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## HARMFUL AQUATIC ORGANISMS IN BALLAST WATER

### Report of the Correspondence Group on the review of the Guidelines (G8)

Submitted by the United Kingdom

#### SUMMARY

*Executive summary:* This document contains the report of the Correspondence Group on the review of the *Guidelines for approval of ballast water management systems (G8)* established by MEPC 68

*Strategic direction:* 2

*High-level action:* 2.0.1

*Output:* 2.0.1.2

*Action to be taken:* Paragraph 133

*Related documents:* MEPC 68/2/12 and MEPC 68/WP.8

#### Introduction

1 The Marine Environment Protection Committee (MEPC) at its sixty-seventh session endorsed a plan of action for reviewing the *Guidelines for approval of ballast water management systems (G8)* and established a Correspondence Group on the review of the Guidelines (G8). The work of the correspondence group was not completed and the group was re-established by MEPC 68 with instructions to:

- .1 continue the review of the Guidelines (G8), focusing on the issues identified in paragraphs 14 and 16 of document MEPC 68/WP.8, taking into account any available data provided from the Study on the implementation of the ballast water performance standard described in regulation D-2 of the Convention (the D-2 Study) and any other relevant information provided during the timeline of the review;
- .2 develop and use an interface for incoming data of the Study; and
- .3 submit a report to MEPC 69.

2 The correspondence group had participants from the following Member Governments:

ARGENTINA	LATVIA
AUSTRALIA	LIBERIA
BAHAMAS	MALAYSIA
BELGIUM	MALTA
BRAZIL	MARSHALL ISLANDS
CANADA	NEW ZEALAND
CHINA	NETHERLANDS
CYPRUS	NIGERIA
DENMARK	NORWAY
FINLAND	PERU
FRANCE	POLAND
GERMANY	REPUBLIC OF KOREA
GREECE	RUSSIAN FEDERATION
INDIA	SINGAPORE
IRAN (ISLAMIC REPUBLIC OF)	SOUTH AFRICA
IRELAND	SWEDEN
ITALY	UNITED KINGDOM
JAMAICA	UNITED STATES
JAPAN	

the following intergovernmental organization:

EUROPEAN COMMISSION (EC)

the following non-governmental organizations in consultative status:

INTERNATIONAL CHAMBER OF SHIPPING (ICS)  
BIMCO  
INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES (IACS)  
EUROPEAN CHEMICAL INDUSTRY COUNCIL (CEFIC)  
COMMUNITY OF EUROPEAN SHIPYARDS' ASSOCIATIONS (CESA)  
INTERNATIONAL ASSOCIATION OF INDEPENDENT TANKER OWNERS  
(INTERTANKO)  
THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE (IUCN)  
CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA)  
INTERNATIONAL ASSOCIATION OF DRY CARGO SHIPOWNERS  
(INTERCARGO)  
THE INSTITUTE OF MARINE ENGINEERING, SCIENCE AND TECHNOLOGY  
(IMAREST)  
INTERNATIONAL SHIP MANAGERS' ASSOCIATION (INTERMANAGER)  
INTERNATIONAL TRANSPORT WORKERS' FEDERATION (ITF)  
WORLD SHIPPING COUNCIL (WSC)  
NACE INTERNATIONAL

the World Maritime University (WMU); and

the GESAMP-Ballast Water Working Group (BWWG).

### **Background**

3 The correspondence group (hereafter the group) communicated via email over a seven month period from May to December 2015.

4 The work of the group has built on that of the previous correspondence group and has been conducted under the instruction and terms of reference as provided by MEPC 68. The items discussed by the group, as determined by the terms of reference, were as follows:

Item	Topic
1	Testing being performed using fresh, brackish and marine waters, including Type Approval (TA) Certificate amendments
2	Testing considering the effect of temperature in cold and tropical waters on operational effectiveness and environmental acceptability
3.1	Specification of standard test organisms for use in testing
3.4	Propose definition of "viability" of organisms, taking into account the damage caused to organisms by ballast water management systems making use of UV
4	Challenge levels set with respect to suspended solids in test water
5.1	Type approval testing. Clarification of "test run" and "test cycle"
5.3	Test reports – to include the installation, commissioning, repair and maintenance documentation relating to land-based and shipboard tests. Environmental test reports?
5.4	The reporting of operational parameters including power consumption, mechanical reliability, replacement of components and consumables.
6	Type approval testing realistically representing the flow rates the system is approved for
7	Any differences between type approval protocols of Member States
8	Any items raised by, and any data arising from the D-2 Study and any other relevant information provided, within the timeline for the review Guidelines (G8) <ul style="list-style-type: none"> <li>- Critical Parameters</li> <li>- Language for type approval certificate information</li> <li>- Stripping and gravity filling/discharges</li> </ul>
9.1	Testing facility validation – standardized protocol
10.2	Operational testing period for ships
11.2	The discharge of treated ballast water during shipboard testing
12	Should upgrades to ballast water management systems (BWMS) be allowed during testing?
13.1	The final type approval of a BWMS – when should it be issued, following the completion of land-based test analysis, or following completion of both land and ship-based tests analysis?

- 13.2 Should safety considerations, risk assessments, PPE requirements, required for the safe operation of BWMS be part of the type approval? Should that information be provided in a public safety report?
- 15.2 There is a wide range of C & M modules used with varying availability of secure logging and data outputs. Improve unit testing and standardize required outputs?
- 15.3 Should the location for suitable fitment of electronic and electrical equipment be specified in the approval (taking into account: vibration, heat, moisture, ventilation)?
- 16 BWMS bypass arrangements – under what circumstances should bypassing of a BWMS occur, and how should the sequences of events be recorded?
- 17 Scaling of BWMS – should all documentation relating to scaling of a BWMS be included in the test report, including the decision process following computer modelling, description of model assumptions and validation documents?
- 18 Holding time – is there a requirement for a verification of the minimum holding time required for BWMS?
- 19 Shipboard testing of BWMS – comments were made regarding the sample volume and collection method, sampling test duration period, sampling parameters, management of risk during the test period (use of control samples or a control holding tank), verification of system operation during variable flow rates, and the clarification of sample point arrangements
- 20.1 Land-based testing – proposed modification of existing sampling protocol regarding sample biological content and sample volume in specific circumstances
- 20.2 Technical and biological tests – proposed separation of biological and technical factors in testing protocol
- 20.3 Environmental tests – the current requirements for environmental testing makes use of outdated specifications and it is proposed that those specifications should be updated
- 21 Equipment technical specifications – proposed modification of specification text relating to the monitoring of hazards and the safe operation of the equipment in BWMS
- 22 Documentation, pre-test evaluation – additional documentation relating to potential risks and hazard mitigation pertaining to the operation of BWMS, to be submitted to the approving Administration

### **Comments and discussions**

5 All items were discussed resulting in the group being able to draw conclusions or propose ways forward. The group was also able to identify items for future consideration and further development.

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**Item 1: Testing being performed using fresh, brackish and marine waters**

6 The group agreed that the proposed ranges were sufficient to ensure that an appropriate range of salinities are used during testing and that the ranges sufficiently reflect fresh, brackish and marine water. Concerns were expressed that the ranges were not contiguous, however the group supported maintaining the 10 PSU separation in the ranges and recognized that these ranges give sufficient confidence that systems tested in this way will operate across all salinity ranges. It was noted that the extreme values could prove to be challenging.

7 The water salinities in the table of paragraph 2.3.17 of the annex to Guidelines (G8) should therefore be amended to:

"Fresh (salinity < 1 PSU)  
Brackish (salinity 10-20 PSU)  
Marine (salinity 28-36 PSU)"

8 In support of this amendment the following amendments to the annex of Guidelines (G8) new text as proposed within MEPC 68/2/12, paragraph 10, were agreed by the group:

Paragraph 2.3.17 is replaced by the following:

"2.3.17 For any given set of test cycles (5 replicates is considered a set) a salinity range should be chosen for each cycle. Given the salinity of the test set up for a test cycle in fresh, brackish and marine water, each should have dissolved and particulate content in one of the following combinations:"

The following new paragraph is inserted:

"2.3.18*bis* One set of test cycles should be conducted within each of the three salinity ranges as prescribed in paragraph 2.3.17 with a minimum separation of 10 PSU between the ranges."

**Item 1: Type Approval (TA) Certificate amendments**

9 The group agreed that the Type Approval Certificate should be annotated on the front page to indicate when a system is certified for limited operations.

10 The group discussed the inclusion of limiting factors as a part of the Type Approval Certificate, resulting in the development of the concept of "critical parameters" or "system design limitations" (SDL). Details regarding the concept of critical parameters (SDL) can be found under Item 8.

11 To reflect the inclusion of limiting factors on the Type Approval Certificate, four alternate text proposals were received for addition to section 6 of Guidelines (G8):

- .1 "Where the effective operation of the BWMS is restricted this should be clearly stated on the Type Approval Certificate, with reference made, as appropriate, to the nature of the limiting condition(s) which may include those listed under paragraph 6.2. The Type Approval Certificate should be annotated on the front page with the description "Limiting Operational Conditions."
- .2 "Where the effective operation of the BWMS is restricted, e.g. to specific salinity and temperature ranges, this should be clearly stated on the Type Approval Certificate together with any other limiting conditions as required under paragraph 6.2. The Type Approval Certificate should be annotated on the front page with the description "Limiting Operational Conditions."

- .3 "Where the effective operation of a BWMS is restricted in terms of salinity, temperature and/or total suspended solid to operational ranges less than the specified ranges for testing of each parameter as prescribed in these Guidelines then this should be clearly stated on the Type Approval Certificate. The Type Approval Certificate should be annotated on the front page with the description "Limiting Operational Conditions" and each restricted parameter stated together with the actual effective operational value range."
- .4 "A Type Approval Certificate of BWMS should 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 conditions or circumstances as appropriate. As a minimum, a limiting condition for each Critical Parameter found by the Administration to affect the performance of the BWMS should appear on the Type Approval Certificate."

12 Although in agreement that the Type Approval Certificate should be amended, the decision of the group was to defer agreeing text reflecting these changes within a revised Guidelines (G8) until the concept of critical parameters (SDL) had been fully explored and, if appropriate, agreed.

13 The group concluded that any work to amend the current Type Approval Certificate should be postponed until the review of Guidelines (G8) is completed to ensure that all proposed changes can be included in any new document proposals.

## **Item 2: Testing considering the effect of temperature in cold and tropical waters on operational effectiveness and environmental acceptability**

14 In recognition of the complicated nature of this subject, the group created a subgroup in order for relevant experts and interested parties to discuss this issue outside of the ongoing work of the correspondence group.

15 It was recognized by the correspondence group that this issue needed to be overseen by a member of the group that fully understood the technical nature of the discussion. As such the coordinator of the correspondence group invited group members to volunteer to be the coordinator of the subgroup. Supported by members of the subgroup, a member of the delegation of Singapore offered to fulfil the role of coordinator of this subgroup and operate under the terms of reference agreed by the correspondence group.

16 The report of this subgroup, including terms of reference and participants list, as submitted to the group can be found in annex 1.

17 In summary, the subgroup reported/found that:

- .1 temperature affects BWMS operations, efficacy, chemical degradation rates and organism regrowth rates;
- .2 full scale testing at all temperatures may significantly increase costs of system development and reduce availability of approved technologies;
- .3 the subgroup questioned whether there is an alternative to full scale testing; and
- .4 testing must be robust and reflect real conditions, if possible.

18 The subgroup also made a number of proposals that were considered by the group. Based upon the work of the subgroup, the group concluded that BWMS should be adequately tested to ensure effective operation at different temperatures. In order to achieve this, the group supported the use of a combination of ship-based, land-based and bench scale tests. It was acknowledged that financial burden was a consideration when undertaking the tests but that this should not be used as an excuse to not undertake comprehensive testing to ensure effectiveness at the relevant temperatures.

19 The group agreed that the critical parameters (SDL) approach and bench scale tests could be used to determine limits of the effects of temperature on a system and that such information should be included on the Type Approval Certificate.

20 A number of members suggested that there was a need for the inclusion of temperature ranges within a revised Guidelines (G8). It was also highlighted that further discussion would be required to ensure robust procedures were developed and that complete evaluations were undertaken when setting the temperature ranges. These were highlighted as items that required further discussion.

21 The subgroup noted that more data and information is required in order to fully understand the impacts of temperature. This resulted in the following suggestions to facilitate data collection:

.1 from Administrations

.1 there is collectively a large amount of information amongst Administrations that have undertaken type approval to identify technologies that are affected by temperature. MEPC could encourage Administrations to submit their experiences through submissions to MEPC. In the future, Administrations should be encouraged to share this data through test reports.

.2 from the D-2 Study

.1 additional data should be forthcoming from the D-2 Study; and  
.2 propose that the Committee considers the feasibility of a study to collect more information and data.

.3 as part of the revised Guidelines (G8)

.1 the revised Guidelines (G8) could stipulate which test parameters are shared/published thus enabling the evaluation of the various technologies at different temperatures. The information could then be used in the consideration of alternative test plans.

.4 from expert sources

.1 there was a suggestion that the necessary technical work is beyond the capacity of a correspondence group, and that specific proposals for evaluation procedures are needed and must be subjected to careful review.  
.2 the Organization/MEPC request that the ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors identify and assess the available data and methods for determining the performance

of BWMS at extreme temperature ranges (i.e. below 1 degree Celsius and above [X] degrees Celsius) and provide a report to MEPC 70, PPR 4 or a future correspondence group with options/recommendations for guidance to administrations.

22 The group did not have time to explore all of these suggestions and as such this issue should be considered as requiring further discussion.

23 When considering the effects of temperature on holding time, the subgroup supported the following proposals:

- .1 ensure that holding time is flexible and the use of Q10/Arrhenius approaches is encouraged to increase comparability between test facilities. This may require the setting up of a group and data sharing to ascertain reference temperatures and holding times; and
- .2 test designs should be developed to include an evaluation of the minimum holding times necessary for the BWMS to work.

24 It was acknowledged that the issue of holding time and temperature is complex and requires further discussion in order to develop clear understanding and conclusions of the methodologies that may be adopted.

25 The subgroup was also tasked with discussing the effects of temperature on environmental acceptability. Information on this topic was shared within the subgroup. No conclusions regarding this topic were reported back to the correspondence group. The subgroup requested that the GESAMP-Ballast Water Working Group (GESAMP-BWWG) consider amending its Methodology for information gathering and conduct of work of the GESAMP-BWWG to request data on the effects of temperature and holding time. It was noted that this request could only be introduced when the Methodology was revised and endorsed by MEPC.

26 At the request of the group, the GESAMP-BWWG considered the issues regarding environmental acceptability in extreme conditions at the seventh GESAMP-BWWG Stocktaking Workshop held in September 2015. The formal output of the meeting was not finalized in time for consideration by the group but has been submitted to MEPC 69 as document MEPC 69/4/3 (Secretariat).

### **Item 3.1: Specification of standard test organisms (STO) for use in testing**

27 The group continued the discussion on the need to ensure that test water provided appropriately challenging conditions and the use of standard test organisms as a possible method of ensuring robustness of testing. As in earlier discussions, the use of suitable organisms to consistently and appropriately challenge the operation of BWMS during testing was highlighted as an important topic.

28 As with item 2 the group agreed that the technical nature of this subject required input from subject experts and created another subgroup to discuss the issues surrounding the use of standard test organisms (STO).

29 This subgroup was also, with the agreement of the correspondence group, coordinated by a representative from Singapore. The report, including a list of participants and the agreed Terms of reference, which was submitted to the group by this subgroup, can be found in annex 2 of this report.



30 The report of the subgroup indicated there was a lack of information and data available on the use of standard test organisms. However the subgroup did agree the following points:

- .1 the use of exogenous STO which have the potential to harm the environment should be avoided;
- .2 the number of organisms in challenge water as specified in Guidelines (G8) is difficult/impractical to achieve in some conditions; and
- .3 testing should be robust and reflect real conditions as far as possible.

31 The following recommendations were also made:

- .1 further information is required and the group should encourage the compilation of additional information;
- .2 if STO are used they should be locally isolated to ensure that no damage occurs to the local environment; and
- .3 an evaluation and justification of the use of STO should be included within test reports.

32 It was reiterated by some members of the subgroup that there was a need to evaluate the impact, positive and negative, that the addition of STO may have on the tests being undertaken and that an assessment of the robustness of naturally occurring organisms versus cultivated organisms should be undertaken. It was also emphasized that prior to discussing the specification of STO, and based on the need to standardize tests but to also reflect the random nature of the natural environment, a discussion regarding the need to specify STO may be pertinent.

33 Having reviewed the report of the subgroup, the group agreed that the use of STO should not be accepted as the norm.

34 However, the group did agree that if their use is supported, robust procedures, processes and guidance would need to be developed regarding the use of STO, including validation and standardization of their use. The group was not convinced that the Guidelines (G8) review was the correct forum within which to undertake this work.

35 The group also agreed that if their use is supported, an evaluation and justification of the use of STO should be included within test reports (including criteria for selection and explanation of quantities used). The fact that care should be taken when using STO and concentrated natural assemblages to prevent inaccurate data regarding the performance of a BWMS was also reiterated.

36 It was noted that no guidance was currently available but some Administrations may already be undertaking the use of STO and that this experience should not be lost. It was also noted that existing practices could be reviewed to ensure there is no divergence between Administrations in the future. Additionally, it was suggested that there are relevant national and local agencies that could provide experience and guidance to ensure that damage does not occur to the local environment if STO are used.

37 As such, the group considered that MEPC could invite Member States and international organizations to provide information and experiences on this issue including existing guidance where available.

**Item 3.4: Use of validated testing methods**

38 Tasked with proposing a definition of the "viability" of organisms, taking into account the damage caused to organisms by BWMS making use of UV, the group agreed, with the exception of Italy and the United States, that there was a need to amend the existing definition of "viable organisms" (Guidelines (G8), paragraph 3.12).

39 The group supported the following definition:

"3.12 *Viable organisms* are organisms that are reproductively viable (meaning the organism has the ability to successfully generate new individuals in order to perpetuate the species)."

40 However, continued discussion resulted in an alternative approach to address the issue of viability of organisms. The alternative approach is to retain the existing definition of viable whilst amending Guidelines (G8) to allow for alternative methods that provide an equivalent level of protection to the existing methods of determining viability. It was suggested that this approach could be reflected by amending paragraph 4.6 of the annex of Guidelines (G8). Three text proposals were received in support of amending paragraph 4.6:

- .1 "4.6 Viability of an organism can be determined by methods appropriate to the ballast water treatment technology being tested. Methods used should provide assurance that the discharge of harmful aquatic organisms and pathogens is prevented. As per paragraph 4.3 of this annex, alternative methods may be employed if standard test methods are not available. When an alternative method is used, a complete description of the method(s), together with references and/or data demonstrating suitability and reliability should be reported in accordance with resolution MEPC.228(65) on information reporting on type approved ballast water management systems."
- .2 "4.6 Viability of an organism can be determined by methods appropriate to the ballast water treatment technology being tested. Methods used should provide assurance that the discharge of harmful aquatic organisms and pathogens is prevented. Viability of an organism can be determined by appropriate methods including, but not limited to: morphological change, mobility, staining using vital dyes, molecular techniques, or bioassays confirming the organisms' ability for growth (such as most probable number assays with algae). The methods applied for the quantitative determination of viable organisms shall be accompanied by data documenting their suitability and reliability."
- .3 "4.6 Viability of an organism can be determined through live/dead judgement by appropriate methods including, but not limited to: morphological change, mobility, staining using vital dyes or molecular techniques. However, another method besides live/dead judgement may be used for evaluating the reproductive viability of organisms should it provide equivalent assurance that the discharge of harmful aquatic organisms and pathogens is prevented. A complete description of any other method used, together with references and/or data demonstrating its suitability and reliability should be reported in accordance with resolution MEPC.228(65) on information reporting on type approved ballast water management systems."

41 Having developed and agreed a new definition for the term viable, the ToR for this item was achieved, however, the group was of the opinion that the amendment of paragraph 4.6 and its implications should be investigated further to ensure a complete and comprehensive review of Guidelines (G8). It is therefore recommended that the integration of the new definition of viability and the proposed amendments to paragraph 4.6 of Guidelines (G8) be given further consideration and be included as a future work item for the group.

42 The group supported the need to ensure that any amendments affecting the testing of BWMS should result in methods being available to port State control (PSC) officers. It was also agreed that any methods would need to adequately assess compliance with the ballast water performance standard described in regulation D-2 of the Convention (D-2 standard) as required by PSC.

#### **Item 4: Challenge levels set with respect to suspended solids in test water**

43 Although the group, with the exception of Norway, agreed that the challenge levels of Total Suspended Solids (TSS) listed in the current Guidelines (G8) required amending, the group did not support the levels proposed within publications that were provided to the group.

44 It was agreed that challenge levels should reflect "conditions normally encountered during operations" and was acknowledged that current challenge levels do not do this. The group was split when it came to agreeing to the introduction of three set TSS levels (high, medium, low) to Guidelines (G8). An alternative to the suggested three levels was to test at a high level of TSS in order to give sufficient confidence in the ability of the BWMS to operate at lower TSS levels. There was support for including TSS as a critical parameter (SDL). As no conclusion on this issue was drawn, this item needs further consideration.

45 It was recognized by the group that particle size, sediment quality (filter relevant material) and distribution were important factors but the group did not support adapting test levels to filter sizes.

46 The majority of the group agreed that changing the TSS challenge levels is required to provide confidence that BWMS remain effective when treating ballast water with TSS levels that may reasonably be encountered during worldwide operation. The group also acknowledged that changing the levels could result in unintended consequences on challenge water and that such consequences should be considered when discussing changes to TSS levels.

47 Concerns were raised within the group with regards to the increase in financial burden during system development. The group did not support the use of bench scale testing as a means of reducing the financial burden during testing as it was felt this would not provide sufficient confidence in the development of BWMS.

48 No opinions regarding the proposal to split the testing into (i) ability to meet the D-2 standard and (ii) operational/maintenance requirement were expressed.

#### **Item 5.1: Clarification of the terms "test run" and "test cycle".**

49 Following discussions the group agreed that the revised Guidelines (G8) should use the term "test cycle" and all references to "test run" will be removed or replaced with "test cycle".

50 The following definitions were proposed to further clarify the language used within the revised Guidelines (G8). However, they did not gain the total support of the group and as such further discussion regarding these terms is required.

- .1 "*Failed test*: All of the required test conditions have been met but due to the BWMS performance, the test cycle is noncompliant with the standard in regulation D-2 [and/or any other discharge/performance standards required by the approving authority]."
- .2 "*Invalid test*: Due to reasons outside the control of the BWMS the test cycle:
  - .1 does not meet the required discharge [and/or performance] standards; or
  - .2 the test cycle could not be completed.

This can be caused by absence of suitable test water, by an error caused by the test facility or an incident, such as a leaking tank or inappropriate piping, etc. When a test is invalid, it does not count as one of the required consecutive test cycles in a test cycle series and the series of test cycles can be continued."
- .3 "*Successful test*: A test that is neither a Failed test nor an Invalid test."

51 It was determined that definitions for the terms "Invalid test cycle" and "Unsuccessful test cycle" are not required and that the term "Test cycle discharge failing the D-2" would be captured by the definition of a failed test. To ensure data concerning test cycle discharges that failed to meet the D-2 standard is not lost, it was suggested that it should be a requirement to note such failures.

52 In discussing the definitions outlined above, a number of additional questions, which were not fully addressed during the email exchanges, were raised:

- .1 is there a need to distinguish between a "test cycle" and a "test" or do they have the same meaning?; and
- .2 is the term "valid test" required?

53 As a part of the "test cycle" discussion, comments were raised relating to the start and end of the test period, the need for test cycles to be consecutive, and the use of the term "replicates" within paragraph 2.3.17 of the annex of Guidelines (G8). The group was not able to discuss these issues within the set timeframe but noted that they should form a part of future discussions.

54 The group discussed amending paragraph 2.3.18 of the annex of Guidelines (G8) from "At least two sets..." to "At least three sets..." This change was not supported by the group and the text of paragraph 2.3.18 will remain unchanged. The consensus was that the text should not be changed to ensure that in the rare circumstance where a system may be developed to only work in two of the three salinity ranges the system can still be assessed under Guidelines (G8). The group supported the need for the inclusion of a clarifying statement to ensure testing in all three salinity ranges remains the norm. It was suggested that the text of paragraph 2.3.18 could be strengthened to do this. The group reiterated that failure to test in all three ranges would result in a "limited operation" notation.

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**Item 5.3: Test reports – to include the installation, commissioning, repair and maintenance documentation relating to land-based and shipboard tests. Environmental test reports?****Item 5.4: The reporting of operational parameters including power consumption, mechanical reliability, replacement of components and consumables**

55 Items 5.3 and 5.4 deal with similar issues and as such are reported together.

56 The group agreed to the use of the United States Environmental Technology Verification (ETV) report template as a starting point for the development of a test template. The group indicated that environmental tests, critical parameters, maintenance logs during testing, impacts on ballasting system and total operating time of the BWMS during the shipboard testing period should all be considered for inclusion in the report. It was suggested that installation information and any items relating to the United States Environmental Protection Agency (EPA) specific requirements could be removed from the document.

57 The group agreed that the test report should be made available to the authorizing Administration. There was also limited support for submitting the report to the IMO for distribution by the Secretariat to Member States.

58 The previous correspondence group agreed that there was a need for additional text in order to ensure the reporting of operational parameters, including power consumption, mechanical reliability, replacement of components and consumables, are included within section 2.4 of the annex of the revised Guidelines (G8). The group supported using paragraph 1 of resolution MEPC.228(65) as a starting point for the development of the text. It was noted that the text of ETV section 5.4.9 could also prove useful.

59 Although, the group did not have time to develop the test report or the proposed additional text, the member from Canada was tasked with providing a redraft of section 2.4 of the annex to Guidelines (G8) to reflect resolution MEPC.228(65), including the outcome of the group's deliberations on critical parameters (SDL) and items 5.3, 5.4 and 22. The draft text, as provided by Canada is included as annex 3 to this report.

60 It should be noted that the text provided in annex 3 has not yet been reviewed or agreed by the group but has been developed with the aim of providing a starting point on which to base the continued revision of Guidelines (G8).

**Item 6: Type approval testing realistically representing the flow rates the system is approved for**

61 The group agreed that the format of the Type Approval Certificate should be amended to reflect the minimum and maximum flow rates for which the BWMS is certified. The Type Approval Certificate should be amended by replacing the text "treatments rated capacity" by the following:

"Treatment rated: minimum capacity: m<sup>3</sup>/h  
maximum capacity: m<sup>3</sup>/h"

62 The group agreed that the following text from BWM.2/Circ.43 should be added to the text of the Guidelines (G8), annex, section 1.6 (Documentation) as follows:

1.6.1**bis** sufficient information to verify operation in different salinity ranges (fresh, brackish and marine water) in which the BWMS will operate;

- |                            |  |
|----------------------------|--|
| 1.6.2 <sup>ter</sup>       | sufficient information to verify operation in the different temperature ranges (cold, temperate and tropical) in which the BWMS will operate;  |
| 1.6.3 <sup>quater</sup>    | sufficient information to verify operation with the different sediment loads under which the BWMS will operate;  |
| 1.6.4 <sup>quinqüies</sup> | 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 |
| 1.6.5 <sup>sexies</sup>    | suggestions for improvements of the installation related to safety or additional testing R&D."   |

63 There was also agreement that paragraph 6.3 of the revised Guidelines (G8) should refer to part 1 of the annex, in addition to the current reference to parts 2 to 4. Paragraph 6.3 of Guidelines (G8) is proposed to be replaced by the following:

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

64 The following new paragraph to the annex to the Guidelines (G8) (Land-based monitoring and sampling) was agreed by the group:

"2.3.24<sup>bis</sup> The range of operational flow rates that a BWMS is expected to achieve in service, including both the maximum and minimum operational flow rates, should 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. Demonstration of system efficacy at low flow rates should reflect the need for flow reduction during the final stages of ballast operations."

#### **Item 7: Any differences between type approval protocols of Member States**

65 Owing to the number of discussion points under the Terms of reference of the group, the coordinator, with the support of the group, deferred this discussion pending the release of information to the group from the D-2 Study.

66 When the group received the information from the study, no members raised this issue as requiring further discussion.

#### **Item 8: Any items raised by, and any data arising from the Study on the Implementation of the ballast water performance standard described in regulation D-2 of the BWM Convention, and any other relevant information provided, within the timeline for the review of the Guidelines (G8)**

67 Three new items were raised for discussion:

- .1 New Item 1. How to ensure that critical water quality and operational parameters specific to the treatment process and the BWMS are assessed? Note – This proposed item may pick up some of the concerns regarding the salinity ranges and the impact of salinity on different BWMS;
- .2 New item 2. Language of the information on the Type Approval Certificate and its annexes; and
- .3 New item 3. How to specifically understand if/how the BWMS are operated for "stripping" and "gravity filling/discharge".

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## New Item 1: Critical parameters

68 The concept of critical parameters was introduced during discussions on annotating the Type Approval Certificate for "limited operations", ensuring that BWMS are adequately tested to ensure operation in the most challenging water qualities likely to be encountered and identifying non type approval parameters that could impact on the effective operation of the equipment.

69 The proposal was further developed to ensure that critical water quality and operational parameters specific to treatment processes and the BWMS are assessed. It was proposed that the guidelines should require that critical parameters be identified, that the specific limitations of the BWMS on these critical parameters be made clear, and that they be clearly set out on the Type Approval Certificate.

70 During the discussion it was acknowledged that the term "critical parameters" was leading to some confusion within the group and that there was a need to distinguish between system limitations and the requirements of type approval, and to separate the concept of extremes of operation from the "Limited Operations" notation that has been proposed for equipment that is not rated for worldwide operation. In order to avoid confusion, the term "system design limitations" was proposed and generally supported for use, until such time as appropriate terminology was proposed and accepted by the group. To reflect this situation when discussing this topic the group now refers to SDL, although for clarity of understanding the term "critical parameters" (SDL) is used within this report. The following definition of SDL was proposed and accepted as a starting point on which to base discussions regarding the terminology to be used.

**"System design limitations** - The maxima and minima of those water quality and operational parameters that are critical to the successful operation of the ballast water management system. The parameters identified for inclusion as system design limitations should be identified by the manufacturer and Administration, may be dependent upon the technology being employed to achieve the D-2 performance standard, and should not be limited to those parameters assessed as part of the type approval process."

71 The group had robust discussions regarding what was meant by the term "critical parameters" (SDL) and how it could be used within the revised Guidelines (G8) to assess the functionality of BWMS. To ensure all fully understood the concept and its proposed use, the group developed a number of principles on which to base "critical parameters" (SDL), which are listed in annex 4.

72 Having accepted the concept of critical parameters (SDL), the group are now focussed on how to use the term and incorporate it into the revised Guidelines (G8). To help with this process it was proposed that a matrix of critical parameters (SDL) that are not covered by the type approval process should be developed. This idea was supported by the group but time restraints meant that the work could not be undertaken within the work programme of this correspondence group. The group highlighted this as an important piece of work for the future.

73 To aid with the introduction of the concept of critical parameters (SDL) Canada offered to provide text identifying where within the revised Guidelines (G8) the concept could be of use. This offer was accepted by the group on the understanding that any proposed text has not been reviewed or agreed by the group but would form the basis of future discussions on this topic. The text proposal can be found in annex 5 of this report.

74 Having identified critical parameters (SDL) as a key tool in providing confidence in the efficacy of BWMS the group have identified this item as key in moving the review of Guidelines (G8) forward.

### **New Item 2: Language of type approval information**

75 In order to align with regulation E-4 of the Convention, it was proposed, and the group agreed that the Type Approval Certificate, its annexes and any test results and reports released in conjunction with the revised Guidelines (G8) should be accompanied by a translation into English, French or Spanish, if not written in one of those languages. The text needed to express this requirement and where it should be placed within Guidelines (G8) was not considered.

### **New Item 3: Stripping and gravity filling/discharge**

76 The group was of the opinion that this issue had already been addressed by the MEPC and the discussion was taken no further.

### **Item 9.1: Testing facility validation – standardized protocol**

77 The general consensus of the group was that ISO 17025 was not considered suitable for validating test facilities and that no other international standards are available for this purpose. The majority of the group did not support the development of a test standard to which test facilities would be required to subscribe. However, it was agreed that test facilities should be able to prove their ability to meet the requirements of Guidelines (G8) to an appropriate standard. The group did support the concept of test facilities being "certified" to appropriate standards in order to give confidence in the quality of the service being offered and to this end suggested that the proposal in paragraphs 64 and 65 of document MEPC 68/2/12 could also apply to the validation of test facilities.

78 The group therefore proposed the following amendments to Guidelines (G8). Paragraph 2.1.1 in section 2.1 (Quality assurance and quality control procedures) of the annex to the Guidelines (G8) is proposed to be replaced by the following:

"2.1.1 The testing facility performing tests should have implemented appropriate quality assurance and control measures approved, certified and audited by an independent accreditation body, or to the satisfaction of the Administration in accordance with appropriate internationally recognized quality assurance standards."

79 The following new paragraph is proposed to the annex to the Guidelines (G8):

"2.1.2bis The testing facility performing the BWMS tests should be independent. It should not be owned or affiliated with the manufacturer or vendor of any ballast water management system, or by the manufacturer or supplier of the major components of that equipment."

### **Item 10.2: Operational testing period for ships**

80 The group reviewed the suggested text in paragraph 68 of document MEPC 68/2/12, which resulted in a number of alternative proposals being made. Upon completion of these discussions the group agreed with the inclusion of the following new paragraph to the annex of Guidelines (G8):



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"2.2.2.8*bis* 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 2.2.2.8 must be suitably separated across the six-month period (with a period of at least one month between test cycles)."

81 In alignment with previous correspondence group discussions it was agreed that the ship on which the BWMS is installed for testing should run the BWMS at all times during its normal operations and this should be reflected in the annex of the revised Guidelines (G8) as follows:

"2.2.2.10.1*bis* Documentation that the BWMS was operated during the normal ballasting and deballasting of the ship for the complete test period of six months."

82 There was concern that the proposed text would cause a conflict with paragraph 1.3 of MEPC.2/Circ.33, however following discussion it was found that no conflict existed.

83 The group concurred with the view that there was no need for the use of control water during shipboard testing and that its use could be confined to the land-based tests. The group therefore recommends that the need for control water to be used during shipboard testing be removed from Guidelines (G8). Further discussion is needed to develop actual text proposals in this regard.

#### **Item 11.2: The discharge of treated ballast water during shipboard testing**

84 As this issue was addressed during MEPC 68, where the Ballast Water Review Group invited the Committee to consider the development of an MEPC resolution (MEPC 68/WP.8, paragraph 38.8), the group did not give this topic further consideration.

#### **Item 12: Should upgrades to BWMS be allowed during testing?**

85 The group confirmed that the text suggested in document MEPC 68/2/12, paragraph 78 is acceptable for inclusion in the annex of Guidelines (G8).

"1.5*quinquies* Upgrades of the BWMS that relate to the safe operation of that system may be allowed during and after type approval and should be reported. If such safety upgrades directly affect the ability of the system to meet the standard of regulation D-2, it should be treated as a change of a major component, as per paragraph 1.5*bis*."

#### **Item 13.1: The final type approval of a BWMS – when should it be issued, following the completion of land-based test analysis, or following completion of both land and ship-based tests analysis?**

86 The use of sections 5 and 6 of BWM.2/Circ.43 pertaining to the approval process was supported by the group. After much discussion it was agreed that it was preferable to include the relevant sections in a revised Guidelines (G8) rather than referencing the circular. The group therefore supported the insertion of sections 5 and 6 of BWM.2/Circ.43 into Guidelines (G8). The matter of where in Guidelines (G8) these sections are to be included requires further discussion.

**Item 13.2: Should safety considerations, risk assessment, PPE requirements, required for the safe operation of BWMS be part of the type approval? Should that information be provided in a public safety report?**

87 The group agreed that the following text should be added to section 1 (Introduction) of Guidelines (G8).

"1.6*bis* Administrations should ensure adequate risk assessments including the implementation of preventative actions, have been undertaken relating to the safe operation of BWMS."

88 The following additional text was also supported for inclusion in the annex to Guidelines (G8) (Reporting of test results):

"2.4.1*bis* The report should include information regarding the operational safety requirements of the BWMS and all safety related findings that have been made during the type approval tests."

89 Additional safety considerations were highlighted and were dealt with under item 21.

90 There was also a request from within the group to clarify what is meant by the term "public safety report".

**Item 15.2: There is a wide range of C & M modules used with varying availability of secure logging and data outputs. Improve unit testing and standardize required outputs?**

91 The group agreed to the use of document PPR 2/5 (Germany and Republic of Korea) on draft guidance of self-monitoring of ballast water management systems as a basis from which to develop a standardized approach to control and monitoring. It was noted that, where possible, critical parameters (SDL) should be included as parameters to be controlled and monitored.

92 Time restraints meant that the group did not have time to further propose text on this issue but highlighted this as an important future area of work.

**Item 15.3: Should the location for suitable fitment of electronic and electrical equipment be specified in the approval (taking into account: vibration, heat, moisture, ventilation)?**

93 There was consensus amongst the group that IACS UR E10 contained appropriate information and wording that could be used in Guidelines (G8). The group spent some time discussing whether it would be more appropriate to reference the document or to directly quote its content. It was decided that, providing that a date and/or version number of the document was included to ensure the content of the document being referred to can be controlled, directly referencing IACS UR E10 would be the most appropriate way forward.

94 The group therefore recommended that a direct reference of a dated version of IACS UR E10 is used to replace all of part 3 of the annex to Guidelines (G8). Further discussion is required on how to reflect this in Guidelines (G8).

**Item 16: BWMS bypass arrangements – under what circumstances should bypassing of a BWMS occur, and how should the sequences of events be recorded?**

95 The group concluded that bypass of BWMS should only occur during emergency situations, for safety reasons or if a malfunction of the equipment occurs.

96 The group supported the recording of bypass events within the ballast water record book in addition to the requirements set out under section 4.5.4 of Guidelines (G8). Further consideration of the text required to reflect this decision is required.

97 Forwarding this issue to the Maritime Safety Committee was not supported.

**Item 17: Scaling of BWMS – should all documentation relating to scaling of a BWMS be included in the test report, including the decision process following computer modelling, description of model assumptions and validation documents?**

98 The group concluded that guidance is already available in BWM.2/Circ.33 on Guidance on scaling of ballast water management systems, however it was agreed that there was a need for the circular to be reviewed to ensure that it remained relevant. Further discussion concluded that the whole of the text and intent of the circular should be included in Guidelines (G8). The group supported transferring the information from the circular into Guidelines (G8) and then requesting the revocation of the circular.

99 The group was invited to propose amendments to BWM.2/Circ.33 in preparation for the insertion of text in to Guidelines (G8). While no text proposals were received the following observations were made:

- .1 it was noted that the documentation required for the type approval test report would depend on the system being tested and that paragraph 1.8 of BWM.2/Circ.33 could be used as a starting point for developing requirements;
- .2 the new text should ensure that the documentation includes details of the process undertaken with justification for the methods used and any information required for the decision making process. This information does not need to be included in the test report but should be communicated to the Administration;
- .3 the text currently implies that the following combinations are acceptable; (a) land-based and computational fluid dynamics (CFD) instead of ship-board test, or (b) CFD instead of land-based and ship-board test, or (c) CFD instead of both;
- .4 BWM.2/Circ.33, paragraph 1.9, suggests that not all scaled system's capacities, except for a representative number, need to go through shipboard testing. To ensure consistency and universal application, the representative number, which may be dependent on treatment technology type, should be clearly articulate;
- .5 applicants are currently required to provide drawings and specifications relevant to the scaling of systems to the Administration when applying for type approval. It is the responsibility of the Administration, directly or through the appointment of an appropriate body, to verify (through mathematical modelling) the scaling of the systems if they have not undergone land- or ship-based testing;
- .6 it should be noted that the majority of the group favoured the validation of modelling though full-scale shipboard testing and
- .7 If an institution is appointed to carry out verification on behalf of an Administration, the capacity of the facility to do so should be validated using similar principles as those applied to test facilities.

**Item 18: Holding time – is there a requirement for a verification of the minimum holding time required for BWMS?**

100 Following a discussion regarding the use of the terms "holding time" and "storage time", the consensus of the group was to use the term "holding time" and it was agreed to amend the text of Guidelines (G8) to reflect this decision, including the removal and or replacement of the phrase "storage time".

101 The group came to the conclusion that the text proposals of the Ballast Water Review Group at MEPC 68 (MEPC 68/WP.8, paragraph 17) were not suitable and should not be included in the Guidelines (G8) in their current form. Concern was expressed that the existing text does not provide assurances that ballast water treatment systems will function on very short voyages.

102 Few comments regarding alternate text were received from the group. It was suggested that text should not be decided before the conclusion of discussions on how Guidelines (G8) can be adapted to reflect the interaction between temperature and voyage time had been concluded, but that document MEPC 63/2/16 (Norway and Singapore) contained valid information that could be of use when drafting text. The group agreed any text proposals should be included under sections 2.3.22 and 2.3.7 of the revised Guidelines (G8).

103 To address the issues of short voyages the group proposed to introduce the phrase "at least 24 hours" to replace the five-day holding time requirements. In doing this the issue of regrowth was raised along with the need to ensure that any holding time and testing ensured that possible regrowth in a comparable way between test facilities working under different climatic conditions and situations where the water could be held for longer periods were also addressed within the Guidelines. It was acknowledged that this would be a difficult issue to address but the group agreed that there was a need to provide assurance through the testing regime that systems were able to function on both very short and longer voyages. Once again, the critical parameters (SDL) approach was highlighted as a possible way to assess manufacturer claims regarding holding time and that such claims could be verified through ship- and land-based testing.

104 The issue of holding time was not fully resolved to the satisfaction of the group and as such this item requires further consideration.

**Item 19: Shipboard testing of BWMS – comments were made regarding the sample volume and collection method, sampling test duration period, sampling parameters, management of risk during the test period (use of control samples or a control holding tank), verification of system operation during variable flow rates, and the clarification of sample point arrangements**

105 The group concluded that the sampling and sample points for shipboard testing should be in accordance with the PSC requirements for both indicative and full compliance sampling and that guidance is already available in *Guidelines for ballast water sampling* (G2), the *Guidelines for PSC under the Ballast Water Convention* (resolution MEPC.252(67)), and documents BLG 17/INF.16, MEPC 66/INF.27 and MEPC 68/INF.21.

106 Concerns were raised regarding the connection of samplers and the disposal of sample and flushing water. Further discussion resulted in the group concluding that the issues raised formed a part of the *Guidelines for ballast water sampling* (G2) and as such should not form a part of the Guidelines (G8) revision.

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**Item 20.1: Land-based testing – proposed modification of existing sampling protocol regarding sample biological content and sample volume in specific circumstances**

107 The group noted that the fragile nature of many organisms in the 10 to 50 µm range made filtering an unsuitable process when concentrating samples. One member noted that based on available scientific studies, it should be possible to achieve greater differentiation with biological content.

108 The group considered information submitted concerning the chemical composition of the challenge water, especially the dissolved organic matter (DOM) / dissolved organic carbon (DOC) content. The group noted that there is a need to consider the differences between naturally occurring DOC and the additives that may be used. Discussions resulted in suggestions that the group further discuss this issue with particular reference to the amount of aromatic DOC present in BWMS challenge water, potential changes to the chemical (DOM/DOC) composition of challenge water which could result in increased regrowth and any implications for existing BWMS.

109 The group agreed that there was a need to discuss whether a minimum level of DOC was required and if the complexity of the carbohydrates involved would also need to be taken into consideration.

110 When invited to provide further information and proposals with regard to developing a common approach to achieving thresholds for the biological and physical constituents of Guidelines (G8), no comments were received other than to suggest that the results of relevant studies should be submitted to the Committee.

**Item 20.2: Technical and biological tests – proposed separation of biological and technical factors in testing protocol**

111 The group supported splitting of biological and technical factors for testing purposes and acknowledged that guidance was required. However, there was also some confusion within the group as to what constituted technical and biological tests and what the group was trying to achieve with the inclusion of this discussion point. Further discussion is therefore required to ascertain the purpose of the tests, the range of tests, what is hoped to be achieved by splitting the tests and what is meant by a "technical test".

**Item 20.3: Environmental tests – the current requirements for environmental testing makes use of outdated specifications and it is proposed that those specifications should be updated.**

112 Depending upon the outcome of a review of the text to ensure the content is suitable and not overly onerous, the group supported the use of IACS UR E10 to ensure the standards used reflect those relevant within the maritime industry.

113 Three views concerning the specification for the locating of BWMS were expressed:

- .1 that the manufacturer specifies conditions for installations;
- .2 that this should be based on where the BWMS should not be installed; and
- .3 that this issue is already dealt with by classification societies and as such does not need to be included in Guidelines (G8). There was insufficient time to debate these opinions further.

114 There was limited support for the inclusion of the following new paragraph for the annex of Guidelines (G8) (MEPC 68/2/12, paragraph 105 with amendment):

"3.2**bis** The Type Approval Certificate and the installation specification should define the suitable locations for the BWM System to be installed, based on the result of the completed environmental testing [and subjected to hazardous area classification, if any.]"

115 The group agreed to defer consideration of paragraph 106 of document MEPC 68/2/12 (the deletion of paragraphs 3.3 through 3.15 of the annex to the Guidelines (G8)) until such time as the current discussions are concluded and it is possible to review a "clean" version of the revised Guidelines (G8).

**Item 21: Equipment technical specifications – proposed modification of specification text relating to the monitoring of hazards and the safe operation of the equipment in BWMS**

116 The following definition was proposed for inclusion in section 3 of Guidelines (G8):

"*Dangerous gas/liquid* means any gas/liquid which may develop an explosive and/or toxic atmosphere being hazardous to the crew and the ship, [e.g.] [including but not limited to] hydrogen (H<sub>2</sub>), ozone (O<sub>3</sub>), chlorine (Cl<sub>2</sub>) and chlorine dioxide (ClO<sub>2</sub>), etc."

117 Further discussion to finalize the definition for inclusion within the revised Guidelines (G8) is required.

118 Although there was support for the proposal to replace paragraph 4.2 of Guidelines (G8) with the following, concerns were raised regarding the ability of type approving Administrations to evaluate ship specific installations and whether this falls under the remit of the type approval process:

"4.2 The BWMS should not contain or use any substance of a dangerous nature, unless adequate arrangements for storage, application, mitigation, safe handling and specifications for a safe installation, acceptable to the Administration, are provided to mitigate any safety hazards introduced thereby."

119 In response to these concerns, the following alternate text was proposed:

"4.2 The BWMS should not contain or use any substance of a dangerous nature, unless appropriate safe arrangements for storage, application and handling of the substances that is acceptable to the Administration are provided to mitigate hazards introduced thereby."

120 Further discussion on this issue is required to finalize suitable text.

121 Following discussion and based upon the text of document MEPC 68/2/12, paragraph 109, the group agreed that paragraph 4.7 of Guidelines (G8) should be replaced by the following:

"4.7 The ballast water treatment equipment should be designed and constructed;

- .1 for robust and suitable working in the shipboard environment;
- .2 for the service which it is intended;

- .3 to reduce 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 LEL or level of toxic concentrations that can result in severe effects on human health); and
- .4 with materials compatible for the substances used, purpose which it is intended, the working conditions to which it will be subjected and the environmental conditions on board."

122 The group also supported the inclusion of a new paragraph 4.15 to the Guidelines (G8) as follows:

"4.15 For BWMS that could emit dangerous gases, means of gas detection by redundant safety systems is to be fitted in the space of the BWMS, and an audible and visual alarm is to be activated at a local area and at a manned BWMS control station in case of leakage. The gas detection device is to 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 are to be provided on the BWMS."

123 No views regarding paragraph 110 of document MEPC 68/2/12 were expressed.

124 Based upon paragraph 111 of document MEPC 68/2/12, the following new paragraph was developed and agreed for inclusion in the annex of Guidelines (G8):

"1.6.4bis Hazard identification – If the BWMS or the storage tanks for processing chemicals could emit dangerous gases or liquids, a hazard identification is to be conducted to identify potential hazards and define appropriate control measures. In the case of ballast water management systems that make use of Active Substances or Preparations containing one or more Active Substances the *Procedure for the approval of ballast water management systems that make use of Active Substances (G9)*, as revised, should be followed."

125 The group remained split on the issue of hazard analysis and associated documentation requirements. Two text proposals were received for consideration, however time restraints meant this issue was not resolved. The proposals were as follows:

Proposal 1:

"The hazard analysis is to be a self-contained document addressing design and operational aspects of the BWMS taking into account document MSC 83/INF.2 and the *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 and crew resulting from the treatment process (BWM.2/Circ.20)* as follows:

- .1 BWMS installation location;
- .2 storage and handling of hazardous chemicals, directly or indirectly generated or used by the BWMS;
- .3 operation of the system;
- .4 fire hazards;

- .5 chemicals or preparations in the treated ballast water;
- .6 the management of hazardous gas emitted to the ballast tanks with the treated ballast water;
- .7 gas emission systems from hazardous gas separators (including air vent valves, dilution blowers, materials and routing of piping);
- .8 longer-term impacts to the safety of the crew and vessel through effects of the BWMS on corrosion in the ballast system and other spaces;
- .9 safety procedures for inspection and maintenance;
- .10 emergency evacuation procedures;
- .11 safety and control system: As a minimum a cause and effect diagram should be provided. Also a description of automatic safety procedures (e.g. pressure testing or purging);
- .12 consequence of leakage in enclosed space;
- .13 operational profile of the system; and
- .14 prevention measures, i.e. separate compartment, ventilation, detection system, marking of piping, available PPE."

Proposal 2:

"The Hazard identification is to be conducted in accordance with ISO- 31010 or other recognized standard acceptable to the Administration and taking in to account document MSC 83/INF.2 and BWM.2/Circ. 20, the hazard identification is to focus on, but not be limited to the following:

- .1 bunkering, storage and handling of dangerous chemicals used in BWMS;
- .2 production, application and handling of dangerous chemicals/gas directly or indirectly generated by BWMS;
- .3 design and operation of dangerous gas separators (including air vent, dilution blowers, piping system);
- .4 leakage scenarios;
- .5 fire, Explosion and Toxic hazards;
- .6 accumulation of dangerous gas in ballast tanks;
- .7 corrosion (i.e. long-term effect on ballast piping and tanks);
- .8 operation, maintenance and inspection; and
- .9 human exposure scenarios."



126 The following new bullet points were proposed for inclusion in paragraph 1.6.1 (Technical Manual) in part 1 of the annex to Guidelines (G8) as follows:

- Details of safety and control system (including alarm cause and action list); and
- Material Safety Data Sheets (MSDS) of the chemicals and Personnel Protective Equipment (PPE) required, as applicable.

127 An additional text proposal regarding the upgrade of BWMS was not supported by the group as it was felt that the text suggestion made in document MEPC 68/2/12, paragraph 78, introducing 1.5*quinquies*, which had already been accepted by the group, is adequate in reflecting the agreement reached.

**Item 22: Documentation, pre-test evaluation – additional documentation relating to potential risks and hazard mitigation pertaining to the operation of BWMS, to be submitted to the approving Administration**

128 It was agreed that the text proposal in paragraphs 114 to 115 of document MEPC 68/2/12, should be included in section 6.5 of Guidelines (G8) as follows:

"6.4*bis* Include details of all imposed limiting conditions on the operation of the BWMS. Such limiting conditions should include any applicable environmental conditions (e.g. salinity, UV transmittance, temperature, etc.) and/or system operational parameters (e.g. min/max pressure, pressure differentials, min/max Total Residual Oxidants (TRO), etc.)"

"6.4*ter* Contain the test results of each land-based and shipboard test run. 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"

129 The group supported the standardized test report being submitted to the Organization and circulated by the Secretariat; and agreed that the text from resolution MEPC.228(65) on information reporting on type approved ballast water management systems should be incorporated into section 2.4 of the annex of Guidelines (G8) (including amendment for critical parameters (SDL) if required and resulting discussions from items 5.3 and 5.4). Further discussion is required to develop actual text proposals.

## **Conclusions**

130 The group held full and robust discussions on a range of topics and was able to conclude a number of items within the terms of reference of the review of Guidelines (G8).

131 Based on the work completed to date and discussions held by the correspondence group, it was able to identify the next steps that need to be taken to continue the review of Guidelines (G8). Annex 6 outlines the outstanding issues and questions that require further consideration as a part of the continued review of Guidelines (G8).

132 The range of items outstanding indicate that further work is essential to complete the review of Guidelines (G8) and that there may be a need to establish the correspondence group in order to facilitate the completion of the work

**Action requested of the Committee**

- 133 The Committee is invited to:
- .1 agree to the proposed amendments and conclusions of the group for inclusion within Guidelines (G8);
  - .2 concur that the conclusions drawn and agreements reached, as reflected in the report, should be not be re-opened for discussion unless identified as a future area of work in annex 6 or if review of any item identified in annex 6 affects the status of those conclusions or decisions and may prompt their reconsideration;
  - .3 having agreed to the proposed amendments and conclusions of the report of the correspondence group, acknowledge that annex 6 on future work and outstanding issues should be used as a starting point for determining the next items to be considered as a part of the review of Guidelines (G8);
  - .4 request the GESAMP-BWWG to take the findings of the subgroup report set out in annex 1 into consideration when next reviewing their Methodology (paragraph 25);
  - .5 invite Member States and international organizations to provide and share information and experiences of the use and handling of standard test organisms in order to facilitate the development of suitable procedures and processes for their use when testing BWMS (paragraph 36); and
  - .6 instruct the Ballast Water Review Group to consider annexes 3, 5 and 6, continue the review of Guidelines (G8) and, if required, develop terms of reference to re-establish the Correspondence Group on the review of Guidelines (G8), taking into consideration any items identified within annex 6 which remain unresolved.

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ANNEX 1	Report of the temperature subgroup to the correspondence group
ANNEX 2	Report of the standard test organism subgroup to the correspondence group
ANNEX 3	Draft amendments to reporting provisions of Guidelines (G8)
ANNEX 4	Critical Parameter (SDL) Principles
ANNEX 5	Draft amendments to implement critical parameters (SDL) in Guidelines (G8)
ANNEX 6	Future work items / Outstanding issues

## ANNEX 1

### REPORT OF THE EFFECTS OF TEMPERATURE SUB-GROUP TO THE CORRESPONDENCE GROUP

#### Report from the subgroup on temperature to the coordinator of the Correspondence Group on the review of Guidelines (G8)

The following report presents an overview of the discussions which took place as part of the temperature subgroup initiated by the Correspondence Group on the review of Guidelines (G8).

#### Table of Contents

Terms of reference .....	1
Timeline.....	1
List of participants in the subgroup.....	2
Discussions and conclusions .....	2
General agreements.....	4
Solutions to the temperature issues (ToR 5).....	4
Solutions to the temperature issues in relation to holding time (ToR 4).....	4
Propositions.....	5
On environmental acceptability .....	6

#### Terms of reference

- 1 The terms of reference for the present report were as follows:
  - .1 nominate a coordinator within the subgroup to report to the coordinator of the Correspondence Group on the review of the Guidelines (G8). Name to be provided to the coordinator at the earliest opportunity;
  - .2 consider the effect of temperature on operational effectiveness and environmental acceptability;
  - .3 specifically look at testing in cold and tropical waters and the impact this may have on operational effectiveness and environmental acceptability;
  - .4 with regards to the efficacy of Guidelines (G8), review the effects of temperature on holding times;
  - .5 propose how this issue can be addressed in Guidelines (G8);
  - .6 provide an update of progress to the correspondence group by Friday, 14 August 2015;
  - .7 report findings of the subgroup to the correspondence group by Friday, 18 September 2015.

#### Timeline

- 2 A voluntary coordination was proposed by Singapore on 28 July 2015, the coordinator of the correspondence group accepted on 4 August 2015 and the discussions were initiated on 5 August 2015. The coordination of the discussions was done by G. Drillet (DHI Singapore).

### List of participants in the subgroup

3 The discussions in the subgroup were carried out via email. Delegations as well as stakeholder answering on their personal capacities participated actively or passively (not responding to comments and propositions) in the subgroup. All in all there were 71 recipients included in the mailing list; the exact name of the involved delegation or stakeholder is not reported here:

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### Discussions and conclusions

4 An Excel sheet was prepared to help the participants organize the sharing of scientific facts and other information. The following tasks were proposed to the subgroup:

	<b>Operational effectiveness</b>	
<b>1</b>	How does temperature affect water physical parameters?	Freezing point
		Viscosity
<b>2</b>	How does a change in temperature affect an organism's biology and vital rates?	Grazing rate
		Respiration rate
		Mortality rate
		Sedimentation of organisms and eggs / cysts in tanks
		Size of organisms
		Growth / regrowth
<b>3</b>	How does a change in temperature affect BWMS efficacy?	Mechanical treatment
		UV treatment
		Chemical treatment

<b>Operational effectiveness</b>		
4	How may extreme temperature limit operational effectiveness?	Extreme cold temperature (Arctic)
		Extreme high temperature (Tropics)
5	Methods to take temperature effects into account in other fields to ensure comparability	

<b>Environmental acceptability</b>		
1	How does temperature affect the production of Active Substances / Relevant Chemicals / free radicals?	Dosing of Active Substance
		Production of Active Substance
2	How does temperature affect the fate of Active Substances / Relevant Chemicals / free radicals?	Which chemical shows increasing concentration over time (after treatment)
		Which chemical shows decreasing concentration over time (after treatment)
		What is the method used for environmental acceptability
3	How does temperature affect the neutralization rates of BWMS?	
4	How does temperature affect the risk associated with active substances / Relevant Chemicals / free radicals?	Risk for the crew
		Risk for the ship
		Risk for the environment

<b>Storage time (holding time) – related to Guidelines (G8)</b>		
1	Which types of BWMS require storage time (holding time) to take place? And how long?	UV
		Active Substances
		Filtration
2	What storage time is adequate to ensure that the mortality observed in treatment tanks is due to BWMS and not natural mortality? (evaluation of the treatment efficacy)	
3	How to evaluate potential regrowth or organisms during testing? (are Guidelines (G8) adapted to answer this question?)	
4	How to ensure that storage time during testing gives confidence in the treatment of ballast water during short voyages?	
5	How to ensure that storage time during testing gives confidence in the treatment efficacy of ballast water during long voyages?	

5 Answers and replies in other formats from participants who did not use the proposed Excel format were also accepted and shared with all. The proposition made was to try to share scientific information in the first few weeks and to propose pragmatic solutions to improve the

guidelines with a stronger scientific ground. However, note that statement from subgroup members have been received until the last day (18 September 2015) and their incorporation in the report has been done at the very last moment before submission to the coordinator of the correspondence group.

### **General agreements**

6 After the first round of discussions, the coordinator concluded that the group agreed on the following (proposed to the members on 28 August 2015):

- .1 temperature affects BWMS operations and efficacy, the degradation of chemicals and the regrowth of organisms. These effects are not similar in all cases depending on the technology used;
- .2 full-scale testing at all temperatures may significantly increase the costs of testing for BWMS developers and therefore limit the number of type-approved technologies available in the future (under the revised Guidelines (G8)); The term "full-scale" was added at a later stage as a response to members comments; and
- .3 testing must be robust and represent real conditions as far as possible.

### **Solutions to the temperature issues (ToR 5)**

7 In order to ease the development of propositions to be forwarded to the correspondence group (point 5 of the ToR), the answers and comments from the participants were taken into account and a set of propositions was prepared. (The participants were invited to choose from one of the following propositions:

- .1 we do not evaluate the effects of temperature (we propose to keep Guidelines (G8) as they are);
- .2 we propose to add a requirement to evaluate BWMS in full-scale at different temperatures (tropical, temperate and polar conditions) as part of the testing. This could be a combination of land-based or ship-board tests; and
- .3 we propose to evaluate the effects of temperature to define the limitations of BWMS as part of a critical parameters approach or an adjustment of the test plan to ensure the robustness of testing practices. This may include the use of bench-scale experiments, literature studies and the adjustment of holding time as appropriate.

### **Solutions to the temperature issues in relation to holding time (ToR 4)**

8 In the case of holding time (point 4 of the ToR), the following choices were proposed:

- .1 we do not change the wording of Guidelines (G8) on the topic of holding time and accept to keep the agreement on flexibility which has been agreed upon at MEPC 63;
- .2 we propose to ensure that the holding time is flexible ("more or less than 5 days") and is used to increase the comparability between test facilities and seasons using a Q10 or Arrhenius approach (this will require the setup of a working group and the sharing of data to propose reference temperature and reference holding time); and

- .3 we propose that the testing design is chosen to evaluate the minimum holding time necessary for a BWMS to work, and therefore could align with the actual USCG proposition of "at least one day" (This does not take into account the complex effects of temperature, but it is pragmatic and answers the concerns about short voyages).

## Propositions

9 To date, no objections have been made by any of the subgroup members against any of the proposed points 6.1 to 6.3 above, therefore we can conclude that the subgroup has agreed with these statements. Only the term "full-scale" was added at a later stage as a response to member's comments.

10 The majority of the replies on the proposed solutions to terms of reference 5 have clearly stated their disagreement with the proposition in paragraph 7.1 above to keep Guidelines (G8) as they are and therefore it is clear that evaluating the effects of temperature during the approval process should be required in the revision of Guidelines (G8). There seems to be an agreement that propositions 7.2 and 7.3 (or a combination of both) should be used in the revision of Guidelines (G8) in order to ensure a robust testing that takes temperature into account.

A summary of the discussion can be reflected as follows:

11 Using bench scale testing to evaluate the potential effect of temperature on the processes occurring during ballast water treatment at temperatures normally encountered during worldwide operation has the advantage that it potentially lower the financial burden on technology developers ensuring that additional systems will be type approved. Therefore temperature effect should first be tested using a bench-scale approach when possible and when the testing methods proposed can be equally effective as results demonstrated in potential subsequent full scale tests. This could include (but is not limited to) the evaluation of disinfection by-product production at different temperature.

12 However, a large number of the participants in the subgroup raised concerns in using solely a bench-scale approach for evaluating the effect of temperature normally encountered during worldwide operation on other processes occurring during testing (e.g. filtration performances, differences in the diversity of organisms from different climates zones...). It was noted that a critical parameters approach (validating manufacturer's temperature performance claims at bench-scale) could be combined with full-scale validation (to ensure that full-scale testing produces the expected dose variation based on the ambient water temperature). Another proposed solution was mentioned during the discussions and consisted in the initialization of the testing in extreme conditions (0/4°C and 30/35°C) before confirming the treatment efficacy at mid-range temperatures (15°C)

13 Testing the effects of temperature on processes occurring during ballast water management operations using a bench-scale approach should therefore be used for processes which can be evaluated at such scale and full-scale tests should be required for the evaluation of BWMS efficacy otherwise. Note that some of the propositions also included the flexibility of holding time which is reflected as a separated point in the terms of reference.

14 Though many scientific reports and papers are dealing with the effects of temperature on chemical reaction rates and biological rates of aquatic organisms, the subgroup also noted that the discussion on the complex temperature-related issues revealed a lack of understanding of all these effects on the testing of BWMS during the type approval process. More data should be reported and further discussions may be needed before all the issues can be considered resolved.

15 Regarding holding time (point 4 of the terms of reference), the received opinion supported the proposed solutions 8.2 and 8.3 above. The solution 8.2 refers to the use of a flexible and temperature dependent minimum holding time (as proposed by Singapore at MEPC 63 and in Drillet et al. 2013). A proposition to engage discussions in order to integrate this Q10 approach with the critical parameter approach was done. The solution 8.3 refers to an alignment the Guidelines (G8) requirements with the ETV protocol from the USCG. However, it was also noted that taking temperature into account for adapting holding time sums complex technical issues which may require time and discussion.

16 Long voyages and regrowth during voyages were also noted as a concern but the challenges of evaluating regrowth is extremely complex and more discussions may be required to achieve a clear conclusion on methodology to use to carry out this evaluation.

### **On environmental acceptability**

17 It was pointed out that the terms of reference for this subgroup was to discuss the potential effects of temperature on environmental acceptability which falls under the Procedure (G9) Protocols, and the focus should instead be given to issues related to the Guidelines (G8) being revised. Nevertheless, information on environmental acceptability was shared along with the information on other matters listed above. A member of the GESAMP-BWWG reiterated that it is not the scope of the GESAMP-BWWG to deal with holding time in the context of the assessment of biological efficacy under Guidelines (G8).

There was a request that the GESAMP-BWWG should consider in their Methodology to request data on the effect on temperature and holding time but it was noted that this could only occur if and when the GESAMP-BWWG Methodology would be revised and endorsed by MEPC.

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## ANNEX 2

### REPORT OF THE STANDARD TEST ORGANISMS (STO) SUB-GROUP TO THE CORRESPONDENCE GROUP

#### Report from the subgroup on STO to the coordinator of the correspondence group

The following report presents an overview of the discussions which took place as part of the subgroup on standard test organisms (STO) initiated by the Correspondence Group on the review of the Guidelines (G8).

#### Table of contents

Terms of reference .....	1
Timeline.....	1
List of participants in the subgroup.....	2
Discussion and conclusions .....	2
General agreement .....	3
Findings on the point 2 of the terms of reference.....	3
Pros.....	4
Cons.....	4
Propositions.....	4

#### Terms of reference

- 1 The ToR for the present report are as follows:
  - .1 nominate a coordinator within the subgroup to report to the Coordinator of the Correspondence Group on the review of Guidelines (G8). Name to be provided to the coordinator at the earliest opportunity;
  - .2 provide evidence to support / oppose the use of STOs for the testing of BWMS;
  - .3 if the use of STOs is supported, suggest organisms to be used, taking into consideration the use of naturally occurring and cultured species and their appropriate ratios;
  - .4 discuss how the robustness of the BWMS can be assured if STOs are used;
  - .5 provide details of how testing can be undertaken if the use of STOs is not supported;
  - .6 provide an update of the discussions to the correspondence group by Friday, 21 August 2015; and
  - .7 report findings of the subgroup to the correspondence group for consideration by Friday, 18 September 2015.

#### Timeline

- 2 A voluntary coordination was proposed by Singapore on 28 July 2015, the coordinator of the correspondence group accepted on 4 August 2015 and the discussions were initiated on 5 August 2015. The coordination of the discussions was done by G. Drillet (DHI Singapore).

## List of participants in the subgroup

3 The discussions in the subgroup were carried out via email. Delegations as well as stakeholders answering on their personal capacities participated actively or passively (not responding to comments and propositions) in the subgroup. All in all there were 71 recipients included in the mailing list; the exact name of the involved delegation or stakeholder is not reported here:

Guillaume Drillet <gdr@dhigroup.com>; Leanne Page <Leanne.Page@mcga.gov.uk>;  
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## Discussion and conclusions

4 An Excel sheet was prepared to help the participants organize the sharing of scientific facts and other information. The following tasks were proposed to the group:

	<b>STO use in BWMS testing</b>	
1	Pros of using STOs during testing	Use of STOs across test facilities
		Use of STOs within a test facility
		How to reach intake numbers recommended by Guidelines (G8) if no STOs are used
2	Cons of using STOs during testing	Risk of new invasions where STOs are used
		Lack of rigorous validation that any particular suite of STOs adequately reflects the efficacy of BWMS treatment on ambient organisms globally

	STO use in BWMS testing	
		Potential effects of STOs on naturally occurring organisms
3	STOs isolated locally – a solution?	
4	STOs effects on robustness during testing	Do STOs represent a weakness? Do STOs represent a strength?
5	If STOs are not used during testing, how is robustness ensured? How do we define the minimum density of organisms that a BWMS should treat in a size class?	
6	If STOs are to be used, what should be the minimum proportion of naturally occurring organisms used during the tests?	
7	Use of mesocosms	

5 Answers and replies in other formats from participants who did not use the proposed Excel format were also accepted and shared with all. The proposition made was to try to share scientific information in the first few weeks and to propose pragmatic solutions to improve the Guidelines (G8) with a stronger scientific ground.

### General agreement

6 There were exchanges of opinions and information between members of the subgroup discussing the use of STOs during the testing of BWMS. The only set of data available for this topic was the report shared by the United States.

7 The following points of agreements were proposed to the subgroup and no negative reply from any members was received after this email was sent by the coordinator on 2 September 2015. Therefore, we can consider that all the members agreed to the following:

- .1 the amount of data available to provide solid recommendation to the correspondence group is limited;
- .2 the use of exogenous STOs which could potentially harm the environment should be avoided (this is simply contrary to the all objectives of the BWM Convention);
- .3 the number of organisms in challenge water recommended by Guidelines (G8) to perform a valid test can be difficult and/or impractical to achieve in some climates, seasons and areas using only ambient organisms; and
- .4 testing must be robust and represent real conditions as far as possible.

### Findings on the point 2 of the terms of reference

8 Though limited evidence (data) was shared amongst the subgroup, there have been very clear and tangible opinions both supporting and disapproving the use of STOs.

9 To summarize these opposing points of view, we can list the pros and cons as follows:

**Pros:**

- .1 increase comparability between tests within a single test facility;
- .2 increased numbers of organisms and taxa during most tests; and
- .3 potentially increased robustness of some testing organisms.

**Cons:**

- .1 unknown effects of STOs on naturally occurring plankton organisms (could be deleterious);
- .2 potentially too easy to treat (i.e. too large and easy to filter out, too sensitive to a particular treatment);
- .3 useless to compare tests between different facilities because of other factors affecting STOs (temperature, salinity, etc.); and
- .4 there is no guarantee that a STO medium once prepared remains stable over time.

**Propositions**

10 The following propositions were made by the coordinator. Replies received up to 16 September 2015 were incorporated. No further replies were received and therefore recommendations were considered agreed:

*We could recommend that efforts to generate / compile additional information should be carried out. This would address point 7.1 above.*

*We could recommend that STOs should be locally isolated (or naturally occurring in the surrounding waters). This would address point 7.2 above.*

*We could recommend that STOs be carefully chosen prior to testing and propose that an evaluation of the STO should be carried out before being used during BWMS (either in bench-scale or full-scale tests). This should document that the performance of the STO provides a consistent, quantitative and more robust indication of the treatment effect that would be observed if ambient organisms had been used. If STOs are to be added to ambient assemblages to achieve numerical or taxonomic criteria, then there must be clear limits established and criteria for selection of organisms to avoid biased results.*

11 However, in the case that locally isolated STOs are not being used because it is deemed inappropriate or because STOs could not be found/tested, the question remains as to what is considered a reasonable number of organisms in the intake waters for the tests (point 7.3 above). The particular issue may require that testing BWMS without STOs is carried out with only naturally occurring organisms and therefore the minimum number of organisms at intake may not be fulfilled. Apart from the Netherlands, who suggested adopting "regional" intake values based on location, i.e. lower values for tropical versus temperate test waters, no other practical propositions were made.

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## ANNEX 3

### DRAFT AMENDMENTS TO REPORTING PROVISIONS OF GUIDELINES (G8)

#### Introductory comments

The following text has been developed to amend section 2.4 of Guidelines (G8) to reflect resolution MEPC.228(65) on information reporting on type approved ballast water management systems, including the outcome of the deliberations of the correspondence group on critical parameters (SDL) and items 5.3 and 5.4.

As the group concluded that the United States Environmental Technology Verification (ETV) report template should also be used as a base document for section 2.4, there was a need to address the conceptual overlap between the ETV report template and MEPC.228(65). Owing to the scope of resolution MEPC.228(65) and the ETV report template going beyond test reports, it was apparent that it is not possible to confine the changes to section 2.4, which pertains only to test reports for land-based and shipboard tests. Additional text amendments have therefore been included.

On item 5.4, as the group concluded that operational parameters should be reflected but did not propose any specific text or parameters to be included, the following proposal only includes understandings reached during the first correspondence group as reported in document MEPC 68/2/12 (Ireland).

In light of the above constraints and to reflect the changes required, a new Part 5 in the annex to Guidelines (G8) has been developed to hold the report of type approval as a whole and the certificate requirements of MEPC.228(65). The amendments to section 2.4 deal with the reports of specific tests.

As both resolution MEPC.228(65) and the ETV report template are essentially report templates, it was easier to propose a template as a part of this work and as such a draft report template is included within paragraphs 7 to 10 of this annex.

All the proposals outlined below have yet to be reviewed, discussed or agreed by the correspondence group but provide a starting point for continued discussion.

#### Amendments to the body of Guidelines (G8)

1 Paragraph 1.3 in the *Introduction* section of Guidelines (G8) is proposed to be amended by inserting the underlined text as follows:

"1.3 The Guidelines include general requirements concerning design and construction, technical procedures for evaluation and the procedure for issuance of the Type Approval Certificate of the ballast water management system and reporting to the Organization."

2 Paragraph 6.1 in the *Approval and certification procedures* section of Guidelines (G8) is proposed to be amended by inserting the underlined text as follows:

"6.1 A BWMS which in every respect fulfils the requirements of these Guidelines may be approved by the Administration for fitting on board ships. The approval should take the form of a Type Approval Certificate of BWMS, specifying the main particulars of the apparatus and any limiting conditions on its usage necessary to ensure its

proper performance. Such certificate should be issued in accordance with Part 5 of the annex in the format shown in appendix 1. A copy of the Type Approval Certificate of BWMS should be carried on board ships fitted with such a system at all times."

3 The following new paragraphs are proposed to be inserted into the *Approval and certification procedures* section of Guidelines (G8):

"6.7 An Administration approving a ballast water management system should promptly provide a type approval report to the Organization in accordance with Part 5 of the annex. Upon receipt of a type approval report, the Organization should promptly make it available to [the public] [Member States] by an appropriate means.

6.8 In the case of an approval based entirely on testing already carried out under supervision by another Administration, the type approval report should be prepared and kept on file instead of being provided to the Organization."

### **Amendments to the annex of Guidelines (G8)**

4 The *Reporting of test results* section of the annex to Guidelines (G8) is proposed to be amended by inserting the underlined text in paragraph 2.4.1, with two new paragraphs to follow:

"2.4.1 After land-based and shipboard approval tests have been completed, a report should be submitted to the Administration. This report should include information regarding the test design, methods of analysis and the results of these analyses, as well as information on maintenance logs during testing and impacts on ballasting system. Shipboard test reports should include information on the total operating time of the BWMS.

2.4.1**bis** A report should also be submitted to the Administration containing all documentation (including procedures, methods, data, models, results, and interpretations) associated with the validation of system design limitations.

2.4.1**ter** The reports submitted in accordance with paragraphs 2.4.1 and 2.4.1**bis** should contain the following information: [INSERT TEST REPORT TEMPLATE HERE]"

5 Part 3 of the annex to Guidelines (G8) is proposed to be amended by adding a new heading and paragraph after the existing paragraph 3.15 as follows:

#### **"Reporting of test results**

3.15**bis** A report on environmental tests should be submitted to the Administration in accordance with paragraph 2.4.1**ter**."

6 The annex to Guidelines (G8) is proposed to be amended by adding a new part after the existing Part 4:

### **"PART 5 – TYPE APPROVAL CERTIFICATE AND TYPE APPROVAL REPORT**

#### **Type Approval Certificate**

5.1 The Type Approval Certificate should include details on all imposed limiting conditions on the operation of the BWMS. This should include any applicable environmental conditions (e.g. salinity, UV transmittance, temperature, etc.) and/or system operational parameters (e.g. min/max pressure, pressure differentials, min/max Total Residual Oxidants (TRO), etc.).

- 5.2 The Type Approval Certificate should include an appendix containing 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 [including the measured values of all System Design Limitation parameters];

#### **Type approval report**

- 5.3 The type approval report should be submitted to the Organization and made available to [the public] [Member States] by an appropriate means. It should contain [INSERT TYPE APPROVAL REPORT TEMPLATE HERE]
- [5.4 The Administration may redact proprietary information of the manufacturer from the type approval report before submitting it to the Organization.]
- 5.5 The Type Approval Certificate and the type approval report (including their entire contents and all annexes, appendices or other attachments) should be accompanied by a translation into English, French or Spanish if not written in one of those languages.
- [5.6 Documents should not be incorporated by reference into the Type Approval Certificate, which should be carried onboard vessels. 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 should promptly re-submit the type approval report to the Organization and include the referenced document or an updated reference to it; the Organization should promptly make the revised report available to [the public] [Member States] through an appropriate means.]"

#### **Draft test report template (draft sub-paragraphs to new paragraph 2.4.1 *ter*)**

7 This draft test report template was prepared to facilitate a discussion on the group's decision to consider integrating resolution MEPC.228(65) with annex 2 of document MEPC 68/2/12 (Ireland). The items from both of these sources pertinent to a test report have been selected, organized and merged. This list also takes into account paragraph 83 of document MEPC 68/2/12, which has been agreed. Potential additional items are shown in square brackets.

8 If agreed, the following elements would become sub-paragraphs of paragraph 2.4.1 *ter* of the annex to Guidelines (G8). The test report should include:

- ".1 the name and address of the laboratory performing or supervising the inspections, tests or evaluations, and its national accreditation, if appropriate;
- .2 the name of the manufacturer;
- .3 the trade name, product designation (such as model numbers), and a brief 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, inspection or evaluation conducted, summary descriptions of:
  - .1 test conditions;
  - .2 experimental design;
  - .3 methods and procedures; and
  - .4 results and discussion, including a description of each failure;
- .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:
  - .1 the manufacturer or manufacturer's representative, if the inspection, tests or evaluations are conducted by the manufacturer; or
  - .2 the chief officer of the laboratory, or the chief officer's representative, if the Inspection or tests were conducted by an independent laboratory.
- .13 appendices, including:
  - .1 the complete test plan and the data generated during tests and evaluations reported under subparagraph .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 Treatment Rated Capacity, if available); and
- .3 for system design limitations, details of all procedures, methods, data, models, results, and interpretations leading to validation;
- .2 [the QMP, the QAPP and] Quality Assurance and Quality Control records;
- .3 maintenance logs; and
- .4 relevant records and tests results maintained or created during testing."

### **Draft type approval report template (draft sub-paragraphs to new paragraph 5.3)**

9 The following draft type approval report template was prepared to facilitate a discussion on the group's decision to consider integrating resolution MEPC.228(65) with annex 2 of document MEPC 68/2/12. The items from both of these sources pertinent to a type approval report have been selected, organized and merged. This list also takes into account paragraph 83 of document MEPC 68/2/12, which has been agreed. Potential additional items are shown in square brackets.

10 If agreed, the following elements would become sub-paragraphs of paragraph 5.3 of the annex to Guidelines (G8). The type approval report should include:

- ".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 a description of the Active Substance(s) employed; and
  - .2 identification of the specific MEPC report and paragraph number granting Final Approval in accordance with the *Procedure for approval of ballast water management systems that make use of active substances* (G9), adopted by resolution MEPC.169(57);

- [.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 2.4.1, 2.4.1 *bis*, 2.4.1 *ter* and 3.16;
- .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 these Guidelines, including demonstrating under the procedures and conditions specified for both land-based and shipboard testing that it met the ballast water performance standard of regulation D-2;
  - .2 is designed and constructed according to requirements;
  - .3 is in compliance with all applicable requirements;
  - .4 operates within the system design limitations at the rated capacity, performance, and reliability as specified by the manufacturer;
  - .5 contains control and monitoring equipment that operates correctly;
  - .6 was installed in accordance with the technical installation specification of the manufacturer for all tests; and
  - .7 was used to treat volumes and flow rates of ballast water during the shipboard tests consistent with the normal ballast operations of the vessel;
- .8 the following annexes:
  - [.1 the QAPP and the QMP]
  - .2 each complete test report prepared in accordance with paragraphs 2.4.1, 2.4.1 *bis*, 2.4.1 *ter* and 3.16."

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## ANNEX 4

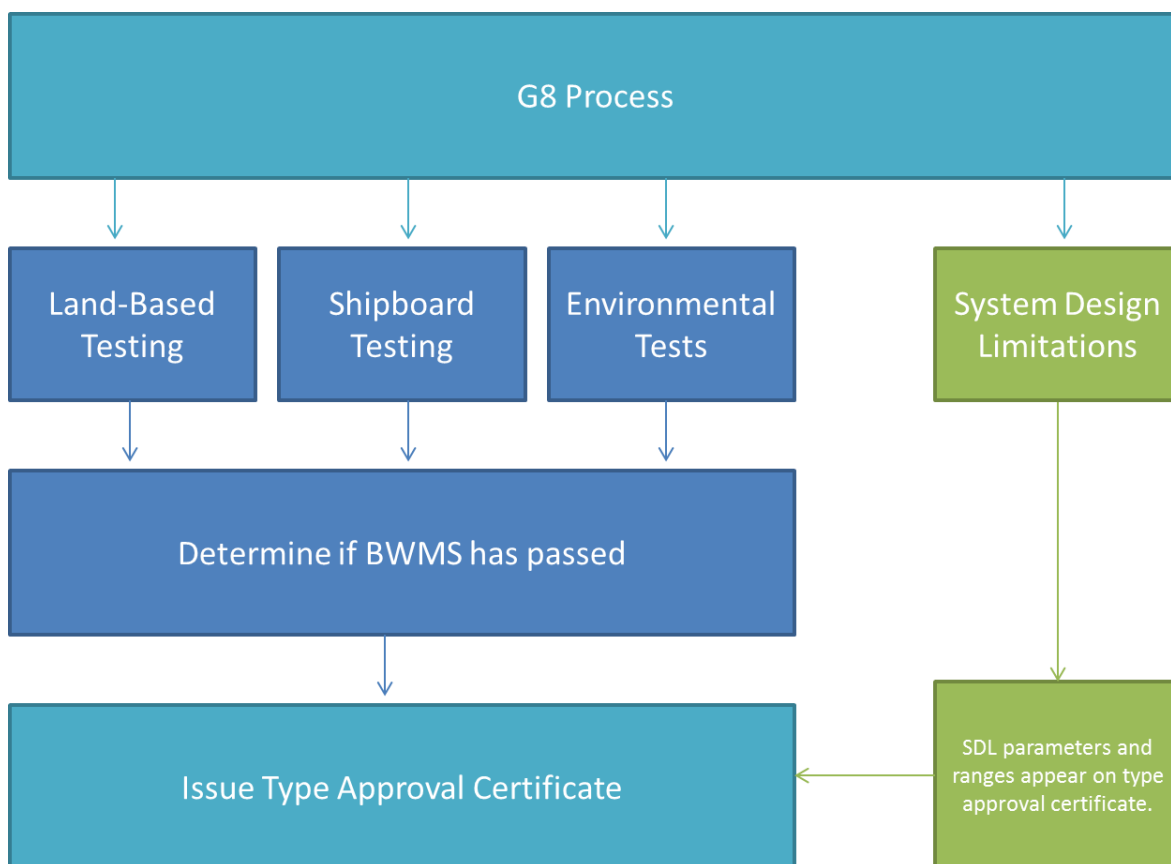
### CRITICAL PARAMETERS (SDL) PRINCIPLES

The group had a robust discussion in order to fully understand what is meant by the term "critical parameters" (SDL) and how the concept could be used within the revised Guidelines (G8). Based on those discussions and to aid the group in understanding the concept of critical parameters (SDL), the following principles were agreed:

- 1 Critical parameters (SDL) will form an integral part of the revised Guidelines (G8);
- 2 While the Guidelines (G8) process will not try actively to find the critical parameters (SDL)'s of the system (e.g. through stress testing), it should validate the specific performance claims made by the manufacturer;
- 3 Specific outcomes of critical parameters (SDL) will not have an impact on whether the BWMS passes/fails type approval; the critical parameters (SDL) process instead produces validated information to be reported on the certificate;
- 4 The issuance of a Type Approval Certificate is not dependent on the outcome of the assessment of critical parameters (SDL);
- 5 Critical parameters (SDL) should not be limited to those parameters assessed as a part of the type approval process;
- 6 The data provided by the manufacturer to identify critical parameters (SDL) and the test reports supporting the manufacturer claims should be reviewed and validated to the satisfaction of the Administration and made publicly available;
- 7 For a critical parameters (SDL) that has a minimum standard set out in the revised Guidelines (G8), a "Limited Operation" notation should be included on the Type Approval Certificate if the critical parameters (SDL) is more restrictive than the minimum standard;
- 8 Critical parameters (SDL) are technology dependant and may vary from system to system;
- 9 Critical parameters (SDL) are proposed by the manufacturer and agreed by the Administration;
- 10 Critical parameters (SDL) should include all water quality and operational parameters that play a critical role in determining whether operation of a BWMS will be effective;
- 11 Critical parameters (SDL) should be used to assess manufacturer performance claims during testing overseen by the Administration;
- 12 Critical parameters (SDL) may be assessed outside of land-based and shipboard testing;
- 13 Where practicable [practical], critical parameters should be monitored and recorded by the BWMS to ensure proper operation;

- 14 Recording and monitoring systems should note when operation occurs outside of the systems specification, including critical parameter specifications;
- 15 It has not yet been determined if there should be a list of "common" critical parameters for specific technology types or for inclusion in the annex of the Type Approval Certificate; and
- 16 Further discussion is required to conclude whether the evaluation of critical parameters (SDL) should be standardized depending on the parameter.

To aid understanding of the relationship between Guidelines (G8), type approval and critical parameters (SDL), the following model was produced.



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## ANNEX 5

### DRAFT AMENDMENTS TO IMPLEMENT CRITICAL PARAMETERS (SDL) IN GUIDELINES (G8)

#### Introductory comments

Within the report of the Correspondence Group on the review of Guidelines (G8), for ease of understanding the term "critical parameters (SDL)" is used. However, as this annex is aimed at providing draft amendments the term "system design limitations" has been adopted (pending future agreement on the term).

The proposals outlined below have yet to be reviewed, discussed or agreed by the correspondence group but provide a starting point for continued discussion.

#### Amendments to the body of Guidelines (G8)

1 Paragraph 1.15 in the *Introduction* section of Guidelines (G8) is amended by striking out text and inserting the underlined text:

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

2 The following new paragraph is proposed to be inserted into the *Summary of requirements* subsection of the *Introduction* section of Guidelines (G8). This new paragraph does not use the term system design limitations because this subsection describes the Guidelines (G8) process in general terms and appears before the *Definitions* section.

"1.17bis The limitations of the ballast water management system imposed by its design – as submitted by its manufacturer and validated by the Administration – should 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 under which proper functioning of the equipment can be expected."

3 The following new paragraph is proposed to be inserted into the *Definitions* section of Guidelines (G8):

"3.9bis The system design limitations of a BWMS set out the water quality and operational parameters that are material 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 system design limitations 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 system design limitations should be identified by the manufacturer and validated under the supervision of the Administration in accordance with these Guidelines."

4 Paragraph 4.11 of the *Control and Monitoring Equipment* subsection of the *Technical Specifications* section of Guidelines (G8) is proposed to be amended by inserting the underlined text:

"4.11 The control equipment should incorporate a continuous self-monitoring function during the period in which the BWMS is in operation. [Where practical.] system design limitation parameters should be monitored and recorded by the BWMS to ensure proper operation."

5 Paragraph 6.1 of the *Approval and Certification Procedures* section of Guidelines (G8) is proposed to be amended by inserting the underlined text:

"6.1 A BWMS which in every respect fulfils the requirements of these Guidelines may be approved by the Administration for fitting on board ships. The approval should take the form of a Type Approval Certificate of BWMS, specifying the main particulars of the apparatus, its validated system design limitations and any limiting conditions on its usage necessary to ensure its proper performance. Such certificate should be issued in the format shown in appendix 1. A copy of the Type Approval Certificate of BWMS should be carried on board ships fitted with such a system at all times."

6 The following new paragraph is proposed to be inserted into the *Approval and certification procedures* section of Guidelines (G8):

"6.3bis The system design limitations should 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 performance standard of regulation D-2."

#### **Amendments to the annex to Guidelines (G8)**

7 Paragraph 1.2 of the *General* subsection of the *Specifications for pre-test evaluation of system documentation* section of the annex to Guidelines (G8) is proposed to be amended by striking out text and inserting the underlined text:

"1.2 Documentation should be provided by the manufacturer/developer for ~~two~~ three primary purposes: evaluating the readiness of the BWMS for undergoing approval testing, ~~and~~ evaluating the manufacturer's proposed approval testing requirements and procedures for the test, and evaluating the manufacturer's proposed system design limitations and validation procedures."

8 The following sub-heading and new paragraphs are proposed to be inserted into the *Specifications for pre-test evaluation of system documentation* section of the annex to Guidelines (G8) after existing paragraph 1.5:

#### **"System Design Limitation evaluation**

1.5bis The system design limitation evaluation should be undertaken by the Administration. It should assess the basis for the manufacturer's claim that the system design limitations include all known water quality and operational parameters to which the design of the BWMS is sensitive that are material to its ability to achieve the performance standard of regulation D-2.

1.5<sup>ter</sup> The Administration should also evaluate the suitability and reliability of the methods proposed for validating the claimed low and/or high values for each system design limitation. 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.

1.5<sup>quater</sup> In its evaluation, the Administration should take into consideration potential interactions [between parameters, notably interactions] between temperature and other parameters, [and guidance from the Organization on identifying and validating system design limitations for common BWMS processes]."

9 The following new paragraph is proposed to be inserted into the *Documents* subsection of the *Specifications for pre-test evaluation of system documentation* section of the annex to Guidelines (G8) after existing paragraph 1.6.4:

1.6.4<sup>bis</sup> **System design limitations** – The manufacturer should identify all known parameters to which the design of the BWMS is sensitive that are material to its ability to achieve the performance standard of regulation D-2. The basis for this identification should be supplied. The parameters should not be limited to those that are specifically referenced in these Guidelines, and should include both water quality parameters [(e.g. salinity, temperature, oxidant demand, ultraviolet transmittance)] and operational parameters [(e.g. minimum flow rate, time between uptake and discharge)]. For each parameter the manufacturer should claim a low and/or a high value for which the BWMS is capable of achieving the performance standard of regulation D-2. The proposed method for validating each claimed system design limitation should be set out, together with information on the source, suitability and reliability of the method."

10 The title of Part 2 of the annex to Guidelines (G8) is proposed to be amended by inserting the underlined text:

**PART 2 – TEST AND PERFORMANCE SPECIFICATIONS FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS AND VALIDATION OF SYSTEM DESIGN LIMITATIONS**

11 The existing section 2.4 of the annex to Guidelines (G8) is proposed to be renumbered to be section 2.5. This creates space for a new proposed section 2.4 to be inserted as follows:

**"2.4 Validation of system design limitations**

2.4.1 the objective of the system design limitations approach is twofold. First, it ensures that the performance of the BWMS has been transparently assessed with respect to the known water quality and operational parameters that are material to its operation, including those that may not be specifically provided for in these Guidelines. Second, it provides transparent oversight of manufacturer BWMS performance claims that may go beyond specific criteria in these Guidelines. Although the validation of system design limitations yields transparent information that is reported on the Type Approval Certificate, this information does not affect the eligibility of a BWMS to receive type approval or not;

2.4.2 the low and/or high parameter values for each system design limitation should be validated to the satisfaction of the Administration as follows:

- .1 the validation should be overseen by the Administration and should 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 system design limitations should be undertaken in accordance with section 2.1 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 sections 2.2 and 2.3 of this annex. Laboratory or bench-scale testing may also be used in the validation of system design limitations;
- .3 methods other than testing, such as the use of existing data and/or models, may be used in the validation of system design limitations. The source, suitability and reliability of such methods should be reported;
- .4 validation is not intended as a stress-test of the BWMS or as a procedure for identifying equipment failure points. Validation should be undertaken independently of the BWMS manufacturer and should be separate from BWMS research and development activities. Data and models may be supplied by manufacturer when appropriate but should be independently assessed; and
- [.5 the validation should take into account guidance from the Organization on identifying and validating system design limitations for common BWMS processes]

2.4.3 Claims of open-ended performance (expressed as the lack of either a low or a high parameter value for a system design limitation) should also be validated.

2.4.4 BWMS manufacturers may include a margin of error in claiming system design limitations. For this reason, system design limitations should not necessarily be interpreted as the exact parameter values beyond which the BWMS is incapable of operation.

2.4.5 System design limitations should be established for all known parameters to which the design of the BWMS is sensitive that are material to the operation of the BWMS. In the case of system design limitation parameters that are also subject to specific criteria in sections 2.2 and/or 2.3 of this annex, the procedure set out in those sections should be followed. For such parameters, the approach in paragraph 2.4.2 may be used only to the extent that the performance claim goes beyond the specific criteria in sections 2.2 and/or 2.3."

12 The following new paragraph is proposed to be inserted into the renumbered section 2.5 *Reporting of test results* of the annex to Guidelines (G8):

"2.5.1bis A report should also be submitted to the Administration containing all documentation (including procedures, methods, data, models, results, and interpretations) associated with the validation of system design limitations."

#### **Amendments to the appendix to Guidelines (G8)**

13 The following tabular information is proposed to be inserted immediately above the official stamp. (Example rows are shown in italics.)

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

<u>Design Parameter</u>	<u>Low</u>	<u>-</u>	<u>High</u>
<i>Salinity</i>	<i>0.1 PSU</i>	<i>-</i>	<i>N/A]</i> "
		***	



## ANNEX 6

### FUTURE WORK ITEMS / OUTSTANDING ISSUES

**(Based on the report of the Correspondence Group on the review of Guidelines (G8) submitted to MEPC 69)**

- 1 Testing being performed using fresh, brackish and marine waters, including Type Approval Certificate amendments**
  - .1 review of the four text proposals for section 6;
  - .2 amend the Type Approval Certificate to reflect all changes to Guidelines (G8):
    - .1 limited operations;
    - .2 SDL;
    - .3 flow rates;
    - .4 language requirements; and
  - .3 review the revised Guidelines (G8) to ensure the Type Approval Certificate includes all required information.
  
- 2 Testing considering the effect of temperature in cold and tropical waters on operational effectiveness and environmental acceptability. Discuss the possibility of introducing three temperature ranges**
  - .1 is there a need to introduce three temperature ranges to the testing regime?
    - .1 if agreed how can the ranges be determined and evaluated?
  - .2 develop text to reflect the agreed understandings as outlined in the report;
  - .3 consider how SDL can be used to improve confidence in a systems' ability to operate in all temperature ranges;
  - .4 consider the interactions between temperature and other factors (notably between temperature and voyage length);
  - .5 consider how data sharing can be used to increase understanding of the effects of temperature;  
Options:
    - .1 recommend that MEPC request Administrations share data;
    - .2 undertake a review of current type approvals to collect data;
    - .3 review the work of the D-2 Study;
    - .4 ensure that Guidelines (G8) reflects the need to share temperature data;

- .5 request that the ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors identify and assess the available data and methods for determining the performance of BWMS at extreme temperature ranges (i.e. below 1 degree Celsius and above [X] degrees Celsius) and provide a report to MEPC 70, PPR 4 or a future correspondence group with options/recommendations for guidance to Administrations;
- .6 The effects of temperature on holding time requires further discussion:
  - .1 what are the issues which need to be discussed?;
  - .2 does this require a group to be set up to collate and share data in order to ascertain reference temperature and holding time?;
  - .3 how do we ensure (if needed) tests are designed to evaluate the minimum holding time required for effective operation of the BWMS?; and
  - .4 following this discussion and consideration, text needs to be developed to reflect the agreed understanding on the effects of temperature on holding time.
- .7 Impacts of temperature on environmental acceptability:
  - .1 To date no proposals have been received on this issue. Is there anything to discuss?; and
  - .2 If yes, what?

### **3.1 Specification of standard test organisms for use in testing**

- .1 develop text to reflect the agreed understandings as outlined in the report;
- .2 discuss if the group has the skills and knowledge to further address this issue? Are other bodies (ISO?) better placed to develop a "standard"?
- .3 is there adequate scientific information/research available to enable progress to be made?;
- .4 consider the need to collect further information;
- .5 if the option to use STO is agreed, there is a need to develop procedures, processes and guidance on their use;
  - .1 does the group have the relevant information to be able to do this?;
  - .2 are other organizations better placed / experienced to do this?;
  - .3 are relevant documents already available?;
  - .4 could GloBallast be used?;
- .6 should the STO to be used be specified?; and
  - .1 If yes, how?

**3.4 Propose definition of "viability" of organisms, taking into account the damage caused to organisms by ballast water management systems making use of UV**

- .1 need to determine the way forward. Options:
  - .1 adopt the new definition;
  - .2 adopt new definition and amended text of paragraph 4.6 of the annex to Guidelines (G8); and
  - .3 retain existing definition and amend paragraph 4.6.

**4 Challenge levels set with respect to suspended solids in test water**

- .1 consider the implications of amending TSS levels; could there be any unintended consequences?;
- .2 is there a need to introduce three TSS level or will the SDL approach ensure adequate testing of the systems?; and
- .3 need to review Guidelines (G8) and if necessary propose text to reflect the decision to require full scale testing rather than bench scale tests.

**5.1 Clarification of "test run" and "test cycle"**

- .1 review text to ensure "test cycle" is used and "test run" removed;
- .2 based on previous work further develop the following definitions;
  - .1 failed test, invalid test, successful and successful test;
  - .2 is a definition for "valid test" required;
- .3 review Guidelines (G8) to ensure that failures to meet the D-2 discharge standard are recorded and communicated;
- .4 determine if there is a difference between "test" and "test cycle";
- .5 do we need to define "valid test"?
- .6 need to define the start and end of a test period;
- .7 determine whether or not test cycles must be consecutive;
- .8 clarification of the term "replicate" in paragraph 2.3.17 of the annex to Guidelines (G8); and
- .9 propose text to clarify paragraph 2.3.18 to ensure testing normally takes place at three salinities.

**5.3 Test reports – to include the installation, commissioning, repair and maintenance documentation relating to land-based and shipboard tests. Environmental test reports?**

- .1 review annex 3 of this report with a view to developing the new test report template; and
- .2 using annex 3 of this report as a starting point, propose text to reflect the decision made by the correspondence group and ensure that test reports are made available to all authorizing Administrations and to the IMO.

**5.4 The reporting of operational parameters including power consumption, mechanical reliability, replacement of components and consumables.**

- .1 based on annex 3 of this report, MEPC.228(65) and ETV section 5.49, develop text for inclusion in section 2.4 of the annex to Guidelines (G8) and to reflect reporting requirements.

**6 Any differences between type approval protocols of Member States**

- .1 determine if this is still necessary;
- .2 if this item is still necessary, will the D-2 Study help?;
- .3 if still necessary how do we complete the comparison? Request Member States to submit their protocols for review? Alternatives?

**7 Any items raised by, and any data arising from the D-2 Study and any other relevant information provided, within the timeline for the review Guidelines (G8)**

- .1 critical parameters (SDL);
  - .1 refine the definition of critical parameters (SDL);
  - .2 develop a matrix of SDL parameters;
  - .3 review text proposals provided by Canada (annex 5 of this report);
- .2 language for Type Approval Certificate information; and
  - .1 develop text to require the Type Approval Certificate is provided in either English, Spanish or French if not already produced in that language.

**8 Testing facility, validation – standardized protocol**

- .1 text proposals required to reflect the need for test facilities to prove they are able to meet the requirements of Guidelines (G8); and
- .2 text required to reflect the need for test facilities to be "certified".

- 9 Operational testing period for ships. The use of control water.**
- .1 text proposals required to reflect the decision that control water should not be used during shipboard testing.
- 10 Final Type Approval of BWMS.**
- .1 determine where in Guidelines (G8) sections 5 and 6 of BWM.2/Circ.43 should be inserted.
- 11 Should safety considerations, risk assessments, PPE requirements, required for the safe operation of BWMS be part of the type approval? Should that information be provided in a public safety report?**
- .1 what is meant by "a public safety report"?
- 12 There is a wide range of C & M modules used with varying availability of secure logging and data outputs. Improve unit testing and standardize required outputs?**
- .1 using document PPR 2/5 (Germany and Republic of Korea) as a basis, develop text for the control and monitoring of systems.
- 13 Use of IACS UR E10**
- .1 replace Part 3 of Guidelines (G8) with a dated reference to IACS UR E10.
- 14 BWMS bypass arrangements – under what circumstances should bypassing of a BWMS occur, and how should the sequences of events be recorded?**
- .1 text is required to reflect the decisions of the correspondence group; and
- .2 text proposals are required to amend paragraph 4.5.4 of Guidelines (G8) to include the need to record instances of bypass in the ballast water record book.
- 15 Scaling of BWMS – should all documentation relating to scaling of a BWMS be included in the test report, including the decision process following computer modelling, description of model assumptions and validation documents?**
- .1 review BWM.2/Circ.33 with a view to proposing new text for inclusion in Guidelines (G8), which will replace BWM.2/Circ.33;
- .2 when reviewing BWM.2/Circ.33, ensure that points already raised are taken into consideration;
- .1 the current text implies that the following combination could apply:
1. land-based and CFD instead of shipboard test, or
  2. CFD instead of land based and shipboard test, or
  3. CFD instead of both;

- .2 paragraph 1.9 of BWM.2./Circ.33 suggests that not all capacities of scaled systems, but a representative number of them (taking into account the type of treatment technology), need to go through shipboard testing. To ensure consistency and universal application, the representative number, adjusted for the type of treatment technology, should be clearly articulated;
- .3 as part of the type approval process, the manufacturer should deliver relevant drawings and specifications to the Administration with respect to scaled systems applying for type approval;
- .4 It is the responsibility of the Administration to carry out, or appoint an independent body to carry out this task on their behalf, the required mathematical modelling to verify the scaling of systems not tested in land-based and/or shipboard testing; and
- .5 The capacity of the institutions appointed to carry out the modelling should be validated using similar principles as for the validation of test facilities.

**16 Holding time – is there a requirement for a verification of the minimum holding time required for BWMS?**

- .1 Review the text in order to insert "holding time" where required and remove the term "storage time" – (based on review undertaken by Japan);
- .2 Further consider the impact of holding times on regrowth (including bacterial regrowth);
- .3 Are there any other implications of introducing the "at least 24 hours" holding time?; and
- .4 Consider the implications of holding times for the performance of BWMS on both short and long voyages, as well as any interactions with temperature.

**19 Shipboard testing of BWMS – comments were made regarding the sample volume and collection method, sampling test duration period, sampling parameters, management of risk during the test period (use of control samples or a control holding tank), verification of system operation during variable flow rates, and the clarification of sample point arrangements**

- .1 need to review the revised Guidelines (G8) and if required propose text to ensure the agreed decisions are reflected within the text;
- .2
  - .1 sampling should be undertaken in line with Guidelines (G2); and
  - .2 PSC requirements need to be considered.

**20 Land-based testing – proposed modification of existing sampling protocol regarding sample biological content and sample volume in specific circumstances**

- .1 explore impacts of changes to DOC/DOM levels;
  - .1 is a minimum level needed?;

- .2 what impact does the type of sugars involved have? Is this important? Is this something that should be considered as part of the Guidelines (G8) review?;
- .3 is enough known about the behaviour of artificial DOC?;
  - .1 does naturally occurring DOC behave differently to artificially introduced DOC when considering biological availability.
- .2 text is required to reflect the concerns regarding the filtering of samples and the differentiation of biological content;
- .3 is there still a need to develop thresholds for biological and physical constituents?;
  - .1 if yes, what are the constituents?;
  - .2 could critical parameters (SDL) be used?;
  - .3 if thresholds are required how can they be developed?; and
    - .1 Do relevant and applicable thresholds already exist?

**21 Technical and biological tests – proposed separation of biological and technical factors in testing protocol**

- .1 need to determine what is meant by technical tests;
  - .1 what type of parameters are suitable for being technically tested?;
- .2 need to determine what is meant by biological tests; and
- .3 what is hoped to be achieved by separating the tests?

**22 Environmental tests – the current requirements for environmental testing makes use of outdated specifications and it is proposed that those specifications should be updated**

- .1 review of UR E10 to ensure it is suitable for use;
- .2 should the specification for locating of BWMS be included within Guidelines (G8)?;
  - .1 should restrictions for installing a BWMS on board ships be included in Guidelines (G8) based on the environmental test?;
- .3 if location should be included, text proposals will be required; and
- .4 Proposal from document MEPC 68/2/12 (Ireland), paragraph 106 – defer until review is complete.

**23 Equipment technical specifications – proposed modification of specification text relating to the monitoring of hazards and the safe operation of the equipment in BWMS**

- .1 agree to a definition of dangerous liquid (based on the accepted proposal);
- .2 determine if Guidelines (G8) should evaluate ship specific installation issues;
- .3 finalize text proposals for paragraph 4.2 of Guidelines (G8) regarding the handling of dangerous substances;
- .4 consider text proposal of MEPC 68/2/12, paragraph 110; and
- .5 review and discuss the hazard analysis and documentation proposals that were received during the last correspondence group.

**24 Documentation**

- .1 text from MEPC.228(65) to be incorporated into section 2.4 of the annex of Guidelines (G8) (including amendment for critical parameters if required and resulting discussions from items 5.3 and 5.4); and
- .2 text required to reflect the need to submit the report for circulation by the Secretariat.

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