INTERNATIONAL MARITIME ORGANIZATION

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73rd session
Agenda items 4 and 15

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HARMFUL AQUATIC ORGANISMS IN BALLAST WATER

WORK PROGRAMME OF THE COMMITTEE AND SUBSIDIARY BODIES

Report of the Ballast Water Review Group

Introduction

1 The Ballast Water Review Group (BWRG) met from 22 to 24 October 2018, and was chaired by Ms. Leanne Page (United Kingdom).

2 The meeting was attended by delegations from the following Member Governments:

ARGENTINA
AUSTRALIA
BANGLADESH
BRAZIL
CANADA
CHINA
DENMARK
FINLAND
FRANCE
GERMANY
GHANA
INDONESIA
IRAN (ISLAMIC REPUBLIC OF)
IRELAND
ITALY
JAPAN
LATVIA
LIBERIA
MALTA
MARSHALL ISLANDS
MEXICO
NETHERLANDS
NEW ZEALAND
NIGERIA
NORWAY
PHILIPPINES
POLAND
REPUBLIC OF KOREA
RUSSIAN FEDERATION
SAUDI ARABIA
SINGAPORE
SOUTH AFRICA
SWEDEN
THAILAND
TURKEY
UKRAINE
UNITED KINGDOM
UNITED STATES

by observers from the following non-governmental organizations:

INTERNATIONAL CHAMBER OF SHIPPING (ICS)
BIMCO
INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES (IACS)
INTERNATIONAL ASSOCIATION OF INDEPENDENT TANKER OWNERS (INTERTANKO)
THE INSTITUTE OF MARINE ENGINEERING, SCIENCE AND TECHNOLOGY (IMarEST)
INTERNATIONAL SHIP MANAGERS' ASSOCIATION (InterManager)
THE ROYAL INSTITUTION OF NAVAL ARCHITECTS (RINA)
INTERNATIONAL TRANSPORT WORKERS' FEDERATION (ITF)
INTERNATIONAL PAINT AND PRINTING INK COUNCIL (IPPIC)
NACE INTERNATIONAL
WORLD SHIPPING COUNCIL (WSC)

and by the Chair of the GESAMP-BWWG.

Terms of reference

3 The Review Group was instructed to take into consideration the comments and decisions made in plenary and to:

with regard to agenda item 4:

.1 finalize the draft *Guidance on System Design Limitations of ballast water management systems and their monitoring*, using document PPR 5/24, annex 19, as a basis, and taking into account the proposals in document MEPC 73/11/3;

.2 finalize the draft guidance on validation of the compliance of individual BWMS with regulation D-2 of the BWM Convention in conjunction with their commissioning, using document MEPC 72/WP.9, annex 5, as a basis;

.3 further consider the matter of contingency measures in the ballast water management plan, taking into account documents MEPC 73/4/8 and MEPC 73/INF.8, and advise the Committee accordingly;

with regard to agenda item 15:

.4 review the proposals for new outputs contained in documents MEPC 73/15, MEPC 73/15/1 and MEPC 73/15/2, taking into account documents MEPC 73/15/5 and MEPC 73/15/6, with a view to refining the titles of the outputs and defining the scope of work of each output, and advise the Committee accordingly; and

.5 submit a written report to plenary by Thursday, 25 October 2018.

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

4 As instructed by the Committee, the Group considered, with a view to finalization, the draft *Guidance on System Design Limitations of ballast water management systems and their*

monitoring, using the text set out in annex 19 to document PPR 5/24 as the basis, taking also into account document MEPC 73/11/3 (IMarEST).

5 Recognizing that this draft had been extensively reviewed previously, the Group agreed that there was no need to conduct a paragraph-by-paragraph review. Instead, the Group considered only the proposed amendments to the table in the annex to the Guidance, provided in the annex to document MEPC 73/11/3. In this regard, the Group conducted a thorough row-by-row review of the table with a view to its finalization.

6 The Group also considered the proposal that the draft guidance be revised throughout to reference the BWMS Code, rather than the 2016 Guidelines (G8). The Group noted that MEPC had already resolved that references to the Guidelines (G8) and 2016 Guidelines (G8) in existing IMO instruments should be read to mean references to the BWMS Code (resolution MEPC.300(72), paragraph 6); however, in the interest of clarity, the Group agreed to implement this proposal.

7 Following discussion, the Group finalized the draft *Guidance on System Design Limitations of ballast water management systems and their monitoring*, set out in annex 1, and invited the Committee to approve it for dissemination as a BWM.2 circular. In doing so, the Group noted that the information contained in the table in the annex to the Guidance is provided only for reference and is not meant to be exhaustive nor to pre-empt any decisions by Administrations granting type approval to BWMS.

Draft Guidance on validation of the compliance of individual BWMS with regulation D-2 of the BWM Convention in conjunction with their commissioning

8 As instructed by the Committee, the Group considered, with a view to finalization, the draft guidance on validation of the compliance of individual BWMS with regulation D-2 of the BWM Convention in conjunction with their commissioning, using the text set out in annex 5 to document MEPC 72/WP.9 as the basis.

9 The Group recalled that the 2017 version of the Harmonized System of Survey and Certification (HSSC), adopted by A 30 through resolution A.1120(30), already included the provision for this validation (survey item (BI) 1.1.2.19), and that the Committee agreed not to keep the validation in abeyance as proposed in document MEPC 73/4/5 (Japan).

10 The Group conducted a paragraph-by-paragraph review of the draft guidance, replaced mandatory language with text of recommendatory nature, and, in addition to reviewing the text, considered some issues that were identified.

11 It was noted that, while the validation was intended to be carried out for all new installations of BWMS, survey item (BI) 1.1.2.19 is applicable only to initial surveys whereas for existing ships this installation might be connected to an additional survey. Noting this, the Group recognized that there was a need to identify how the validation can be addressed in the HSSC for existing ships, or elsewhere.

12 In this regard, the Group noted that the Correspondence Group on Updated Survey Guidelines under the Harmonized System of Survey and Certification (HSSC), established by III 5, would, inter alia, review the Survey Guidelines under the BWM Convention, with a view to their approval at III 6 and subsequent adoption at A 31 as part of the 2019 HSSC Guidelines. It was agreed that this provided the opportunity to address this matter and the Group invited the Committee to instruct the Correspondence Group to consider the commissioning testing of new BWMS installations on existing ships and ensure that it be addressed for incorporation in the 2019 HSSC Guidelines.

13 The Group considered issues related to whether the intake water for testing in the context of this validation should be challenging in terms of organism counts exceeding the D-2 standard or the shipboard testing requirements in the BWMS Code, and whether sampling of the intake water should be carried out. In considering these issues, the Group recognized the distinction between what would be ideal and what may be possible for some cases, taking also into account the objectives of this validation, which is meant to provide assurance that the installation and commissioning of a BWMS is successful. In conclusion, the Group decided that the ambient water should be accepted for testing regardless of the level of challenge it poses to the BWMS.

14 Furthermore, the Group agreed that this validation would entail indicative analysis and is not meant to confirm compliance with regulation D-2 at the same level as type approval testing, recalling again the aforementioned objective of the validation. It was also agreed that testing should cover all size classes defined in regulation D-2 and it was proposed that the methods listed in circular BWM.2/Circ.42/Rev.1 should be used on a trial basis during the experience-building phase.

15 Finally, the Group considered other issues, including how to deal with instances when the properties of the intake water for testing are beyond the SDLs of the BWMS. The Group reiterated that this validation should be performed to the satisfaction of the Administration and took that into account in finalizing the text of the guidance.

16 In conclusion, the Group finalized the draft *Guidance for the commissioning testing of ballast water management systems*, set out in annex 2, and invited the Committee to approve it for dissemination as a BWM.2 circular.

Contingency measures in the ballast water management plan

17 As instructed by the Committee, the Group considered the matter of contingency measures in the ballast water management plan, taking into account documents MEPC 73/4/8 and MEPC 73/INF.8. The Group recalled that the main consideration at MEPC 72 had been the timing when information on contingency measures should be included in ballast water management plans (BWMPs), rather than what that information should be.

18 In the ensuing discussion, some delegations were of the view that this should be done when a BWMP is revised due to a ship's compliance with regulation D-2, while other delegations expressed the view that this should be done as soon as possible. Noting the different views and that this is ultimately up to the Administration, the Group invited the Committee to agree that each Member State may determine the timing for the incorporation of information on contingency measures in the BWMPs of ships flying its flag.

19 The Group also considered whether an amendment should be made to the *Guidelines for ballast water management and development of ballast water management plans* (G4), to address the incorporation of information on contingency measures in BWMPs. There was general support for this option and the Group noted that this could be achieved with a minor addition to the Guidelines (G4), which would not require a revision of the Guidelines or a new output.

20 In conclusion, the Group agreed to the addition of a new paragraph 4.3 in part B of the Guidelines (G4), as set out in annex 3, and invited the Committee to adopt the corresponding amendment to the Guidelines.

Proposals for new outputs

21 As instructed by the Committee, the Group reviewed the proposals for new outputs contained in documents MEPC 73/15, MEPC 73/15/1 and MEPC 73/15/2, taking into account documents MEPC 73/15/5 and MEPC 73/15/6. The Group noted that the Committee instructed it to refine the titles of the outputs and define the scope of work of each output.

22 Recognizing that there was significant potential overlap in the proposals contained in documents MEPC 73/15, MEPC 73/15/2 and MEPC 73/15/5, the Group agreed to consider these proposals together in order to finalize the descriptions and other aspects of new outputs that would cover these matters most effectively.

Seafarers' training related to ballast water management

23 The Group considered the proposal in document MEPC 73/15/1 (China) for an output to develop a model course under the BWM Convention to standardize the training, certification and watchkeeping for seafarers related to ballast water management, together with commenting document MEPC 73/15/6 (ICS), proposing an expansion of the scope of the output to avoid the work being constrained to the development of a model course only.

24 There was overwhelming support for the approach proposed by ICS and the Group agreed to propose an output with an expanded scope. In considering the appropriate level of detail in the description of the output's scope, the Group agreed that it should be clear and specific without being too prescriptive or restrictive.

25 With regard to the most appropriate associated organ, the Group considered whether this should be PPR, HTW or both Sub-Committees. In light of the expanded scope of the output in line with the proposal in document MEPC 73/15/6 (ICS), the Group agreed that this output should be assigned to the HTW Sub-Committee as the associated organ, with MEPC as the parent organ.

26 In addition, the Group noted that, in accordance with the assessment in document MEPC 73/WP.4, this output would be included in the post-biennial agenda of the Committee. Consequentially, in light of the proposal for this work to be carried out over two sessions of the HTW Sub-Committee, the Group agreed that the target completion year should be 2021.

27 In conclusion, the Group invited the Committee to approve a new output on "Development of training provisions for seafarers related to the BWM Convention" in the post-biennial agenda of the Committee, assigning the HTW Sub-Committee as the associated organ, with two sessions needed to complete the work, and with the scope set out in annex 4.

Experience-building phase and urgent measures

28 The Group considered the proposals in document MEPC 73/15 (Denmark et al.) and commenting document MEPC 73/15/5 (Australia et al.), which were related to the experience-building phase associated with the BWM Convention (EBP); in this regard the Group also considered the proposal in document MEPC 73/15/2 (Russian Federation and Turkey) as the matters addressed could be dealt with under the same outputs.

29 The Chair of the BWRG proposed draft basis text for the Group to use as a starting point for its consideration of these proposed outputs, with the aim to consider these proposals together in order to finalize the descriptions and other aspects of new outputs that would cover all these matters most effectively. Following brief consideration, the Group agreed to base its discussions on the draft basis text, with the understanding that its purpose was to facilitate the Group's work and not to pre-empt its decisions.

30 The draft basis text entailed two outputs, one addressing directly the EBP while the second would cover urgent matters that may need to be resolved before the conclusion of the EBP. In finalizing these two outputs and their scope, the Group considered also overall procedural and other aspects pertaining to the way the Organization's work is organized in outputs, in order to develop the best possible description of the outputs.

31 With regard to the first output, the Group agreed that its scope would not be constrained by the templates in the data gathering and analysis plan (DGAP) for the EBP (BWM.2/Circ.67) but would also accommodate other information and data that may be considered under the EBP (e.g. according to paragraphs 4.3 and 4.4.1 of the DGAP).

32 Recalling the relevant discussions in plenary, the Group also agreed to include an explicit reference to amending Article 9 of the Convention in the scope of the first output, in order to reflect the agreement that this is a matter that needs to be addressed but was not considered urgent. The Group also agreed that amendment of Article 9 should be considered through the package of amendments developed for the EBP. The observer from ICS expressed the view that this matter should be included in the scope of the second output on urgent matters, and a statement by the observer in this regard is set out in annex 5.

33 As for the second output, given its intended focus on urgent issues, the Group agreed that it was important to identify what would be considered urgent, in order to achieve a clear definition of the output's scope. In the ensuing discussion, various views were expressed and the Group agreed to wording that would best capture the intent of this output.

34 Moreover, the Group had extensive discussions on whether explicit reference to potential amendments to the Convention should be made in the scope of this output. Following an exchange of views, the Group agreed not to include such a reference, but refer instead to other measures. The majority of delegations were of the view that amendments are included under the term "other measures".

35 The Group considered whether the PPR Sub-Committee should be designated as an associated organ for these two outputs. Following brief discussion, the Group agreed that both these outputs were more appropriate for consideration at the Committee level only, while noting that the MEPC may at any time decide to refer specific matters to the PPR Sub-Committee as necessary.

36 Finally, while noting that, in accordance with the assessment in document MEPC 73/WP.4, these outputs would be included in the post-biennial agenda of the Committee, the Group agreed that these two outputs are urgent and should be included in the current biennial agenda instead, in line with the timeline of the EBP, while the target completion year should be 2023.

37 In conclusion, the Group invited the Committee to approve two new outputs on "Review of the BWM Convention based on data gathered in the experience-building phase" and "Urgent measures emanating from issues identified during the experience-building phase of the BWM Convention" in the biennial agenda of the Committee, with a target completion year of 2023, and with the scopes set out in annex 4.

Summary of proposed outputs

38 In summary, the Group agreed to recommend to the Committee three new outputs, with the descriptions, timelines and related organs as set out in annex 4. These proposed new outputs are:

.1 "Development of training provisions for seafarers related to the BWM Convention";

.2 "Review of the BWM Convention based on data gathered in the experience-building phase"; and

.3 "Urgent measures emanating from issues identified during the experience-building phase of the BWM Convention".

Future work

39 Considering the continued workload under this agenda item, including new topics and existing ones requiring further consideration, as well as the experience-building phase associated with the BWM Convention, the Group agreed to invite the Committee to re-establish the Review Group at MEPC 74, in accordance with the provisions of regulation D-5 of the BWM Convention.

Action requested of the Committee

40 The Committee is invited to approve the report in general and in particular to:

.1 approve the draft BWM.2 circular on *Guidance on System Design Limitations of ballast water management systems and their monitoring* (paragraph 7 and annex 1);

.2 instruct the Correspondence Group on Updated Survey Guidelines under the Harmonized System of Survey and Certification (HSSC), established by III 5, to ensure that the validation of BWMS at their commissioning be incorporated in the 2019 HSSC Guidelines for all ships, including new ballast water management system installations on existing ships (paragraph 12);

.3 approve the draft BWM.2 circular on *Guidance for the commissioning testing of ballast water management systems* (paragraph 16 and annex 2);

.4 concur with the view of the Group that each Member State may determine the timing for the incorporation of information on contingency measures in the ballast water management plans of ships flying its flag (paragraph 18);

.5 adopt the draft MEPC resolution on amendments to the *Guidelines for ballast water management and development of ballast water management plans* (G4) (paragraph 20 and annex 3);

.6 approve the following new outputs, with the corresponding scopes (paragraphs 27, 37 and 38, and annex 4):

.1 "Development of training provisions for seafarers related to the BWM Convention", in the post-biennial agenda of the Committee, assigning the HTW Sub-Committee as the associated organ, with two sessions needed to complete the work;

.2 "Review of the BWM Convention based on data gathered in the experience-building phase", in the biennial agenda of the Committee, with a target completion year of 2023; and

.3 "Urgent measures emanating from issues identified during the experience-building phase of the BWM Convention", in the biennial agenda of the Committee, with a target completion year of 2023; and

.7 re-establish the review Group at MEPC 74, in accordance with the provisions of regulation D-5 of the BWM Convention (paragraph 39).

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ANNEX 1

DRAFT BWM CIRCULAR

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 *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

DRAFT 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 the 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 the 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 The 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, 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 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 provide 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	- Removal of particles and organisms greater than the filter mesh size (disk, basket, candle, etc.) - Automatic cleaning	- Suspended solids (size, quality, quantity) - Salinity and temperature	- Maximum flow rate - Minimum backwash pressure	- Flow rate - Inlet/outlet pressure or differential pressure (dP) - Minimum backwash pressure	- Mesh size or retention threshold (nominal or absolute) - Filtration capacity (flow rate) - Cleaning capacity (backflush) - Number or frequency of backwashes or cleaning cycles
Hydrocyclone	- Gravitational separation of particles by centrifugal force (removal of organisms)	- Suspended solids (specific gravity, quantity) - Salinity and temperature	- Minimum and maximum flow rate	- Flow rate - Inlet/outlet pressure	- Capacity - Separation percentage
Ultraviolet (UV) irradiation	- UV irradiation (low pressure / medium pressure) damages cells	- UVT - Salinity and temperature	- UVI - Minimum and maximum flow rate - Minimum holding time	- UVI, UVT, and/or UV dose - Power, or current and voltage - Minimum and maximum flow rate	- 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

Technology	Principles	Potential SDL		Control and monitoring parameters seen in BWMS	Design elements / related information
		Environmental / water quality parameters	Technical / operational parameters		
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
	- 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.

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ANNEX 2

DRAFT BWM CIRCULAR

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; and

.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.

.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.

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ANNEX 3

DRAFT RESOLUTION MEPC.[…](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; and

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 should include contingency measures developed taking into account guidelines developed by the Organization*."

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

ANNEX 4

PROPOSED NEW OUTPUTS FOR MATTERS RELATED TO BALLAST WATER MANAGEMENT

Output number	Description	Target completion year	Parent organ	Associated organ
1	Review of the BWM Convention based on data gathered in the experience-building phase **Scope**: The scope of this output would be guided by resolution MEPC.290(71) and the contents of the data gathering and analysis plan (DGAP) for the experience-building phase (EBP) associated with the BWM Convention (BWM.2/Circ.67). Implementation of the BWM Convention by Member States will produce data and show trends through the EBP that will allow the Committee to consider opportunities to improve the Convention. This output addresses the need for this review and discussion and would allow the Committee to take stock of the Convention in line with resolution MEPC.290(71), where the Committee resolved to undertake an analysis of the data gathered and a systematic and evidence-based review of the text of the Convention and develop a package of amendments to the Convention, including article 9.	2023	MEPC	
2	Urgent measures emanating from issues identified during the experience-building phase of the BWM Convention **Scope**: The scope of this output would allow for the consideration of issues, with justification, that may be addressed prior to the development of a package of amendments through the experience-building phase and where those issues impact on a Member State's ability to effectively and consistently implement the Convention. Such issues would include those to ensure crew and ship safety including technical and operational matters and the protection of the marine environment. This may entail the development or revision of guidance or other measures necessary to address such urgent issues.	2023	MEPC	

Output number	Description	Target completion year	Parent organ	Associated organ
3	Development of training provisions for seafarers related to the BWM Convention **Scope**: The scope of this output would encompass the development of generic training for seafarers to implement the requirements of the regulations under the BWM Convention and including themes listed in paragraph 20.4 of the manual entitled "Ballast Water Management – How to do it". It shall be based on seafarers' capacities, duties, and responsibilities on board ships, and could include, inter alia: exceptions and exemptions, ballast water management plans, ballast water record books, ballast water management requirements (regulation B-3), reception facilities, other methods (regulation B-3.7), sediment management, ballast water exchange, duties of officers and crew, survey and certification, additional measures (regulation C-1) and warnings concerning ballast water uptake.	2021	MEPC	HTW

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ANNEX 5

STATEMENT BY THE OBSERVER FROM ICS

"ICS expressed concern about including a specific reference to Article 9 in the scope of the output on the review of the BWM Convention based on data gathered in the experience-building phase since any review of Article 9, such as to harmonize it with the four-stage approach agreed to in the PSC guidelines under the Ballast Water Management Convention adopted by Resolution MEPC.252(67), would not necessarily be based on data gathered in the experience-building phase. As such, in order to avoid confusion and misinterpretation, ICS recommended that no reference was made to Article 9 or any other specific Article of the BWM Convention in the scope of the output."