 BWMS with at least one model with a TRC equal to or smaller than 200 m³/h shall not be downscaled.

2.27 For BWMS with at least one model that has a TRC higher than 200 m³/h or 1000 m³/h the following must be observed for land-based testing. In-line treatment equipment may be downsized for land-based testing, but only when the following criteria are taken into account:

- .1 BWMS with at least one model with a TRC higher than 200 m³/h but lower than 1,000 m³/h may be downscaled to a maximum of 1:5 scale, but may not be lower than 200 m³/h; and
- .2 BWMS with at least one model with a TRC equal to, or higher than, 1,000 m³/h may be downscaled to a maximum of 1:100 scale, but may not be lower than 200 m³/h.

2.28 In-tank treatment equipment shall be tested on a scale that allows verification of full-scale effectiveness. The suitability of the test set-up shall be evaluated by the manufacturer and approved by the Administration.

Land-based test design – inlet and outlet criteria

2.29 For any given set of test cycles (five are considered a set) a salinity range shall be chosen for each cycle. Given the salinity of the test set-up for a test cycle in fresh, brackish and marine water, each shall have dissolved and particulate content in one of the combinations set out in the table below. Deviations from the marine and brackish salinity ranges of the table shall be reported and justified and the resulting tests shall not be less challenging for the BWMS than would be the circumstance if the deviations had not occurred:

	Salinity		
	Marine 28 – 36 PSU	Brackish 10 – 20 PSU	Fresh < 1 PSU
Dissolved organic carbon (DOC)	> 1 mg/L	> 5 mg/L	> 5 mg/L
Particulate organic carbon (POC)	> 1 mg/L	> 5 mg/L	> 5 mg/L
Total suspended solids (TSS)	> 1 mg/L	> 50 mg/L	> 50 mg/L

2.30 The source of the test water shall be natural water. Any augmentation of test water with dissolved organic carbon (DOC), particulate organic carbon (POC) or total suspended solids (TSS) to achieve the minimum required content shall be validated and approved by the Administration. As natural DOC constituents are complex and primarily of aromatic character, the type of added DOC is particularly critical to the evaluation of BWMS performance. The validation shall ensure that relevant properties of the augmented water (such as the oxidant demand/TRO decay and UV absorption in the range of 200 to 280 nm, the production of disinfectant by-products and the particle size distribution of suspended solids) are

⁷ Refer to the *Guidance on scaling of ballast water management systems* (BWM.2/Circ.33/Rev.1).

equivalent, on a mg/L basis, to that of natural water that would quantitatively meet the challenge conditions. In addition, the validation shall ensure that augmentation does not bias a test for or against any specific treatment process. The test report shall include the basis for the selection, use and validation of augmentation.

2.31 The BWMS must be tested in conditions for which it will be approved. For a BWMS to achieve an unlimited Type Approval Certificate with respect to salinity, one set of test cycles shall be conducted within each of the three salinity ranges with the associated dissolved and particulate content as prescribed in paragraph 2.29 above. Tests under adjacent salinity ranges in the above table shall be separated by at least 10 PSU.

2.32 Use of standard test organisms (STO):

- .1 the use of standard test organisms (STO) is permissible if the challenge levels in naturally occurring water at the test facility require supplementation. The use of STO shall not be considered standard practice and the Administration shall in every case review that the selection, number and use of supplementary STOs ensures that the challenge posed to the BWMS provides an adequately robust test. The use of STOs shall not bias a test for or against any specific treatment process. They shall be locally isolated to ensure that the risk to the local environment is minimized; non-indigenous organisms which have the potential to cause harm to the environment shall not be used;
- .2 procedures, processes and guidance for the use of STO shall be based on the most relevant and up-to-date available scientific data. Such procedures, processes and guidance shall form a part of the testing facilities quality assurance regimes; and
- .3 the use of STO, including concentrations and species, shall be recorded within the test report. The test report shall include information pertaining to the evaluation and justification for the use of STO, an assessment of the impact of their use on other test parameters and potential impacts on the test being undertaken. The information contained within the report shall reflect both the positive and negative impacts of the use of STO.

2.33 The influent water shall include:

- .1 test organisms of greater than or equal to 50 µm or more in minimum dimension that shall be present in a total density of preferably 10^6 but not less than 10^5 individuals per cubic metre, and shall consist of at least five species from at least three different phyla/divisions;
- .2 test organisms greater than or equal to 10 µm and less than 50 µm in minimum dimension that shall be present in a total density of preferably 10^4 but not less than 10^3 individuals per mL, and shall consist of at least five species from at least three different phyla/divisions;
- .3 heterotrophic bacteria that shall be present in a density of at least 10^4 living bacteria per mL; and
- .4 a variety of organisms which shall be documented according to the size classes mentioned above regardless of whether natural organism assemblages or cultured organisms were used to meet the density and organism variety requirements.

2.34 The following bacteria do not need to be added to the influent water, but shall be measured at the influent and at the time of discharge:

- .1 coliform;
- .2 Enterococcus group;
- .3 *Vibrio cholerae*; and
- .4 heterotrophic bacteria.

2.35 If cultured test organisms are used, local applicable quarantine regulations shall be taken into account during culturing and discharge.

Land-based monitoring and sampling

2.36 Change of numbers of test organisms by treatment and during storage in the simulated ballast tank shall be measured using methods described in Part 4 of this annex (paragraphs 4.5 to 4.7).

2.37 It shall be verified that the treatment equipment performs within its specified parameters, such as power consumption and flow rate, during the test cycle.

2.38 The range of operational flow rates that a BWMS is expected to achieve in service, at the maximum and minimum operational flow rates (where it is appropriate for that technology), shall be verified after the filter on the discharge side of the pump. The range of flow rate may be derived from empirical testing or from computational modelling. Where appropriate for the technology, demonstration of system efficacy at low flow rates shall reflect the need for flow reduction during the final stages of ballast operations.

2.39 Environmental parameters such as pH, temperature, salinity, dissolved oxygen, TSS, DOC, POC and turbidity (Nominal Turbidity Unit, NTU) shall be measured at the same time that the samples described are taken.

2.40 Samples during the test for the purposes of determining biological efficacy shall be taken at the following times and locations: immediately before the treatment equipment, immediately after the treatment equipment and upon discharge after the appropriate holding time.

2.41 The control and treatment cycles may be run simultaneously or sequentially. Control samples are to be taken in the same manner as the equipment test as prescribed in paragraph 2.40 above and upon influent and discharge.

2.42 Facilities or arrangements for sampling shall be provided to ensure representative samples of treated and control water can be taken that introduce as little adverse effects as possible on the organisms.

2.43 Samples described in paragraphs 2.40 and 2.41 above shall be collected with the following sampling regime and volumes for analysis:

- .1 for the enumeration of viable organisms greater than or equal to 50 µm or more in minimum dimension:
 - .1 influent water shall be collected over the duration of uptake as one time-integrated sample. The sample shall be collected as a single, continuous sample or a composite of sequential samples, e.g. collected at intervals during the beginning, middle and end of the operation. The total sample volume shall be at least one cubic metre. If smaller volume is validated to ensure representative sampling of organisms, it may be used;
 - .2 control and treated discharged water shall be collected as one time-integrated sample over the duration of discharge from the tank(s). The sample may be collected as a single, continuous sample or a composite of sequential samples, e.g. collected throughout the beginning, middle and end of the operation. The total sample volume shall be at least 3 m³;
 - .3 if samples are concentrated for enumeration, the organisms shall be concentrated using a mesh with holes no greater than 50 µm in the diagonal dimension. Only organisms greater than 50 µm in minimum dimension shall be enumerated; and
 - .4 the full volume of the sample shall be analysed unless the total number of organisms is high, e.g. 100. In this case, the average density may be extrapolated based on a well-mixed subsample using a validated method;
- .2 for the enumeration of viable organisms greater than or equal to 10 µm and less than 50 µm in minimum dimension:
 - .1 influent water shall be collected over the duration of uptake as one, time-integrated sample. The sample shall be collected as a single, continuous sample or a composite of sequential samples, e.g. collected at intervals during the beginning, middle and end of the operation. A sample of at least 10 L shall be collected, and a fraction may be subsampled for transport to the laboratory, provided it is representative of the sample and is a minimum of 1 L. A minimum of three 1 mL subsamples shall be analysed in full to enumerate organisms;
 - .2 control and treated discharged water shall be collected as one time-integrated sample over the duration of discharge from the tank(s). The sample may be collected as a single, continuous sample or a composite of sequential samples, e.g. collected throughout the beginning, middle and end of the operation. A sample of at least 10 L shall be collected, and a fraction may be subsampled for transport to the laboratory, provided it is representative of the sample and is a minimum of 1 L. A minimum of six 1 mL subsamples shall be analysed in full to enumerate organisms;

- .3 the sample may not be concentrated for analysis unless the procedure is validated. Only organisms greater than 10 µm and less than 50 µm in minimum dimension shall be enumerated; and
 - .4 the full volume of the sample shall be analysed unless the total number of organisms is high, e.g. 100. In this case, the average density may be extrapolated based on a well-mixed subsample using a validated method; and
- .3 for the evaluation of bacteria:
- .1 for the influent and discharge samples, a minimum 10 L sample referred to in paragraphs 2.8.6.2.1 and 2.8.6.2.2 above, respectively, or another sample at least 10 L in volume and collected in a similar manner, should be used; a subsample of minimum 1 L may be transferred to a sterile container for analysis;
 - .2 a minimum of three subsamples of appropriate volume taken from the 1 L subsample described above shall be analysed for colony forming units of bacteria listed in regulation D-2; and
 - .3 the toxicogenic test requirements shall be conducted in an appropriately approved laboratory. If no approved laboratory is available, the analysis method may be validated to the satisfaction of the Administration.

2.44 The samples shall be analysed as soon as possible after sampling, and analysed live within six hours or treated in such a way so as to ensure that proper analysis can be performed.

2.45 If in any test cycle the discharge results from the control water is of a concentration less than or equal to 10 times the values in regulation D-2.1, the test cycle is invalid.

Temperature

2.46 The effective performance of BWMS through a ballast water temperature range of 0°C to 40°C (2°C to 40°C for fresh water) and a mid-range temperature of 10°C to 20°C shall be the subject of an assessment verified by the Administration.

2.47 This assessment may include:

- .1 testing during land-based, shipboard, laboratory or bench-scale testing; and/or
- .2 the use of existing data and/or models, provided that their source, suitability and reliability is reported.

2.48 The report submitted to the Administration shall contain all documentation (including procedures, methods, data, models, results, explanations and remarks) associated with the temperature assessment. The report shall include at least the information identified in paragraph 2.57 of this annex.

Evaluation of regrowth

2.49 The evaluation of the regrowth of organisms shall be undertaken to the satisfaction of the Administration in land-based and/or shipboard testing in at least two test cycles in each salinity.

2.50 In the case of land-based testing being performed with a holding time of less than five days, a sufficient volume of treated uptake water shall be held under conditions similar to conditions in the relevant holding tank. In the case of shipboard testing, water shall be retained on board for the evaluation of regrowth during a shipboard test cycle. Additional bench-scale testing may be used to supplement the land-based and/or shipboard testing.

2.51 In the case of a BWMS that includes mechanical, physical, chemical and/or biological processes intended to kill, render harmless or remove organisms within ballast water at the time of discharge or continuously between the time of uptake and discharge, regrowth shall be assessed in accordance with sections "Shipboard tests" and "Land-based testing" of this annex with a holding time of at least five days.

2.52 Otherwise, the enumeration of organisms to assess regrowth shall be undertaken at least five days after the completion of all of the mechanical, physical, chemical and/or biological processes intended to kill, render harmless or remove organisms within ballast water.

2.53 Any neutralization of ballast water required by the BWMS shall occur at the end of the holding time and immediately before the enumeration of organisms.

2.54 The evaluation of regrowth is not intended to evaluate contamination in ballast tanks or piping, such as may arise from the presence of untreated water or residual sediments.

2.55 A report shall be submitted to the Administration containing all documentation (including procedures, methods, data, models, results, explanations and remarks) associated with the evaluation of regrowth. The report shall include at least the information identified in paragraph 2.57 of this annex.

Reporting of test results

2.56 After approval tests have been completed, a report shall be submitted to the Administration. This report shall include information regarding the test design, methods of analysis and the results of these analyses for each test cycle (including invalid test cycles), BWMS maintenance logs and any observed effects of the BWMS on the ballast system of the ship (e.g. pumps, pipes, tanks, valves). Shipboard test reports shall include information on the total and continuous operating time of the BWMS.

2.57 The reports submitted in accordance with paragraph 2.56 above shall contain at least the following information:

- .1 the name and address of the laboratory performing or supervising the inspections, tests or evaluations, and its national accreditation or quality management certification, if appropriate;
- .2 the name of the manufacturer;
- .3 the trade name, product designation (such as model numbers), and a detailed description of the equipment or material inspected, tested or evaluated;

- .4 the time, date, and place of each approval inspection, test or evaluation;
- .5 the name and title of each person performing, supervising, and witnessing the tests and evaluations;
- .6 executive summary;
- .7 introduction and background;
- .8 for each test cycle, inspection or evaluation conducted, summary descriptions of:
 - .1 experimental design;
 - .2 methods and procedures;
 - .3 results and discussion, including a description of any invalid test cycle (in the case of a report referred to in Part 2 of this annex) and a comparison to the expected performance; and
 - .4 in the case of land-based testing, test conditions including details on challenge water preparation in line with paragraph 2.30 of this annex;
- .9 a description or photographs of the procedures and apparatus used in the inspections, tests or evaluation, or a reference to another document that contains an appropriate description or photographs;
- .10 at least one photograph that shows an overall view of the equipment or material tested, inspected or evaluated and other photographs that show:
 - .1 design details; and
 - .2 each occurrence of damage or deformation to the equipment or material that occurred during the approval tests or evaluations;
- .11 the operational safety requirements of the BWMS and all safety-related findings that have been made during the inspections, tests or evaluations;
- .12 an attestation that the inspections, tests or evaluations were conducted as required and that the report contains no known errors, omissions or false statements. The attestation must be signed by the chief officer of the laboratory, or the chief officer's representative;
- .13 appendices, including:
 - .1 the complete test plan and the data generated during tests and evaluations reported under paragraph 2.57.8 above, including at least:
 - .1 for land-based tests, whether ambient, cultured or a mixture of test organisms have been used (including a species-level identification for cultured organisms, and an identification to the lowest possible taxonomic level for ambient organisms);

- .2 for shipboard tests, the operating parameters of the system during successful treatment operations (e.g. dosage rates, ultraviolet intensity and the energy consumption of the BWMS under normal or tested TRC, if available);
 - .3 for SDL, details of all procedures, methods, data, models, results, explanations and remarks, leading to validation; and
 - .4 invalid test information.
-
- .2 the QMP, the QAPP and quality assurance and quality control records;
 - .3 maintenance logs including a record of any consumable components that were replaced; and
 - .4 relevant records and test results maintained or created during testing.

2.58 The results of biological efficacy testing of the BWMS shall be accepted if during the land-based and shipboard testing conducted as specified in sections "Shipboard tests" and "Land-based testing" of this annex it is shown that the system has met the standard in regulation D-2 and that the uptake water quality requirements were met in all individual test cycles as provided in paragraph 4.7 below.

2.59 The test report shall include all test cycles during land-based and shipboard tests, including failed test cycles and invalid test cycles with the explanation required in paragraph 2.8.11.4 for both shipboard and land-based tests.

2.60 The Administration shall identify and redact commercially sensitive information (information that is proprietary and not related to the BWMS performance) and make all other information available to interested parties and the Organization. The information shall include all of the test reports, including failed tests from both land-based and shipboard testing.

PART 3 – SPECIFICATION FOR ENVIRONMENTAL TESTING FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS

3.1 The electrical and electronic sections of the BWMS in the standard production configuration shall be subject to the relevant tests specified in paragraph 3.3 below at a laboratory approved for the purpose by the Administration or by the accreditation body of the laboratory, with relevant accreditation⁸ covering the relevant test standards.

3.2 Evidence of successful compliance with the environmental tests below shall be submitted to the Administration by the manufacturer together with the application for type approval.

3.3 Equipment is to be tested taking into account international test specifications for type approval.⁹

⁸ Refer to *General requirements for the competence of testing and calibration laboratories* (ISO/IEC 17025:2017).

⁹ Refer to IACS UR E10, Rev.6, October 2014 – *Test Specification for Type Approval*.

3.4 A report on environmental tests shall be submitted to the Administration and include at least the information identified in paragraph 2.57 of this Annex.

PART 4 – SAMPLE ANALYSIS METHODS FOR THE DETERMINATION OF BIOLOGICAL CONSTITUENTS IN BALLAST WATER

Sample processing and analysis

4.1 Samples taken during testing of BWMS are likely to contain a wide taxonomic diversity of organisms, varying greatly in size and susceptibilities to damage from sampling and analysis.

4.2 When available, widely accepted standard methods for the collection, handling (including concentration), storage, and analysis of samples should be used. These methods shall be clearly cited and described in test plans and reports. This includes methods for detecting, enumerating, and determining minimum dimension of and identifying organisms and for determining viability (as defined in this Code).

4.3 When standard methods are not available for particular organisms or taxonomic groups, methods that are developed for use shall be described in detail in test plans and reports. The descriptive documentation shall include any experiments needed to validate the use of the methods.

4.4 Given the complexity in samples of natural and treated water, the required rarity of organisms in treated samples under regulation D-2, and the expense and time requirements of current standard methods, it is likely that several new approaches will be developed for the analyses of the composition, concentration and viability of organisms in samples of ballast water. Administrations/Parties are encouraged to share information concerning methods for the analysis of ballast water samples, using existing scientific venues, and documents distributed through the Organization.

Sample analysis for determining efficacy in meeting the discharge standard

4.5 Sample analysis is meant to determine the species composition and the number of viable organisms in the sample. Different samples may be taken for determination of viability and for species composition.

4.6 The viability of organisms shall be determined taking into account guidance developed by the Organization¹⁰ using methodologies appropriate to the ballast water treatment technology being tested. Such methodologies shall provide assurance that organisms not removed from ballast water have been killed or rendered harmless to the environment, human health, property and resources. Viability may be established by assessing the presence of one or more essential characteristics of life, such as structural integrity, metabolism, reproduction, motility or response to stimuli.

4.7 A treatment test cycle shall be deemed successful if:

- .1 it is valid in accordance with paragraph 2.8.5 (shipboard) or 2.29, 2.30, 2.33 and 2.47 (land-based testing) of this annex as appropriate;

¹⁰ Refer to the *Guidance on methodologies that may be used for enumerating viable organisms* (BWM.2/Circ.61).

- .2 the density of organisms greater than or equal to 50 µm in minimum diameter in the replicate samples is less than 10 viable organisms per cubic metre;
- .3 the density of organisms less than 50 µm and greater than or equal to 10 µm in minimum diameter in the replicate samples is less than 10 viable organisms per mL;
- .4 the density of *Vibrio cholerae* (serotypes O1 and O139) is less than 1 cfu per 100 ml, or less than 1 cfu per 1 g (wet weight) zooplankton samples;
- .5 the density of *E. coli* in the replicate samples is less than 250 cfu per 100 mL;
- .6 the density of Intestinal Enterococci in the replicate samples is less than 100 cfu per 100 mL; and
- .7 no averaging of test cycles, or the discounting of failed test cycles, has occurred.

4.8 It is recommended that a non-exhaustive list of standard methods and innovative research techniques be considered.¹¹

Sample analysis for determining eco-toxicological acceptability of discharge

4.9 Toxicity tests of the treated water discharge shall be conducted taking into account guidelines developed by the Organization.¹²

PART 5 – SELF-MONITORING

Introduction

5.1 BWMS shall monitor and store a minimum number of parameters for detailed evaluation. In addition, all system indications and alerts shall be stored and available for inspection. Data storage and retrieval shall follow common standards. This part gives an overview of the minimum required self-monitoring parameters.

Monitoring of parameters

5.2 The applicable self-monitoring parameters listed below shall be recorded for every BWMS.¹³ Any additional parameters that are necessary to ascertain system performance and safety shall be determined by the Administration and stored in the system. If a parameter is not applicable due to the particulars of the system, the Administration may waive the requirement to record that parameter. Limiting operating conditions on the operation of the BWMS shall be determined by the manufacturer and approved by the Administration.

¹¹ Suggested sources may include but are not limited to:

- .1 The Handbook of Standard Methods for the Analysis of Water and Waste Water
- .2 ISO standard methods
- .3 UNESCO standard methods
- .4 World Health Organization
- .5 American Society of Testing and Materials (ASTM) standard methods
- .6 United States EPA standard methods
- .7 Research papers published in peer-reviewed scientific journals
- .8 MEPC documents

¹² Refer to paragraphs 5.2.3 to 5.2.7 of the *Procedure for approval of ballast water management systems that make use of Active Substances (G9)* (resolution MEPC.169(57)).

¹³ Associated guidance for a template on technical details of the monitoring parameters and record intervals to be developed by the Organization.

General information for all systems

5.3 The information and applicable self-monitoring parameters to be recorded for all systems shall include, inter alia:

- .1 general information: ship name, IMO number, BWMS manufacturer and type designation, BWMS serial number, date of BWMS installation on ship, BWMS TRC and principle of treatment (in-line/in-tank);
- .2 operational parameters: all recorded parameters should be time tagged if applicable: BWMS operational modes and any transition modes, including bypass operations (e.g. uptake, discharge, warming-up, cleaning and start up), ballast water pump in operation (yes/no – if information is available from ship), flow-rate at system outlet, and indication of the ballast water tank that is involved in the ballast water operation when practicable;
- .3 it is recommended that positional information on ballast water operations and on the holding time should be recorded automatically. Otherwise it shall be entered manually in the ballast water record book as appropriate. Administrations are encouraged to apply automatic position information recording to ships which install BWMS during a ship's building to the greatest extent possible;
- .4 system alerts and indications: all systems shall have an alert regime. Every alert shall be logged and time stamped. To assist the inspections it would be helpful to record an alert summary after each ballast water operation automatically, if possible;
- .5 general alerts include: shutdown of system while in operation, when maintenance is required, BWMS bypass valve status and status of BWMS valves representing system operational mode as appropriate;
- .6 operational alerts: whenever a relevant parameter exceeds the acceptable range approved by the Administration, the system shall give an alert. In addition, an alert shall be logged and time stamped also when a combination of relevant parameters exceeds system specifications, even if each single parameter does not exceed its approved range. If a safety relevant parameter (safety for crew, cargo and/or the ship) related to the BWMS exceeds approved limits, an alert/alarm shall be mandatory (e.g. hydrogen level at appropriate measurement point(s));
- .7 the Administration may require additional alerts depending on the design of the system and for future developments; and
- .8 the SDL parameters and their corresponding data such as range, alarm limit, alert delay, etc., be password protected on a level above what is required for normal operation and maintenance, i.e. on a system administrator level. Change of any data or parameters which are password protected and interruption of the measurement (wire break, signal out of range) shall be automatically logged and retrievable on a maintenance access level.

Data storage and retrieval

5.4 Storage of data shall follow the requirements in paragraphs 4.17 to 4.22 of this Code. The equipment shall be able to store a minimum number of self-monitoring parameters following common standards determined by the Organization.

5.5 The control and monitoring equipment shall automatically record the proper functioning or failure of a BWMS without user interaction and add a time stamp to every entry. Additionally, the system shall have a tool to produce summary text files for each ballast water operation on demand to support inspections work.

5.6 The system shall store the required data in an acceptable format to be able to display, print or export the data for official inspections. An acceptable format could be:

- .1 an internationally standardized readable format (e.g. text format, pdf, MS Excel); or
- .2 the extensible mark-up language (xml).

5.7 The equipment shall be so designed that, as far as is practical, it will not be possible to manipulate either the data being stored by the system or the data which has already been recorded. Any attempt to interfere with the integrity of the data shall be recorded.

5.8 Permanent deletion of recordings shall not be possible. The system shall be capable of storing recorded data for at least 24 months to facilitate compliance with regulation B-2 of the Convention. Where navigation equipment is connected to the monitoring system to provide data for recording, the interfaces shall be developed taking into account applicable parts of relevant international standards.¹⁴

PART 6 – VALIDATION OF SYSTEM DESIGN LIMITATIONS

6.1 The objective of the SDL approach is twofold. Firstly, it ensures that the performance of the BWMS has been transparently assessed with respect to the known water quality and operational parameters that are important to its operation, including those that may not be specifically provided for in this Code. Secondly, it provides transparent oversight of BWMS performance claims by the manufacturer that may go beyond specific criteria in this Code. Although the validation of SDL yields information that is reported on the Type Approval Certificate, this information does not affect the eligibility of a BWMS to receive type approval.

6.2 The low and/or high parameter values for each SDL shall be validated to the satisfaction of the Administration as follows:

- .1 the validation shall be overseen by the Administration and shall consist of a rigorous evidence-based assessment of a specific claim by the BWMS manufacturer that the equipment will operate as intended between pre-stated parameter values;
- .2 tests to validate SDL shall be undertaken in accordance with paragraphs 2.2 to 2.4 of this annex. Such tests may be combined with land-based and/or shipboard testing if the QAPP establishes that the validation tests will not interfere with the specific procedures in Part 2 of this annex. Laboratory or bench-scale testing may also be used in the validation of SDL;

¹⁴ Refer to *Digital interfaces for navigational equipment within a ship* (IEC 61162).

- .3 methods other than testing, such as the use of existing data and/or models, may be used in the validation of SDL. The source, suitability and reliability of such methods shall be reported; and
- .4 validation is not intended as a stress-test of the BWMS or as a procedure for identifying equipment failure points. Validation shall be undertaken independently of the BWMS manufacturer and shall be separate from BWMS research and development activities. Data and models may be supplied by the manufacturer when appropriate but shall be independently assessed.

6.3 Claims of open-ended performance (expressed as the lack of either a low or a high parameter value for a System Design Limitation) shall also be validated.

6.4 BWMS manufacturers may include a margin of error in claiming SDL. For this reason, SDL should not necessarily be interpreted as the exact parameter values beyond which the BWMS is incapable of operation. The Administration shall take this into account in considering whether to include any additional restrictions on the Type Approval Certificate in connection with the validation of SDL.

6.5 SDL shall be established for all known parameters to which the design of the BWMS is sensitive that are important to the operation of the BWMS. In the case of SDL parameters that are also subject to specific criteria in Part 2 of this annex, the procedure set out in Part 2 shall be followed. For such parameters, the approach in paragraph 6.2 above may be used only to the extent that the performance claim goes beyond the specific criteria in Part 2.

6.6 A report shall be submitted to the Administration containing all documentation (including procedures, methods, data, models, results, explanations and remarks) associated with the validation of SDL. The report shall include at least the information identified in paragraph 2.57 of this annex.

PART 7 – TYPE APPROVAL CERTIFICATE AND TYPE APPROVAL REPORT

Type Approval Certificate

7.1 The Type Approval Certificate of a BWMS shall:

- .1 identify the type and model of the BWMS to which it applies and identify equipment assembly drawings, duly dated;
- .2 identify pertinent drawings bearing model specification numbers or equivalent identification details;
- .3 include a reference to the full performance test protocol on which it is based;
- .4 identify if it was issued by an Administration based on a Type Approval Certificate previously issued by another Administration. Such a certificate shall identify the Administration that supervised conduction of the tests on the BWMS and a copy of the original test results shall be attached to the Type Approval Certificate of the BWMS;
- .5 identify all conditions and limitations for the installation of BWMS on board the ship;
- .6 include the SDL, which shall be listed under the heading "This equipment has been designed for operation in the following conditions";

- .7 include any restrictions imposed by the Administration due to the minimum holding time or in accordance with paragraph 6.4 of this annex; such restrictions shall include any applicable environmental conditions (e.g. UV transmittance, etc.) and/or system operational parameters (e.g. min/max pressure, pressure differentials, min/max Total Residual Oxidants (TRO) if applicable, etc.); and
- .8 include an appendix containing test results of each land-based and shipboard test cycle. Such test results shall include at least the numerical salinity, temperature, flow rates, and where appropriate UV transmittance. In addition, these test results shall include all other relevant variables. The Type Approval Certificate shall list any identified SDL parameters.

Type approval report

7.2 The type approval report shall be submitted to the Organization and made available to the public and Member States by appropriate means. It shall contain at least:

- .1 information on the type approval of the BWMS, including:
 - .1 the approval date;
 - .2 the name of the Administration;
 - .3 the name of the manufacturer;
 - .4 the trade name and product designation (such as model numbers) of the BWMS; and
 - .5 a copy of the Type Approval Certificate including its appendices, annexes or other attachments;
- .2 an executive summary;
- .3 a description of the BWMS, including, in the case of BWMS using Active Substances, the following information:
 - .1 the name of the Active Substance(s) or Preparation(s) employed; and
 - .2 identification of the specific Marine Environment Protection Committee (MEPC) report and paragraph number granting Final Approval, taking into account guidelines developed by the Organization;¹⁵
- .4 an overview of the process undertaken by the Administration to evaluate the BWMS, including the name and role of each test facility, subcontractor and test organization involved in testing and approving the BWMS, the role of each report in the type approval decision, and a summary of the Administration's approach to overall quality assurance and quality control;
- .5 the executive summary of each test report prepared in accordance with paragraphs 2.48, 2.55 to 2.57, 3.4 and 6.6 of this Annex;

¹⁵ Refer to the *Procedure for approval of ballast water management systems that make use of Active Substances (G9)* (resolution MEPC.169(57)).

- .6 the operational safety requirements of the BWMS and all safety-related findings that have been made during the type approval process;
- .7 a discussion section explaining the Administration's assessment that the BWMS:
 - .1 in every respect fulfilled the requirements of this Code, including demonstrating under the procedures and conditions specified for both land-based and shipboard testing that it met the ballast water performance standard described in regulation D-2;
 - .2 is designed and manufactured according to requirements and standards;
 - .3 is in compliance with all applicable requirements;
 - .4 has been approved taking into account the recommendations provided by the MEPC in the Final Approval of the BWMS, if any;
 - .5 operates within the SDL at the TRC, performance, and reliability as specified by the manufacturer;
 - .6 contains control and monitoring equipment that operates correctly;
 - .7 was installed in accordance with the technical installation specification of the manufacturer for all tests; and
 - .8 was used to treat volumes and flow rates of ballast water during the shipboard tests consistent with the normal ballast operations of the ship; and
- .8 the following annexes:
 - .1 appropriate information on quality control and assurance; and
 - .2 each complete test report prepared in accordance with paragraphs 2.48, 2.55 to 2.57, 3.4 and 6.6 of this annex.

7.3 The Administration may redact proprietary information of the manufacturer from the type approval report before submitting it to the Organization.

7.4 The Type Approval Certificate and the type approval report (including their entire contents and all annexes, appendices or other attachments) shall be accompanied by a translation into English, French or Spanish if not written in one of those languages.

7.5 Documents shall not be incorporated by reference into the Type Approval Certificate. The Administration may incorporate an annex by reference into the type approval report if the reference (e.g. internet URL) is expected to remain permanently valid. Upon any reference becoming invalid, the Administration shall promptly re-submit the type approval report to the Organization and include the referenced document or an updated reference to it; and the Organization shall promptly make the revised report available to the public and Member States through appropriate means.

APPENDIX

BADGE OR CIPHER

(Limiting Operating Conditions apply)*

NAME OF ADMINISTRATION

TYPE APPROVAL CERTIFICATE OF BALLAST WATER MANAGEMENT SYSTEM

This is to certify that the ballast water management system listed below has been examined and tested in accordance with the requirements of the specifications contained in the *Code for Approval of Ballast Water Management Systems* (resolution MEPC.300(72)). This certificate is valid only for the ballast water management system referred to below.

Name of ballast water management system:

Ballast water management system manufactured by:

Under type and model designation(s)
and incorporating:

To equipment/assembly drawing No.: date:

Other equipment manufactured by:

To equipment/assembly drawing No.: date:

Treatment Rated Capacity (m³/h):

A copy of this Type Approval Certificate shall be carried on board a ship fitted with this ballast water management system, for inspection on board the ship. If the Type Approval Certificate is issued based on approval by another Administration, reference to that Type Approval Certificate shall be made.

Limiting Operating Conditions imposed are described in this document.

(Temperature / Salinity)

Other restrictions imposed include the following:

This equipment has been designed for operation in the following conditions:**

Official stamp

Signed
Administration of
Issued this day of 20
Valid until this day of 20

* Delete as appropriate.

** Insert System Design Limitations.

ANNEX 4

**RESOLUTION MEPC.299(72)
(adopted on 13 April 2018)**

**AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE CONTROL AND
MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

Amendments to regulations E-1 and E-5

**(Endorsements of additional surveys on the
International Ballast Water Management Certificate)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

NOTING article 19 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the BWM Convention), which specifies the amendment procedure and confers upon the Marine Environment Protection Committee of the Organization the function of considering amendments thereto for adoption by the Parties,

HAVING CONSIDERED, at its seventy-second session, proposed amendments to regulations E-1 and E-5 of the BWM Convention concerning endorsements of additional surveys on the International Ballast Water Management Certificate,

1 ADOPTS, in accordance with article 19(2)(c) of the BWM Convention, amendments to regulations E-1 and E-5, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article 19(2)(e)(ii) of the BWM Convention, that the amendments shall be deemed to have been accepted on 13 April 2019 unless, prior to that date, more than one-third of the Parties have notified the Secretary-General that they object to the amendments;

3 INVITES the Parties to note that, in accordance with article 19(2)(f)(ii) of the BWM Convention, the said amendments shall enter into force on 13 October 2019 upon their acceptance in accordance with paragraph 2 above;

4 INVITES FURTHER the Parties to consider the application of the aforesaid amendments to the BWM Convention as soon as possible to ships entitled to fly their flag;

5 REQUESTS the Secretary-General, for the purposes of article 19(2)(d) of the BWM Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Parties to the BWM Convention;

6 REQUESTS ALSO the Secretary-General to transmit copies of the present resolution and its annex to Members of the Organization which are not Parties to the BWM Convention;

7 REQUESTS FURTHER the Secretary-General to prepare a consolidated certified text of the BWM Convention.

ANNEX

AMENDMENTS TO THE ANNEX TO THE BWM CONVENTION

**(Endorsements of additional surveys on the
International Ballast Water Management Certificate)**

Section E – Survey and certification requirements for ballast water management

Regulation E-1 – Surveys

1 In paragraph 1.5, the last sentence "Such surveys shall be endorsed on the Certificate issued under regulation E-2 and E-3" is deleted.

Regulation E-5 – Duration and validity of the Certificate

2 In the chapeau of paragraph 8, the words "annual survey" are replaced by "annual or intermediate survey".

3 In paragraph 8.3, the words "annual surveys" are replaced by "annual or intermediate surveys".

4 The existing paragraph 9.1 is deleted and the existing paragraphs 9.2 to 9.4 are renumbered as paragraphs 9.1 to 9.3, respectively.

ANNEX 3

**RESOLUTION MEPC.298(72)
(adopted on 13 April 2018)**

**DETERMINATION OF THE SURVEY REFERRED TO
IN REGULATION B-3, AS AMENDED, OF THE BWM CONVENTION**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution from ships,

NOTING resolution MEPC.297(72), by which it adopted amendments to regulation B-3 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the BWM Convention),

NOTING ALSO that paragraph 10 of regulation B-3 of the BWM Convention, as amended, states that the Committee shall determine the renewal survey to which paragraphs 1.1, 1.2, 2 and 4 of regulation B-3 of the BWM Convention shall apply,

DETERMINES that the renewal survey referred to in paragraph 10 of regulation B-3 of the BWM Convention is the renewal survey for the ship associated with the International Oil Pollution Prevention Certificate pursuant to Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL).

ANNEX 2

**RESOLUTION MEPC.297(72)
(adopted on 13 April 2018)**

**AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE CONTROL AND
MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

Amendments to regulation B-3

(Implementation schedule of ballast water management for ships)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

NOTING article 19 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the BWM Convention), which specifies the amendment procedure and confers upon the Marine Environment Protection Committee of the Organization the function of considering amendments thereto for adoption by the Parties,

HAVING CONSIDERED, at its seventy-second session, proposed amendments to regulation B-3 of the BWM Convention concerning the implementation schedule of ballast water management for ships,

RECALLING resolution MEPC.287(71), by which it resolved that the Parties should implement the amended regulation B-3 immediately after the entry into force of the BWM Convention, in lieu of the implementation schedule recommended in resolution A.1088(28) on the application of the BWM Convention and notwithstanding the schedule set forth in regulation B-3, with a view to avoiding the creation of a dual treaty regime during the time period between the entry into force of the BWM Convention and the entry into force of the amended regulation B-3,

1 ADOPTS, in accordance with article 19(2)(c) of the BWM Convention, amendments to regulation B-3, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article 19(2)(e)(ii) of the BWM Convention, that the amendments shall be deemed to have been accepted on 13 April 2019 unless, prior to that date, more than one-third of the Parties have notified the Secretary-General that they object to the amendments;

3 INVITES the Parties to note that, in accordance with article 19(2)(f)(ii) of the BWM Convention, the said amendments shall enter into force on 13 October 2019 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article 19(2)(d) of the BWM Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Parties to the BWM Convention;

5 REQUESTS ALSO the Secretary-General to transmit copies of the present resolution and its annex to Members of the Organization which are not Parties to the BWM Convention;

6 REQUESTS FURTHER the Secretary-General to prepare a consolidated certified text of the BWM Convention.

ANNEX

AMENDMENTS TO THE ANNEX TO THE BWM CONVENTION

(Implementation schedule of ballast water management for ships)

Section B – Management and control requirements for ships

Regulation B-3 – Ballast water management for ships

1 The text of regulation B-3 is replaced with the following:

"1 A ship constructed before 2009:

- .1 with a ballast water capacity of between 1,500 and 5,000 cubic metres, inclusive, shall conduct ballast water management that at least meets the standard described in regulation D-1 or regulation D-2 until the renewal survey described in paragraph 10, after which time it shall at least meet the standard described in regulation D-2;
- .2 with a ballast water capacity of less than 1,500 or greater than 5,000 cubic metres shall conduct ballast water management that at least meets the standard described in regulation D-1 or regulation D-2 until the renewal survey described in paragraph 10, after which time it shall at least meet the standard described in regulation D-2.

2 A ship constructed in or after 2009 and before 8 September 2017 with a ballast water capacity of less than 5,000 cubic metres shall conduct ballast water management that at least meets the standard described in regulation D-2 from the date of the renewal survey described in paragraph 10.

3 A ship constructed in or after 2009, but before 2012, with a ballast water capacity of 5,000 cubic metres or more shall conduct ballast water management in accordance with paragraph 1.2.

4 A ship constructed in or after 2012 and before 8 September 2017 with a ballast water capacity of 5,000 cubic metres or more shall conduct ballast water management that at least meets the standard described in regulation D-2 from the date of the renewal survey described in paragraph 10.

5 A ship constructed on or after 8 September 2017 shall conduct ballast water management that at least meets the standard described in regulation D-2.

6 The requirements of this regulation do not apply to ships that discharge ballast water to a reception facility designed taking into account the Guidelines developed by the Organization for such facilities.

7 Other methods of ballast water management may also be accepted as alternatives to the requirements described in paragraphs 1 to 5 and paragraph 8, provided that such methods ensure at least the same level of protection to the environment, human health, property or resources, and are approved in principle by the Committee.

8 A ship constructed before 8 September 2017 to which the renewal survey described in paragraph 10 does not apply, shall conduct ballast water management that at least meets the standard described in regulation D-2 from the date decided by the Administration, but not later than 8 September 2024.

9 A ship subject to paragraphs 2, 4 or 8 will be required to comply with either regulation D-1 or regulation D-2, until such time as it is required to comply with regulation D-2.

10 Notwithstanding regulation E-1.1.2, the renewal survey referred to in paragraphs 1.1, 1.2, 2 and 4 is:

- .1 the first renewal survey, as determined by the Committee,¹ on or after 8 September 2017 if:
 - .1 this survey is completed on or after 8 September 2019; or
 - .2 a renewal survey is completed on or after 8 September 2014 but prior to 8 September 2017; and
- .2 the second renewal survey, as determined by the Committee,¹ on or after 8 September 2017 if the first renewal survey on or after 8 September 2017 is completed prior to 8 September 2019, provided that the conditions of paragraph 10.1.2 are not met."

¹ Reference is made to resolution MEPC.298(72).

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

BWM.2/Circ.70
1 November 2018

**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT
OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

Guidance for the commissioning testing of ballast water management systems

- 1 The Marine Environment Protection Committee (MEPC), at its seventy-third session (22 to 26 October 2018), approved *Guidance for the commissioning testing of ballast water management systems*, as set out in the annex.
- 2 Member Governments and international organizations are invited to bring the annexed Guidance to the attention of all parties concerned.

ANNEX

GUIDANCE FOR THE COMMISSIONING TESTING OF BALLAST WATER MANAGEMENT SYSTEMS

Context

1 The purpose of commissioning testing is to validate the installation of a ballast water management system (BWMS) by demonstrating that its mechanical, physical, chemical and biological processes are working properly. Commissioning testing is not intended to validate the design of type-approved BWMS that are approved by the Administration.

2 The following Guidance for the commissioning testing of BWMS has been developed for use by persons fitting and verifying the installation of BWMS in accordance with:

- .1 regulation E-1.1.1 of the Convention, which requires, inter alia, that an initial survey verify that any structure, equipment, systems, fitting, arrangements, material or processes comply fully with the requirements of the Convention;
- .2 regulation E-1.1.5 of the Convention which requires, inter alia, that an additional survey be made after a change, replacement, or significant repair of the structure, equipment, systems, fittings, arrangements and material necessary to achieve full compliance with the Convention;
- .3 paragraph 8.2.5 of the BWMS Code, which requires that the Administration issuing the International Ballast Water Management Certificate verify that installation commissioning procedures are on board the ship in a suitable format;
- .4 paragraph 8.3.6 of the BWMS Code, which requires that the installation commissioning procedures have been completed;
- .5 paragraph 1.18 of resolution MEPC.174(58), which provides that, when a type-approved ballast water management system is installed on board, an installation survey according to section 8 should be carried out; and
- .6 paragraph 1.1.2.19 of annex 4 of the HSSC Guidelines (resolution A.1120(30)), which includes, "verifying that an operational test of the ballast water management system was carried out based on the installation commissioning procedures and that documented evidence is provided which shows compliance of the treated discharge ballast water during the above mentioned test with regulation D-2 through sampling and analysis based on applicable guidelines developed by the Organization."

3 For the purposes of this Guidance, commissioning testing refers to an operational test of the ballast water management system carried out based on the installation commissioning procedures referred to in paragraph 2.6.

Validating compliance

4 The following steps should be undertaken following installation of the BWMS on board the ship, and after all ballasting equipment (e.g. pumps and piping) has been fully installed and tested as appropriate:

- .1 a sample should be collected during a ballast water uptake to characterize the ambient water, by any means practical (e.g. in-line sample port or direct harbour sample). The ambient water should be accepted for testing regardless of the level of challenge it poses to the BWMS;
- .2 a sample should be collected during the corresponding ballast water discharge after the full treatment has been applied. Samples should be taken in accordance with the *Guidelines on ballast water sampling* (G2);
- .3 the representative samples should be analysed for all size classes included in the D-2 standard using indicative analysis methods listed in table 3 of BWM.2/Circ.42/Rev.1; and
- .4 the applicable self-monitoring parameters (e.g. flow rate, pressure, TRO, UV intensity, etc.) of the BWMS should also be assessed, taking into account the System Design Limitations of the BWMS, and the correct operation of all sensors and related equipment should be confirmed.

5 The validation is successful if the analysis indicates that the discharge sample does not exceed the D-2 standard and the self-monitoring equipment indicates correct operation.

6 In the case that the ambient water is not appropriate for the operational testing during the commissioning of the BWMS (e.g. salinity of ambient water is outside the SDL of the BWMS), testing should be evaluated to the satisfaction of the Administration.

Documentation

7 A written report including methods and detailed results of the commissioning testing should be provided to the Administration.

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

BWM.2/Circ.69
1 November 2018

**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT
OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

**Guidance on System Design Limitations of ballast water management systems
and their monitoring**

- 1 The Marine Environment Protection Committee (MEPC), at its seventy-third session (22 to 26 October 2018), approved the *Guidance on System Design Limitations of ballast water management systems and their monitoring* developed by the PPR Sub-Committee at its fifth session (5 to 9 February 2018), as set out in the annex.
- 2 Member Governments and international organizations are invited to bring the annexed Guidance to the attention of all parties concerned.

ANNEX

GUIDANCE ON SYSTEM DESIGN LIMITATIONS OF BALLAST WATER MANAGEMENT SYSTEMS AND THEIR MONITORING

1 The purpose of this document is to expand on the information provided in the Code for approval of ballast water management systems (BWMS Code) concerning the inclusion of System Design Limitations (SDL) on the Type Approval Certificates of ballast water management systems (BWMS).

2 With a view to increasing global consistency in the application of SDL and the implementation of self-monitoring, this document also provides recommendations to Administrations and manufacturers of BWMS concerning:

- .1 potential SDL for the various types of technologies used in BWMS; and
- .2 self-monitoring parameters that may be associated with these SDL.

System Design Limitations approach

3 BWMS used to comply with the Convention are approved by the Administration taking into account the BWMS Code. This Code include standardized tests (e.g. specifying salinity ranges and other challenge water parameters) that are designed to demonstrate the proper function of BWMS in these conditions, and thereby screen out those systems that would not meet the ballast water performance standard described in regulation D-2.

4 However, an approved BWMS might not be appropriate for all ships or all situations. Also, some ships need assurances that BWMS will be capable of operating in conditions that are more challenging than those included in the standardized tests. The SDL approach is intended to complement the standardized tests in the BWMS Code by providing validated information on the conditions for which an individual BWMS is designed. This information is communicated transparently on the Type Approval Certificate to stakeholders, such as the shipowners who are required by the Convention to meet the D-2 standard during every ballast water discharge and crew members who will operate BWMS.

5 SDLs should be identified and validated for each specific BWMS presented for approval. The SDL approach provides a process to identify and provide information to the end user on performance expectations for the system. The SDL approach has two objectives:

- .1 to ensure that the performance of the BWMS has been transparently assessed with respect to the known water quality and/or operational parameters that are important to its proper function, including those that may not otherwise be provided for in the Code;
- .2 to provide transparent oversight of manufacturer's BWMS performance claims that may go beyond the specific criteria in the Code.

6 The term "System Design Limitations" refers to the physical and/or operational limitations inherent in the design of the BWMS itself, as opposed to the minimum criteria within the BWMS Code. The term does not refer to regulatory restrictions on when the BWMS may or may not be used.

- 7 The SDL approach unfolds through the following steps:
- .1 the manufacturer identifies the parameters to which the BWMS is sensitive and that are important to the proper operation of the BWMS, together with claimed high and/or low values for which the BWMS is capable of achieving the D-2 standard, and the proposed methods for validating these claims (paragraph 1.3.5 of the annex to the BWMS Code;
 - .2 the Administration evaluates the basis for the manufacturer's claims and the suitability and reliability of the methods proposed to validate the claims (paragraphs 1.14 to 1.15 of the annex to the BWMS Code;
 - .3 the Administration oversees the validation of the manufacturer's claimed SDLs through a rigorous evidence-based assessment, which may include testing integrated with the specific tests identified in the BWMS Code and/or the use of existing data and/or models (part 6 of the annex to the BWMS Code);
 - .4 the Administration includes SDLs on the Type Approval Certificate, listed under the heading "*This equipment has been designed for operation in the following conditions*" (paragraph 7.1.6 of the annex to the BWMS Code), and the manufacturer integrates the SDLs into the self-monitoring system of the BWMS where appropriate and practical (paragraph 4.17 of the body of the BWMS Code); and
 - .5 the Administration includes all documentation associated with the validation of applicable SDLs in the type approval report of the BWMS (paragraph 6.6 of the annex to the BWMS Code).

8 On the model Type Approval Certificate shown in the appendix to the BWMS Code, the heading "*This equipment has been designed for operation in the following conditions*" is distinct from the headings pertaining to "Limiting Operational Conditions" and "other restrictions." If no other restriction is to be imposed, the Administration should write the word "nil" in the "other restrictions" sections in order to clearly indicate that SDLs do not directly constitute a restriction.

System Design Limitations identification

9 Essentially, SDLs are the BWMS-specific water quality parameters (environmental factors) and/or operational parameters (arising from the BWMS design) that are important to the operation of the system and for which the BWMS is designed to achieve the D-2 standard.

10 SDLs should be developed using measures and units that are as accessible as possible to the end user, that are relevant to the operation of ships, and that may be displayed, monitored, recorded and alarmed by the BWMS self-monitoring system.

11 While SDLs should be specific to each BWMS, potential SDLs for various types of ballast water management technologies are provided in the annex to this document in order to provide guidance to BWMS manufacturers and Administrations. They are given as examples of what has been used during type approval of BWMS. This annex should be updated based on the experience gained in the implementation of the BWMS Code by Administrations. As experience is gained, the potential SDL applicable to different technology may also change.

12 For each SDL, a low and/or high value should be claimed by the manufacturer and validated by the Administration to provide information on the range in which the BWMS is designed to work properly. These values are reported on the Type Approval Certificate. As BWMS manufacturers may include a margin of error in claiming System Design Limitations, the SDL should not necessarily be interpreted as the exact parameter values beyond which the BWMS is incapable of operation. The Administration should take this into account in considering whether to include any additional restrictions on the Type Approval Certificate in connection with the validation of System Design Limitations.

13 In the case of SDL parameters that are also subject to specific criteria in part 2 of the annex to the BWMS Code, the procedure set out in part 2 shall be followed. For such parameters, the SDL approach may be used only to the extent that the performance claim goes beyond the specific criteria in part 2.

14 In claiming and validating SDLs, manufacturers and Administrations are advised to bear in mind that the SDLs will be communicated to the end user of the equipment for information under the heading "*This equipment has been designed for operation in the following conditions.*" It is therefore advisable that the list focuses only on the key parameters that are most important to the proper operation of the BWMS.

15 In selecting SDLs, parameters that are important to the operation of the system should be included even if such parameters are also assessed specifically by the BWMS Code. This can provide information on the ability (or non-ability) of the system to operate in conditions more challenging than the standardized tests in the BWMS Code. For example, a BWMS that depends on the salinity of ballast water should have an SDL for salinity, for which the manufacturer might claim performance beyond the minimum required under the BWMS Code. The Administration would validate any such claim before including the information on the Type Approval Certificate.

16 It is recommended to only claim SDL which are relevant to the specific technology and that can be measured (directly or indirectly) and be used for regulating or controlling the performance and/or functioning of the BWMS. This is because if no measurement is available, the SDL cannot be verified during test or operation and consequently is not relevant for BWMS operation by the end user.

17 Correlations and potential interactions between parameters do exist. Administrations and BWMS manufacturers are encouraged to report on these correlations to the Organization. SDLs affected by any known or applicable interactions should be identified.

Self-monitoring of System Design Limitations

18 The BWMS Code stipulates that control equipment of a BWMS should incorporate a continuous self-monitoring function during the period in which the system is in operation. The monitoring equipment should record and produce a report of the proper functioning or failure of the ballast water management system in accordance with part 5 of the annex to the BWMS Code (resolution MEPC.300(72)).

19 The self-monitoring function of the BWMS should make the data pertaining to the SDL readily accessible to the end user. The monitoring parameters may be measured directly or indirectly. It is preferable to use direct measurements when feasible. Sensors should be appropriately located to provide a representative reading of the functioning of the BWMS.

20 Potential control and monitoring parameters associated with SDL are provided in the annex to this document. Self-monitoring parameters are given as examples of what has been observed in type-approved BWMS.

21 The BWMS Code also provides that any additional parameters that are necessary to ascertain BWMS performance and safety should be determined by the Administration and stored in the system.

ANNEX

POTENTIAL CONTROL AND MONITORING PARAMETERS ASSOCIATED WITH SYSTEM DESIGN LIMITATIONS

1 The table below sets out information about the technologies commonly used in ballast water management, together with potential SDLs and control and monitoring parameters that the Administration may wish to take into account in connection with the BWMS Code (resolution MEPC.300(72)).

2 The table does not include all potential factors or interactions, nor all self-monitoring parameters as detailed in part 5 of the BWMS Code, but instead is intended to identify known parameters that can be monitored and may be important to the operation of the BWMS.

3 The table is not intended to be exhaustive. It is intended that this remain a living document and that information be added based on experience gained. In particular, more experience is needed on parameters that cannot currently be monitored directly (e.g. suspended solids in the case of filtration).

Table: List of potential System Design Limitations and related self-monitoring parameters

Technology	Principles	Potential SDL		Control and monitoring parameters seen in BWMS	Design elements / related information
		Environmental / water quality parameters	Technical / operational parameters		
Filtration	<ul style="list-style-type: none"> - Removal of particles and organisms greater than the filter mesh size (disk, basket, candle, etc.) - Automatic cleaning 	<ul style="list-style-type: none"> - Suspended solids (size, quality, quantity) - Salinity and temperature 	<ul style="list-style-type: none"> - Maximum flow rate - Minimum backwash pressure 	<ul style="list-style-type: none"> - Flow rate - Inlet/outlet pressure or differential pressure (dP) - Minimum backwash pressure 	<ul style="list-style-type: none"> - Mesh size or retention threshold (nominal or absolute) - Filtration capacity (flow rate) - Cleaning capacity (backflush) - Number or frequency of backwashes or cleaning cycles
Hydrocyclone	<ul style="list-style-type: none"> - Gravitational separation of particles by centrifugal force (removal of organisms) 	<ul style="list-style-type: none"> - Suspended solids (specific gravity, quantity) - Salinity and temperature 	<ul style="list-style-type: none"> - Minimum and maximum flow rate 	<ul style="list-style-type: none"> - Flow rate - Inlet/outlet pressure 	<ul style="list-style-type: none"> - Capacity - Separation percentage
Ultraviolet (UV) irradiation	<ul style="list-style-type: none"> - UV irradiation (low pressure / medium pressure) damages cells 	<ul style="list-style-type: none"> - UVT - Salinity and temperature 	<ul style="list-style-type: none"> - UVI - Minimum and maximum flow rate - Minimum holding time 	<ul style="list-style-type: none"> - UVI, UVT, and/or UV dose - Power, or current and voltage - Minimum and maximum flow rate 	<ul style="list-style-type: none"> - UV dose

Technology	Principles	Potential SDL		Control and monitoring parameters seen in BWMS	Design elements / related information
		Environmental / water quality parameters	Technical / operational parameters		
Electro-chlorination	- Generation of Active Substance through electrolysis of seawater (electric current)	- Salinity and temperature, or conductivity, of the electrolytic feedwater and/or the ambient water to be treated	- Active Substance dose (quantity or concentration) - Maximum flow rate - Minimum holding time	- Power, or current and voltage - Active Substance dose, TRO, and/or ORP - Feedwater (side stream, or full flow) conductivity, or salinity and temperature - Flow rate - Holding time	- Active Substance production rate
	- Neutralizing agent may be used (as per Procedure (G9) requirements)	- Salinity and temperature	- Neutralization dose - Maximum flow rate	- Neutralizing agent flow rate or quantity - Flow rate - Active Substance - Concentration at discharge	- Neutralizing agent storage quantity and dosing rate
Chemical injection (e.g. ozone, sodium hypochlorite, ClO ₂ , etc.)	- Storage or generation of Active Substance and injection of the created biocide in ballast water	- Salinity and temperature	- Active Substance dose (quantity or concentration) - Maximum flow rate - Minimum holding time	- Power, or current and voltage - Temperature of ozone generator - Active Substance dose - Salinity and/or water conductivity - Water temperature - Flow rate - Holding time	- Active substance production rate, storage quantity, and/or dosing rate
	- Neutralizing agent may be used (as per Procedure (G9) requirements)	- Salinity and temperature	- Neutralization dose - Maximum flow rate	- Neutralizing agent flow rate or quantity - Flow rate - Active Substance concentration at discharge	- Neutralizing agent storage quantity and dosing rate

Technology	Principles	Potential SDL		Control and monitoring parameters seen in BWMS	Design elements / related information
		Environmental / water quality parameters	Technical / operational parameters		
Heat	- Disruption of chemical bonds, denaturing of enzymes and structures through heat energy	- Salinity and temperature	- Temperature range and minimum holding time - Maximum flow rate	- Temperature and holding time - Flow rate	- Heating capacity
Cavitation	- Cell membrane is damaged by shear forces	- Salinity and temperature	- Minimum differential pressure - Inlet and outlet pressure - Maximum flow rate	- Differential pressure - Flow rate	- Available differential pressure
Ultrasound	- Ultrasound waves generate cavitation bubbles in water resulting in intense shear forces and high stress to cell membranes	- Salinity and temperature	- Minimum ultrasound power - Maximum flow rate - Minimum exposure time	- Power, or current and voltage - Flow rate	- Frequency, amplitude and exposure time of ultrasound delivery
Deoxygenation	- Inert gas injection or creation (e.g. CO ₂ or N ₂) to reduce the available oxygen for organisms in water	- Salinity and temperature	- Minimum inert gas purity (in %) - Minimum injection rate - Minimum holding time	- Dissolved oxygen content - Inert gas purity (%) - Injection rate - Holding time	- Inert gas production rate and purity - Rate of gas injection and mixing
In tank treatment systems – chemicals	- Application of Active Substance into ballast water tanks	- Salinity and temperature - As appropriate for the Active Substance in use	- Minimum uniformity of tank mixing - Minimum holding time per tank	- Active Substance dose or concentration in tank - Holding time	- Mixing device placement - Circulation flow rate/volume - Holding time

Technology	Principles	Potential SDL		Control and monitoring parameters seen in BWMS	Design elements / related information
		Environmental / water quality parameters	Technical / operational parameters		
	- Neutralizing agent may be used (as per Procedure (G9) requirements)	- Salinity and temperature	- Neutralization dose	- Neutralizing agent flow rate or quantity - Active Substance - Concentration in ballast tank	- Neutralizer storage quantity and dosing rate
In tank treatment systems – non-chemicals	- Application of mechanism into ballast water tanks	- Salinity and temperature - As appropriate for the treatment mechanism in use	- Fraction of the tank water being circulated - Minimum uniformity of mechanism application - Minimum holding time per tank	- Measurement of mechanism to the ballast tank or in the ballast tank - Holding time	- Mixing device placement - Circulation flow rate/volume - Holding time

Note: all parameters refer to properties of the ballast water unless otherwise noted (e.g. feedwater).

Legend for the table:

ORP = Oxidant Reduction Potential

TRO = Total Residual Oxidant

UVI = UV intensity

UVT = UV transmittance

The heading "principles" means a summary of the main process used by the technology to manage the ballast water.

The heading "technical/operational parameters" means design parameters of the BWMS that impact or define its performance and/or operation.

The heading "environmental/water quality parameters" means external factors (e.g. water quality) that may directly impact the functioning of the system.

The heading "control and monitoring parameters seen in BWMS" means parameters that may be monitored/logged by BWMS in relation to the SDL. The intention is to give a list of examples, not to prescribe certain kind of measurements that must be included. These examples come from observed control and monitoring parameters in approved BWMS.

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

BWM.2/Circ.67/Rev.1
24 May 2019

**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT
OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

**Data gathering and analysis plan for the experience-building phase
associated with the BWM Convention**

- 1 The Marine Environment Protection Committee (MEPC), at its seventy-first session (3 to 7 July 2017), adopted resolution MEPC.290(71), establishing the experience-building phase associated with the BWM Convention, to allow the Marine Environment Protection Committee to monitor and improve the *International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004*.
- 2 MEPC 72 (9 to 13 April 2018) approved the *Data gathering and analysis plan for the experience-building phase associated with the BWM Convention* (BWM.2/Circ.67).
- 3 MEPC 74 (13 to 17 May 2019) approved a revision of the circular in order to include a link to standard operating procedures for collection of treated ballast water samples, as agreed by PPR 6 (18 to 22 February 2019).
- 4 Member Governments and international organizations are encouraged to use the annexed plan to gather, prepare and submit data to the experience-building phase (EBP).
- 5 This circular revokes BWM.2/Circ.67.

ANNEX

DATA GATHERING AND ANALYSIS PLAN FOR THE EXPERIENCE-BUILDING PHASE ASSOCIATED WITH THE BWM CONVENTION

1 Overview of the experience-building phase

1.1 Resolution MEPC.290(71) established the experience-building phase associated with the BWM Convention (EBP). The annex to resolution MEPC.290(71) sets out the structure of the EBP, whose purpose is to allow the Marine Environment Protection Committee (the Committee) to monitor and improve the *International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004* (the Convention).

1.2 This data gathering and analysis plan for the experience-building phase associated with the BWM Convention (DGAP) supplements the annex to resolution MEPC.290(71) by setting out the specific arrangements for data gathering during the EBP, with regard to both the interfaces through which data may be submitted to the EBP and the specific data requirements for each interface. The DGAP also includes principles and organizational arrangements for analysing the data collected and sets out the timeline for the EBP. The DGAP is intended to be a living document, to be revised as needed by the Committee in light of developments and trends identified as the data gathering progresses.

1.3 The EBP consists of a data gathering stage, a data analysis stage and a convention review stage. The EBP begins with the entry into force of the Convention and ends with the entry into force of a package of priority amendments. The priority amendments are those that implement improvements to the Convention needed before the end of non-penalization measures specific to the EBP that are set out in resolution MEPC.290(71). A timeline for the stages of the EBP is set out below in section 6.

1.4 Aside from the non-penalization set out in resolution MEPC.290(71), the EBP does not alter the basic roles, responsibilities, obligations and recommendations under the Convention, its guidelines and relevant guidance.

1.5 The EBP includes the more specific "trial period" associated with methods for sampling and analysing ballast water during port State control (PSC).¹ The arrangements for the trial period have been updated and incorporated within the EBP (see section 5 below), and data associated with the trial period will be gathered and analysed in parallel with data concerning other aspects of the Convention.

2 Organizational arrangements

2.1 The EBP will be supported by the Secretariat, which will administer the data gathering and analysis stages on behalf of the Organization. Member States and other stakeholders are invited to make financial contributions in support of the Secretariat's work on data gathering and analysis. Consistent with the resources available, the Secretariat will undertake data handling and management, work with submitters to ensure the quality of data, make global data available to the Committee and its Ballast Water Review Group (BWRG) for consideration as appropriate, and manage the production of a data analysis report.

¹ See document BLG 17/18, annex 6, *Recommendations related to the trial period for reviewing, improving and standardizing the Guidance for ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)*. These recommendations were agreed in principle at MEPC 65.

2.2 The BWRG should meet at each session of the Committee during the EBP. During the data gathering stage, the BWRG will consider the global data in order to register any arising issues with the Convention and propose early actions to the Committee if appropriate. The BWRG will also consider the analysis report and will be the primary forum for discussion during the Convention review stage, preparing the necessary materials and recommendations for the Committee's consideration. The BWRG should also continue to undertake reviews in accordance with regulation D-5 of the Convention during the EBP.

3 Data gathering and data quality

3.1 Member States are encouraged to participate fully in the EBP in order to maximize the information available to the Committee. However, participation is voluntary and Member States may determine the areas in which they wish to provide data. Four different interfaces are provided for submitting data:

- .1 **Basic interface** – straightforward reports from port and flag States that summarize basic data that would normally be collected by these States:
 - .1 basic flag State interface report (see appendix A); and
 - .2 basic port State interface report (see appendix B);
- .2 **Supplementary interface** – reports on specific topics from port States and flag States that would require greater analysis and/or additional research work:
 - .1 ballast water analysis interface report (see appendix C);
- .3 **Trial period interface** – reports from port States on methods for sampling and analysis during PSC (see appendix D); and
- .4 **Stakeholder interface** – reports from all stakeholders on their perspectives and experience (e.g. shipowners, BWMS manufacturers, recognized organizations) (see appendix E).

3.2 The process of data gathering is as follows. The State determines which of the interfaces it wishes to participate in. It assembles the appropriate data and completes the appropriate common data template appended to this document. The State submits the completed template as a report to the Secretariat. The Secretariat includes the data provided by the State in the EBP, making the information available to the Committee and ultimately to the BWRG (figure 1).

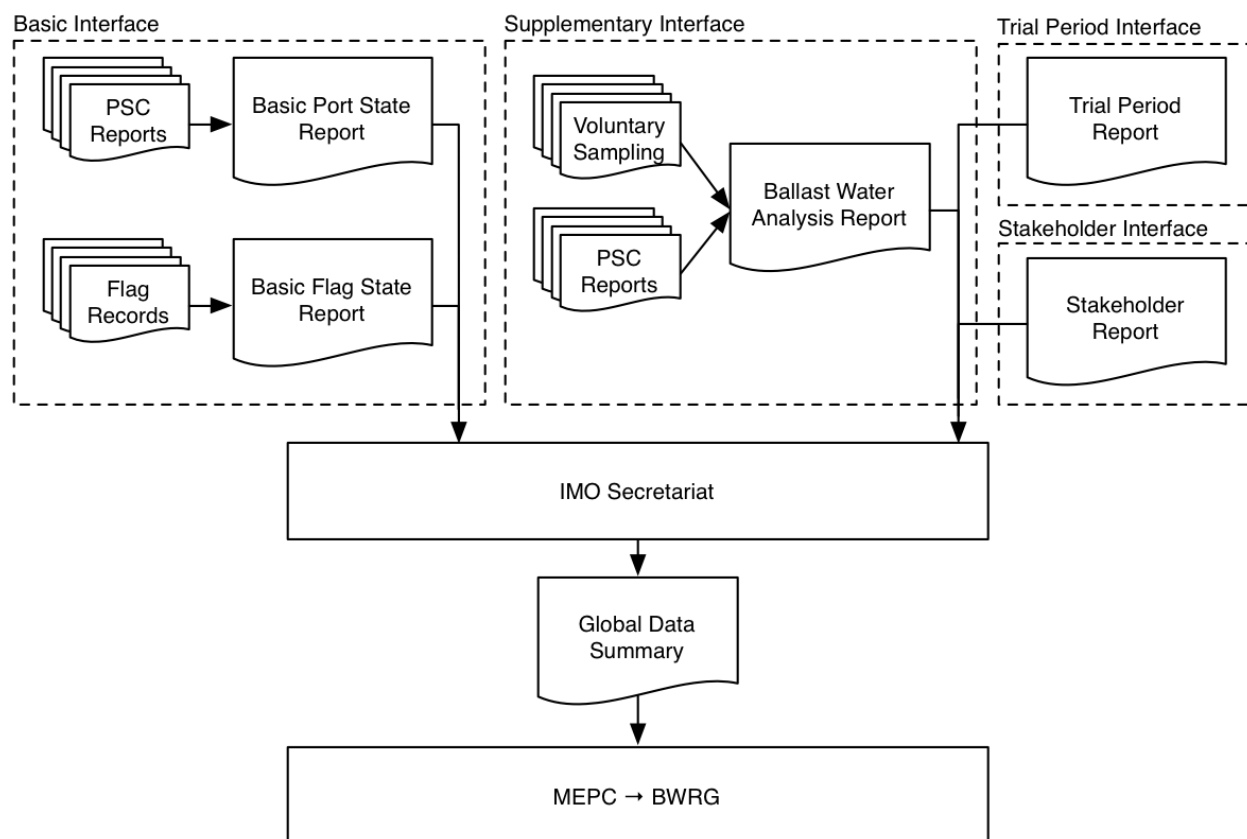


Figure 1: Flowchart of data gathering

3.3 States are particularly encouraged to submit basic reports, which impose the lowest administrative burden while contributing key information on the implementation of the Convention. It is understood that, in light of the additional effort involved, supplementary and trial period reports might be provided by a smaller number of States.

3.4 The EBP is intended to be inclusive and the stakeholder interface is provided to ensure that stakeholder perspectives are considered as the Convention is improved. For practical reasons, stakeholders are invited to provide their voluntary reports to a relevant Member State for aggregation and submission to this interface. In the case of shipowners, the relevant Member State is the flag State. States should ensure that any reports received are included in the EBP.

3.5 Commercial sensitivities will be protected through the use of aggregate reporting by port States and flag States. The EBP does not require ships or shipowners to be identified in data submissions.

3.6 Reports should be submitted in electronic format to the Secretariat, which will work with submitters to ensure that the data adheres to the DGAP, is in the correct format, and that the data quality of the EBP will be maintained when submissions are aggregated. The EBP will consider all data submitted by port States and flag States in accordance with the four interfaces and the report specifications set out in the appendices to this plan. States are requested to submit reports rather than raw data in order to manage the volume of information, and to ensure comparability between reports. Information submitted to the EBP will become part of the public domain.

3.7 The Secretariat, the Committee and the BWRG will maintain a consistent emphasis on data quality, recognizing that aggregating low-quality data with higher-quality data can diminish the usefulness of the product. This plan balances the need for high quality data with the need to achieve a straightforward process that maximizes participation in the EBP.

3.8 Member States are requested to pay particular attention to the accurate categorization of qualitative data, having regard to the report specifications. In the case of quantitative data, Member States are requested not to aggregate data gathered by multiple methods whose results are not comparable, and instead to submit multiple reports if necessary.

4 Data analysis

4.1 As opposed to the data gathering plan (which is highly structured so as to coordinate the input of many Member States), the plan for data analysis takes a more principles-based approach. This provides flexibility for relevant analysis and synthesis to be undertaken based on the data, taking into account emerging trends, and for conclusions to be conveyed in the most appropriate way to the Committee.

4.2 The analysis should shed light on specific provisions of the Convention and its guidelines, as well as on more general topics concerning the implementation itself, such as:

- .1 the progress of, and any challenges in, transitioning ships to the Convention;
- .2 the degree of compliance with regulations D-1 and D-2, and any systematic reasons for non-compliance;
- .3 whether compliance other than with regulations D-1 and D-2 is achievable or not;
- .4 any unforeseen operational, safety or environmental hazards associated with the methods used to comply with the Convention;
- .5 optional/additional actions taken by port States in implementing the Convention;
- .6 the outcome of the trial period on sampling and analysis; and
- .7 additional aspects of the Convention that require consideration during the analysis stage.

4.3 While the analysis will be based primarily on the data gathered through the EBP, it should also take into account any relevant information otherwise provided to the Organization pursuant to the Convention and its guidelines (e.g. notifications under regulation C-3 and BWMS type approval reports under Guidelines G8)).²

4.4 During the data analysis stage, the Secretariat will oversee the development of a final analysis report for the Committee and the BWRG. This report should convey the outcomes of data gathering, and provide deep insights into the Convention and any challenges associated with its implementation, such as those questions outlined above. The report should contain a separate chapter on the outcome of the trial period, including any recommendations for

² In the context of this circular, the Guidelines (G8) refer to the guidelines adopted by resolution MEPC.174(58), the 2016 Guidelines (G8) adopted by resolution MEPC.279(70) and the *Code for approval of ballast water management systems* adopted by resolution MEPC.300(72), as may be appropriate.

sampling and analysis methods for PSC as appropriate. A draft of the final analysis report should be provided to the Committee by the Secretariat for consideration and comment by the BWRG prior to completion of the report. The specific terms of reference for this report should be approved by the Committee towards the end of the data gathering stage. The terms of reference may direct the analysis, inter alia, to also:

- .1 take into account additional information accepted by the Committee that has come to light other than through the EBP;
- .2 undertake additional transparent research to identify reasons for patterns emerging within the data that cannot be gleaned from the data itself; and/or
- .3 make recommendations on specific aspects of the Convention approach for consideration by the BWRG and the Committee during the Convention review stage.

5 Trial period and other sampling and analysis

5.1 MEPC 65 approved the *Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)* (BWM.2/Circ.42). This Guidance sets out recommended methodologies and approaches to sampling and analysis for testing compliance with the standards described in regulations D-1 and D-2 of the Convention. Member States and observers were encouraged to further develop sampling and analysis protocols towards later revisions of the Guidance. The Guidance was revised by MEPC 68 and subsequently disseminated as BWM.2/Circ.42/Rev.1.

5.2 Recognizing that many of the sampling and analysis methods in the Guidance had not been adequately validated, the methods in the Guidance were not fully integrated in the *Guidelines for port State control under the BWM Convention* (resolution MEPC.252(67)) (PSC Guidelines) and MEPC 65 agreed in principle with recommendations for a trial period for reviewing, improving and standardizing the Guidance (as set out in annex 6 to document BLG 17/18). These recommendations are being addressed through the present DGAP.

5.3 As an element of the EBP, the trial period is intended to gather and analyse data on the practical utility for PSC of the methodologies and approaches to sampling and analysis for compliance set out in BWM.2/Circ.42/Rev.1. Recognizing the non-mandatory nature of the Guidance and the Committee's encouragement that sampling and analysis protocols be further developed, the trial period is also intended to gather and analyse data on other sampling and analysis protocols in use by port States. It is to be noted that MEPC 64 agreed that sampling for PSC should be no more stringent than the sampling used for type approval of a BWMS.

5.4 Use of the standard operating procedures (SOPs) developed by the ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors is recommended in order to support the comparable collection and analysis of samples.³ This would facilitate the trial period, as well as research studies during the EBP by groups studying the biological efficacy of ballast water management systems.

³ The procedures referred to are the Standard Operating Procedures – Collection of Treated Ballast Water Samples Using an Inline Sample Port available at: http://www.ices.dk/community/Documents/Expert%20Groups/WGBOSV/SOP_inline%20ballast%20water%20sampling.pdf

5.5 Data relating to the trial period should be analysed with regard to validity, practicability (e.g. cost-effectiveness, timeliness and general applicability with regard to ship type and geographic region) and effectiveness in assessing compliance (e.g. consistency with type approval sampling procedures). The Committee may revise BWM.2/Circ.42/Rev.1 during the EBP as appropriate.

5.6 During the EBP, port States should share the results of the sampling and analysis process in accordance with chapter 3 of the PSC Guidelines, making clear the trial nature of the procedure.

5.7 The goal at the end of the EBP is to have a suite of accepted procedures that can be used for sampling and analysing ballast water in a globally consistent way. The finalization of this suite of accepted procedures should be done during the Convention review stage, on the basis of the data gathered and analysed in accordance with this DGAP. At least one standard precise protocol for indicative and detailed analysis of organisms at each size class is desired.

5.8 Ballast water sampling and analysis during the EBP may be undertaken:

- .1 on a mandatory basis, by or under the authority of a PSC officer pursuant to article 9 of the Convention (in which case the inspection should be in accordance with the PSC Guidelines); or
- .2 independently of a PSC inspection with the voluntary participation of the ship (in which case the sampling may be undertaken by appropriate personnel of the port State, the flag State or another entity).

5.9 The ship should be advised of the context of sampling and whether participation is voluntary or mandatory before a sample is taken. Before voluntary sampling begins, the ship should be advised of any consequences that could follow if the ballast water is found to be non-compliant with the standards in regulations D-1 or D-2 (as appropriate).

5.10 Data derived from both voluntary and PSC-related sampling and analysis will be equally informative to the Committee concerning the effectiveness of BWMS in reaching the standard described in regulation D-2. Therefore, reports on the results of both voluntary and PSC-related sampling and analysis should be reported together through the supplementary EBP interface. Regardless of the voluntary or mandatory nature of any sampling and analysis, quality assurance and quality control should be ensured.

5.11 Only sampling and analysis done in association with PSC inspections will be informative to the Committee concerning the practicability and utility of particular sampling and analysis methods for PSC purposes. Therefore, only data derived from PSC inspections should be reported through the trial period interface.

6 Timeline

6.1 The timeline for the EBP should be short enough to ensure that the outcomes of the EBP are relevant to the Convention review stage, but long enough to generate a reasonable picture of the implementation of the Convention.

6.2 The EBP should unfold according to the following timeline:

- .1 a summary of any data received to date should be submitted by the Secretariat to MEPC 74;

- .2 an aggregate data report, reflecting submissions to the EBP through the second year of experience with the Convention, should be submitted by the Secretariat to MEPC 75, at which the Committee is also expected to take stock of this timeline;
- .3 the next aggregate data report, reflecting submissions to the EBP concerning the third year of experience with the Convention, should be submitted by the Secretariat to MEPC 76,⁴ at which the Committee should also finalize the draft terms of reference for the data analysis report;
- .4 the draft data analysis report should be submitted to MEPC 77;
- .5 the final data analysis report should be submitted to MEPC 78, at which the Committee should also agree to the prioritized evidence-based list of issues with the Convention; and
- .6 the package of amendments to the Convention should be submitted to MEPC 79.

Table 1: Summary of the EBP timeline

MEPC session	Timing	Milestone	EBP/MEPC action
73	Autumn 2018	Convention has been in force one year	
74	Spring 2019		First year of data available.
75	Spring 2020	Convention has been in force two years	Second year of data available, stocktaking of EBP timeline.
76	Autumn 2020	Convention has been in force three years	Partial third year of data available, enough to agree to data analysis report terms of reference.
77	Spring 2021		Full third year of data available, Draft analysis report received.
78	Spring 2022	Convention has been in force four years	Final analysis report received. Convention issues agreed.
79	Autumn 2022	Convention has been in force five years	Package of amendments submitted to the Parties.

⁴ This may reflect a partial year, recognizing that the deadline for document submission to the meeting would occur before the end of the third year that the Convention is in force. The complete data for the third year is expected to be available and taken into account during the preparation of the draft data analysis report.

APPENDIX A: BASIC INTERFACE: BASIC FLAG STATE REPORT TEMPLATE

Part 1: Fleet and its ballast water management plans			Response
Member State:			
Time period of report			
Date report prepared			
Ships to which Convention applies:	Total number of ships	Container ships	
		Bulk carriers	
		Tankers	
		Ferries	
		Cruise ships	
		Other (attach details)	
	Number currently subject to regulation D-2		
	Number fitted with BWMS	Electro-chlorination	
		Ozonation	
		Other chemical injection	
		Ultraviolet	
Other (attach details)			
Approved ballast water management plans	Total number of approved plans		
	Number of approved plans that include:	D-1 procedures	
		Contingency measures	
		Exemptions (regulation A-4)	
		Other methods (regulation B-3.7)	
		Use of reception facilities (regulation B-3.6)	
		Prototype BWMS (regulation D-4)	

Part 2: Outcome of ballast water surveys			Response
Number of surveys undertaken	Initial		
	Annual		
	Renewal		
	Intermediate		
Deficiencies noted during these surveys (even if later resolved)	Mechanical		
	Physical		
	Treatment process		
	Electrical		
	Piping		
	Location		
	Maintenance and cleaning		
	Sampling facilities		
	Other (attach details)		

Part 3: Reported accidents and defects			Response
Number of reports of accidents to the ship and/or defects (regulation E-1.7)	Originating outside the ship's ballast water system		
	Originating in the ship's ballast water system	BWMS treatment equipment	
		BWMS control and monitoring equipment	
		Other aspect of the ballasting system (attach details)	
Number of other safety incidents reported to the flag State that relate to the Convention	Associated with the ship's ballast water system	BWMS treatment equipment	
		BWMS control and monitoring equipment	
		Other aspect of the ballasting system (attach details)	
	Associated with the storage or handling of Active Substances (including neutralizers)		
	Associated with the use of ballast water to control trim, list, draught, stability or stresses of the ship (attach details)		
	Other (attach details)		

APPENDIX B: BASIC INTERFACE: BASIC PORT STATE REPORT TEMPLATE

Part 1: PSC inspection outcomes			Response
Member State:			
Time period of report			
Date report prepared			
Total number of inspections undertaken	With no ballast water sample		
	With a ballast water sample ⁵	Analysed with respect to regulation D-1	
		Analysed with respect to regulation D-2	
Number of PSC inspections by outcome	Satisfactory		
	Unsatisfactory	Valid certificate not on board	
		Approved ballast water management plan not on board	
		Deficiency in record book entries	
		Ship not in compliance with regulation D-1	
		Ship not in compliance with regulation D-2 (BWMS was installed, maintained and operated correctly)	
		Ship not in compliance with regulation D-2 (BWMS was not installed, maintained and operated correctly)	
		Maintenance issues	
		Crew not designated or unfamiliar with ballast water responsibilities	
		Unsanctioned changes to structure, equipment, fittings, arrangements or material	
		BWMS not used in accordance with operational instructions	
		BWMS and equipment not in good working order or treatment not fully operational	
		BWMS safety procedures not followed	
		BWMS has been bypassed	
Other (attach details)			

⁵ Results of sampling/analysis should be reported through the Supplementary Interface (together with the results of non-PSC sampling/analysis).

Part 2: Actions arising from unsatisfactory inspections (report number of actions)			
Action	Deficiency concerning regulation D-1	Deficiency concerning regulation D-2 or a BWMS	Deficiency concerning other aspect of the Convention
No action taken			
Information/advice provided			
Warning			
Sanction			
Detention			
Exclusion			
Other			

Part 3: Implications of unsatisfactory inspections for ballast water discharge (report number of discharges)				
Action		Deficiency concerning regulation D-1	Deficiency concerning regulation D-2 or a BWMS	Deficiency concerning other aspect of the Convention
Discharge permitted without contingency measure				
Discharge permitted following contingency measure	Ballast water exchange			
	Emergency treatment			
	Discharge ashore			
	Other (attach details)			
Discharge not permitted				
Other				

APPENDIX C: SUPPLEMENTARY INTERFACE: BALLAST WATER ANALYSIS REPORT TEMPLATE

Both port and flag States are invited to submit this report if they have engaged in ballast water sampling and analysis.

Report for submission

Part 1: Identification			Response
Member State:			
Time period of report			
Date report prepared			

Part 2: Summary of ballast water sampling and biological analysis***									
Method		Sample group					Results for group		
Sampling method *	Analysis method *	Purpose (PSC or other) **	Ballast water salinity (F/B/S) **	Ship ballast water management method **	BWMS type (if any) **	BWMS/ ship issues Yes/No **	# of ships sampled	# fails per size class	Degree of failures per size class (mean and standard deviation)

* These columns should reference attached details on sampling methods (including probe type and sampling device) and analysis methods (whether indicative or detailed).

** These columns should report standard categories.

*** Information from samples should not be combined and reported on the same line unless the samples share all the same values for the blue columns.

Part 3: Summary of ballast water sampling and chemical analysis***								
Method		Sample group				Results for group		
Sampling method *	Analysis method *	Ballast water salinity (F/B/S) **	Ship ballast water management method **	BWMS type (if any) **	BWMS/ship issues Yes/No **	# of ships sampled	Residual TRO (mean and standard deviation)	Relevant Chemical concentrations (add columns for mean and standard deviation of each specific chemical considered)

* These columns should reference attached details on sampling methods (including probe type and sampling device) and analysis methods (whether indicative or detailed).

** These columns should report standard categories.

*** Information from samples should not be combined and reported on the same line unless the samples share all the same values for the blue columns.

Part 4: Information to be submitted concerning each ballast water sample analysed																									
		Standard assessed (D1/D2)																							
		Measurement type (e.g. ≥50 µm size class)																							
		Measurement result (e.g. count/volume ± standard error)																							
		Isokinetic sample collection (probe size, flow rates and location correct) (Y/N)																							
		Total volume of water discharged from sampled tanks during sampling (m³)																							
		Volume of sample(s) collected (indicate L or m³)																							
		Was the sample(s) concentrated before analysis (Y/N)																							
		Analysis method																							
		Number of subsamples analysed																							
		Analysis completed within standard holding time (Y/N)																							
		Analysis completed by (affiliation)																							
		Exchange conducted (Y/N)																							
		BWMS utilized (Y/N)																							
		BWMS manufacturer and model																							
		Date BWMS installed																							
		Duration BWMS in regular use (# treatment cycles)																							
		Time since last calibration of BWMS sensor (months)																							
		Ship reports difficulty with BWMS operation/maintenance in general (Y/N)																							
		BWMS alarm occurred during sample treatment (Y/N)																							
		BWMS maintenance up to date (Y/N)																							
		Ballast water source location(s)																							
		Age of ballast water (days)																							
		Ballast water salinity at uptake/treatment (PSU)																							
		Ballast water temperature at uptake/treatment (°C)																							
		Maximum Allowable Discharge Concentration exceeded (Y/N)																							
		Any other deficiencies during PSC inspection (Y/N)																							

APPENDIX D: TRIAL PERIOD INTERFACE: TRIAL PERIOD REPORT TEMPLATE

Part 1: Identification	Response
Member State:	
Time period of report	
Date report prepared	

Part 2: Sampling (provide one copy per sampling method used and attach relevant documentation)	Response
Sampling	Name of method/approach
	Comments on validity
	Comments on cost-effectiveness
	Comments on timeliness
	Comments on consistency with the type-approval sampling procedures in Guidelines (G8)*

Part 3: Analysis (provide one copy per analysis method used, and attach relevant documentation)	Response
Analysis	Name of method/approach
	Comments on validity
	Comments on cost-effectiveness
	Comments on timeliness
	Comments on consistency with the type-approval sampling procedures in Guidelines (G8)*

* In the context of this circular, the Guidelines (G8) refer to the guidelines adopted by resolution MEPC.174(58), the 2016 Guidelines (G8) adopted by resolution MEPC.279(70) and the *Code for approval of ballast water management systems* adopted by resolution MEPC.300(72), as may be appropriate.

APPENDIX E: STAKEHOLDER INTERFACE: STAKEHOLDER REPORT TEMPLATE

Instructions:

- Please categorize the stakeholder reports by type according to the table below, and submit a separate template for each type of report.
- Attach the text of the stakeholder reports (or a summary of the reports).
- Reports should be appropriately redacted in accordance with paragraph 3.5 of the data gathering and analysis plan.
- Duplicate reports should not be submitted. Reports from ships should be forwarded through the flag State of the ship.
- The reports submitted should pertain to specific aspects of the Convention and its implementation. Administrations are requested to review the reports and submit only information that is pertinent to the EBP.

Part 1: Identification	Response
Member State:	
Time period of report	
Date report prepared	

Part 2: Category of attached reports (Please select only one category per submitted stakeholder report template)		Mark one category below
Shipowner	Obtaining, fitting, commissioning and surveying BWMS	
	Maintaining and operating a BWMS	
	Regarding other aspects of the Convention	
	Other	
Recognized organization		
BWMS manufacturer		
Other (please identify category)		

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

BWM.2/Circ.67
20 April 2018

**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT
OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

**Data gathering and analysis plan for the experience-building phase
associated with the BWM Convention**

- 1 The Marine Environment Protection Committee (MEPC), at its seventy-first session (3 to 7 July 2017), adopted resolution MEPC.290(71), establishing the experience-building phase associated with the BWM Convention, to allow the Marine Environment Protection Committee to monitor and improve the *International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004*.
- 2 MEPC 72 (9 to 13 April 2018) considered and approved the *Data gathering and analysis plan for the experience-building phase associated with the BWM Convention*, as set out in the annex.
- 3 Member Governments and international organizations are encouraged to use the annexed plan to gather, prepare and submit data to the experience-building phase (EBP).

ANNEX

DATA GATHERING AND ANALYSIS PLAN FOR THE EXPERIENCE-BUILDING PHASE ASSOCIATED WITH THE BWM CONVENTION

1 Overview of the experience-building phase

1.1 Resolution MEPC.290(71) established the experience-building phase associated with the BWM Convention (EBP). The annex to resolution MEPC.290(71) sets out the structure of the EBP, whose purpose is to allow the Marine Environment Protection Committee (the Committee) to monitor and improve the *International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004* (the Convention).

1.2 This data gathering and analysis plan for the experience-building phase associated with the BWM Convention (DGAP) supplements the annex to resolution MEPC.290(71) by setting out the specific arrangements for data gathering during the EBP, with regard to both the interfaces through which data may be submitted to the EBP and the specific data requirements for each interface. The DGAP also includes principles and organizational arrangements for analysing the data collected and sets out the timeline for the EBP. The DGAP is intended to be a living document, to be revised as needed by the Committee in light of developments and trends identified as the data gathering progresses.

1.3 The EBP consists of a data gathering stage, a data analysis stage and a Convention review stage. The EBP begins with the entry into force of the Convention and ends with the entry into force of a package of priority amendments. The priority amendments are those that implement improvements to the Convention needed before the end of non-penalization measures specific to the EBP that are set out in resolution MEPC.290(71). A timeline for the stages of the EBP is set out below in section 6.

1.4 Aside from the non-penalization set out in resolution MEPC.290(71), the EBP does not alter the basic roles, responsibilities, obligations and recommendations under the Convention, its guidelines and relevant guidance.

1.5 The EBP includes the more specific "trial period" associated with methods for sampling and analysing ballast water during port State control (PSC).¹ The arrangements for the trial period have been updated and incorporated within the EBP (see section 5 below), and data associated with the trial period will be gathered and analysed in parallel with data concerning other aspects of the Convention.

2 Organizational arrangements

2.1 The EBP will be supported by the Secretariat, which will administer the data gathering and analysis stages on behalf of the Organization. Member States and other stakeholders are invited to make financial contributions in support of the Secretariat's work on data gathering and analysis. Consistent with the resources available, the Secretariat will undertake data handling and management, work with submitters to ensure the quality of data, make global data available to the Committee and its Ballast Water Review Group (BWRG) for consideration as appropriate, and manage the production of a data analysis report.

¹ See document BLG 17/18, annex 6, *Recommendations related to the trial period for reviewing, improving and standardizing the Guidance for ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)*. These recommendations were agreed in principle at MEPC 65.

2.2 The BWRG should meet at each session of the Committee during the EBP. During the data gathering stage, the BWRG will consider the global data in order to register any arising issues with the Convention and propose early actions to the Committee if appropriate. The BWRG will also consider the analysis report and will be the primary forum for discussion during the Convention review stage, preparing the necessary materials and recommendations for the Committee's consideration. The BWRG should also continue to undertake reviews in accordance with regulation D-5 of the Convention during the EBP.

3 Data gathering and data quality

3.1 Member States are encouraged to participate fully in the EBP in order to maximize the information available to the Committee. However, participation is voluntary and Member States may determine the areas in which they wish to provide data. Four different interfaces are provided for submitting data:

- .1 **Basic interface** – straightforward reports from port and flag States that summarize basic data that would normally be collected by these States:
 - .1 basic flag State interface report (see appendix A); and
 - .2 basic port State interface report (see appendix B);
- .2 **Supplementary interface** – reports on specific topics from port States and flag States that would require greater analysis and/or additional research work:
 - .1 ballast water analysis interface report (see appendix C);
- .3 **Trial period interface** – reports from port States on methods for sampling and analysis during PSC (see appendix D); and
- .4 **Stakeholder interface** – reports from all stakeholders on their perspectives and experience (e.g. shipowners, BWMS manufacturers, recognized organizations) (see appendix E).

3.2 The process of data gathering is as follows. The State determines which of the interfaces it wishes to participate in. It assembles the appropriate data and completes the appropriate common data template appended to this document. The State submits the completed template as a report to the Secretariat. The Secretariat includes the data provided by the State in the EBP, making the information available to the Committee and ultimately to the BWRG (figure 1).

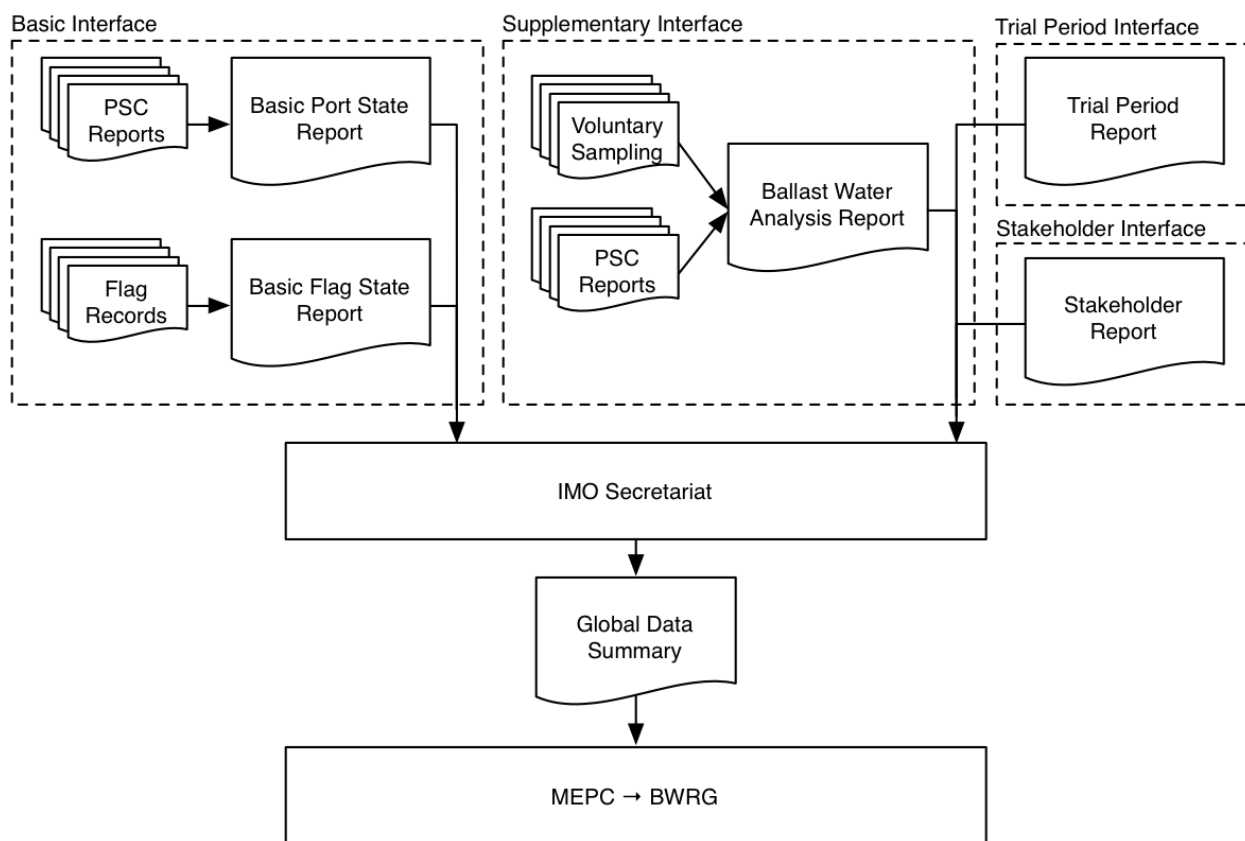


Figure 1: Flowchart of data gathering

3.3 States are particularly encouraged to submit basic reports, which impose the lowest administrative burden while contributing key information on the implementation of the Convention. It is understood that, in light of the additional effort involved, supplementary and trial period reports might be provided by a smaller number of States.

3.4 The EBP is intended to be inclusive and the stakeholder interface is provided to ensure that stakeholder perspectives are considered as the Convention is improved. For practical reasons, stakeholders are invited to provide their voluntary reports to a relevant Member State for aggregation and submission to this interface. In the case of shipowners, the relevant Member State is the flag State. States should ensure that any reports received are included in the EBP.

3.5 Commercial sensitivities will be protected through the use of aggregate reporting by port States and flag States. The EBP does not require ships or shipowners to be identified in data submissions.

3.6 Reports should be submitted in electronic format to the Secretariat, which will work with submitters to ensure that the data adheres to the DGAP, is in the correct format, and that the data quality of the EBP will be maintained when submissions are aggregated. The EBP will consider all data submitted by port States and flag States in accordance with the four interfaces and the report specifications set out in the appendices to this plan. States are requested to submit reports rather than raw data in order to manage the volume of information, and to ensure comparability between reports. Information submitted to the EBP will become part of the public domain.

3.7 The Secretariat, the Committee and the BWRG will maintain a consistent emphasis on data quality, recognizing that aggregating low-quality data with higher-quality data can diminish the usefulness of the product. This plan balances the need for high quality data with the need to achieve a straightforward process that maximizes participation in the EBP.

3.8 Member States are requested to pay particular attention to the accurate categorization of qualitative data, having regard to the report specifications. In the case of quantitative data, Member States are requested not to aggregate data gathered by multiple methods whose results are not comparable, and instead to submit multiple reports if necessary.

4 Data analysis

4.1 As opposed to the data gathering plan (which is highly structured so as to coordinate the input of many Member States), the plan for data analysis takes a more principles-based approach. This provides flexibility for relevant analysis and synthesis to be undertaken based on the data, taking into account emerging trends, and for conclusions to be conveyed in the most appropriate way to the Committee.

4.2 The analysis should shed light on specific provisions of the Convention and its guidelines, as well as on more general topics concerning the implementation itself, such as:

- .1 the progress of, and any challenges in, transitioning ships to the Convention;
- .2 the degree of compliance with regulations D-1 and D-2, and any systematic reasons for non-compliance;
- .3 whether compliance other than with regulations D-1 and D-2 is achievable or not;
- .4 any unforeseen operational, safety or environmental hazards associated with the methods used to comply with the Convention;
- .5 optional/additional actions taken by port States in implementing the Convention;
- .6 the outcome of the trial period on sampling and analysis; and
- .7 additional aspects of the Convention that require consideration during the analysis stage.

4.3 While the analysis will be based primarily on the data gathered through the EBP, it should also take into account any relevant information otherwise provided to the Organization pursuant to the Convention and its guidelines (e.g. notifications under regulation C-3 and BWMS type approval reports under Guidelines G8)).²

4.4 During the data analysis stage, the Secretariat will oversee the development of a final analysis report for the Committee and the BWRG. This report should convey the outcomes of data gathering, and provide deep insights into the Convention and any challenges associated with its implementation, such as those questions outlined above. The report should contain a separate chapter on the outcome of the trial period, including any recommendations for

² In the context of this circular, the Guidelines (G8) refer to the guidelines adopted by resolution MEPC.174(58), the 2016 Guidelines (G8) adopted by resolution MEPC.279(70) and the *Code for approval of ballast water management systems* adopted by resolution MEPC.300(72), as may be appropriate.

sampling and analysis methods for PSC as appropriate. A draft of the final analysis report should be provided to the Committee by the Secretariat for consideration and comment by the BWRG prior to completion of the report. The specific terms of reference for this report should be approved by the Committee towards the end of the data gathering stage. The terms of reference may direct the analysis, inter alia, to also:

- .1 take into account additional information accepted by the Committee that has come to light other than through the EBP;
- .2 undertake additional transparent research to identify reasons for patterns emerging within the data that cannot be gleaned from the data itself; and/or
- .3 make recommendations on specific aspects of the Convention approach for consideration by the BWRG and the Committee during the Convention review stage.

5 Trial period and other sampling and analysis

5.1 MEPC 65 approved the *Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)* (BWM.2/Circ.42). This Guidance sets out recommended methodologies and approaches to sampling and analysis for testing compliance with the standards described in regulations D-1 and D-2 of the Convention. Member States and observers were encouraged to further develop sampling and analysis protocols towards later revisions of the Guidance. The Guidance was revised by MEPC 68 and subsequently disseminated as BWM.2/Circ.42/Rev.1.

5.2 Recognizing that many of the sampling and analysis methods in the Guidance had not been adequately validated, the methods in the Guidance were not fully integrated in the *Guidelines for port State control under the BWM Convention* (resolution MEPC.252(67)) (PSC Guidelines) and MEPC 65 agreed in principle with recommendations for a trial period for reviewing, improving and standardizing the Guidance (as set out in annex 6 to document BLG 17/18). These recommendations are being addressed through the present DGAP.

5.3 As an element of the EBP, the trial period is intended to gather and analyse data on the practical utility for PSC of the methodologies and approaches to sampling and analysis for compliance set out in BWM.2/Circ.42/Rev.1. Recognizing the non-mandatory nature of the Guidance and the Committee's encouragement that sampling and analysis protocols be further developed, the trial period is also intended to gather and analyse data on other sampling and analysis protocols in use by port States. It is to be noted that MEPC 64 agreed that sampling for PSC should be no more stringent than the sampling used for type approval of a BWMS.

5.4 Data relating to the trial period should be analysed with regard to validity, practicability (e.g. cost-effectiveness, timeliness and general applicability with regard to ship type and geographic region) and effectiveness in assessing compliance (e.g. consistency with type approval sampling procedures). The Committee may revise BWM.2/Circ.42/Rev.1 during the EBP as appropriate.

5.5 During the EBP, port States should share the results of the sampling and analysis process in accordance with chapter 3 of the PSC Guidelines, making clear the trial nature of the procedure.

5.6 The goal at the end of the EBP is to have a suite of accepted procedures that can be used for sampling and analysing ballast water in a globally consistent way. The finalization of this suite of accepted procedures should be done during the Convention review stage, on the basis of the data gathered and analysed in accordance with this DGAP. At least one standard precise protocol for indicative and detailed analysis of organisms at each size class is desired.

5.7 Ballast water sampling and analysis during the EBP may be undertaken:

- .1 on a mandatory basis, by or under the authority of a PSC officer pursuant to article 9 of the Convention (in which case the inspection should be in accordance with the PSC Guidelines); or
- .2 independently of a PSC inspection with the voluntary participation of the ship (in which case the sampling may be undertaken by appropriate personnel of the port State, the flag State or another entity).

5.8 The ship should be advised of the context of sampling and whether participation is voluntary or mandatory before a sample is taken. Before voluntary sampling begins, the ship should be advised of any consequences that could follow if the ballast water is found to be non-compliant with the standards in regulations D-1 or D-2 (as appropriate).

5.9 Data derived from both voluntary and PSC-related sampling and analysis will be equally informative to the Committee concerning the effectiveness of BWMS in reaching the standard described in regulation D-2. Therefore, reports on the results of both voluntary and PSC-related sampling and analysis should be reported together through the supplementary EBP interface. Regardless of the voluntary or mandatory nature of any sampling and analysis, quality assurance and quality control should be ensured.

5.10 Only sampling and analysis done in association with PSC inspections will be informative to the Committee concerning the practicability and utility of particular sampling and analysis methods for PSC purposes. Therefore, only data derived from PSC inspections should be reported through the trial period interface.

6 Timeline

6.1 The timeline for the EBP should be short enough to ensure that the outcomes of the EBP are relevant to the Convention review stage, but long enough to generate a reasonable picture of the implementation of the Convention.

6.2 The EBP should unfold according to the following timeline:

- .1 a summary of any data received to date should be submitted by the Secretariat to MEPC 74;
- .2 an aggregate data report, reflecting submissions to the EBP through the second year of experience with the Convention, should be submitted by the Secretariat to MEPC 75, at which the Committee is also expected to take stock of this timeline;
- .3 the next aggregate data report, reflecting submissions to the EBP concerning the third year of experience with the Convention, should be submitted by the

Secretariat to MEPC 76,³ at which the Committee should also finalize the draft terms of reference for the data analysis report;

- .4 the draft data analysis report should be submitted to MEPC 77;
- .5 the final data analysis report should be submitted to MEPC 78, at which the Committee should also agree to the prioritized evidence-based list of issues with the Convention; and
- .6 the package of amendments to the Convention should be submitted to MEPC 79.

Table 1: Summary of the EBP timeline

MEPC session	Timing	Milestone	EBP / MEPC action
73	Autumn 2018	Convention has been in force one year	
74	Spring 2019		First year of data available.
75	Spring 2020	Convention has been in force two years	Second year of data available, stocktaking of EBP timeline.
76	Autumn 2020	Convention has been in force three years	Partial third year of data available, enough to agree to data analysis report terms of reference.
77	Spring 2021		Full third year of data available, Draft analysis report received.
78	Spring 2022	Convention has been in force four years	Final analysis report received. Convention issues agreed.
79	Autumn 2022	Convention has been in force five years	Package of amendments submitted to the Parties.

³ This may reflect a partial year, recognizing that the deadline for document submission to the meeting would occur before the end of the third year that the Convention is in force. The complete data for the third year is expected to be available and taken into account during the preparation of the draft data analysis report.

APPENDIX A: BASIC INTERFACE: BASIC FLAG STATE REPORT TEMPLATE

Part 1: Fleet and its ballast water management plans			Response
Member State:			
Time period of report			
Date report prepared			
Ships to which Convention applies:	Total number of ships	Container ships	
		Bulk carriers	
		Tankers	
		Ferries	
		Cruise ships	
		Other (attach details)	
	Number currently subject to regulation D-2		
	Number fitted with BWMS	Electro-chlorination	
		Ozonation	
		Other chemical injection	
Ultraviolet			
Other (attach details)			
Approved ballast water management plans	Total number of approved plans		
	Number of approved plans that include:	D-1 procedures	
		Contingency measures	
		Exemptions (regulation A-4)	
		Other methods (regulation B-3.7)	
		Use of reception facilities (regulation B-3.6)	
		Prototype BWMS (regulation D-4)	

Part 2: Outcome of ballast water surveys			Response
Number of surveys undertaken	Initial		
	Annual		
	Renewal		
	Intermediate		
Deficiencies noted during these surveys	Mechanical		
	Physical		
	Treatment process		
	Electrical		

Part 2: Outcome of ballast water surveys			Response
(even if later resolved)	Piping		
	Location		
	Maintenance and cleaning		
	Sampling facilities		
	Other (attach details)		

Part 3: Reported accidents and defects			Response
Number of reports of accidents to the ship and/or defects (regulation E-1.7)	Originating outside the ship's ballast water system		
	Originating in the ship's ballast water system	BWMS treatment equipment	
		BWMS control and monitoring equipment	
		Other aspect of the ballasting system (attach details)	
Number of other safety incidents reported to the flag State that relate to the Convention	Associated with the ship's ballast water system	BWMS treatment equipment	
		BWMS control and monitoring equipment	
		Other aspect of the ballasting system (attach details)	
	Associated with the storage or handling of Active Substances (including neutralizers)		
	Associated with the use of ballast water to control trim, list, draught, stability or stresses of the ship (attach details)		
	Other (attach details)		

APPENDIX B: BASIC INTERFACE: BASIC PORT STATE REPORT TEMPLATE

Part 1: PSC inspection outcomes			Response
Member State:			
Time period of report			
Date report prepared			
Total number of inspections undertaken	With no ballast water sample		
	With a ballast water sample ⁴	Analysed with respect to regulation D-1	
		Analysed with respect to regulation D-2	
Number of PSC inspections by outcome	Satisfactory		
	Unsatisfactory	Valid certificate not on board	
		Approved ballast water management plan not on board	
		Deficiency in record book entries	
		Ship not in compliance with regulation D-1	
		Ship not in compliance with regulation D-2 (BWMS was installed, maintained and operated correctly)	
		Ship not in compliance with regulation D-2 (BWMS was not installed, maintained and operated correctly)	
		Maintenance issues	
		Crew not designated or unfamiliar with ballast water responsibilities	
		Unsanctioned changes to structure, equipment, fittings, arrangements or material	
		BWMS not used in accordance with operational instructions	
		BWMS and equipment not in good working order or treatment not fully operational	
		BWMS safety procedures not followed	
		BWMS has been bypassed	
		Other (attach details)	

⁴ Results of sampling/analysis should be reported through the Supplementary Interface (together with the results of non-PSC sampling/analysis).

Part 2: Actions arising from unsatisfactory inspections (report number of actions)			
Action	Deficiency concerning regulation D-1	Deficiency concerning regulation D-2 or a BWMS	Deficiency concerning other aspect of the Convention
No action taken			
Information/advice provided			
Warning			
Sanction			
Detention			
Exclusion			
Other			

Part 3: Implications of unsatisfactory inspections for ballast water discharge (report number of discharges)				
Action		Deficiency concerning regulation D-1	Deficiency concerning regulation D-2 or a BWMS	Deficiency concerning other aspect of the Convention
Discharge permitted without contingency measure				
Discharge permitted following contingency measure	Ballast water exchange			
	Emergency treatment			
	Discharge ashore			
	Other (attach details)			
Discharge not permitted				
Other				

APPENDIX C: SUPPLEMENTARY INTERFACE: BALLAST WATER ANALYSIS REPORT TEMPLATE

Both port and flag States are invited to submit this report if they have engaged in ballast water sampling and analysis.

Report for submission

Part 1: Identification			Response
Member State:			
Time period of report			
Date report prepared			

Part 2: Summary of ballast water sampling and biological analysis***									
Method		Sample group					Results for group		
Sampling method *	Analysis method *	Purpose (PSC or other) **	Ballast water salinity (F/B/S) **	Ship ballast water management method **	BWMS type (if any) **	BWMS/ ship issues Yes/No **	# of ships sampled	# fails per size class	Degree of failures per size class (mean and standard deviation)

* These columns should reference attached details on sampling methods (including probe type and sampling device) and analysis methods (whether indicative or detailed).

** These columns should report standard categories.

*** Information from samples should not be combined and reported on the same line unless the samples share all the same values for the blue columns.

Part 3: Summary of ballast water sampling and chemical analysis***								
Method		Sample group				Results for group		
Sampling method *	Analysis method *	Ballast water salinity (F/B/S) **	Ship ballast water management method **	BWMS type (if any) **	BWMS/ship issues Yes/No **	# of ships sampled	Residual TRO (mean and standard deviation)	Relevant Chemical concentrations (add columns for mean and standard deviation of each specific chemical considered)

* These columns should reference attached details on sampling methods (including probe type and sampling device) and analysis methods (whether indicative or detailed).

** These columns should report standard categories.

*** Information from samples should not be combined and reported on the same line unless the samples share all the same values for the blue columns.

Part 4: Information to be submitted concerning each ballast water sample analysed																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
	Standard assessed (D1/D2)		Measurement type (e.g. ≥50 µm size class)		Measurement result (e.g. count/volume ± standard error)		Isokinetic sample collection (probe size, flow rates and location correct) (Y/N)		Total volume of water discharged from sampled tanks during sampling (m³)		Volume of sample(s) collected (indicate L or m³)		Was the sample(s) concentrated before analysis (Y/N)		Analysis method		Number of subsamples analysed		Analysis completed within standard holding time (Y/N)		Analysis completed by (affiliation)		Exchange conducted (Y/N)		BWMS utilized (Y/N)		BWMS manufacturer and model		Date BWMS installed		Duration BWMS in regular use (# treatment cycles)		Time since last calibration of BWMS sensor (months)		Ship reports difficulty with BWMS operation/maintenance in general (Y/N)		BWMS alarm occurred during sample treatment (Y/N)		BWMS maintenance up to date (Y/N)		Ballast water source location(s)		Age of ballast water (days)		Ballast water salinity at uptake/treatment (PSU)		Ballast water temperature at uptake/treatment (°C)		Maximum Allowable Discharge Concentration exceeded (Y/N)		Any other deficiencies during PSC inspection																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					

APPENDIX D: TRIAL PERIOD INTERFACE: TRIAL PERIOD REPORT TEMPLATE

Part 1: Identification	Response
Member State:	
Time period of report	
Date report prepared	

Part 2: Sampling (provide one copy per sampling method used and attach relevant documentation)	Response
Sampling	Name of method/approach
	Comments on validity
	Comments on cost-effectiveness
	Comments on timeliness
	Comments on consistency with the type-approval sampling procedures in Guidelines (G8)*

Part 3: Analysis (provide one copy per analysis method used, and attach relevant documentation)	Response
Analysis	Name of method/approach
	Comments on validity
	Comments on cost-effectiveness
	Comments on timeliness
	Comments on consistency with the type-approval sampling procedures in Guidelines (G8)*

* In the context of this circular, the Guidelines (G8) refer to the guidelines adopted by resolution MEPC.174(58), the 2016 Guidelines (G8) adopted by resolution MEPC.279(70) and the Code for approval of ballast water management systems adopted by resolution MEPC.300(72), as may be appropriate.

APPENDIX E: STAKEHOLDER INTERFACE: STAKEHOLDER REPORT TEMPLATE

Instructions:

- Please categorize the stakeholder reports by type according to the table below, and submit a separate template for each type of report.
- Attach the text of the stakeholder reports (or a summary of the reports).
- Reports should be appropriately redacted in accordance with paragraph 3.5 of the data gathering and analysis plan.
- Duplicate reports should not be submitted. Reports from ships should be forwarded through the flag State of the ship.
- The reports submitted should pertain to specific aspects of the Convention and its implementation. Administrations are requested to review the reports and submit only information that is pertinent to the EBP.

Part 1: Identification	Response
Member State:	
Time period of report	
Date report prepared	

Part 2: Category of attached reports (Please select only one category per submitted stakeholder report template)		Mark one category below
Shipowner	Obtaining, fitting, commissioning and surveying BWMS	
	Maintaining and operating a BWMS	
	Regarding other aspects of the Convention	
	Other	
Recognized organization		
BWMS manufacturer		
Other (please identify category)		

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

BWM.2/Circ.66/Rev.1
24 May 2019

**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT
OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

**Unified interpretation of Appendix I (Form of the International Ballast Water
Management Certificate) of the BWM Convention**

- 1 The Marine Environment Protection Committee (MEPC), at its seventy-second session (9 to 13 April 2018), approved a unified interpretation of appendix I (Form of the International Ballast Water Management Certificate) of the BWM Convention.
- 2 MEPC 74 (13 to 17 May 2019) approved the updated unified interpretation with appropriate references to the *Code for Approval of Ballast Water Management Systems* (BWMS Code), as set out in the annex.
- 3 Member Governments and international organizations are invited to apply the annexed unified interpretation to appendix I of the BWM Convention from 13 October 2019 and bring it to the attention of all parties concerned.
- 4 This circular revokes BWM.2/Circ.66 from 13 October 2019.

ANNEX

UNIFIED INTERPRETATION OF APPENDIX I (FORM OF THE INTERNATIONAL BALLAST WATER MANAGEMENT CERTIFICATE) OF THE BWM CONVENTION

Appendix I – Form of the International Ballast Water Management Certificate

"Date installed" in relation to "Method of ballast water management used"

1 For the purpose of completing the International Ballast Water Management Certificate, the date when commissioning has been completed in accordance with section 8 of the BWMS Code (resolution MEPC.300(72)) should be used.

2 Notwithstanding the above, it should be noted that, with regard to the deadline for installing a ballast water management system, operative paragraph 5 of resolution MEPC.300(72) (*Code for Approval of Ballast Water Management Systems*) is as follows:

"5 RESOLVES that, for the purpose of operative paragraph 4 of this resolution, the word "installed" means the contractual date of delivery of the ballast water management system to the ship. In the absence of such a date, the word "installed" means the actual date of delivery of the ballast water management system to the ship;".

3 Consequently, two dates, i.e. the contractual date of delivery or the actual date of delivery and the date following commissioning and operation, may exist in relation to installing a ballast water management system.

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

BWM.2/Circ.66
20 April 2018

**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT
OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

**Unified interpretation of Appendix I (Form of the International Ballast Water
Management Certificate) of the BWM Convention**

1 The Marine Environment Protection Committee (MEPC), at its seventy-second session (9 to 13 April 2018), considered and approved the unified interpretation of appendix I (Form of the International Ballast Water Management Certificate) of the BWM Convention, as set out in the annex.

2 Member Governments and international organizations are invited to apply the annexed unified interpretation to appendix I of the BWM Convention and bring it to the attention of all parties concerned.

ANNEX

UNIFIED INTERPRETATION OF APPENDIX I (FORM OF THE INTERNATIONAL BALLAST WATER MANAGEMENT CERTIFICATE) OF THE BWM CONVENTION

Appendix I – Form of the International Ballast Water Management Certificate

"Date installed" in relation to "Method of ballast water management used"

1 For the purpose of completing the International Ballast Water Management Certificate, the date when commissioning has been completed in accordance with section 8 of the Guidelines (G8) (MEPC.174(58) or MEPC.279(70), as applicable) should be used.

2 Notwithstanding the above, it should be noted that, with regard to the deadline for installing a ballast water management system, operative paragraph 6 of resolution MEPC.279(70) (*2016 Guidelines for approval of ballast water management systems (G8)*) is as follows:

"6 AGREES that, for the purpose of operative paragraphs 4 and 5 of this resolution, the word 'installed' means the contractual date of delivery of the ballast water management system to the ship. In the absence of such a date, the word 'installed' means the actual date of delivery of the ballast water management system to the ship;"

3 Consequently, two dates, i.e. the contractual date of delivery or the actual date of delivery, and the date following commissioning and operation, may exist in relation to installing a ballast water management system.

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

BWM.2/Circ.43/Rev.1
10 May 2018

**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT
OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

**Guidance for Administrations on the type approval process
for ballast water management systems**

- 1 The Marine Environment Protection Committee (MEPC), at its sixty-first session (27 September to 1 October 2010), approved the *Guidance for Administrations on the type approval process for ballast water management systems in accordance with Guidelines (G8)*, developed by the Sub-Committee on Bulk Liquids and Gases (BLG) at its fourteenth session (8 to 12 February 2010), disseminated as BWM.2/Circ.28.
- 2 MEPC 65 (13 to 17 May 2013) approved amendments to the Guidance, developed by BLG 17 (4 to 8 February 2013), disseminated as BWM.2/Circ.43, superseding BWM.2/Circ.28.
- 3 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.
- 4 Member Governments and international organizations are invited to bring the annexed Guidance to the attention of all parties concerned.
- 5 This circular supersedes BWM.2/Circ.43.¹

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.43 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 FOR ADMINISTRATIONS ON THE TYPE APPROVAL PROCESS FOR BALLAST WATER MANAGEMENT SYSTEMS

1 PURPOSE

1.1 This document provides guidance for Administrations on the procedure for evaluating an application for type approval of a ballast water management system (BWMS), in accordance with the Code for Approval of Ballast Water Management Systems (BWMS Code). The Guidance can act as an aide-memoire for Administrations and is not intended, in any way, to interfere with the authority of an Administration.

1.2 This document provides guidance on interpretation of the BWMS Code and does not replace or supersede the requirements of the Code.

1.3 This document is intended to provide guidance to Administrations on the details of the type approval to be reported to the Committee.

2 KEY INSTRUMENTS

In evaluating an application for type approval of a BWMS, the latest version of the following instruments should be consulted:

- .1 International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention);
- .2 *Guidelines for approval of ballast water management systems* (G8) (resolutions MEPC.125(53), MEPC.174(58) and MEPC.279(70));
- .3 *Procedure for approval of ballast water management systems that make use of Active Substances* (G9) (resolution MEPC.169(57));
- .4 *Guidelines for ballast water sampling* (G2) (resolution (MEPC.173(58));
- .5 *Code for Approval of Ballast Water Management Systems* (resolution MEPC.300(72));
- .6 *Guidance to ensure safe handling and storage of chemicals and preparations used to treat ballast water and the development of safety procedures for risks to the ship's crew resulting from the treatment process* (BWM.2/Circ.20);
- .7 *Information reporting on type-approved ballast water management systems* (resolution MEPC.175(58));
- .8 *Methodology for information gathering and conduct of work of the GESAMP-BWWG* (BWM.2/Circ.13, as revised); and
- .9 other pertinent ballast water management related resolutions, guidance and circulars.

3 RECOMMENDATIONS FOR REQUIREMENTS OF MANUFACTURERS OR THEIR AGENTS

3.1 To facilitate the type approval of a BWMS, the Administration should ensure that the manufacturers, or their agents have, at a minimum:

- .1 been informed if the Administration delegates to or utilizes the services of a third party quality assurance organization (e.g. recognized organization, nominated body, classification society, surveyors, etc.) in some, or all of the type approval processes;
- .2 understood the steps and requirements of the processes outlined in the instruments listed in section 2 of this Guidance;
- .3 a fully working system built that can be used in the type approval process. It should be noted that the construction procedures and materials for the unit tested need to be the same as for the follow-on production units;
- .4 undertaken preliminary testing to ensure that their BWMS is viable, will meet the D-2 standard of the BWM Convention, will work on board a ship and has been determined not to pose any unacceptable risk to the environment;
- .5 understood the extent of testing that needs to be completed by a recognized testing facility, including toxicity analysis;
- .6 provided a description of the preliminary test to the Administration that should at least include the following:
 - .1 the test set-up, including sampling points;
 - .2 responsible persons/organizations for all or portions of the preliminary testing;
 - .3 possible Quality Management Plan (QMP) of the testing facility;
 - .4 testing laboratories that will be used;
 - .5 Quality Assurance Project Plan (QAPP) for the preliminary test; and
 - .6 provision for survey of the test facility, if required;
- .7 provided a detailed report of the preliminary test results including, at least:
 - .1 toxicity data;
 - .2 Active Substances if relevant; and
 - .3 any Other Chemicals generated during the process;
- .8 an understanding of whether the system under consideration uses an Active Substance as defined in the BWM Convention. If it utilizes an Active Substance, the system will require additional approval under Procedure (G9), whilst the systems not using an Active Substance only need approval under the BWMS Code;

- .9 a contractual agreement to undertake the shipboard testing needed under the BWMS Code with the owner of a suitable ship;
- .10 arranged for a trained person from the land-based testing facility to operate the equipment being type-approved and ensure that for the shipboard test the ship's crew is familiar with the equipment and sufficiently trained to operate the equipment;
- .11 consulted with the classification society that the ship undertaking the shipboard testing is being registered, where necessary, and obtained approval for installation of the BWMS;
- .12 demonstrated by using mathematical modelling and/or calculations or by full-scale shipboard testing, that any up or down scaling will not affect the ultimate functioning and effectiveness on board a ship of the type and size for which the equipment will be certified. In doing so, the manufacturers should take into account all relevant guidance developed by the Organization;
- .13 prepared a type approval application in compliance with the BWMS Code, annex, part 1, which includes at least the following:
 - .1 detailed description of the design, construction, operation and functioning of the BWMS;
 - .2 preliminary assessment of the corrosion effects of the system proposed, if applicable;
 - .3 preliminary test results;
 - .4 technical manual;
 - .5 BWMS piping and instrumentation diagram (P&ID);
 - .6 link to the provisions required in a ballast water management plan;
 - .7 environmental and public health effects; and
 - .8 specific salinities to be tested;
- .14 provided the following, when submitting the type approval application:
 - .1 sufficient information to verify operation in different salinity ranges (fresh, brackish and marine water) in which the BWMS will operate;
 - .2 sufficient information to verify operation in the different temperature ranges (cold, temperate and tropical) in which the BWMS will operate;
 - .3 sufficient information to verify operation with the different sediment loads under which the BWMS will operate;

- .4 sufficient information to verify operation of the minimum effective treatment flow rate as well as the maximum Treatment Rated Capacity (TRC) including the duration of these tests; and
- .5 suggestions for improvements of the installation related to safety or additional testing R&D;
- .15 made all laboratory-scale and, if appropriate, full-scale land-based test results and documentation, including all unsuccessful, failed and invalid tests, available to the Administration; and
- .16 made all shipboard test results and documents, including all unsuccessful, failed and invalid tests, as well as detailed information of the test set up and flow rate at each test cycle, available to the Administration.

3.2 In accordance with paragraphs 4.17 to 4.22 of the Code for Approval of Ballast Water Management Systems (BWMS Code), Administrations should ensure that type-approved BWMS have a suitable self-monitoring system that will monitor and record sufficient data to verify correct operation of the system. Administrations should make every effort to ensure that newly installed BWMS that have already been granted type approval meet this recommendation within one year following approval of this Guidance. Administrations should issue treatment system particulars, including details of the self-monitoring system (as described in document MEPC 61/INF.19), for all type-approved systems.

4 RECOMMENDATIONS FOR FACILITATING A TYPE APPROVAL EVALUATION

4.1 For those Administrations using third party quality assurance organizations, due care should be taken to ensure all such arrangements are in place prior to initiating the type approval programme.

4.2 The Administration should provide the applicant with a document outlining contact details, the expected amount of time between submission and decision and any other requirements separate from the procedures and requirements outlined in the instruments listed in section 2 of this Guidance.

4.3 The Administration should verify that any recommendations made by MEPC during Basic and Final Approval have been addressed prior to issuing the Type Approval Certificate. In accordance with *Information reporting on type-approved ballast water management systems* (resolution MEPC.175(58)), the Administration should submit the final report of land-based and shipboard tests with the notification of type approval to the Organization. The reports should be available to Member States.

4.4 The Administration may certify a range of the BWMS capacities employing the same principles and technology, but due consideration should be given to limitations on performance which might arise from scaling up or scaling down.

4.5 The Administration should, in particular, review Standard Operating Procedures (SOP) for which an international standard has yet not been established.

5 APPROVAL PROCESS

5.1 Under the provisions of the BWM Convention, a BWMS is to be approved in accordance with the BWMS Code and, where appropriate, Procedure (G9).

5.2 The Administration should verify that the following issues have been specifically addressed by the manufacturer and, if the evaluation of the system is carried out by a third party organization, these issues should be relayed to the Administration to enable a decision on:

- .1 a comprehensive explanation of the physical and/or biochemical treatment processes used by the BWMS to meet the D-2 Standard in the BWM Convention. This should be undertaken by the manufacturer and any supporting data should be submitted in writing. Any system which makes use of, or generates, Active Substances, Relevant Chemicals, or free radicals during the treatment process to eliminate organisms in order to comply with the Convention should be submitted to the Organization for review under Procedure (G9), (Procedure (G9), paragraph 3.3);
- .2 whether a BWMS makes use of an Active Substance or not remains the prerogative of the responsible Administration. In making that determination, Administrations should take into account relevant GESAMP-BWWG recommendations and MEPC decisions as to whether a system should be subject to approval under Procedure (G9). When an Administration is unsure of whether a BWMS is subject to Procedure (G9), it may choose to submit such system for review under that Procedure (MEPC 59/24, paragraph 2.16);
- .3 the BWMS that the Administration determines are not subject to Procedure (G9), as provided in paragraph 2.4.11 of the annex to the BWMS Code, the toxicity testing procedures in paragraphs 5.2.2 to 5.2.7 of Procedure (G9) should be used when the system could reasonably be expected to result in changes to the treated water such that adverse impacts to receiving waters might occur upon discharge;
- .4 the approval documents that should include a piping and instrumentation diagram (P&ID) with parts list and material specification. Furthermore, wiring diagrams, function description of the control and monitoring equipment and description of regulator circuit of the BWMS;
- .5 information on the preliminary testing (methodology, test water composition, salinities tested, sampling, analysis laboratories, etc.);
- .6 accreditation of the BWMS Code land-based testing facility or body including their quality management plan (QMP) and quality assurance project plan (QAPP) to be used by the manufacturer for land-based testing;
- .7 approval and subsequent verification of the design, construction, operation and functioning of the equipment used for land-based and shipboard testing;
- .8 approval and subsequent verification of the land-based and shipboard test methodology, including the composition of the test water, and specific salinities to be tested which should be in line with the BWMS Code, Procedure (G9) and the Methodology for information gathering and conduct of work of the GESAMP-BWWG, as appropriate (waiver for multiple testing required);
- .9 approval and subsequent verification of the methodology used to take and store samples, the laboratory testing, the frequency of sampling and the analysis procedure for samples from land-based and shipboard testing;

- .10 approval and subsequent verification of the design, construction, operation and functioning of the equipment used for testing;
- .11 if the system is using an Active Substance, the applications for Final Approval will have to be checked and approved by the Administration prior to making a proposal for approval to the Organization. In addition, the cost-recovery fee for the scientific services provided by the GESAMP-BWWG will have to be submitted;
- .12 a safety assessment of the storage and handling of any chemicals is undertaken and approved in line with the technical guidance developed by the Organization (BWM.2/Circ.20);
- .13 a safety and hazard assessment of the installation, operation and maintenance of the BWMS on the shipboard test is undertaken and approved in line with the technical guidance developed by the Organization (BWM.2/Circ.20), and includes as a minimum:
 - .1 any potential impact on the crew health and safety; and
 - .2 references to the classification society safety and hazard rules and recommendations;
- .14 all electrical equipment used to operate the BWMS should be of a certified safety type required by the applicable national or international standard in respect of the hazardous areas where it is located; and
- .15 results of environmental testing as specified in part 3 of the annex to the BWMS Code.

5.3 For issuance of the Type Approval Certificate, the Administration should set the following requirements and provisions:

- .1 the validity of the approval should be revisited as appropriate;
- .2 in due time before the expiration of the approval, the manufacturer should prepare a report detailing the experiences with the system, including the results of any scientific research relevant to the system, as well as any results of port State controls, if available;
- .3 the occurrence of any unexpected harmful consequences of the operation of the BWMS should be reported by the manufacturer to the Administration immediately;
- .4 in accordance with the BWMS Code, the Type Approval Certificate should include details on all limiting operating conditions, restrictions and/or SDL determined by the Administration for the operation of the BWMS;
- .5 an annex to the Type Approval Certificate should contain the test results of each land-based and shipboard test run. Such test results should include at least the numerical salinity, temperature, flow rates, and where appropriate UV transmittance. In addition, these test results should include all other relevant variables;

- .6 the Type Approval Certificate should specify the components of the BWMS that are type-approved, including the manufacturer of each component; their operating ranges, including temperature, specific salinity and specify the possibility to use other similar components (e.g. filters) and the criteria for allowing such use;
- .7 a separate Type Approval Certificate should be provided for each type or model of the BWMS. However, if Administrations wish to do otherwise, it is recommended that the different types and models are clearly stated and the test each type and model has undergone clearly referred to with test results, operating ranges, salinity, TRC, etc.;
- .8 all accidents (e.g. accidental exposure, leakage) related to the BWMS should be reported;
- .9 any indications that the system is not performing to the standards set by the BWM Convention, the BWMS Code and/or any additional provisions set by the Administration should be reported by the manufacturer to the Administration immediately;
- .10 the Administration should have the opportunity to revoke the approval if these requirements are not met; and
- .11 MSC.1/Circ.1221 on *Validity of Type Approval Certification for marine products* should apply.

6 REPORTING OF THE TYPE APPROVAL

6.1 The Administration should forward a report of the type approval process to the Organization, including the relevant documentation as specified in part 7 of the annex to the BWMS Code.

6.2 In particular, where under Procedure (G9) the Final Approval has been granted with recommendations by the GESAMP-BWWG, evidence that these recommendations have been satisfactorily addressed at type approval should be provided to the Organization. The report should specify the findings of the Administration together with any non-confidential information according to Procedure (G9).

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

BWM.2/Circ.33/Rev.1
10 May 2018

**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.
