

2. GLOBAL REGIME AND GUIDELINES

2.1 The BWM Convention

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

THE PARTIES TO THIS CONVENTION,

RECALLING Article 196(1) of the 1982 United Nations Convention on the Law of the Sea (UNCLOS), which provides that “States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control, or the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto,”

NOTING the objectives of the 1992 Convention on Biological Diversity (CBD) and that the transfer and introduction of Harmful Aquatic Organisms and Pathogens via ships' ballast water threatens the conservation and sustainable use of biological diversity as well as decision IV/5 of the 1998 Conference of the Parties (COP 4) to the CBD concerning the conservation and sustainable use of marine and coastal ecosystems, as well as decision VI/23 of the 2002 Conference of the Parties (COP 6) to the CBD on alien species that threaten ecosystems, habitats or species, including guiding principles on invasive species,

NOTING FURTHER that the 1992 United Nations Conference on Environment and Development (UNCED) requested the International Maritime Organization (the Organization) to consider the adoption of appropriate rules on ballast water discharge,

MINDFUL of the precautionary approach set out in Principle 15 of the Rio Declaration on Environment and Development and referred to in resolution MEPC.67(37), adopted by the Organization's Marine Environment Protection Committee on 15 September 1995,

ALSO MINDFUL that the 2002 World Summit on Sustainable Development, in paragraph 34(b) of its Plan of Implementation, calls for action at all levels to accelerate the development of measures to address invasive alien species in ballast water,

CONSCIOUS that the uncontrolled discharge of Ballast Water and Sediments from ships has led to the transfer of Harmful Aquatic Organisms and Pathogens, causing injury or damage to the environment, human health, property and resources,

RECOGNIZING the importance placed on this issue by the Organization through Assembly resolutions A.774(18) in 1993 and A.868(20) in 1997, adopted for the purpose of addressing the transfer of Harmful Aquatic Organisms and Pathogens,

RECOGNIZING FURTHER that several States have taken individual action with a view to prevent, minimize and ultimately eliminate the risks of introduction of Harmful Aquatic Organisms and Pathogens through ships entering their ports, and also that this issue, being of worldwide concern, demands action based on globally applicable regulations together with guidelines for their effective implementation and uniform interpretation,

DESIRING to continue the development of safer and more effective Ballast Water Management options that will result in continued prevention, minimization and ultimate elimination of the transfer of Harmful Aquatic Organisms and Pathogens,

RESOLVED to prevent, minimize and ultimately eliminate the risks to the environment, human health, property and resources arising from the transfer of Harmful Aquatic Organisms and Pathogens through the control and management of ships' Ballast Water and Sediments, as well as to avoid unwanted side-effects from that control and to encourage developments in related knowledge and technology,

CONSIDERING that these objectives may best be achieved by the conclusion of an International Convention for the Control and Management of Ships' Ballast Water and Sediments,

HAVE AGREED as follows:

Article 1 *Definitions*

For the purpose of this Convention, unless expressly provided otherwise:

1 “Administration” means the Government of the State under whose authority the ship is operating. With respect to a ship entitled to fly a flag of any State, the Administration is the Government of that State. With respect to floating platforms engaged in exploration and exploitation of the sea-bed and subsoil thereof adjacent to the coast over which the coastal State exercises sovereign rights for the purposes of exploration and exploitation of its natural resources, including Floating Storage Units (FSUs) and Floating Production Storage and Offloading Units (FPSOs), the Administration is the Government of the coastal State concerned.

2 “Ballast Water” means water with its suspended matter taken on board a ship to control trim, list, draught, stability or stresses of the ship.

3 “Ballast Water Management” means mechanical, physical, chemical, and biological processes, either singularly or in combination, to remove, render harmless, or avoid the uptake or discharge of Harmful Aquatic Organisms and Pathogens within Ballast Water and Sediments.

4 “Certificate” means the International Ballast Water Management Certificate.

5 “Committee” means the Marine Environment Protection Committee of the Organization.

6 “Convention” means the International Convention for the Control and Management of Ships’ Ballast Water and Sediments.

7 “Gross tonnage” means the gross tonnage calculated in accordance with the tonnage measurement regulations contained in Annex I to the International Convention on Tonnage Measurement of Ships, 1969 or any successor Convention.

8 “Harmful Aquatic Organisms and Pathogens” means aquatic organisms or pathogens which, if introduced into the sea including estuaries, or into fresh water courses, may create hazards to the environment, human health, property or resources, impair biological diversity or interfere with other legitimate uses of such areas.

9 “Organization” means the International Maritime Organization.

10 “Secretary-General” means the Secretary-General of the Organization.

11 “Sediments” means matter settled out of Ballast Water within a ship.

12 “Ship” means a vessel of any type whatsoever operating in the aquatic environment and includes submersibles, floating craft, floating platforms, FSUs and FPSOs.

Article 2 *General Obligations*

1 Parties undertake to give full and complete effect to the provisions of this Convention and the Annex thereto in order to prevent, minimize and ultimately eliminate the transfer of Harmful Aquatic Organisms and Pathogens through the control and management of ships’ Ballast Water and Sediments.

2 The Annex forms an integral part of this Convention. Unless expressly provided otherwise, a reference to this Convention constitutes at the same time a reference to the Annex.

3 Nothing in this Convention shall be interpreted as preventing a Party from taking, individually or

jointly with other Parties, more stringent measures with respect to the prevention, reduction or elimination of the transfer of Harmful Aquatic Organisms and Pathogens through the control and management of ships' Ballast Water and Sediments, consistent with international law.

4 Parties shall endeavour to co-operate for the purpose of effective implementation, compliance and enforcement of this Convention.

5 Parties undertake to encourage the continued development of Ballast Water Management and standards to prevent, minimize and ultimately eliminate the transfer of Harmful Aquatic Organisms and Pathogens through the control and management of ships' Ballast Water and Sediments.

6 Parties taking action pursuant to this Convention shall endeavour not to impair or damage their environment, human health, property or resources, or those of other States.

7 Parties should ensure that Ballast Water Management practices used to comply with this Convention do not cause greater harm than they prevent to their environment, human health, property or resources, or those of other States.

8 Parties shall encourage ships entitled to fly their flag, and to which this Convention applies, to avoid, as far as practicable, the uptake of Ballast Water with potentially Harmful Aquatic Organisms and Pathogens, as well as Sediments that may contain such organisms, including promoting the adequate implementation of recommendations developed by the Organization.

9 Parties shall endeavour to co-operate under the auspices of the Organization to address threats and risks to sensitive, vulnerable or threatened marine ecosystems and biodiversity in areas beyond the limits of national jurisdiction in relation to Ballast Water Management.

Article 3 *Application*

1 Except as expressly provided otherwise in this Convention, this Convention shall apply to:

- (a) ships entitled to fly the flag of a Party; and
- (b) ships not entitled to fly the flag of a Party but which operate under the authority of a Party.

2 This Convention shall not apply to:

- (a) ships not designed or constructed to carry Ballast Water;
- (b) ships of a Party which only operate in waters under the jurisdiction of that Party, unless the Party determines that the discharge of Ballast Water from such ships would impair or damage their environment, human health, property or resources, or those of adjacent or other States;
- (c) ships of a Party which only operate in waters under the jurisdiction of another Party, subject to the authorization of the latter Party for such exclusion. No Party shall grant such authorization if doing so would impair or damage their environment, human health, property or resources, or those of adjacent or other States. Any Party not granting such authorization shall notify the Administration of the ship concerned that this Convention applies to such ship;
- (d) ships which only operate in waters under the jurisdiction of one Party and on the high seas, except for ships not granted an authorization pursuant to sub-paragraph (c), unless such Party determines that the discharge of Ballast Water from such ships would impair or damage their environment, human health, property or resources, or those of adjacent or other States;

- (e) any warship, naval auxiliary or other ship owned or operated by a State and used, for the time being, only on government non-commercial service. However, each Party shall ensure, by the adoption of appropriate measures not impairing operations or operational capabilities of such ships owned or operated by it, that such ships act in a manner consistent, so far as is reasonable and practicable, with this Convention; and
- (f) permanent Ballast Water in sealed tanks on ships, that is not subject to discharge.

3 With respect to ships of non-Parties to this Convention, Parties shall apply the requirements of this Convention as may be necessary to ensure that no more favourable treatment is given to such ships.

Article 4 *Control of the Transfer of Harmful Aquatic Organisms and Pathogens Through Ships' Ballast Water and Sediments*

1 Each Party shall require that ships to which this Convention applies and which are entitled to fly its flag or operating under its authority comply with the requirements set forth in this Convention, including the applicable standards and requirements in the Annex, and shall take effective measures to ensure that those ships comply with those requirements.

2 Each Party shall, with due regard to its particular conditions and capabilities, develop national policies, strategies or programmes for Ballast Water Management in its ports and waters under its jurisdiction that accord with, and promote the attainment of the objectives of this Convention.

Article 5 *Sediment Reception Facilities*

1 Each Party undertakes to ensure that, in ports and terminals designated by that Party where cleaning or repair of ballast tanks occurs, adequate facilities are provided for the reception of Sediments, taking into account the Guidelines developed by the Organization. Such reception facilities shall operate without causing undue delay to ships and shall provide for the safe disposal of such Sediments that does not impair or damage their environment, human health, property or resources or those of other States.

2 Each Party shall notify the Organization for transmission to the other Parties concerned of all cases where the facilities provided under paragraph 1 are alleged to be inadequate.

Article 6 *Scientific and Technical Research and Monitoring*

1 Parties shall endeavour, individually or jointly, to:

- (a) promote and facilitate scientific and technical research on Ballast Water Management; and
- (b) monitor the effects of Ballast Water Management in waters under their jurisdiction.

Such research and monitoring should include observation, measurement, sampling, evaluation and analysis of the effectiveness and adverse impacts of any technology or methodology as well as any adverse impacts caused by such organisms and pathogens that have been identified to have been transferred through ships' Ballast Water.

2 Each Party shall, to further the objectives of this Convention, promote the availability of relevant information to other Parties who request it on:

- (a) scientific and technology programmes and technical measures undertaken with respect to Ballast Water Management; and
- (b) the effectiveness of Ballast Water Management deduced from any monitoring and assessment programmes.

Article 7 *Survey and certification*

1 Each Party shall ensure that ships flying its flag or operating under its authority and subject to survey and certification are so surveyed and certified in accordance with the regulations in the Annex.

2 A Party implementing measures pursuant to Article 2.3 and Section C of the Annex shall not require additional survey and certification of a ship of another Party, nor shall the Administration of the ship be obligated to survey and certify additional measures imposed by another Party. Verification of such additional measures shall be the responsibility of the Party implementing such measures and shall not cause undue delay to the ship.

Article 8 *Violations*

1 Any violation of the requirements of this Convention shall be prohibited and sanctions shall be established under the law of the Administration of the ship concerned, wherever the violation occurs. If the Administration is informed of such a violation, it shall investigate the matter and may request the reporting Party to furnish additional evidence of the alleged violation. If the Administration is satisfied that sufficient evidence is available to enable proceedings to be brought in respect of the alleged violation, it shall cause such proceedings to be taken as soon as possible, in accordance with its law. The Administration shall promptly inform the Party that reported the alleged violation, as well as the Organization, of any action taken. If the Administration has not taken any action within 1 year after receiving the information, it shall so inform the Party which reported the alleged violation.

2 Any violation of the requirements of this Convention within the jurisdiction of any Party shall be prohibited and sanctions shall be established under the law of that Party. Whenever such a violation occurs, that Party shall either:

- (a) cause proceedings to be taken in accordance with its law; or
- (b) furnish to the Administration of the ship such information and evidence as may be in its possession that a violation has occurred.

3 The sanctions provided for by the laws of a Party pursuant to this Article shall be adequate in severity to discourage violations of this Convention wherever they occur.

Article 9 *Inspection of Ships*

1 A ship to which this Convention applies may, in any port or offshore terminal of another Party, be subject to inspection by officers duly authorized by that Party for the purpose of determining whether the ship is in compliance with this Convention. Except as provided in paragraph 2 of this Article, any such inspection is limited to:

- (a) verifying that there is onboard a valid Certificate, which, if valid shall be accepted; and
- (b) inspection of the Ballast Water record book, and/or
- (c) a sampling of the ship's Ballast Water, carried out in accordance with the guidelines to be developed by the Organization. However, the time required to analyse the samples shall not be used as a basis for unduly delaying the operation, movement or departure of the ship.

2 Where a ship does not carry a valid Certificate or there are clear grounds for believing that:

- (a) the condition of the ship or its equipment does not correspond substantially with the particulars of the Certificate; or
- (b) the master or the crew are not familiar with essential shipboard procedures relating to Ballast Water Management, or have not implemented such procedures;

a detailed inspection may be carried out.

1 In the circumstances given in paragraph 2 of this Article, the Party carrying out the inspection shall take such steps as will ensure that the ship shall not discharge Ballast Water until it can do so without presenting a threat of harm to the environment, human health, property or resources.

Article 10 *Detection of Violations and Control of Ships*

1 Parties shall co-operate in the detection of violations and the enforcement of the provisions of this Convention.

2 If a ship is detected to have violated this Convention, the Party whose flag the ship is entitled to fly, and/or the Party in whose port or offshore terminal the ship is operating, may, in addition to any sanctions described in Article 8 or any action described in Article 9, take steps to warn, detain, or exclude the ship. The Party in whose port or offshore terminal the ship is operating, however, may grant such a ship permission to leave the port or offshore terminal for the purpose of discharging Ballast Water or proceeding to the nearest appropriate repair yard or reception facility available, provided doing so does not present a threat of harm to the environment, human health, property or resources.

3 If the sampling described in Article 9.1(c) leads to a result, or supports information received from another port or offshore terminal, indicating that the ship poses a threat to the environment, human health, property or resources, the Party in whose waters the ship is operating shall prohibit such ship from discharging Ballast Water until the threat is removed.

4 A Party may also inspect a ship when it enters the ports or offshore terminals under its jurisdiction, if a request for an investigation is received from any Party, together with sufficient evidence that a ship is operating or has operated in violation of a provision in this Convention. The report of such investigation shall be sent to the Party requesting it and to the competent authority of the Administration of the ship concerned so that appropriate action may be taken.

Article 11 *Notification of Control Actions*

1 If an inspection conducted pursuant to Article 9 or 10 indicates a violation of this Convention, the ship shall be notified. A report shall be forwarded to the Administration, including any evidence of the violation.

2 In the event that any action is taken pursuant to Article 9.3, 10.2 or 10.3, the officer carrying out such action shall forthwith inform, in writing, the Administration of the ship concerned, or if this is not possible, the consul or diplomatic representative of the ship concerned, of all the circumstances in which the action was deemed necessary. In addition, the recognized organization responsible for the issue of certificates shall be notified.

3 The port State authority concerned shall, in addition to parties mentioned in paragraph 2, notify the next port of call of all relevant information about the violation, if it is unable to take action as specified in Article 9.3, 10.2 or 10.3 or if the ship has been allowed to proceed to the next port of call.

Article 12 *Undue Delay to Ships*

1 All possible efforts shall be made to avoid a ship being unduly detained or delayed under Article 7.2, 8, 9 or 10.

2 When a ship is unduly detained or delayed under Article 7.2, 8, 9 or 10, it shall be entitled to compensation for any loss or damage suffered.

Article 13 *Technical Assistance, Co-operation and Regional Co-operation*

1 Parties undertake, directly or through the Organization and other international bodies, as appropri-

ate, in respect of the control and management of ships' Ballast Water and Sediments, to provide support for those Parties which request technical assistance:

- (a) to train personnel;
- (b) to ensure the availability of relevant technology, equipment and facilities;
- (c) to initiate joint research and development programmes; and
- (d) to undertake other action aimed at the effective implementation of this Convention and of guidance developed by the Organization related thereto.

2 Parties undertake to co-operate actively, subject to their national laws, regulations and policies, in the transfer of technology in respect of the control and management of ships' Ballast Water and Sediments.

3 In order to further the objectives of this Convention, Parties with common interests to protect the environment, human health, property and resources in a given geographical area, in particular, those Parties bordering enclosed and semi-enclosed seas, shall endeavour, taking into account characteristic regional features, to enhance regional co-operation, including through the conclusion of regional agreements consistent with this Convention. Parties shall seek to co-operate with the Parties to regional agreements to develop harmonized procedures.

Article 14 *Communication of information*

1 Each Party shall report to the Organization and, where appropriate, make available to other Parties the following information:

- (a) any requirements and procedures relating to Ballast Water Management, including its laws, regulations, and guidelines for implementation of this Convention;
- (b) the availability and location of any reception facilities for the environmentally safe disposal of Ballast Water and Sediments; and
- (c) any requirements for information from a ship which is unable to comply with the provisions of this Convention for reasons specified in regulations A-3 and B-4 of the Annex.

2 The Organization shall notify Parties of the receipt of any communications under the present Article and circulate to all Parties any information communicated to it under subparagraphs 1(b) and (c) of this Article.

Article 15 *Dispute Settlement*

Parties shall settle any dispute between them concerning the interpretation or application of this Convention by negotiation, enquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements or other peaceful means of their own choice.

Article 16 *Relationship to International Law and Other Agreements*

Nothing in this Convention shall prejudice the rights and obligations of any State under customary international law as reflected in the United Nations Convention on the Law of the Sea.

Article 17 *Signature, Ratification, Acceptance, Approval and Accession*

1 This Convention shall be open for signature by any State at the Headquarters of the Organization from 1 June 2004 to 31 May 2005 and shall thereafter remain open for accession by any State.

- 2 States may become Parties to the Convention by:
- (a) signature not subject to ratification, acceptance, or approval; or
 - (b) signature subject to ratification, acceptance, or approval, followed by ratification, acceptance or approval; or
 - (c) accession.
- 3 Ratification, acceptance, approval or accession shall be effected by the deposit of an instrument to that effect with the Secretary-General.
- 4 If a State comprises two or more territorial units in which different systems of law are applicable in relation to matters dealt with in this Convention, it may at the time of signature, ratification, acceptance, approval, or accession declare that this Convention shall extend to all its territorial units or only to one or more of them and may modify this declaration by submitting another declaration at any time.
- 5 Any such declaration shall be notified to the Depositary in writing and shall state expressly the territorial unit or units to which this Convention applies.

Article 18 *Entry into Force*

- 1 This Convention shall enter into force twelve months after the date on which not less than thirty States, the combined merchant fleets of which constitute not less than thirty-five percent of the gross tonnage of the world's merchant shipping, have either signed it without reservation as to ratification, acceptance or approval, or have deposited the requisite instrument of ratification, acceptance, approval or accession in accordance with Article 17.
- 2 For States which have deposited an instrument of ratification, acceptance, approval or accession in respect of this Convention after the requirements for entry into force thereof have been met, but prior to the date of entry in force, the ratification, acceptance, approval or accession shall take effect on the date of entry into force of this Convention or three months after the date of deposit of instrument, whichever is the later date.
- 3 Any instrument of ratification, acceptance, approval or accession deposited after the date on which this Convention enters into force shall take effect three months after the date of deposit.
- 4 After the date on which an amendment to this Convention is deemed to have been accepted under Article 19, any instrument of ratification, acceptance, approval or accession deposited shall apply to this Convention as amended.

Article 19 *Amendments*

- 1 This Convention may be amended by either of the procedures specified in the following paragraphs.
- 2 Amendments after consideration within the Organization:
- (a) Any Party may propose an amendment to this Convention. A proposed amendment shall be submitted to the Secretary-General, who shall then circulate it to the Parties and Members of the Organization at least six months prior to its consideration.
 - (b) An amendment proposed and circulated as above shall be referred to the Committee for consideration. Parties, whether or not Members of the Organization, shall be entitled to participate in the proceedings of the Committee for consideration and adoption of the amendment.

- (c) Amendments shall be adopted by a two-thirds majority of the Parties present and voting in the Committee, on condition that at least one-third of the Parties shall be present at the time of voting.
- (d) Amendments adopted in accordance with subparagraph (c) shall be communicated by the Secretary-General to the Parties for acceptance.
- (e) An amendment shall be deemed to have been accepted in the following circumstances:
 - (i) An amendment to an article of this Convention shall be deemed to have been accepted on the date on which two-thirds of the Parties have notified the Secretary-General of their acceptance of it.
 - (ii) An amendment to the Annex shall be deemed to have been accepted at the end of twelve months after the date of adoption or such other date as determined by the Committee. However, if by that date more than one-third of the Parties notify the Secretary-General that they object to the amendment, it shall be deemed not to have been accepted.
- (f) An amendment shall enter into force under the following conditions:
 - (i) An amendment to an article of this Convention shall enter into force for those Parties that have declared that they have accepted it six months after the date on which it is deemed to have been accepted in accordance with subparagraph (e)(i).
 - (ii) An amendment to the Annex shall enter into force with respect to all Parties six months after the date on which it is deemed to have been accepted, except for any Party that has:
 - (1) notified its objection to the amendment in accordance with subparagraph (e)(ii) and that has not withdrawn such objection; or
 - (2) notified the Secretary-General, prior to the entry into force of such amendment, that the amendment shall enter into force for it only after a subsequent notification of its acceptance.
- (g)
 - (i) A Party that has notified an objection under subparagraph (f)(ii)(1) may subsequently notify the Secretary-General that it accepts the amendment. Such amendment shall enter into force for such Party six months after the date of its notification of acceptance, or the date on which the amendment enters into force, whichever is the later date.
 - (ii) If a Party that has made a notification referred to in subparagraph (f)(ii)(2) notifies the Secretary-General of its acceptance with respect to an amendment, such amendment shall enter into force for such Party six months after the date of its notification of acceptance, or the date on which the amendment enters into force, whichever is the later date.

3 Amendment by a Conference:

- (a) Upon the request of a Party concurred in by at least one-third of the Parties, the Organization shall convene a Conference of Parties to consider amendments to this Convention.
- (b) An amendment adopted by such a Conference by a two-thirds majority of the Parties present and voting shall be communicated by the Secretary-General to all Parties for acceptance.

- (c) Unless the Conference decides otherwise, the amendment shall be deemed to have been accepted and shall enter into force in accordance with the procedures specified in paragraphs 2(e) and (f) respectively.

4 Any Party that has declined to accept an amendment to the Annex shall be treated as a non-Party only for the purpose of application of that amendment.

5 Any notification under this Article shall be made in writing to the Secretary-General.

6 The Secretary-General shall inform the Parties and Members of the Organization of:

- (a) any amendment that enters into force and the date of its entry into force generally and for each Party; and
- (b) any notification made under this Article.

Article 20 *Denunciation*

1 This Convention may be denounced by any Party at any time after the expiry of two years from the date on which this Convention enters into force for that Party.

2 Denunciation shall be effected by written notification to the Depositary, to take effect one year after receipt or such longer period as may be specified in that notification.

Article 21 *Depositary*

1 This Convention shall be deposited with the Secretary-General, who shall transmit certified copies of this Convention to all States which have signed this Convention or acceded thereto.

2 In addition to the functions specified elsewhere in this Convention, the Secretary-General shall:

- (a) inform all States that have signed this Convention, or acceded thereto, of:
 - (i) each new signature or deposit of an instrument of ratification, acceptance, approval or accession, together with the date thereof;
 - (ii) the date of entry into force of this Convention; and
 - (iii) the deposit of any instrument of denunciation from the Convention, together with the date on which it was received and the date on which the denunciation takes effect; and
- (b) as soon as this Convention enters into force, transmit the text thereof to the Secretariat of the United Nations for registration and publication in accordance with Article 102 of the Charter of the United Nations.

Article 22 *Languages*

This Convention is established in a single original in the Arabic, Chinese, English, French, Russian and Spanish languages, each text being equally authentic.

DONE AT LONDON this thirteenth day of February, two thousand and four.

IN WITNESS WHEREOF the undersigned, being duly authorised by their respective Governments for that purpose, have signed this Convention.

ANNEX

REGULATIONS FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS

SECTION A - GENERAL PROVISIONS

Regulation A-1 *Definitions*

For the purposes of this Annex:

- 1 "Anniversary date" means the day and the month of each year corresponding to the date of expiry of the Certificate.
- 2 "Ballast Water Capacity" means the total volumetric capacity of any tanks, spaces or compartments on a ship used for carrying, loading or discharging Ballast Water, including any multi-use tank, space or compartment designed to allow carriage of Ballast Water.
- 3 "Company" means the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the owner of the ship and who on assuming such responsibility has agreed to take over all the duties and responsibilities imposed by the International Safety Management Code¹.
- 4 "Constructed" in respect of a ship means a stage of construction where:
 - .1 the keel is laid; or
 - .2 construction identifiable with the specific ship begins;
 - .3 assembly of the ship has commenced comprising at least 50 tonnes or 1 percent of the estimated mass of all structural material, whichever is less; or
 - .4 the ship undergoes a major conversion.
- 5 "Major conversion" means a conversion of a ship:
 - .1 which changes its ballast water carrying capacity by 15 percent or greater, or
 - .2 which changes the ship type, or
 - .3 which, in the opinion of the Administration, is projected to prolong its life by ten years or more, or
 - .4 which results in modifications to its ballast water system other than component replacement-in-kind. Conversion of a ship to meet the provisions of regulation D-1 shall not be deemed to constitute a major conversion for the purpose of this Annex.
- 6 "From the nearest land" means from the baseline from which the territorial sea of the territory in question is established in accordance with international law except that, for the purposes of the Convention, "from the nearest land" off the north-eastern coast of Australia shall mean from a line drawn from a point on the coast of Australia in

latitude 11°00' S, longitude 142°08' E

¹ Refer to the ISM Code adopted by the Organization by resolution A.741(18), as amended.

to a point in latitude 10°35' S, longitude 141°55' E
 thence to a point latitude 10°00' S, longitude 142°00' E
 thence to a point latitude 9°10' S, longitude 143°52' E
 thence to a point latitude 9°00' S, longitude 144°30' E
 thence to a point latitude 10°41' S, longitude 145°00' E
 thence to a point latitude 13°00' S, longitude 145°00' E
 thence to a point latitude 15°00' S, longitude 146°00' E
 thence to a point latitude 17°30' S, longitude 147°00' E
 thence to a point latitude 21°00' S, longitude 152°55' E
 thence to a point latitude 24°30' S, longitude 154°00' E
 thence to a point on the coast of Australia
 in latitude 24°42' S, longitude 153°15' E.

7 “Active Substance” means a substance or organism, including a virus or a fungus, that has a general or specific action on or against Harmful Aquatic Organisms and Pathogens.

Regulation A-2 *General Applicability*

Except where expressly provided otherwise, the discharge of Ballast Water shall only be conducted through Ballast Water Management in accordance with the provisions of this Annex.

Regulation A-3 *Exceptions*

The requirements of regulation B-3, or any measures adopted by a Party pursuant to Article 2.3 and Section C, shall not apply to:

- 1 the uptake or discharge of Ballast Water and Sediments necessary for the purpose of ensuring the safety of a ship in emergency situations or saving life at sea; or
- 2 the accidental discharge or ingress of Ballast Water and Sediments resulting from damage to a ship or its equipment:
 - .1 provided that all reasonable precautions have been taken before and after the occurrence of the damage or discovery of the damage or discharge for the purpose of preventing or minimizing the discharge; and
 - .2 unless the owner, Company or officer in charge wilfully or recklessly caused damage; or
- 3 the uptake and discharge of Ballast Water and Sediments when being used for the purpose of avoiding or minimizing pollution incidents from the ship; or
- 4 the uptake and subsequent discharge on the high seas of the same Ballast Water and Sediments; or
- 5 the discharge of Ballast Water and Sediments from a ship at the same location where the whole of that Ballast Water and those Sediments originated and provided that no mixing with unmanaged Ballast Water and Sediments from other areas has occurred. If mixing has occurred, the Ballast Water taken from other areas is subject to Ballast Water Management in accordance with this Annex.

Regulation A-4 *Exemptions*

- 1 A Party or Parties, in waters under their jurisdiction, may grant exemptions to any requirements to apply regulations B-3 or C-1, in addition to those exemptions contained elsewhere in this Convention, but only when they are:
 - .1 granted to a ship or ships on a voyage or voyages between specified ports or locations; or to a ship which operates exclusively between specified ports or locations;

- .2 effective for a period of no more than five years subject to intermediate review;
- .3 granted to ships that do not mix Ballast Water or Sediments other than between the ports or locations specified in paragraph 1.1; and
- .4 granted based on the Guidelines on risk assessment developed by the Organization.

2 Exemptions granted pursuant to paragraph 1 shall not be effective until after communication to the Organization and circulation of relevant information to the Parties.

3 Any exemptions granted under this regulation shall not impair or damage the environment, human health, property or resources of adjacent or other States. Any State that the Party determines may be adversely affected shall be consulted, with a view to resolving any identified concerns.

4 Any exemptions granted under this regulation shall be recorded in the Ballast Water record book.

Regulation A-5 *Equivalent compliance*

Equivalent compliance with this Annex for pleasure craft used solely for recreation or competition or craft used primarily for search and rescue, less than 50 metres in length overall, and with a maximum Ballast Water capacity of 8 cubic metres, shall be determined by the Administration taking into account Guidelines developed by the Organization.

SECTION B - MANAGEMENT AND CONTROL REQUIREMENTS FOR SHIPS

Regulation B-1 *Ballast Water Management Plan*

Each ship shall have on board and implement a Ballast Water Management plan. Such a plan shall be approved by the Administration taking into account Guidelines developed by the Organization. The Ballast Water Management plan shall be specific to each ship and shall at least:

- 1 detail safety procedures for the ship and the crew associated with Ballast Water Management as required by this Convention;
- 2 provide a detailed description of the actions to be taken to implement the Ballast Water Management requirements and supplemental Ballast Water Management practices as set forth in this Convention;
- 3 detail the procedures for the disposal of Sediments:
 - .1 at sea; and
 - .2 to shore;
- 4 include the procedures for coordinating shipboard Ballast Water Management that involves discharge to the sea with the authorities of the State into whose waters such discharge will take place;
- 5 designate the officer on board in charge of ensuring that the plan is properly implemented;
- 6 contain the reporting requirements for ships provided for under this Convention; and
- 7 be written in the working language of the ship. If the language used is not English, French or Spanish, a translation into one of these languages shall be included.

Regulation B-2 *Ballast Water Record Book*

- 1 Each ship shall have on board a Ballast Water record book that may be an electronic record system,

or that may be integrated into another record book or system and, which shall at least contain the information specified in Appendix II.

2 Ballast Water record book entries shall be maintained on board the ship for a minimum period of two years after the last entry has been made and thereafter in the Company's control for a minimum period of three years.

3 In the event of the discharge of Ballast Water pursuant to regulations A-3, A-4 or B-3.6 or in the event of other accidental or exceptional discharge of Ballast Water not otherwise exempted by this Convention, an entry shall be made in the Ballast Water record book describing the circumstances of, and the reason for, the discharge.

4 The Ballast Water record book shall be kept readily available for inspection at all reasonable times and, in the case of an unmanned ship under tow, may be kept on the towing ship.

5 Each operation concerning Ballast Water shall be fully recorded without delay in the Ballast Water record book. Each entry shall be signed by the officer in charge of the operation concerned and each completed page shall be signed by the master. The entries in the Ballast Water record book shall be in a working language of the ship. If that language is not English, French or Spanish the entries shall contain a translation into one of those languages. When entries in an official national language of the State whose flag the ship is entitled to fly are also used, these shall prevail in case of a dispute or discrepancy.

6 Officers duly authorized by a Party may inspect the Ballast Water record book on board any ship to which this regulation applies while the ship is in its port or offshore terminal, and may make a copy of any entry, and require the master to certify that the copy is a true copy. Any copy so certified shall be admissible in any judicial proceeding as evidence of the facts stated in the entry. The inspection of a Ballast Water record book and the taking of a certified copy shall be performed as expeditiously as possible without causing the ship to be unduly delayed.

Regulation B-3 *Ballast Water Management for Ships*

1 A ship constructed before 2009:

- .1 with a Ballast Water Capacity of between 1,500 and 5,000 cubic metres, inclusive, shall conduct Ballast Water Management that at least meets the standard described in regulation D-1 or regulation D-2 until 2014, after which time it shall at least meet the standard described in regulation D-2;
- .2 with a Ballast Water Capacity of less than 1,500 or greater than 5,000 cubic metres shall conduct Ballast Water Management that at least meets the standard described in regulation D-1 or regulation D-2 until 2016, after which time it shall at least meet the standard described in regulation D-2.

2 A ship to which paragraph 1 applies shall comply with paragraph 1 not later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date of delivery of the ship in the year of compliance with the standard applicable to the ship.

3 A ship constructed in or after 2009 with a Ballast Water Capacity of less than 5,000 cubic metres shall conduct Ballast Water Management that at least meets the standard described in regulation D-2.

4 A ship constructed in or after 2009, but before 2012, with a Ballast Water Capacity of 5,000 cubic metres or more shall conduct Ballast Water Management in accordance with paragraph 1.2.

5 A ship constructed in or after 2012 with a Ballast Water Capacity of 5000 cubic metres or more shall conduct Ballast Water Management that at least meets the standard described in regulation D-2.

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

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

Regulation B-4 *Ballast Water Exchange*

- 1 A ship conducting Ballast Water exchange to meet the standard in regulation D-1 shall:
 - .1 whenever possible, conduct such Ballast Water exchange at least 200 nautical miles from the nearest land and in water at least 200 metres in depth, taking into account the Guidelines developed by the Organization;
 - .2 in cases where the ship is unable to conduct Ballast Water exchange in accordance with paragraph 1.1, such Ballast Water exchange shall be conducted taking into account the Guidelines described in paragraph 1.1 and as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 metres in depth.

2 In sea areas where the distance from the nearest land or the depth does not meet the parameters described in paragraph 1.1 or 1.2, the port State may designate areas, in consultation with adjacent or other States, as appropriate, where a ship may conduct Ballast Water exchange, taking into account the Guidelines described in paragraph 1.1.

3 A ship shall not be required to deviate from its intended voyage, or delay the voyage, in order to comply with any particular requirement of paragraph 1.

4 A ship conducting Ballast Water exchange shall not be required to comply with paragraphs 1 or 2, as appropriate, if the master reasonably decides that such exchange would threaten the safety or stability of the ship, its crew, or its passengers because of adverse weather, ship design or stress, equipment failure, or any other extraordinary condition.

5 When a ship is required to conduct Ballast Water exchange and does not do so in accordance with this regulation, the reasons shall be entered in the Ballast Water record book.

Regulation B-5 *Sediment Management for Ships*

1 All ships shall remove and dispose of Sediments from spaces designated to carry Ballast Water in accordance with the provisions of the ship's Ballast Water Management plan.

2 Ships described in regulation B-3.3 to B-3.5 should, without compromising safety or operational efficiency, be designed and constructed with a view to minimize the uptake and undesirable entrapment of Sediments, facilitate removal of Sediments, and provide safe access to allow for Sediment removal and sampling, taking into account guidelines developed by the Organization. Ships described in regulation B-3.1 should, to the extent practicable, comply with this paragraph.

Regulation B-6 *Duties of Officers and Crew*

Officers and crew shall be familiar with their duties in the implementation of Ballast Water Management particular to the ship on which they serve and shall, appropriate to their duties, be familiar with the ship's Ballast Water Management plan.

SECTION C - SPECIAL REQUIREMENTS IN CERTAIN AREAS

Regulation C-1 *Additional Measures*

1 If a Party, individually or jointly with other Parties, determines that measures in addition to those in Section B are necessary to prevent, reduce, or eliminate the transfer of Harmful Aquatic Organisms and Pathogens through ships' Ballast Water and Sediments, such Party or Parties may, consistent with international law, require ships to meet a specified standard or requirement.

2 Prior to establishing standards or requirements under paragraph 1, a Party or Parties should consult with adjacent or other States that may be affected by such standards or requirements.

3 A Party or Parties intending to introduce additional measures in accordance with paragraph 1 shall:

- .1 take into account the Guidelines developed by the Organization.
- .2 communicate their intention to establish additional measure(s) to the Organization at least 6 months, except in emergency or epidemic situations, prior to the projected date of implementation of the measure(s). Such communication shall include:
 - .1 the precise co-ordinates where additional measure(s) is/are applicable;
 - .2 the need and reasoning for the application of the additional measure(s), including, whenever possible, benefits;
 - .3 a description of the additional measure(s); and
 - .4 any arrangements that may be provided to facilitate ships' compliance with the additional measure(s).
- .3 to the extent required by customary international law as reflected in the United Nations Convention on the Law of the Sea, as appropriate, obtain the approval of the Organization.

4 A Party or Parties, in introducing such additional measures, shall endeavour to make available all appropriate services, which may include but are not limited to notification to mariners of areas, available and alternative routes or ports, as far as practicable, in order to ease the burden on the ship.

5 Any additional measures adopted by a Party or Parties shall not compromise the safety and security of the ship and in any circumstances not conflict with any other convention with which the ship must comply.

6 A Party or Parties introducing additional measures may waive these measures for a period of time or in specific circumstances as they deem fit.

Regulation C-2 *Warnings Concerning Ballast Water Uptake in Certain Areas and Related Flag State Measures*

1 A Party shall endeavour to notify mariners of areas under their jurisdiction where ships should not uptake Ballast Water due to known conditions. The Party shall include in such notices the precise coordinates of the area or areas, and, where possible, the location of any alternative area or areas for the uptake of Ballast Water. Warnings may be issued for areas:

- .1 known to contain outbreaks, infestations, or populations of Harmful Aquatic Organisms and Pathogens (e.g., toxic algal blooms) which are likely to be of relevance to Ballast Water uptake or discharge;

- .2 near sewage outfalls; or
- .3 where tidal flushing is poor or times during which a tidal stream is known to be more turbid.

2 In addition to notifying mariners of areas in accordance with the provisions of paragraph 1, a Party shall notify the Organization and any potentially affected coastal States of any areas identified in paragraph 1 and the time period such warning is likely to be in effect. The notice to the Organization and any potentially affected coastal States shall include the precise coordinates of the area or areas, and, where possible, the location of any alternative area or areas for the uptake of Ballast Water. The notice shall include advice to ships needing to uptake Ballast Water in the area, describing arrangements made for alternative supplies. The Party shall also notify mariners, the Organization, and any potentially affected coastal States when a given warning is no longer applicable.

Regulation C-3 *Communication of Information*

The Organization shall make available, through any appropriate means, information communicated to it under regulations C-1 and C-2.

SECTION D - STANDARDS FOR BALLAST WATER MANAGEMENT

Regulation D-1 *Ballast Water Exchange Standard*

1 Ships performing Ballast Water exchange in accordance with this regulation shall do so with an efficiency of at least 95 percent volumetric exchange of Ballast Water.

2 For ships exchanging Ballast Water by the pumping-through method, pumping through three times the volume of each Ballast Water tank shall be considered to meet the standard described in paragraph 1. Pumping through less than three times the volume may be accepted provided the ship can demonstrate that at least 95 percent volumetric exchange is met.

Regulation D-2 *Ballast Water Performance Standard*

1 Ships conducting Ballast Water Management in accordance with this regulation shall discharge less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension and less than 10 viable organisms per millilitre less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension; and discharge of the indicator microbes shall not exceed the specified concentrations described in paragraph 2.

2 Indicator microbes, as a human health standard, shall include:

- .1 Toxicogenic *Vibrio cholerae* (O1 and O139) with less than 1 colony forming unit (cfu) per 100 millilitres or less than 1 cfu per 1 gram (wet weight) zooplankton samples;
- .2 *Escherichia coli* less than 250 cfu per 100 millilitres;
- .3 Intestinal Enterococci less than 100 cfu per 100 milliliters.

Regulation D-3 *Approval requirements for Ballast Water Management systems*

1 Except as specified in paragraph 2, Ballast Water Management systems used to comply with this Convention must be approved by the Administration taking into account Guidelines developed by the Organization.

2 Ballast Water Management systems which make use of Active Substances or preparations containing one or more Active Substances to comply with this Convention shall be approved by the Organization, based on a procedure developed by the Organization. This procedure shall describe the approval and withdrawal of approval of Active Substances and their proposed manner of application. At withdrawal of approval, the use of the relevant Active Substance or Substances shall be prohibited within 1 year after the date of such withdrawal.

3 Ballast Water Management systems used to comply with this Convention must be safe in terms of the ship, its equipment and the crew.

Regulation D-4 *Prototype Ballast Water Treatment Technologies*

1 For any ship that, prior to the date that the standard in regulation D-2 would otherwise become effective for it, participates in a programme approved by the Administration to test and evaluate promising Ballast Water treatment technologies, the standard in regulation D-2 shall not apply to that ship until five years from the date on which the ship would otherwise be required to comply with such standard.

2 For any ship that, after the date on which the standard in regulation D-2 has become effective for it, participates in a programme approved by the Administration, taking into account Guidelines developed by the Organization, to test and evaluate promising Ballast Water technologies with the potential to result in treatment technologies achieving a standard higher than that in regulation D-2, the standard in regulation D-2 shall cease to apply to that ship for five years from the date of installation of such technology.

3 In establishing and carrying out any programme to test and evaluate promising Ballast Water technologies, Parties shall:

- .1 take into account Guidelines developed by the Organization, and
- .2 allow participation only by the minimum number of ships necessary to effectively test such technologies.

4 Throughout the test and evaluation period, the treatment system must be operated consistently and as designed.

Regulation D-5 *Review of Standards by the Organization*

1 At a meeting of the Committee held no later than three years before the earliest effective date of the standard set forth in regulation D-2, the Committee shall undertake a review which includes a determination of whether appropriate technologies are available to achieve the standard, an assessment of the criteria in paragraph 2, and an assessment of the socio-economic effect(s) specifically in relation to the developmental needs of developing countries, particularly small island developing States. The Committee shall also undertake periodic reviews, as appropriate, to examine the applicable requirements for ships described in regulation B-3.1 as well as any other aspect of Ballast Water Management addressed in this Annex, including any Guidelines developed by the Organization.

2 Such reviews of appropriate technologies shall also take into account:

- .1 safety considerations relating to the ship and the crew;
- .2 environmental acceptability, i.e., not causing more or greater environmental impacts than they solve;
- .3 practicability, i.e., compatibility with ship design and operations;
- .4 cost effectiveness, i.e., economics; and
- .5 biological effectiveness in terms of removing, or otherwise rendering not viable, Harmful Aquatic Organisms and Pathogens in Ballast Water.

3 The Committee may form a group or groups to conduct the review(s) described in paragraph 1. The Committee shall determine the composition, terms of reference and specific issues to be addressed by any such group formed. Such groups may develop and recommend proposals for amendment of this Annex for consideration by the Parties. Only Parties may participate in the formulation of recommendations and amendment decisions taken by the Committee.

4 If, based on the reviews described in this regulation, the Parties decide to adopt amendments to this Annex, such amendments shall be adopted and enter into force in accordance with the procedures contained in Article 19 of this Convention.

SECTION E - SURVEY AND CERTIFICATION REQUIREMENTS FOR BALLAST WATER MANAGEMENT

Regulation E-1 *Surveys*

1 Ships of 400 gross tonnage and above to which this Convention applies, excluding floating platforms, FSUs and FPSOs, shall be subject to surveys specified below:

- .1 An initial survey before the ship is put in service or before the Certificate required under regulation E-2 or E-3 is issued for the first time. This survey shall verify that the Ballast Water Management plan required by regulation B-1 and any associated structure, equipment, systems, fitting, arrangements and material or processes comply fully with the requirements of this Convention.
- .2 A renewal survey at intervals specified by the Administration, but not exceeding five years, except where regulation E-5.2, E-5.5, E-5.6, or E-5.7 is applicable. This survey shall verify that the Ballast Water Management plan required by regulation B-1 and any associated structure, equipment, systems, fitting, arrangements and material or processes comply fully with the applicable requirements of this Convention.
- .3 An intermediate survey within three months before or after the second Anniversary date or within three months before or after the third Anniversary date of the Certificate, which shall take the place of one of the annual surveys specified in paragraph 1.4. The intermediate surveys shall ensure that the equipment, associated systems and processes for Ballast Water Management fully comply with the applicable requirements of this Annex and are in good working order. Such intermediate surveys shall be endorsed on the Certificate issued under regulation E-2 or E-3.
- .4 An annual survey within three months before or after each Anniversary date, including a general inspection of the structure, any equipment, systems, fittings, arrangements and material or processes associated with the Ballast Water Management plan required by regulation B-1 to ensure that they have been maintained in accordance with paragraph 9 and remain satisfactory for the service for which the ship is intended. Such annual surveys shall be endorsed on the Certificate issued under regulation E-2 or E-3.
- .5 An additional survey either general or partial, according to the circumstances, shall be made after a change, replacement, or significant repair of the structure, equipment, systems, fittings, arrangements and material necessary to achieve full compliance with this Convention. The survey shall be such as to ensure that any such change, replacement, or significant repair has been effectively made, so that the ship complies with the requirements of this Convention. Such surveys shall be endorsed on the Certificate issued under regulation E-2 or E-3.

2 The Administration shall establish appropriate measures for ships that are not subject to the provisions of paragraph 1 in order to ensure that the applicable provisions of this Convention are complied with.

3 Surveys of ships for the purpose of enforcement of the provisions of this Convention shall be carried

out by officers of the Administration. The Administration may, however, entrust the surveys either to surveyors nominated for the purpose or to organizations recognized by it.

4 An Administration nominating surveyors or recognizing organizations to conduct surveys, as described in paragraph 3 shall, as a minimum, empower such nominated surveyors or recognized organizations² to:

- .1 require a ship that they survey to comply with the provisions of this Convention; and
- .2 carry out surveys and inspections if requested by the appropriate authorities of a port State that is a Party.

5 The Administration shall notify the Organization of the specific responsibilities and conditions of the authority delegated to the nominated surveyors or recognized organizations, for circulation to Parties for the information of their officers.

6 When the Administration, a nominated surveyor, or a recognized organization determines that the ship's Ballast Water Management does not conform to the particulars of the Certificate required under regulation E-2 or E-3 or is such that the ship is not fit to proceed to sea without presenting a threat of harm to the environment, human health, property or resources such surveyor or organization shall immediately ensure that corrective action is taken to bring the ship into compliance. A surveyor or organization shall be notified immediately, and it shall ensure that the Certificate is not issued or is withdrawn as appropriate. If the ship is in the port of another Party, the appropriate authorities of the port State shall be notified immediately. When an officer of the Administration, a nominated surveyor, or a recognized organization has notified the appropriate authorities of the port State, the Government of the port State concerned shall give such officer, surveyor or organization any necessary assistance to carry out their obligations under this regulation, including any action described in Article 9.

7 Whenever an accident occurs to a ship or a defect is discovered which substantially affects the ability of the ship to conduct Ballast Water Management in accordance with this Convention, the owner, operator or other person in charge of the ship shall report at the earliest opportunity to the Administration, the recognized organization or the nominated surveyor responsible for issuing the relevant Certificate, who shall cause investigations to be initiated to determine whether a survey as required by paragraph 1 is necessary. If the ship is in a port of another Party, the owner, operator or other person in charge shall also report immediately to the appropriate authorities of the port State and the nominated surveyor or recognized organization shall ascertain that such report has been made.

8 In every case, the Administration concerned shall fully guarantee the completeness and efficiency of the survey and shall undertake to ensure the necessary arrangements to satisfy this obligation.

9 The condition of the ship and its equipment, systems and processes shall be maintained to conform with the provisions of this Convention to ensure that the ship in all respects will remain fit to proceed to sea without presenting a threat of harm to the environment, human health, property or resources.

10 After any survey of the ship under paragraph 1 has been completed, no change shall be made in the structure, any equipment, fittings, arrangements or material associated with the Ballast Water Management plan required by regulation B-1 and covered by the survey without the sanction of the Administration, except the direct replacement of such equipment or fittings.

Regulation E-2 *Issuance or Endorsement of a Certificate*

1 The Administration shall ensure that a ship to which regulation E-1 applies is issued a Certificate

² Refer to the guidelines adopted by the Organization by resolution A.739(18), as may be amended by the Organization, and the specifications adopted by the Organization by resolution A.789(19), as may be amended by the Organization.

after successful completion of a survey conducted in accordance with regulation E-1. A Certificate issued under the authority of a Party shall be accepted by the other Parties and regarded for all purposes covered by this Convention as having the same validity as a Certificate issued by them.

2 Certificates shall be issued or endorsed either by the Administration or by any person or organization duly authorized by it. In every case, the Administration assumes full responsibility for the Certificate.

Regulation E-3 *Issuance or Endorsement of a Certificate by Another Party*

1 At the request of the Administration, another Party may cause a ship to be surveyed and, if satisfied that the provisions of this Convention are complied with, shall issue or authorize the issuance of a Certificate to the ship, and where appropriate, endorse or authorize the endorsement of that Certificate on the ship, in accordance with this Annex.

2 A copy of the Certificate and a copy of the survey report shall be transmitted as soon as possible to the requesting Administration.

3 A Certificate so issued shall contain a statement to the effect that it has been issued at the request of the Administration and it shall have the same force and receive the same recognition as a Certificate issued by the Administration.

4 No Certificate shall be issued to a ship entitled to fly the flag of a State which is not a Party.

Regulation E-4 *Form of the Certificate*

The Certificate shall be drawn up in the official language of the issuing Party, in the form set forth in Appendix I. If the language used is neither English, French nor Spanish, the text shall include a translation into one of these languages.

Regulation E-5 *Duration and Validity of the Certificate*

1 A Certificate shall be issued for a period specified by the Administration that shall not exceed five years.

2 For renewal surveys:

- .1 Notwithstanding the requirements of paragraph 1, when the renewal survey is completed within three months before the expiry date of the existing Certificate, the new Certificate shall be valid from the date of completion of the renewal survey to a date not exceeding five years from the date of expiry of the existing Certificate.
- .2 When the renewal survey is completed after the expiry date of the existing Certificate, the new Certificate shall be valid from the date of completion of the renewal survey to a date not exceeding five years from the date of expiry of the existing Certificate.
- .3 When the renewal survey is completed more than three months before the expiry date of the existing Certificate, the new Certificate shall be valid from the date of completion of the renewal survey to a date not exceeding five years from the date of completion of the renewal survey.

3 If a Certificate is issued for a period of less than five years, the Administration may extend the validity of the Certificate beyond the expiry date to the maximum period specified in paragraph 1, provided that the surveys referred to in regulation E-1.1.3 applicable when a Certificate is issued for a period of five years are carried out as appropriate.

4 If a renewal survey has been completed and a new Certificate cannot be issued or placed on board the ship before the expiry date of the existing Certificate, the person or organization authorized by the Administration may endorse the existing Certificate and such a Certificate shall be accepted as valid for a further period which shall not exceed five months from the expiry date.

5 If a ship at the time when the Certificate expires is not in a port in which it is to be surveyed, the Administration may extend the period of validity of the Certificate but this extension shall be granted only for the purpose of allowing the ship to complete its voyage to the port in which it is to be surveyed, and then only in cases where it appears proper and reasonable to do so. No Certificate shall be extended for a period longer than three months, and a ship to which such extension is granted shall not, on its arrival in the port in which it is to be surveyed, be entitled by virtue of such extension to leave that port without having a new Certificate. When the renewal survey is completed, the new Certificate shall be valid to a date not exceeding five years from the date of expiry of the existing Certificate before the extension was granted.

6 A Certificate issued to a ship engaged on short voyages which has not been extended under the foregoing provisions of this regulation may be extended by the Administration for a period of grace of up to one month from the date of expiry stated on it. When the renewal survey is completed, the new Certificate shall be valid to a date not exceeding five years from the date of expiry of the existing Certificate before the extension was granted.

7 In special circumstances, as determined by the Administration, a new Certificate need not be dated from the date of expiry of the existing Certificate as required by paragraph 2.2, 5 or 6 of this regulation. In these special circumstances, the new Certificate shall be valid to a date not exceeding five years from the date of completion of the renewal survey.

8 If an annual survey is completed before the period specified in regulation E-1, then:

- .1 the Anniversary date shown on the Certificate shall be amended by endorsement to a date which shall not be more than three months later than the date on which the survey was completed;
- .2 the subsequent annual or intermediate survey required by regulation E-1 shall be completed at the intervals prescribed by that regulation using the new Anniversary date;
- .3 the expiry date may remain unchanged provided one or more annual surveys, as appropriate, are carried out so that the maximum intervals between the surveys prescribed by regulation E-1 are not exceeded.

9 A Certificate issued under regulation E-2 or E-3 shall cease to be valid in any of the following cases:

- .1 if the structure, equipment, systems, fittings, arrangements and material necessary to comply fully with this Convention is changed, replaced or significantly repaired and the Certificate is not endorsed in accordance with this Annex;
- .2 upon transfer of the ship to the flag of another State. A new Certificate shall only be issued when the Party issuing the new Certificate is fully satisfied that the ship is in compliance with the requirements of regulation E-1. In the case of a transfer between Parties, if requested within three months after the transfer has taken place, the Party whose flag the ship was formerly entitled to fly shall, as soon as possible, transmit to the Administration copies of the Certificates carried by the ship before the transfer and, if available, copies of the relevant survey reports;
- .3 if the relevant surveys are not completed within the periods specified under regulation E-1.1; or
- .4 if the Certificate is not endorsed in accordance with regulation E-1.1.

APPENDIX I

FORM OF INTERNATIONAL BALLAST WATER MANAGEMENT CERTIFICATE
INTERNATIONAL BALLAST WATER MANAGEMENT CERTIFICATE

Issued under the provisions of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (hereinafter referred to as "the Convention") under the authority of the Government of

.....
(full designation of the country)

by

*(full designation of the competent person or organization
authorized under the provisions of the Convention)*

Particulars of ship¹

Name of ship

Distinctive number or letters

Port of registry

Gross Tonnage

IMO number²

Date of Construction

Ballast Water Capacity (in cubic metres)

Details of Ballast Water Management Method(s) Used

Method of Ballast Water Management used

Date installed (if applicable)

Name of manufacturer (if applicable)

¹ Alternatively, the particulars of the ship may be placed horizontally in boxes.

² IMO Ship Identification Number Scheme adopted by the Organization by resolution A.600(15).

ENDORSEMENT FOR ANNUAL AND INTERMEDIATE SURVEY(S)

THIS IS TO CERTIFY that a survey required by regulation E-1 of the Annex to the Convention the ship was found to comply with the relevant provisions of the Convention:

Annual survey: Signed
(Signature of duly authorized official)
 Place
 Date.....
(Seal or stamp of the authority, as appropriate)

Annual*/Intermediate survey*: Signed
(Signature of duly authorized official)
 Place
 Date.....
(Seal or stamp of the authority, as appropriate)

Annual*/Intermediate survey*: Signed
(Signature of duly authorized official)
 Place
 Date.....
(Seal or stamp of the authority, as appropriate)

Annual survey: Signed
(Signature of duly authorized official)
 Place
 Date.....
(Seal or stamp of the authority, as appropriate)

* Delete as appropriate.

**ANNUAL/INTERMEDIATE SURVEY
IN ACCORDANCE WITH REGULATION E-5.8.3**

THIS IS TO CERTIFY that, at an annual/intermediate* survey in accordance with regulation E-5.8.3 of the Annex to the Convention, the ship was found to comply with the relevant provisions of the Convention:

Signed
(Signature of authorized official)

Place

Date.....

(Seal or stamp of the authority, as appropriate)

**ENDORSEMENT TO EXTEND THE CERTIFICATE IF VALID FOR LESS THAN 5 YEARS
WHERE REGULATION E-5.3 APPLIES**

The ship complies with the relevant provisions of the Convention, and this Certificate shall, in accordance with regulation E-5.3 of the Annex to the Convention, be accepted as valid until.....

Signed
(Signature of authorized official)

Place

Date.....

(Seal or stamp of the authority, as appropriate)

**ENDORSEMENT WHERE THE RENEWAL SURVEY HAS BEEN COMPLETED
AND REGULATION E-5.4 APPLIES**

The ship complies with the relevant provisions of the Convention and this Certificate shall, in accordance with regulation E-5.4 of the Annex to the Convention, be accepted as valid until

Signed
(Signature of authorized official)

Place

Date

(Seal or stamp of the authority, as appropriate)

* Delete as appropriate.

**ENDORSEMENT TO EXTEND THE VALIDITY OF THE CERTIFICATE UNTIL REACHING THE
PORT OF SURVEY OR FOR A PERIOD OF GRACE
WHERE REGULATION E-5.5 OR E-5.6 APPLIES**

This Certificate shall, in accordance with regulation E-5.5 or E-5.6* of the Annex to the Convention, be accepted as valid until

Signed
(Signature of authorized official)

Place

Date.....

(Seal or stamp of the authority, as appropriate)

**ENDORSEMENT FOR ADVANCEMENT OF ANNIVERSARY DATE WHERE
REGULATION E-5.8 APPLIES**

In accordance with regulation E-5.8 of the Annex to the Convention the new Anniversary date is

Signed
(Signature of authorized official)

Place

Date.....

(Seal or stamp of the authority, as appropriate)

In accordance with regulation E-5.8 of the Annex to the Convention the new Anniversary date is

Signed
(Signature of duly authorized official)

Place

Date.....

(Seal or stamp of the authority, as appropriate)

* Delete as appropriate.

APPENDIX II

FORM OF BALLAST WATER RECORD BOOK

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

Period From: To:

Name of Ship

IMO number

Gross tonnage

Flag

Total Ballast Water capacity (in cubic metres)

The ship is provided with a Ballast Water Management plan

Diagram of ship indicating ballast tanks:

1 Introduction

In accordance with regulation B-2 of the Annex to the International Convention for the Control and Management of Ships' Ballast Water and Sediments, a record is to be kept of each Ballast Water operation. This includes discharges at sea and to reception facilities.

2 Ballast Water and Ballast Water Management

"Ballast Water" means water with its suspended matter taken on board a ship to control trim, list, draught, stability, or stresses of a ship. Management of Ballast Water shall be in accordance with an approved Ballast Water Management plan and taking into account Guidelines³ developed by the Organization.

3 Entries in the Ballast Water Record Book

Entries in the Ballast Water record book shall be made on each of the following occasions:

3.1 When Ballast Water is taken on board:

- .1 Date, time and location port or facility of uptake (port or lat/long), depth if outside port
- .2 Estimated volume of uptake in cubic metres
- .3 Signature of the officer in charge of the operation.

3.2 Whenever Ballast Water is circulated or treated for Ballast Water Management purposes:

- .1 Date and time of operation
- .2 Estimated volume circulated or treated (in cubic metres)

³ Refer to the Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens adopted by the Organization by resolution A.868(20).

- .3 Whether conducted in accordance with the Ballast Water Management plan
- .4 Signature of the officer in charge of the operation
- 3.3 When Ballast Water is discharged into the sea:
 - .1 Date, time and location port or facility of discharge (port or lat/long)
 - .2 Estimated volume discharged in cubic metres plus remaining volume in cubic metres
 - .3 Whether approved Ballast Water Management plan had been implemented prior to discharge
 - .4 Signature of the officer in charge of the operation.
- 3.4 When Ballast Water is discharged to a reception facility:
 - .1 Date, time, and location of uptake
 - .2 Date, time, and location of discharge
 - .3 Port or facility
 - .4 Estimated volume discharged or taken up, in cubic metres
 - .5 Whether approved Ballast Water Management plan had been implemented prior to discharge
 - .6 Signature of officer in charge of the operation
- 3.5 Accidental or other exceptional uptake or discharges of Ballast Water:
 - .1 Date and time of occurrence
 - .2 Port or position of the ship at time of occurrence
 - .3 Estimated volume of Ballast Water discharged
 - .4 Circumstances of uptake, discharge, escape or loss, the reason therefore and general remarks.
 - .5 Whether approved Ballast Water Management plan had been implemented prior to discharge
 - .6 Signature of officer in charge of the operation
- 3.6 Additional operational procedure and general remarks

4 Volume of Ballast Water

The volume of Ballast Water onboard should be estimated in cubic metres. The Ballast Water record book contains many references to estimated volume of Ballast Water. It is recognized that the accuracy of estimating volumes of ballast is left to interpretation.

RECORD OF BALLAST WATER OPERATIONS

SAMPLE BALLAST WATER RECORD BOOK PAGE

Name of Ship:

Distinctive number or letters

Date	Item (number)	Record of operations/signature of officers in charge

Signature of master

2.2 IMO guidelines for the uniform implementation of the BWM Convention

**RESOLUTION MEPC.152(55)
adopted on 13 October 2006**

GUIDELINES FOR SEDIMENT RECEPTION FACILITIES (G1)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that Article 5 of the Ballast Water Management Convention provides that, each Party undertakes to ensure that, in ports and terminals designated by that Party where cleaning or repair of ballast tanks occurs, adequate facilities are provided for the reception of sediments, taking into account the Guidelines developed by the Organization,

NOTING ALSO that resolution 1 adopted by the International Conference on Ballast Water Management for Ships invited the Organization to develop these Guidelines as a matter of urgency,

HAVING CONSIDERED, at its fifty-fifth session, the draft Guidelines for sediment reception facilities (G1) developed by the Ballast Water Working Group, and the recommendation made by the Sub-Committee on Flag State Implementation at its fourteenth session,

1. ADOPTS the Guidelines for sediment reception facilities (G1) as set out in the Annex to this resolution;
2. INVITES Governments to apply these Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep these Guidelines under review.

* * *

ANNEX

GUIDELINES FOR SEDIMENT RECEPTION FACILITIES (G1)

1 INTRODUCTION

Purpose

1.1 The purpose of these guidelines is to provide guidance for the provision of facilities for the reception of sediments that are provided in accordance with Article 5 of the Convention. The guidance is also intended to encourage a worldwide uniform interface between such facilities and the ships without prescribing dedicated shoreside reception plants.

Application

1.2 These guidelines apply to sediment reception facilities referred to in the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Convention), Article 5 and Regulation B-5.

1.3 These guidelines do not apply to sediment from tanks other than ballast water tanks.

1.4 It is recognized that some countries, areas or ports have requirements or regulations relating to the disposal of waste materials including waste material from ships which may include sediment from ships ballast water tanks. These guidelines are not intended in any way to replace or adversely impact any local or national requirements or regulations concerning the disposal and/or treatment of sediment from ships ballast water tanks.

2 DEFINITIONS

2.1 For the purposes of these guidelines, the definitions in the Convention apply and:

- .1 "Ballast Water Tank" means any tank, hold or space used for the carriage of ballast water as defined in Article 1 of the Convention.

3 GENERAL REQUIREMENTS FOR RECEPTION FACILITIES

3.1 Article 5 of the Convention requires that: "reception facilities shall operate without causing undue delay to ships and shall provide for the safe disposal of such sediments that does not impair or damage their environment, human health, property or resources or those of other States."

3.2 A facility should provide the resources to enable, as far as practicable, their use by all ships wishing to discharge sediment from ballast water tanks.

3.3 Each Party shall report to the Organization and, where appropriate, make available to other Parties, information on the availability and location of any reception facilities for the environmentally safe disposal of sediments.

4 PROVISION OF SEDIMENT RECEPTION FACILITIES

4.1 When considering the requirements of these facilities many factors will have to be taken into account, these should include but not be limited to:

- .1 regional, national and local legislation which will affect the facility and related to the items below;
- .2 site selection;
- .3 collection, handling and transport of sediment;
- .4 sampling, testing and analysis of sediment;
- .5 storage of sediment and storage conditions;
- .6 estimated required capacity (volume/weight) including moisture content of the sediment the facility will handle;
- .7 environmental benefits and costs;
- .8 proximity of available sites to local ballast tank cleaning and repair facilities;

- .9 effect on the environment in construction and operation of the facility;
- .10 training of facility staff;
- .11 equipment required to off load sediment from ships, such as cranes;
- .12 human health;
- .13 safety;
- .14 maintenance;
- .15 operational limitations; and
- .16 waterway access, approaches and traffic management.

5 TREATMENT, HANDLING AND DISPOSAL OF RECEIVED SEDIMENT

5.1 Disposal, handling and treatment measures applied to the sediment shall avoid unwanted side effects that may create a risk to or damage to the Party's environment, human health, property or resources or those of other States.

5.2 Personnel involved in the handling of sediment should be aware of the possible risk to human health associated with sediment from ships ballast water tanks. Personnel should be adequately trained and be provided with suitable personal protective clothing and equipment.

6 CAPABILITIES OF A RECEPTION FACILITY

6.1 Reception facilities should be designed, taking into account the ship types that may be anticipated to use them and consideration should be given to the requirements for ballast tank cleaning that may take place and of repair facilities in the area(s) the reception facility serves.

6.2 Details of the capabilities and any capacity limitations of reception process (facilities and equipment) should be made available to ships wishing to use the facility. The details made available to ships should include but not be limited to:

- .1 maximum capacity (volume or weight) of sediment;
- .2 maximum volume or weight that can be handled at any one time;
- .3 packaging and labelling requirements;
- .4 hours of operation;
- .5 ports, berths, areas where access to the facility is available;
- .6 ship-to-shore transfer details;
- .7 if ship or shore crew are required for the transfer;
- .8 contact details for the facility;
- .9 how to request use of the facility including any notice period and what information is required from the ship;
- .10 all applicable fees; and
- .11 other relevant information.

7 TRAINING

7.1 Personnel in charge of and those employed in the provision of a sediment reception facility including the treatment and disposal of sediment, should have received adequate instruction. Frequent training should include but not be limited to:

- .1 the purpose and principles of the Convention;
- .2 the risks to the environment and human health;
- .3 risk associated with the handling of sediment including both general safety and human health risks;
- .4 safety;
- .5 adequate knowledge of the equipment involved;
- .6 a sufficient understanding of ships using the facility, and any operational constraints;
- .7 the ship/port communication interface; and
- .8 an understanding of local disposal controls.

7.2 The training should be organized by the manager or the operator of the reception facility and delivered by suitably qualified professionals.

RESOLUTION MEPC.173(58)
adopted on 10 October 2008

GUIDELINES FOR BALLAST WATER SAMPLING (G2)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that article 9 of the Ballast Water Management Convention provides that a ship to which the Convention applies may, in any port or offshore terminal of another Party, be subject to inspection by officers duly authorized by that Party for the purpose of determining whether the ship is in compliance with this Convention. Such an inspection is limited to, *inter alia*, a sampling of the ship's ballast water, carried out in accordance with the guidelines to be developed by the Organization,

NOTING ALSO that the International Conference on Ballast Water Management for Ships, in its resolution 1, invited the Organization to develop Guidelines for uniform application of the Convention as a matter of urgency,

HAVING CONSIDERED, at its fifty-eighth session, the draft Guidelines for ballast water sampling (G2) developed by the Ballast Water Review Group,

1. ADOPTS the Guidelines for ballast water sampling (G2) as set out in the Annex to this resolution;
2. INVITES Governments to apply the Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep the Guidelines under review.

* * *

ANNEX

GUIDELINES FOR BALLAST WATER SAMPLING (G2)

1 INTRODUCTION

1.1 The objectives of these Guidelines are to provide Parties, including port State control officers, with practical and technical guidance on ballast water sampling and analysis for the purpose of determining whether the ship is in compliance with the Ballast Water Management Convention (the Convention) according to article 9 "Inspection of Ships". These Guidelines only address general technical sampling procedures, and do not address legal requirements.

1.2 These Guidelines provide general recommendations for ballast water sampling by port State control

authorities. Guidance on sampling procedures for use by Parties in assessing compliance with regulations D-1 or D-2 is given in the annex to these Guidelines.

1.3 Sampling by port State control or other authorized officers, should seek to use methods that are (a) safe to the ship, inspectors, crew and operators; and (b) simple, feasible, rapid and applicable at the point of ballast discharge.

1.4 The time needed for analysis of samples shall not be used as a basis for unduly delaying the operation, departure, or movement of the vessel. Article 12 of the Convention applies. Additionally, the use of validated automated systems for ballast water sampling and analysis should be explored when the developments of such systems are sufficiently progressed.

2 BACKGROUND

2.1 Sampling requirements for compliance control of regulations D-1 and D-2 of the Convention will differ as these two regulations have significantly different parameters. Sections 2.2 and 2.3 below reproduce the text contained in the Convention.

2.2 Ballast water exchange standard (D-1)

2.2.1 Ships performing ballast water exchange in accordance with regulation D-1 of the Convention shall do so with an efficiency of at least 95 per cent volumetric exchange of ballast water.

2.2.2 For ships exchanging ballast water by the pumping-through method, pumping through three times the volume of each ballast water tank shall be considered to meet the standard. Pumping through less than three times the volume may be accepted provided the ship can demonstrate that at least 95 per cent volumetric exchange is met.

2.3 Ballast water performance standard (D-2)

2.3.1 Regulation D-2 of the Convention refers to two size categories of organisms and a group of indicator microbes. Ships conducting ballast water management in accordance with regulation D-2 shall discharge:

- .1 less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension;
- .2 less than 10 viable organisms per millilitre less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension; and
- .3 discharge of the indicator microbes shall not exceed:
 - (i) Toxicogenic *Vibrio cholerae* (O1 and O139) with less than 1 colony forming unit (cfu) per 100 millilitres or less than 1 cfu per 1 gramme (wet weight) zooplankton samples;
 - (ii) *Escherichia coli* less than 250 cfu per 100 millilitres; and
 - (iii) Intestinal *Enterococci* less than 100 cfu per 100 millilitres.

3 DEFINITIONS

3.1 For the purpose of these Guidelines, the definitions as stated in the Convention apply and:

- .1 “Minimum Dimension” means the minimum dimension of an organism based upon the dimensions of that organism’s body, ignoring e.g., the size of spines, flagellae, or antenna. The

minimum dimension should therefore be the smallest part of the “body”, i.e. the smallest dimension between main body surfaces of an individual when looked at from all perspectives. For spherical shaped organisms, the minimum dimension should be the spherical diameter. For colony forming species, the individual should be measured as it is the smallest unit able to reproduce that needs to be tested in viability tests.

- .2 “Sampling Point” means that place in the ballast water piping where the sample is taken.
- .3 “Sampling Facilities” means the equipment installed to take the sample.

4 SAMPLING FOR COMPLIANCE WITH THE BALLAST WATER EXCHANGE STANDARD (REGULATION D-1)

4.1 In-tank samples may be taken via sounding or air pipes and manholes by using pumps, sampling bottles or other water containers. Samples may also be taken from the discharge line.

4.2 Sampling the ballast water on arriving ships may provide information on compliance with regulation B-4 of the Convention by analysing their physical and/or chemical parameters. However, it is difficult to use indicator (physical/chemical) parameters in isolation to conclusively prove that ballast water exchange either has or has not occurred to the D-1 Standard. As with any analytical procedures or techniques used to test for compliance with regulation B-4, methods used to test for compliance with ballast water exchange requirements should be rigorously validated and widely distributed through the Organization.

5 SAMPLING FOR COMPLIANCE WITH THE BALLAST WATER PERFORMANCE STANDARD (REGULATION D-2)

5.1 Although the Convention contains no requirements for provision of sampling points, the Guidelines for approval of ballast water management systems (G8) adopted by resolution MEPC.174(58) do expressly call for the provision of sampling facilities, not only for the purpose of type approval, but also for the purpose of these ballast water sampling Guidelines (refer to paragraphs 3.2, 3.8, and section 8 of the Guidelines for approval of ballast water management systems (G8) for further detail regarding provision of sampling facilities).

5.2 Samples should be taken from the discharge line, as near to the point of discharge as practicable, during ballast water discharge whenever possible.

5.3 In cases where the ballast system design does not enable sampling from the discharge line, other sampling arrangements may be necessary. Sampling via manholes, sounding pipes, or air pipes is not the preferred approach for assessing compliance with regulation D-2. Scientific trials have shown that using these sampling locations may not provide accurate estimates of organism concentrations that would occur in the discharge, i.e. such sampling may provide an under- or over-estimate of the concentration of organisms.

5.4 In-tank sampling should only be used if ballast water treatment occurs on uptake prior to or whilst ballast water is in the tank. If any part of the treatment process occurs during the ballast water discharge, then in-tank sampling will be inappropriate.

5.5 In light of these potential shortcomings, sampling to determine compliance with regulation D-2 should, whenever practicable to do so, be carried out in the discharge line near the discharge point.

5.6 An exception to this is the case when tanks are emptied through direct overboard discharge valves, as in upper side wing tanks, rather than through the ballast pumps. In such cases, tank sampling may be an appropriate approach.

6 BALLAST WATER SAMPLING AND ANALYSIS

6.1 In accordance with article 9 of the Convention, a Party may sample the ship's ballast water for the purpose of determining whether the ship is in compliance with the Convention in accordance with these Guidelines.

6.2 Any sampling protocol for testing of compliance with the Convention should observe the following principles to help ensure consistency of approach between Parties and to provide certainty to the shipping industry:

- .1 the sampling protocol should be in line with these Guidelines;
- .2 the sampling protocol should result in samples that are representative of the whole discharge of ballast water from any single tank or any combination of tanks being discharged;
- .3 the sampling protocol should take account of the potential for a suspended sediment load in the discharge to affect sample results;
- .4 the sampling protocol should provide for samples to be taken at appropriate discharge points;
- .5 the quantity and quality of samples taken should be sufficient to demonstrate whether the ballast water being discharged meets with the relevant standard;
- .6 sampling should be undertaken in a safe and practical manner;
- .7 samples should be concentrated to a manageable size;
- .8 samples should be taken, sealed and stored to ensure that they can be used to test for compliance with the Convention;
- .9 samples should be fully analysed within test method holding time limit using an accredited laboratory; and
- .10 samples should be transported, handled and stored with the consideration of the chain of custody.

6.3 Prior to testing for compliance with the D-2 standard, it is recommended that, as a first step, an indicative analysis of ballast water discharge may be undertaken to establish whether a ship is potentially compliant or non-compliant. Such a test could help the Party identify immediate mitigation measures, within their existing powers, to avoid any additional impact from a possible non-compliant ballast water discharge from the ship.

6.4 In emergency or epidemic situations, port States may use alternative sampling methods which may need to be introduced at short notice and should endeavour to communicate these to ships entering ports under their jurisdiction. Although in such situations they may not necessarily notify the Organization, such notification could be beneficial for other Parties.

6.5 Alternative sampling measures instigated as a result of paragraph 6.4 should give due cognizance to the requirements of article 12 of the Convention.

6.6 Given the complexity in ballast water sampling and analysis, it is likely that new approaches will be developed for ballast sampling and analyses of the composition, concentration, and viability of organisms. Administrations are encouraged to share information concerning methods for the analysis of ballast water samples, using existing scientific reports, and papers distributed through the Organization.

6.7 The Organization should make available, through any appropriate means, information communicated to it regarding ballast water sampling and analysis.

6.8 Further guidance on the interpretation of the results arising from sample analysis will be developed by the Organization in due course.

* * *

Annex

This annex provides practical recommendations regarding sampling techniques and procedures for use by Member States and port State control and other authorized officers assessing compliance with regulation D-1 or D-2.

PART 1 - SAMPLING FROM THE BALLAST WATER DISCHARGE LINE

PART 2 - SAMPLING FROM BALLAST WATER TANKS

PART 3 - SAMPLING AND ANALYSIS PROTOCOLS

PART 4 - SAMPLE DATA FORMS

PART 5 - HEALTH AND SAFETY ASPECTS

PART 6 - RECOMMENDATION FOR A PORT STATE CONTROL BALLAST WATER SAMPLING KIT

PART 7 - MAINTENANCE, STORAGE, LABELLING AND TRANSPORTATION

PART 8 - CHAIN OF CUSTODY RECORD

PART 1 – SAMPLING FROM THE BALLAST WATER DISCHARGE LINE

1 The advantage in sampling the biota present in the ballast water discharge line is that this is most likely to accurately represent the concentration of substances and organisms in the actual discharge, which is of primary concern in assessing compliance with the discharge regulations.

2 The disadvantages of this method are that, on most ships, in-line sampling should be carried out in the engine room, where space may be limited, and the handling of water once the samples were concentrated may be impracticable.

3 In order to undertake an accurate measurement on the organism concentration in the ballast water, it is recommended to install an “isokinetic” sampling facility. Isokinetic sampling is intended for the sampling of water mixtures with secondary immiscible phases (i.e. sand or oil) in which there are substantial density differentials. In such conditions, convergence and divergence from sampling ports is of significant concern. Since most organisms are relatively neutrally buoyant, true isokinetic sampling is unnecessary. However, the mathematics related to isokinetic sampling are deemed to be useful as a basis for describing and specifying sampling geometries. Isokinetic sampling is necessary to ensure that a sample contains the same proportions of the various flowing constituents as the flow stream being sampled. During isokinetic sampling the sampling device does not alter the profile or velocity of the flowing stream at the moment or point at which the sample is separated from the main flow stream. Under isokinetic conditions, the velocities of both the sample and the main flow are equal at the point at which the sample is separated from the main flow. To achieve isokinetic sampling conditions, a sampler is designed to separate a subsection of the total flow-stream in a manner that does not encourage or discourage water entry other than that which is

otherwise in the cross-section of the sampler opening. In other words, flow streams in the main flow of the pipe should not diverge or converge as they approach the opening of the sampler.

4 Technical specifications for design of in-line sampling facilities

4.1 Through computational fluid dynamics modelling, it has been shown that the isokinetic diameter calculation can provide guidance for sizing of sample ports for sampling of organisms. Simulations showed that flow transitions from the main stream were best for sample port diameters between 1.5 and 2.0 times the isokinetic diameter. Ports sized in this range had smooth transitions and pressure profiles that allowed for direct sampling without the need of a pump to induce sample collection. The isokinetic sample port diameter should therefore be determined generally according to the equation:

$$Diso = Dm \sqrt{Qiso / Qm}$$

where $Diso$ and Dm are the diameters of the sample port opening and the main flow in the discharge line, respectively; and $Qiso$ and Qm represent the respective volumetric flow rates through the two pipes. It is recommended that sample port size be based on the combination of maximum sample flow rate and minimum ballast flow rate that yields the largest isokinetic diameter.

4.2 The opening of the sampling pipe should be chamfered to provide a smooth and gradual transition between the inside and outside pipe diameters.

4.3 The length of the straight sample pipe facing into the flow can vary, but should not usually be less than one diameter of the sampling pipe. The sampling port should be oriented such that the opening is facing upstream and its lead length is parallel to the direction of flow and concentric to the discharge pipe which may require sampling pipes to be “L” shaped with an upstream facing leg if installed along a straight section of discharge pipe.

4.4 The need to be able to service the sample pipe is important and should be considered, taking the safety of ship into consideration. Therefore, the sampling pipe should be retrievable either manually, or mechanically, or it should be in a system which can be isolated. Because of the potential for the opening and interior of the sample pipe to become occluded by biological or inorganic fouling, it is recommended that samplers be designed to be closable at the opening, removed between sampling intervals or be easily cleaned prior to sampling.

4.5 The sample pipe and all associated parts of the sampler that come into contact or near proximity with the ballast piping should be constructed of galvanically compatible materials and generally corrosion resistant. Any corrosion of the sampling system will affect sample flow rates and potentially sample representativeness.

4.6 If flow control of the sample flow rate is required, ball, gate and butterfly valve types should be avoided as they may cause significant shear forces which may result in organism mortality. For flow control, it is recommended that diaphragm valves or similar valve types be used to minimize sharp velocity transitions. For flow distribution, ball valves may be utilized in such a manner that they are either fully open or fully closed.

5 Technical specifications for installation of a sample point in the ballast water discharge line

5.1 The sample taken should be removed from the main pipeline at a location where the flowing stream at the sample point is representative of the contents of the stream. The sample facility should be placed at a point where the flow in the main pipe is fully mixed and fully developed.

5.2 The sampling point should be installed in a straight part of the discharge line as near to the ballast water discharge overboard as practicable. The sampling facility should be positioned such that a representa-

tive sample of ballast water is taken. It is recommended that the position of the sample point is established using methods such as computational fluid dynamics.

PART 2 – SAMPLING FROM BALLAST WATER TANKS

1 In-tank sampling may be appropriate for assessing D-1 compliance. There may be circumstances when in-tank sampling to provide an indication of compliance or non-compliance with the ballast water performance standard D-2 may be found appropriate. D-2 compliance should be assessed at ballast water discharge, whenever this is possible.

2 Manholes

2.1 Sampling of ballast water via manholes allows direct access to ballast tanks and ballast holds.

2.2 The disadvantages of this type of sampling access include the need for opening and closing manholes and hatches. Further, overlaying cargo may prevent access for sampling. Also, hatches and horizontal openings inside tanks are not aligned one below the other, which means that although the tank may have three or more decks, only the top deck may be accessible for sampling. Further, in some ships, access hatches and vertical openings are on the side of the tank and thus are not accessible unless the tank is empty. Another disadvantage is ladders and platforms may inhibit access to the full depth of the tank. Sampling from some certain parts of the ballast water tank may result in a lack of representation of the whole ballast water discharge.

2.3 Samples should be collected using scientific sampling equipment including plankton nets and pumps, as appropriate, for the sampling and analytical method intended for use.

2.4 Whenever possible samples should be taken from multiple water depths inside the ballast tank.

2.5 When employing plankton nets:

- .1 the sample should be taken in a vertical net haul from the deepest sampling point accessible in the tank;
- .2 all plankton nets should be lowered to the maximum accessible depth inside the ballast tank and retrieved at a speed of approximately 0.5 m/s; and
- .3 multiple vertical net hauls may be needed to meet the required sample volume. The water volume sampled may be measured by flow meters in the opening of the net or by noting the sampling depth and net opening diameter.

2.6 When employing pumps:

- .1 pump intake pipes should be lowered to multiple depths (if possible) for different samples to obtain a vertical sample; and
- .2 the water volume sampled may be measured by flow meters in the hose or by using larger containers to measure the pumped water volume.

3 Sounding pipes or air pipes

3.1 Sampling by sounding pipes, when available, could be appropriate due to accessibility. However, there are some limitations when using this point to test for compliance. The use of sounding pipes will be more effective when the ship's sounding pipes are perforated along their length, ensuring better mixing of ballast water and that within the sounding tube. However, care must be taken if initial water samples from a sounding pipe indicate no or insufficient exchange even though the ship's records document otherwise. Experience has shown that in some cases water within unperforated sounding pipes is not affected during

an exchange. This may occur during flow-through because the water in pipes is not exposed to the mixing within the tank. This may also occur during empty refill when water in the sounding pipes is held within the pipe by vacuum pressure while the tanks are drained and then filled.

3.2 Samples should be collected using scientific sampling equipment as appropriate.

4 Use of pumps

4.1 Pumps of various types may be used to sample via sounding or air pipes.

4.1.1 The use of pumps may be limited by inability to overcome the pumping head, i.e. when the vertical distance from the pump to the water level in tank exceeds 10 metres, suction pumps cannot be used.

4.1.2 Pump intake pipes should be lowered to multiple depths (if possible) for different samples to obtain a vertical sample. The water volume sampled may be measured by flow meters in the hose or by using larger containers to measure the pumped water volume.

4.2 In principle, intrinsically safe pumps should be used in all circumstances.

4.3 Pumps that do not contribute to the mortality of organisms should be preferred.

PART 3 – SAMPLING AND ANALYSIS PROTOCOLS

1 The sample volume and number of samples required will depend upon:

- .1 the objective of sampling, e.g., to determine the number of organisms in different size classes; to assess the viability of organisms in different size classes; or to assess compliance with the D-1 or D-2 standard;
- .2 the specific analytical method to be used; and
- .3 the statistical significance and certainty required.

2 Sample handling and storage will also vary depending on the objectives and specific analytical methods. In particular the way the sample is taken (e.g., net or pump) and the conditions in which it is stored (e.g., light, temperature, storage container) should be appropriate for the analytical method used.

3 Sample analysis methods are rapidly developing and the best available procedures should be used consistently with availability.

4 The sampling and analysis methodologies to test for compliance with the Convention are still in development. Although significant technical advances and refinements have been made in these areas since the adoption of the Convention, there are still numerous issues to be resolved. Administrations are still undertaking research to define the most appropriate methods to test for compliance, and the best way to take, handle and analyse samples.

5 At the present time, there are no specific sampling or analysis protocols that can be recommended for Administrations to use. However, it is expected that in due course this information is likely to become available once full compliance testing regimes are developed and Administrations have had time to gain experience and develop best practice in ballast water sampling and analysis.

6 An IMO circular will be developed as a high-priority matter, to provide sampling and analysis protocols to be followed and give advice on the uniform application of these protocols. Such a circular will be updated when new protocols are developed.

7 To aid this process, Administrations are requested to supply information on any scientifically validated sampling and analysis techniques to the Organization, as soon as possible.

PART 4 – SAMPLE DATA FORM

The following minimum information is recommended for sample documentation:

Sampling date	
Ship particulars	Name of ship: Distinctive number or letters Port of registry: Gross tonnage: IMO Number: Date of construction: Ballast water capacity:
Identification of sampled tank*	
Type and position of sampled tank*	
Capacity of sampled tank*	(m ³)
Type of ballast water management undertaken	(type of exchange or treatment)
Make of ballast water management system	
Date of ballast water management undertaken	
Sample identification code	(including number of replicate)
Sample type	(larger, smaller plankton, microbes)
Sampling techniques used	net (including depth of vertical net haul, net opening size, mesh size) pumps (including sampling depth, pumping capacity in l/min.) bottle (incl. sampling depth, bottle capacity in l.) specify other sampling technique if used
Sampling time/start	
Sampling end time	
Origin of water sampled*	(lat/lon/port)
Type of sampling access point	
Location of sampling access point	
Water volume sampled	(by volume)
In case sample is concentrated on board specify filter or net sizes (if applicable)	(µm)
Preservative (if used)	
Transport to laboratory	cooling container, dark storage, etc.
Sample results	

* If appropriate.

Other information as necessary should be included in the table.

PART 5 – HEALTH AND SAFETY ASPECTS

1 As shipboard and port State control procedures on health and safety aspects already exist there is no need to develop new procedures for the purpose of ballast water sampling. In general, ship procedures, especially for entry into enclosed spaces, shall be followed if more stringent than national regulations. However, the following paragraphs provide some additional guidance.

2 Worker health and safety should be a primary consideration during all the sampling operations as ships and ports are hazardous environments in which to work. Any sampling operation should be undertaken after consideration of the specific risks associated with the ballast water being sampled. Appropriate personal protective equipment connected with the work should be worn as necessary.

3 In the event sampling involves entry into confined spaces, Recommendations for entering enclosed spaces aboard ships (resolution A.864(20)) and relevant IACS Recommendations on confined space safe practice (www.iacs.org.uk), and standard industry practice on man entry into enclosed spaces should be consulted (e.g., ISGOTT).

4 All electrical equipment, including torches, should be intrinsically safe for use on board ships when required. Safety limitations on the use of mobile telephones, etc., should always be observed. Standard industry practice on the use of electrical equipment including mobile telephone should be consulted (e.g., ISGOTT).

5 All electrical equipment to be used aboard should be checked to ensure that it is intrinsically safe. Pumps in particular should be fitted with waterproof junctions at the point where the electrical lead passes into the pump body and all plugs should be waterproof with rubber casings. If there is any doubt about an electrical supply or equipment aboard a vessel, advice from the ship's master or a member of the port company electrical staff should be sought.

PART 6 – RECOMMENDATION FOR A PORT STATE CONTROL BALLAST WATER SAMPLING KIT

1 The sampling kit for discharge line sampling should in minimum consist of:

- net or sieve to concentrate sample (with replacement material of identical mesh size);
- at least two containers to measure water volume extracted from discharge line. The container is further needed to collect sieved water for rinsing sieve or net when sampling is completed;
- water appropriate for rinsing net or sieve;
- funnel to ease filling of sample container;
- sample containers including sterile containers for microbial analysis;
- all necessary forms including sample data reporting/chain of custody forms;
- toolkit to enable net or sieve replacement, etc.;
- tape to seal the sample jar lid to the jar; and
- first aid kit.

2 The sampling kit for manhole sampling should in minimum consist of:

- plankton net with an associated flow meter – scientific trials have shown that plankton nets equipped with a cone shaped opening and filtering cod-end provide the most accurate samples. Nets to be lowered down into the tank should further not exceed 1 m in length and 30

cm in diameter to reduce the risk to become entangled inside the tank. A spare net including an extra cod end should be added to the sampling kit in case damages occur. A weight (minimum 1 kg) should be used to keep the wire vertical during the net haul;

- rope to lower down net (the rope should be metered to document net haul depth);
- net or sieve to concentrate sample (with replacement material of identical mesh size) spare sieves with identical mesh size should be added to the sampling kit in case damages occur;
- collecting sieved water for rinsing sieve and plankton net when sampling is completed;
- water bottle to rinse net or sieve;
- funnel to ease filling of sample container;
- sample containers including sterile containers for microbial analysis;
- all necessary forms including sample data reporting/ chain of custody forms;
- toolkit to enable net or sieve replacement, etc.;
- tape to seal the sample jar lid to the jar; and
- first aid kit.

3 The sampling kit for sounding or air pipe sampling should in minimum consist of:

- pump (e.g., suction, power or air driven);
- hose (optional with weight to ease lowering down the hose);
- net or sieve to concentrate sample (with replacement material of identical mesh size);
- at least two containers to measure water volume pumped on deck. The container is further needed to collect sieved water for rinsing sieve when sampling is completed and to rinse hose;
- water bottle to rinse net or sieve;
- funnel to ease filling of sample container;
- sample containers including sterile containers for microbial analysis;
- all necessary forms including sample data reporting/ chain of custody forms;
- toolkit to enable net or sieve replacement, opening of sounding or air pipes, etc.;
- tape to seal the sample jar lid to the jar; and
- first aid kit.

PART 7 – MAINTENANCE, STORAGE, LABELLING AND TRANSPORTATION

1 Samples should be handled and stored as appropriate for the intended analytical method. The sample collection data form and chain of custody record should be kept with each individual sample.

2 Sample Sealing: Tape should be used to seal the sample jar lid to the jar.

3 Sample data forms: Prior to the beginning of the sampling programme, a suitable set of recording forms based on part 4 should be designed which incorporate all the sample information required to meet the aims of the programme. Details of each sample should be entered on the forms as soon as practicable.

4 Labelling of sample containers: Each sample container should be labelled by, e.g., using a water-proof permanent marker and additional vegetal paper which may be deposited inside the sample container, if appropriate. The information recorded should include but not be limited to the date, ship name, sample identification code, tank numbers and preservative if used. Codes may be used for some of these details as long as they are included on the sample data forms.

PART 8 – CHAIN OF CUSTODY RECORD

1 In the context of compliance control, it is advisable to maintain chain of custody records for the samples collected.

2 Information to be included should contain a complete record of those handling the sample from the time of the sampling onwards.

3 The chain of custody should also include date, ship identification, sample identification code, and a list of people who have handled the sample, including the person who takes the sample, dates and time, and the reason for sample transfer and the integrity of the sample on transfer.

RESOLUTION MEPC.123(53)
adopted on 22 July 2005

GUIDELINES FOR BALLAST WATER MANAGEMENT EQUIVALENT COMPLIANCE (G3)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that Regulation A-5 of the Annex to the Ballast Water Management Convention provides that equivalent compliance with its provisions for pleasure craft used solely for recreation or competition or craft used primarily for search and rescue, less than 50 metres in length overall, and with a maximum Ballast Water capacity of 8 cubic metres, shall be determined by the Administration taking into account Guidelines developed by the Organization,

NOTING ALSO that resolution 1 adopted by the International Conference on Ballast Water Management for Ships invites the Organization to develop these Guidelines as a matter of urgency,

HAVING CONSIDERED the draft Guidelines for ballast water management equivalent compliance developed by the Ballast Water Working Group and the recommendation made by the Sub-Committee on Bulk Liquids and Gases at its ninth session,

1. ADOPTS the Guidelines for ballast water management equivalent compliance, as set out in the annex to this resolution;
2. INVITES Governments to apply the Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep the Guidelines under review.

* * *

ANNEX

GUIDELINES FOR BALLAST WATER MANAGEMENT EQUIVALENT COMPLIANCE (G3)

1 Administrations shall take these Guidelines into account in determining whether ships satisfy the requirements of *Regulation A-5, Equivalent compliance* of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004. Ships subject to these Guidelines should, insofar as practicable, comply with the Convention, and if that is not practicable, shall achieve equivalent compliance in accordance with Regulation A-5 and these Guidelines.

Definitions

- 2 For the purpose of these Guidelines the definitions in the Convention apply.

Application

3 These Guidelines apply to pleasure craft used solely for recreation or competition or craft used primarily for search and rescue less than 50 metres in overall length and with a maximum ballast water capacity of eight cubic metres. Overall length means the length of the hull excluding bowsprits, booms, bumpkins, pulpits, etc.

Exceptions

4 These Guidelines do not apply to the uptake or discharge of ballast water and sediments:

- .1 necessary for the purpose of ensuring the safety of a ship in emergency situations or saving life at sea;
- .2 when being used for the purpose of avoiding or minimizing pollution incidents from the ship; and
- .3 on the high seas of the same ballast water and sediments.

5 In addition, these Guidelines do not apply to:

- .1 the accidental discharge or ingress of ballast water and sediments resulting from damage to a ship or its equipment provided that all reasonable precautions have been taken before and after the occurrence of the damage or discovery of the damage or discharge for the purpose of preventing or minimizing the discharge and the owner or the person in charge did not wilfully cause such damage;
- .2 the discharge of ballast water and sediments from a ship at the same location where the whole of that ballast water and those sediments originated provided that no mixing with unmanaged ballast water from other areas has occurred. In the context of these Guidelines, “same location” shall be taken to mean the same harbour, mooring or anchorage; and
- .3 the discharge of ballast water and sediments if the master reasonably decides that compliance with these Guidelines would threaten the safety or stability of the ship, its crew, or its passengers because of adverse weather, ship design or stress, equipment failure, or any other extraordinary condition.

Precautionary practices to minimize the uptake or transfer of harmful aquatic organisms and pathogens

Uptake of ballast water

6 Wherever possible, ballast water should be taken up outside of port waters and as far from the coast as practicable. In addition, consideration should be given to the use of dockside water supplies (e.g. water not taken directly from the harbour; such as fresh water, potable water, etc.) as the source for ballast water.

7 When loading ballast water, every effort should be made to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediments that may contain such organisms. The uptake of ballast water should be minimized or, where practicable, avoided in areas and situations such as:

- .1 in areas identified by the port State in connection with warnings provided by ports concerning ballast uptake and any other port contingency arrangements in the event of emergency situations;
- .2 in darkness when organisms may rise up in the water column;
- .3 in very shallow water;

- .4 where propellers may stir up sediment;
- .5 areas with current large phytoplankton blooms (algal blooms, such as red tides);
- .6 nearby sewage outfalls;
- .7 where a tidal stream is known to be more turbid;
- .8 where tidal flushing is known to be poor; or
- .9 in areas close to aquaculture.

8 If it is necessary to take on and discharge ballast water in the same location, care should be taken to avoid unnecessary discharge of ballast water that has been taken up in another location.

Discharge of ballast water

9 To prevent, minimize and ultimately eliminate the transfer of harmful aquatic organisms and pathogens to the maximum extent practicable taking into account the nature of the ship Ballast Water should either be exchanged prior to discharge in accordance with Regulation B-4 or otherwise managed in accordance with the requirements of the Administration. Any chemical treatment shall only use Active Substances approved by the Organization pursuant to Regulation D-3 of the Convention.

Sediment control

10 Where practicable, routine cleaning of the ballast tank to remove sediments should be carried out under controlled arrangements, and suitable arrangements made for the environmentally sound disposal of any resulting sediments.

Compliance with other guidelines

11 Nothing in these Guidelines shall prevent a ship to which these Guidelines apply from using any method of Ballast Water Management approved under any other Guidelines issued by the Organization. If suitable new and emergent treatments and technologies prove viable, these should be evaluated with a view to be incorporated, as appropriate, into these Guidelines.

RESOLUTION MEPC.127(53)
adopted on 22 July 2005

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

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

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

NOTING ALSO that resolution 1 adopted by the International Conference on Ballast Water Management for Ships invites the Organization to develop these Guidelines as a matter of urgency,

HAVING CONSIDERED the draft Guidelines for ballast water management and development of ballast water management plans developed by the Ballast Water Working Group and the recommendation made by the Sub-Committee on Bulk Liquids and Gases at its ninth session,

- 1 ADOPTS the Guidelines for ballast water management and development of ballast water management plans, as set out in the Annex to this resolution;
- 2 INVITES Governments to apply the Guidelines as soon as possible, or when the Convention becomes applicable to them; and
- 3 AGREES to keep the Guidelines under review.

* * *

ANNEX

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

1 INTRODUCTION

1.1 Ballast water is essential to control trim, list, draught, stability, or stresses of the ship. However, ballast water may contain aquatic organisms or pathogens which, if introduced into the sea including estuaries, or into fresh water courses, may create hazards to the environment, human health, property or resources, impair biological diversity or interfere with other legitimate uses of such areas.

1.2 The selection of appropriate methods of ballast water management should take into account the need ensure that Ballast Water Management practices used to comply with this Convention do not cause

greater harm than they prevent to the environment, human health, property or resources of any States and the safety of ships.

1.3 The objectives of these Guidelines are to assist Governments, appropriate authorities, ships masters, operators and owners, and port authorities, as well as other interested parties, in preventing, minimizing and ultimately eliminating the risk of introducing harmful aquatic organisms and pathogens from ships' ballast water and associated sediments while protecting ships' safety in applying the International Convention for the Control and Management of Ships' Ballast Water and Sediments (hereinafter referred to as the "Convention").

1.4 These guidelines consist of two parts:

Part A – "Guidelines for Ballast Water Management", which contains guidance on the general principles of Ballast Water Management; and

Part B – "Guidelines for the development of Ballast Water Management Plans", which contains guidance on the structure and content of Ballast Water Management Plans required by Regulation B-1 of the Convention.

2 DEFINITIONS

2.1 For the purposes of these Guidelines, the definitions in the Convention apply.

2.2 Ballast Water Tank means any tank, hold, or space used for the carriage of ballast water.

3 APPLICATION

3.1 The Guidelines apply to all ships and to Flag Administrations, port States, coastal States, ship owners, ship operators, ships' personnel involved in Ballast Water Management, ship designers, ship builders, classification societies as well as other interested parties.

PART A – GUIDELINES FOR BALLAST WATER MANAGEMENT

1 SHIP OPERATIONAL PROCEDURES

1.1 Precautionary practices

Avoiding unnecessary discharge of ballast water

1.1.1 If it is necessary to take on and discharge ballast water in the same port to facilitate safe cargo operations, care should be taken to avoid unnecessary discharge of ballast water that has been taken up in another port.

1.1.2 Managed ballast water which is mixed with unmanaged ballast water is no longer in compliance is no longer in compliance with Regulations D-1 and D-2 of the Annex to the Convention.

Minimizing the uptake of harmful aquatic organisms, pathogens and sediments

1.1.3 When loading ballast, every effort should be made to avoid the uptake of potentially harmful aquatic organisms, pathogens, and sediment that may contain such organisms. The uptake of ballast water should be minimized or, where practicable, avoided in areas and situations such as:

- .1 in areas identified by the port State in connection with advice provided by ports under paragraph 2.2.2;
- .2 in darkness when organisms may rise up in the water column;
- .3 in very shallow water;

- .4 where propellers may stir up sediment; or
- .5 where dredging is or recently has been carried out.

1.2 Ballast water management options

1.2.1 Ballast Water Exchange

1.2.1.1 Ballast water exchange is to be conducted in accordance with Regulation B-4 of the Convention and in accordance with the Guidelines for Ballast Water Exchange.

1.2.1.2 The voyage should be planned taking into account when ballast water exchange in accordance with Regulation B-4 of the Convention can be carried out.

1.2.1.3 Because of the possibility that partially exchange may encourage re-growth of organisms, ballast water exchange should only be commenced in any tank if there is sufficient time to complete the exchange to comply with the standard in Regulation D-1 and the ship can comply with the distance from land and minimum water depth criteria in Regulation B-4. As many complete tanks should be exchanged to the standard in Regulation D-1 as the time allows, if for any tank the standard in Regulation D-1 can not be fully met the exchange should not be commenced for that tank.

1.2.1.4 If ballast water exchange is not undertaken for the reasons in Regulation B-4.4, i.e. if the master reasonably decides that such exchange would threaten the safety or stability of the ship, its crew, or its passengers because of adverse weather, ship design or stress, equipment failure, or any other extraordinary condition, then details of the reasons ballast water exchange was not undertaken are to be recorded in the Ballast Water Record Book.

1.2.1.5 A port State may designate areas in which exchange may be conducted taking into account the Guidelines on designation of areas for ballast water exchange. Designated areas should only be used for those ballast water tanks that are intended to be discharged in the port of that State and that could not be exchanged in accordance with Regulation B-4.1 of the Convention.

1.2.2 Ballast Water Management Systems

1.2.2.1 Ballast Water Management Systems installed for compliance with Regulation B-3 are to be approved in accordance with Regulation D-3. Such systems are to be operated in accordance with the system design criteria and the manufacture's operational and maintenance instructions. The use of such systems should be detailed in the ship's Ballast Water Management Plan. All failures and malfunctions of the system are to be recorded in the Ballast Water Record Book.

1.2.3 Discharge to ballast water reception facilities

1.2.3.1 If ballast water reception facilities provided by a port State are utilized, Regulation B-3.6 applies.

1.2.4 Prototype ballast water treatment technologies

1.2.4.1 Prototype ballast water treatment technologies should be used within a programme approved by the Administration in accordance with Regulation D-4.

1.3 Sediment management

1.3.1 Regulation B-5 requires that all ships shall remove and dispose of sediments from spaces designated to carry ballast water in accordance with the ballast water management plan.

1.3.2 All practical steps should be taken during ballast uptake to avoid sediment accumulation, however, it is recognized that sediment will be taken on board and will settle on tank surfaces. When sediment has accu-

mulated, consideration should be given to flushing tank bottoms and other surfaces when in suitable areas, i.e. areas complying with the minimum depth and distance described by Regulations B-4.1.1 and B-4.1.2.

1.3.3 The volume of sediment in a ballast tank should be monitored on a regular basis.

1.3.4 Sediment in ballast tanks should be removed in a timely basis in accordance with the Ballast Water Management Plan and as found necessary. The frequency and timing of removal will depend on factors such as sediment build up, ship's trading pattern, availability of reception facilities, work load of the ship's personnel and safety considerations.

1.3.5 Removal of sediment from ballast tanks should preferably be undertaken under controlled conditions in port, at a repair facility or in dry dock. The removed sediment should preferably be disposed of in a sediment reception facility if available, reasonable and practicable.

1.3.6 When sediment is removed from the ship's ballast tanks and is to be disposed of by that ship at sea, such disposal should only take place in areas outside 200 nm from land and in water depths of over 200 m.

1.3.7 Regulation B-5 requires that ships constructed in or after 2009 should, without compromising safety or operational efficiency, be designed and constructed with a view to minimize the uptake and undesirable entrapment of sediments, facilitate removal of sediments, and provide safe access to allow for sediment removal and sampling, taking into account the Guidelines for sediments control on ships (G12). This also applies to ships constructed prior to 2009, to the extent practicable.

1.4 Additional Measures

1.4.1 Ships to which additional measures apply, under Regulation C-1, should take them into account in the ships voyage planning. Actions taken to comply with any additional measures should be recorded in the Ballast Water Record Book.

1.5 Exemptions

1.5.1 Regulation A-4 provides that an exemption may be granted from the requirements of Regulations B-3 or C-1 by a Party or Parties to a ship in specific circumstances. Applications for and the granting of such exemptions should be completed in accordance with the Guidelines for risk assessment (G7).

1.5.2 Ships granted an exemption referred to in paragraph 1.5.1 above should record the exemption in the Ballast Water Record Book and what actions have been taken with regards to the ships ballast water.

2 RECORDING PROCEDURES

2.1 Procedures for ships

2.1.1 To facilitate the administration of ballast water management and treatment procedures on board each ship, a responsible officer is to be designated in accordance with Regulation B-1 to ensure the maintenance of appropriate records and to ensure that ballast water management and/or treatment procedures are followed and recorded.

2.1.2 When carrying out any ballast water operation the details are to be recorded in the Ballast Water Record Book together with any exemptions granted in accordance with Regulation B-3 or C-1.

2.1.3 Where a port State requires information on ships ballast operations, relevant documentation, which takes account of the information requirements of the Convention, should be made available to the port State.

2.2 Procedures for port States

2.2.1 Port States should provide ships with details of their requirements concerning ballast water management including:

- .1 the location and terms of use of areas designated for ballast water exchange under Regulation B-4.2 of the Convention;
- .2 any additional measures determined under Regulation C-1 of the Convention;
- .3 warnings concerning ballast uptake and any other port contingency arrangements in the event of emergency situations; and
- .4 the availability, location, capacities of reception facilities that are provided for the environmentally safe disposal of ballast water and/or sediments, under Article 5 and Regulation B-3.6.

2.2.2 To assist ships in applying the precautionary practices described in section 1.1 of Part A, port States are required by Regulation C-2 of the Convention to endeavour to notify mariners of area(s), where ships should not uptake Ballast Water due to known conditions. Similar notification should be given for areas where the uptake of ballast water should be minimized, such as:

- .1 areas with outbreaks, infestations or known populations of harmful organisms and pathogens;
- .2 areas with current phytoplankton blooms (algal blooms, such as red tides);
- .3 nearby sewage outfalls;
- .4 areas where a tidal stream is known to be the more turbid;
- .5 areas where tidal flushing is known to be poor;
- .6 nearby dredging operations; and
- .7 nearby or in sensitive or estuarine sea areas.

3 TRAINING AND EDUCATION

3.1 Regulation B-6 requires that officers and crew shall be familiar with their duties in the implementation of Ballast Water Management particular to the ship on which they serve. Owners, managers, operators, and others involved in officer and crew training for ballast water management should consider the following:

3.2 Training for ships' masters and crews as appropriate should include instructions on the requirements of the Convention, the ballast water and sediment management procedures and the Ballast Water Record Book particularly having regard to matters of ship safety and maintenance of records in accordance with the information contained in these Guidelines.

3.3 The Ballast Water Management Plan should include training and education on ballast water management practices and the systems and procedures used on board the ship.

PART B – GUIDELINES FOR THE DEVELOPMENT OF BALLAST WATER MANAGEMENT PLANS

1 INTRODUCTION

1.1 These Guidelines have been developed to assist with the preparation of a ship's Ballast Water Management Plan (hereafter referred to as the "Plan"). The Plan must be approved by the Administration in

accordance with Regulation B-1 of the Convention.

1.2 This Part is comprised of three primary sections:

- .1 **General:** this section provides the objectives and a general overview of the subject matter and introduces the reader to the basic concept of the Guidelines and the Plan that is expected to be developed from them. This section also contains guidance on updating and use of the Plan.
- .2 **Mandatory provisions:** this section provides guidance to ensure that the mandatory provisions of Regulation B-1 of the Annex to the Convention are met.
- .3 **Non-mandatory provisions:** this section provides guidance concerning the inclusion of other information in the Plan. This information, although not required under Regulation B-1 of the Convention, may be found useful by local authorities in ports visited by the ship, or may provide additional assistance to the ship's master.

1.3 The format for a Ballast Water Management Plan is given in Appendix 1.

2 GENERAL

2.1 Concept of the Guidelines

2.1.1 These Guidelines are intended to provide a basis for the preparation of the Plans for individual ships. The broad spectrum of ships for which Plans are required makes it impractical to provide specific guidelines for each ship type. For a Plan to be effective and to comply with Regulation B-1 of the Annex of the Convention, it must be carefully tailored to the particular ship for which it is intended. Properly used, the Guidelines will ensure that all appropriate issues that may be applicable to a particular ship are considered in developing the Plan.

2.1.2 The issues that may require consideration include but are not limited to: type and size of ship, volume of ballast carried and total capacity of tanks used for ballast, ballast pumping capacity, ship and crew safety issues, voyage type and length, the ship's typical operational requirements, and ballast water management techniques used on board.

2.2 Concept of the Plan

2.2.1 The Plan is required to be onboard the ship and available to guide personnel in safe operation of the Ballast Water Management system employed on a particular ship. Effective planning ensures that the necessary actions are taken in a structured, logical, and safe manner.

2.2.2 For the Plan to accomplish its purpose, it must be:

- .1 realistic, practical, and easy to use;
- .2 understood by ship's personnel engaged in ballast water management, both on board and ashore;
- .3 evaluated, reviewed, and updated as necessary; and
- .4 consistent with the operational ballasting requirements of the ship.

2.2.3 The Plan envisioned by Regulation B-1 of the Annex to the Convention is intended to be a simple document. Inclusion of extensive background information on the ship, its structure, etc., should be avoided, as this is generally available elsewhere. If such information is relevant, it should be kept in annexes, or an existing document or manual reference should be made to the location of the information.

2.2.4 The Plan is a document to be used on board by the ship's personnel engaged in ballast water management. The Plan must therefore be available in a working language of the ship's personnel. A change in the personnel and or the, working language or would require the issuance of the Plan in the new language(s).

2.2.5 The Plan should be readily available for inspection by officers authorized by a Party to the Convention.

2.3 Exemptions

2.3.1 Regulation A-4 allows that exemption may be granted to a ship from Regulation B-3 or C-1.

2.3.2 Details of exemptions should be retained with the Plan.

2.3.3 Any exemption granted is to be recorded in the Ballast Water Record Book.

2.4 Additional Measures

2.4.1 The Convention, in Regulation C-1 Additional Measures, gives a Party individually or jointly with other Parties, the right to introduce measures in addition to those in Section B. Such Additional Measures are to be communicated to the Organization at least 6 months prior to the projected date of implementation.

2.4.2 The Plan should be accompanied by a most recent list of Additional measures, as communicated by the Organization relevant to the ship's trade. The Plan should contain details and advice on the actions a ship must take to comply with any additional measures that may be required in accordance with Regulation C-1 and for any emergency or epidemic situations.

2.5 Review of the Plan

2.5.1 Regular review of the Plan by the owner, operator, or master should be conducted to ensure that the information contained is accurate and updated. A feedback system should be employed which will allow quick capture of changing information and incorporation of it into the Plan.

2.5.2 Changes to the provisions of this Plan will need Administration approval.

3 MANDATORY PROVISIONS

3.1 This section provides individual guidelines for the seven mandatory provisions of Regulation B-1 of the Annex to the Convention. In addition, it provides information to assist ships personnel in managing ballast water and sediments.

3.2 Regulation B-1 of the Annex to the Convention provides that the Plan shall be specific to each ship and shall at least:

- .1 detail safety procedures for the ship and the crew associated with Ballast Water Management as required by the Convention;
- .2 provide a detailed description of the actions to be taken to implement the Ballast Water Management practices required by the Convention;
- .3 detail the procedures for the disposal of sediments at sea and to shore;
- .4 include the procedures for co-ordinating shipboard Ballast Water Management that involves discharge to the sea with the authorities of the State into whose waters such discharge will take place;
- .5 designates the officer on board in charge of ensuring that the Plan is properly implemented;
- .6 contain the reporting requirements for ships provided for under the Convention; and
- .7 be written in the working language of the ship. If the language used is not English, French or Spanish, a translation into one of these languages should be provided.

- 3.3 The Ballast Water Management Plan should give guidance on the ballast handling procedures to be followed, including:
- .1 uptake of ballast water;
 - .2 step-by-step procedures and sequences for the Ballast Water Management System used; and
 - .3 any operational or safety restrictions including those associated with the Ballast Water Management System used. This will also assist ship's personnel when responding to enquiries from inspection officers authorized by a Party.
- 3.4 Safety aspects of the Ballast Water Management system used should include, as applicable, guidance on:
- .1 stability to be maintained at all times to values not less than those recommended by the Organization (or required by the Administration);
 - .2 approved longitudinal stress and, where applicable, torsional stress values are to be maintained within permitted values;
 - .3 transfer or exchange of ballast that can generate significant structural loads by sloshing action in partially-filled tanks. If these operations include partially-filled tanks, consideration should be given to carrying out the operation in favourable sea and swell conditions such that the risk of structural damage is minimized;
 - .4 wave-induced hull vibrations when carrying out ballast water exchange;
 - .5 forward and aft draughts and trim, with particular reference to bridge visibility, slamming and minimum forward draft;
 - .6 the effects of any potential hazards and occupational health that may affect ship's personnel shall also be identified together with any safety precautions that need to be taken; and
 - .7 the possible effects of tank over pressurization.
- 3.5 If a ship is able to complete at least 95 per cent volumetric exchange in less than three pumped volumes, documentation indicating that this ballast water exchange process has been approved under Regulation D-1.2 should be provided in the Plan.
- 3.6 The Plan should also include procedures for the disposal of sediments and in particular:
- .1 on the sediment removal or reduction at sea, and when cleaning of the ballast tanks to remove sediments;
 - .2 regarding the safety consideration to be taken if tank entry is required to remove sediments; and
 - .3 regarding the use of port reception facilities for sediments.
- 3.7 The Plan should clearly identify the officer in charge of ballast water management and outline his/her duties which should include:
- .1 ensuring that the Ballast Water Management performed follows the procedures in the Plan;
 - .2 ensuring that the Ballast Water Record Book and any other necessary documentation are maintained; and
 - .3 being available to assist the inspection officers authorized by a Party for any sampling that may need to be undertaken.
- 3.8 The Plan should contain guidance on the recording requirements according to ship's Ballast Water Record Book provided for under this Convention including details of exemptions granted to the ship.

- 3.9 In addition to the above, the Plan should include the following:
- .1 A foreword which should provide the ship's crew with explanations on the need for ballast water management and for record keeping. The foreword should include a statement that, "This Plan must be kept available for inspection on request by an authorized authority".
 - .2 Ship particulars including at least:
 - .1 ships' name, flag, port of registry, Gross Tonnage, IMO number*, length (BP), beam, international call sign; deepest ballast drafts (normal and heavy weather);
 - .2 the total ballast capacity of the ship in cubic meters and other units if applicable to the ship;
 - .3 a brief description of the main ballast water management method(s) used on the ship; and
 - .4 identification (rank) of the officer in charge for implementing the Plan.
 - .3 Information on Ballast Water Management System used on board, including:
 - .1 ballast tank arrangement;
 - .2 ballast capacity plan;
 - .3 a ballast water piping and pumping arrangement, including air pipes and sounding arrangements;
 - .4 ballast water pump capacities;
 - .5 the Ballast Water Management System used on board, with references to operational and maintenance manuals held on board;
 - .6 installed ballast water treatment systems; and
 - .7 a plan and profile of the ship, or a schematic drawing of the ballast arrangement.
 - .4 Information on the ballast water sampling points, including:
 - .1 A list or diagrams indicating the location of sampling and access points in pipelines and ballast water tanks, to enable crew members to assist the authorized officers of a Party that have reason to obtain samples.
 - .2 This section should make clear that sampling of ballast water is primarily a matter for the authorized inspection officers, and there is unlikely to be any need for crew members to take samples except at the express request, and under the supervision, of the authorized inspection officers.
 - .3 The authorized inspection officers should be advised of all safety procedures to be observed when entering enclosed spaces.
 - .5 Provisions for crew training and familiarization, including:
 - .1 requirements of a general nature regarding Ballast Water Management;
 - .2 training and information on ballast water management practices;

* In accordance with resolution A.600(15) IMO Ship Identification Number Scheme.

- .3 ballast water exchange;
- .4 ballast water treatment systems;
- .5 general safety considerations;
- .6 the Ballast Water Record Book and maintenance of records;
- .7 the operation and maintenance of installed ballast water treatment systems;
- .8 safety aspects associated with the particular systems and procedures used onboard the ship which affect the safety or human health of crew and passengers and/or the safety of the ship;
- .9 precautions for entering tanks for sediment removal;
- .10 procedures for the safe handling and packaging of sediment; and
- .11 storage of sediment.

4 NON-MANDATORY INFORMATION

4.1 In addition to the provisions required by Articles and regulations of the Convention, the owner/operator may include in the Plan, as appendices, additional information such as: provision of additional diagrams and drawings, shipboard equipment and reference materials. National or regional requirements that differ from the Convention may also be recorded for reference.

4.2 Non-mandatory information may also include manufactures manuals (either as extracts or complete) or reference to the location on board of such manuals and other relevant material.

* *

APPENDIX

STANDARD FORMAT FOR THE BALLAST WATER MANAGEMENT PLAN

PREAMBLE

The ballast water management plan should contain the information required by Regulation B-1 of the Convention.

For guidance in preparing the plan the following information is to be included. The plan should be specific to each ship.

INTRODUCTION

At the beginning of each plan, wording should be included to reflect the intent of the following text.

1 This Plan is written in accordance with the requirements of Regulation B-1 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention) and the associated Guidelines.

2 The purpose of the Plan is to meet the requirements for the control and management of ship's ballast water and sediments in accordance with the Guidelines for Ballast Water Management and the Development of Ballast Water Management Plans resolution MEPC XX(YY) (The Guidelines). It provides standard operational guidance for the planning and management of ships' ballast water and sediments and describes safe procedures to be followed.

3 This Plan has been approved by the Administration and no alteration or revision shall be made to any part of it without the prior approval of the Administration.

4 This Plan may be inspected on request by an authorized authority.

Note: The Plan is to be written in the working language of the crew, if the text is not in English, French, or Spanish, the plan is to include a translation into one of these languages.

SHIP PARTICULARS

At least the following details should be included:

Ships' name;

Flag;

Port of registry;

Gross Tonnage;

IMO number*;

Length (BP);

Beam;

International call sign;

Deepest ballast drafts (normal and heavy weather);

Total ballast capacity of the ship in cubic meters and other units if applicable to the ship;

A brief description of the main ballast water management method(s) used on the ship; and

Identification (rank) of the appointed ballast water management officer.

INDEX

An index of sections should be included to reference the content of the Plan.

PURPOSE

Should contain a brief introduction for the ship's crew, explaining the need for ballast water management, and the importance of accurate record keeping.

PLANS/DRAWINGS OF THE BALLAST SYSTEM

Plans or drawings of the ballast system for example:

- 1) ballast tank arrangement;
- 2) ballast capacity plan;
- 3) a ballast water piping and pumping arrangement, including air pipes and sounding arrangements;
- 4) ballast water pump capacities;
- 5) the ballast water management system used onboard, with references to detailed operational and maintenance manuals held on board;
- 6) installed ballast water treatment systems; and
- 7) a plan and profile of the ship, or a schematic drawing of the ballast arrangement.

* In accordance with resolution A.600(15), IMO Ship Identification Number Scheme.

DESCRIPTION OF THE BALLAST SYSTEM

A description of the ballast system.

BALLAST WATER SAMPLING POINTS

Lists and/or diagrams indicating the location of sampling and access points in pipelines and ballast water tanks.

A note that sampling of ballast water is primarily a matter for the authorized authority, and there is unlikely to be any need for crew members to take samples except at the express request, and under the supervision, of the authorized authority.

OPERATION OF THE BALLAST WATER MANAGEMENT SYSTEM

A detailed description of the operation of the Ballast Water Management System(s) used on board.

Information on general ballast water management precautionary practices.

SAFETY PROCEDURES FOR THE SHIP AND THE CREW

Details of specific safety aspects of the ballast water management system used.

OPERATIONAL OR SAFETY RESTRICTIONS

Details of specific operational or safety restrictions including those associated with the management system which affects the ship and or the crew including reference to procedures for safe tank entry.

DESCRIPTION OF THE METHOD(S) USED ON BOARD FOR BALLAST WATER MANAGEMENT AND SEDIMENT CONTROL

Details of the method(s) used on board for the management of ballast and for sediment control including step-by-step operational procedures.

PROCEDURES FOR THE DISPOSAL OF SEDIMENTS

Procedures for the disposal of sediments at sea and to shore.

METHODS OF COMMUNICATION

Details of the procedures for co-ordinating the discharge of ballast in waters of a coastal State.

DUTIES OF THE BALLAST WATER MANAGEMENT OFFICER

Outline of the duties of the designated officer.

RECORDING REQUIREMENTS

Details of the record-keeping requirements of the Convention.

CREW TRAINING AND FAMILIARIZATION

Information on the provision of crew training and familiarization.

EXEMPTIONS

Details of any exemptions granted to the ship under Regulation A-4.

APPROVING AUTHORITY

Details and stamp of approving authority.

RESOLUTION MEPC.153(55)
adopted on 13 October 2006

GUIDELINES FOR BALLAST WATER RECEPTION FACILITIES (G5)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that Regulation B-3.6 of the Ballast Water Management Convention provides that, the requirements of ballast water management standards do not apply to ships that discharge ballast water to a reception facility designed taking into account the Guidelines developed by the Organization for such facilities,

NOTING ALSO that resolution 1 adopted by the International Conference on Ballast Water Management for Ships invited the Organization to develop these Guidelines as a matter of urgency,

HAVING CONSIDERED, at its fifty-fifth session, the draft the Guidelines for ballast water reception facilities (G5) developed by the Ballast Water Working Group, and the recommendation made by the Sub-Committee on Flag State Implementation at its fourteenth session,

1. ADOPTS the Guidelines for ballast water reception facilities (G5) as set out in the Annex to this resolution;
2. INVITES Governments to apply these Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep these Guidelines under review.

* * *

ANNEX

GUIDELINES FOR BALLAST WATER RECEPTION FACILITIES (G5)

1 INTRODUCTION

Purpose

1.1 The purpose of these guidelines is to provide guidance for the provision of facilities for the reception of ballast water as referred to in Regulation B-3.6 of the Convention. These guidelines are not intended to require that a Party shall provide such facilities. The guidance is also intended to encourage a worldwide uniform interface between such facilities and the ships without prescribing dedicated shoreside reception plants.

Application

1.2 These guidelines apply to ballast water reception facilities referred to in the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Convention), Regulation B-3.6.

1.3 These guidelines do not apply to reception facilities for sediment referred to in Article 5 and Regulation B-5 of the Convention.

2 DEFINITIONS

2.1 For the purposes of these guidelines, the definitions in Article 1 and Regulation A-1 of the Convention apply.

3 GENERAL REQUIREMENTS FOR BALLAST WATER RECEPTION FACILITIES

3.1 A ballast water reception facility should be capable of receiving ballast water from ships so as not to create a risk to the environment, human health, property and resources arising from the release to the environment of Harmful Aquatic Organisms and Pathogens. A facility should provide pipelines, manifolds, reducers, equipment and other resources to enable, as far as practicable, all ships wishing to discharge ballast water in a port to use the facility. The facility should provide adequate equipment for mooring ships using the facility and when applicable safe anchorage.

3.2 Each Party shall report to the Organization and, where appropriate, make available to other Parties, information on the availability and location of any reception facilities for the environmentally safe disposal of ballast water.

4 PROVISION OF BALLAST WATER RECEPTION FACILITIES

4.1 When considering the requirements of these facilities many factors will have to be taken into account, these should include but not be limited to:

- .1 regional, national and local legislation which will affect the facility and related to the items below;
- .2 site selection;
- .3 ship type and size that will use the facility;
- .4 ship configurations;
- .5 mooring requirements;
- .6 handling of ballast water;
- .7 sampling, testing and analysis of ballast water;
- .8 storage and of conditions of ballast water;
- .9 environmental benefits and costs;
- .10 proximity of available sites to local ports;
- .11 effect on the environment in construction and operation of the facility;
- .12 training of facility staff;
- .13 human health;
- .14 safety;
- .15 maintenance;
- .16 operational limitations;
- .17 waterway access, approaches and traffic management; and
- .18 the amount of ballast water likely to be received.

5 TREATMENT AND DISPOSAL OF RECEIVED BALLAST

5.1 Disposal of ballast water from a reception facility should not create a risk to the environment, human health, property and resources arising from the release or transfer to the environment of Harmful Aquatic Organisms and Pathogens.

5.2 Treatment methods applied to the ballast water should not produce effects that may create a risk to the environment, human health, property and resources.

5.3 Where ballast water is disposed into the aquatic environment it should at least meet the ballast water performance standard specified in Regulation D-2 of the Convention. Disposal to other environments should be to a standard acceptable to the Port State. Such a standard should not create a risk to the environment, human health, property and resources arising from the release or transfer to the environment of Harmful Aquatic Organisms and Pathogens.

6 SUSPENDED MATTER

6.1 Ballast water discharged from a ship should be accepted by the ballast water reception facility including its suspended matter.

7 CAPABILITIES OF A RECEPTION FACILITY

7.1 Details of the capabilities and any capacity limitations of a treatment facility should be made available to the ships that intend to use the facility.

7.2 The details made available to ships should include but not be limited to:

- .1 maximum volumetric capacity of ballast water;
- .2 maximum volume of ballast water that can be handled at any one time;
- .3 maximum transfer rates of ballast water (cubic metres per hour);
- .4 hours of operation;
- .5 ports, berths, areas where access to the facility is available;
- .6 ship-to-shore pipeline connection details (pipeline size and reducers available);
- .7 if ship or shore crew are required for duties such as to connect or disconnect hoses;
- .8 contact details for the facility;
- .9 how to request use of the facility including any notice period and what information is required from the ship;
- .10 all applicable fees; and
- .11 other relevant information.

7.4 The facility should provide ship to shore connections that are compatible with a recognized standard such as those in the Oil Companies International Marine Forum (OCIMF) "Recommendations for Oil Tankers Manifolds and Associated Equipment". It is recognized that this standard was originally produced for oil tankers however the general principles in this standard can be applied to connections for ballast transfer on other ship types in particular the sections related to flanges and connection methods.

8 TRAINING

8.1 Personnel in charge of and those employed in the provision of a ballast water reception facility including the treatment and disposal of ballast water should have received adequate instruction. Frequent training should include but not be limited to:

- .1 the purpose and principles of the Convention;
- .2 the risks to the environment and human health;

- .3 risk associated with the handling of ballast water including both general safety and human health risks;
- .4 safety;
- .5 adequate knowledge of the equipment involved;
- .6 a sufficient understanding of ships using the facility, and any operational constraints;
- .7 the ship/port communication interface; and
- .8 an understanding of local disposal controls.

8.2 The training should be organized by the manager or the operator of the reception facility and delivered by suitably qualified professionals.

RESOLUTION MEPC.124(53)
adopted on 22 July 2005

GUIDELINES FOR BALLAST WATER EXCHANGE (G6)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that Regulation B-4 of the Annex to the Ballast Water Management Convention addresses the conditions under which ballast water exchange should be conducted, taking into account Guidelines developed by the Organization,

NOTING ALSO that resolution 1 adopted by the International Conference on Ballast Water Management for Ships invites the Organization to develop these Guidelines as a matter of urgency,

HAVING CONSIDERED the draft Guidelines for ballast water exchange developed by the Ballast Water Working Group and the recommendation made by the Sub-Committee on Bulk Liquids and Gases at its ninth session,

1. ADOPTS the Guidelines for ballast water exchange, as set out in the Annex to this resolution;
2. INVITES Governments to apply the Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep the Guidelines under review.

* * *

ANNEX

GUIDELINES FOR BALLAST WATER EXCHANGE (G6)

1 INTRODUCTION

1.1 The purpose of these Guidelines is to provide shipowners and operators with general guidance on the development of ship specific procedures for conducting ballast water exchange. Whenever possible ship owner and operators should enlist the assistance of classification societies or qualified marine surveyors in tailoring ballast exchange practices for various conditions of weather, cargo and stability. The application of processes and procedures concerning ballast water management are at the core of the solution to prevent, minimize and ultimately eliminate the introduction of harmful aquatic organisms and pathogens. Ballast water exchange offers a means, when used in conjunction with good ballast water management practices, to assist in achieving this solution.

1.2 Ballast water exchange introduces a number of safety issues, which affect both the ship and its crew. These Guidelines are intended to provide guidance on the safety and operational aspects of ballast water exchange at sea.

1.3 Given that there are different types of ships, which may be required to undertake ballast water exchange at sea, it is impractical to provide specific guidelines for each ship type. Shipowners are cautioned that they should consider the many variables that apply to their ships. Some of these variables include type and size of ship, ballast tank configurations and associated pumping systems, trading routes and associated weather conditions, port State requirements and manning.

Application

1.4 The Guidelines apply to all those involved with ballast water exchange including, shipowners and operators, designers, classification societies and shipbuilders. Operational procedures and guidance reflecting the issues rose in these Guidelines should be reflected in the ships ballast water management plan.

2 DEFINITIONS

2.1 For the purposes of these Guidelines, the definitions in the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Convention) apply and:

- .1 "Ballast Water Tank" – means any tank, hold, or space used for the carriage of ballast water.

3 RESPONSIBILITIES

3.1 Shipowners and operators should ensure, prior to undertaking ballast water exchange, that all the safety aspects associated with the ballast water exchange method or methods used onboard have been considered and that suitably trained personnel are onboard. A review of the safety aspects, the suitability of the exchange methods being used and the aspects of crew training should be undertaken at regular intervals.

3.2 The Ballast Water Management Plan is to include the duties of key shipboard control personnel undertaking ballast water exchange at sea. Such personnel should be fully conversant with the safety aspects of ballast water exchange and in particular the method of exchange used on board their ship and the particular safety aspects associated with the method used.

3.3 In accordance with Regulation B-4.4 of the Convention if the master reasonably decides that to perform ballast water exchange would threaten the safety or stability of the ship, its crew or its passengers, because of adverse weather, the ship's design, stress, equipment failure, or any other extraordinary condition a ship shall not be required to comply with Regulations B-4.1 and B-4.2.

- .1 When a ship does not undertake ballast water exchange for the reasons stated in paragraph above, the reasons shall be entered in the Ballast Water Record Book.
- .2 The port or coastal State concerned may require that the discharge of ballast water must be in accordance with procedures determined by them taking into account the Guidelines for additional measures including emergency situations (G13).

4 BALLAST WATER EXCHANGE REQUIREMENTS

4.1 Exchange of ballast water in deep ocean areas or open seas offers a means of limiting the probability that harmful aquatic organisms and pathogens be transferred in ships ballast water.

4.2 Regulation D-1 of the Convention requires that:

- .1 ships performing ballast water exchange in accordance with this regulation shall do so with an efficiency of at least 95 per cent volumetric exchange of ballast water; and

.2 for ships exchanging ballast water by the pumping-through method, pumping through three times the volume of each ballast water tank shall be considered to meet the standard described in paragraph 1. Pumping through less than three times the volume may be accepted provided the ship can demonstrate that at least 95 per cent volumetric exchange is met.

4.3 There are three methods of Ballast Water exchange which have been evaluated and accepted by the Organization. The three methods are the sequential method, the flow-through method and the dilution method. The flow-through method and the dilution method are considered as “pump through” methods.

4.4 The three accepted methods can be described as follows:

Sequential method – a process by which a ballast tank intended for the carriage of ballast water is first emptied and then refilled with replacement ballast water to achieve at least a 95 per cent volumetric exchange.

Flow-through method – a process by which replacement ballast water is pumped into a ballast tank intended for the carriage of ballast water, allowing water to flow through overflow or other arrangements.

Dilution method – a process by which replacement ballast water is filled through the top of the ballast tank intended for the carriage of ballast water with simultaneous discharge from the bottom at the same flow rate and maintaining a constant level in the tank throughout the ballast exchange operation.

5 SAFETY PRECAUTIONS ASSOCIATED WITH BALLAST WATER EXCHANGE

5.1 Three methods of carrying out ballast water exchange at sea have been identified as acceptable by the Organization. Each has particular safety aspects associated with it that should be considered when selecting the method(s) to be used on a particular ship.

5.2 When identifying the ballast water exchange method(s) for the first time for a particular ship, an evaluation should be made which should include:

- .1 the safety margins for stability and strength contained in allowable seagoing conditions, as specified in the approved trim and stability booklet and the loading manual relevant to individual types of ships. Account should also be taken of the loading conditions and the envisaged ballast water exchange method or methods to be used;
- .2 the ballast pumping and piping system taking account of the number of ballast pumps and their capacities, size and arrangements of ballast water tanks; and
- .3 the availability and capacity of tank vents and overflow arrangements, for the flow through method, the availability and capacity of tank overflow points, prevention of under and over pressurization of the ballast tanks.

5.3 Particular account should be taken of the following:

- .1 stability which is to be maintained at all times and not less than those values recommended by the Organization or required by the Administration;
- .2 longitudinal stress, and where applicable torsional stress values, not to exceed permitted values with regard to prevailing sea conditions;
- .3 exchange of ballast in tanks where significant structural loads may be generated by sloshing action in the partially filled tank to be carried out in favourable sea and swell conditions such that the risk of structural damage is minimized;
- .4 wave-induced hull vibrations when carrying out ballast water exchange;

- .5 imitations of the available methods of ballast water exchange in respect of sea and weather conditions;
- .6 forward and aft draughts and trim, with particular reference to bridge visibility, slamming, propeller immersion and minimum forward draft; and
- .7 additional work loads on the master and crew.

5.4 Having undertaken an evaluation for a particular ship and the exchange method or methods to be used, the ship should be provided with procedures, advice and information appropriate to the exchange method(s) identified and ship type in the Ballast Water Management Plan. The procedures, advice, and information in the Ballast Water Management Plan, may include but is not limited to the following:

- .1 avoidance of over and under-pressurization of ballast tanks;
- .2 free surface effects on stability and sloshing loads in tanks that may be slack at any one time;
- .3 maintain adequate intact stability in accordance with an approved trim and stability booklet;
- .4 permissible seagoing strength limits of shear forces and bending moments in accordance with an approved loading manual;
- .5 torsional forces;
- .6 forward and aft draughts and trim, with particular reference to bridge visibility, propeller immersion and minimum forward draft;
- .7 wave-induced hull vibrations when performing ballast water exchange;
- .8 watertight and weathertight closures (e.g. manholes) which may have to be opened during ballast exchange must be re-secured;
- .9 maximum pumping/flow rates – to ensure the tank is not subjected to a pressure greater than that for which it has been designed;
- .10 internal transfers of ballast;
- .11 admissible weather conditions;
- .12 weather routeing in areas seasonably affected by cyclones, typhoons, hurricanes, or heavy icing conditions;
- .13 documented records of ballasting and/or de-ballasting and/or internal transfers of ballast;
- .14 contingency procedures for situations which may affect ballast water exchange at sea, including deteriorating weather conditions, pump failure and loss of power;
- .15 time to complete the ballast water exchange for each tank or an appropriate sequence thereof;
- .16 continual monitoring of the ballast water operation; monitoring should include pumps, levels in tanks, line and pump pressures, stability and stresses;
- .17 a list of circumstances in which ballast water exchange should not be undertaken. These circumstances may result from critical situations of an exceptional nature or *force majeure* due to stress of weather, known equipment failures or defects, or any other circumstances in which human life or safety of the ship is threatened;

- .18 ballast water exchange at sea should be avoided in freezing weather conditions. However, when it is deemed absolutely necessary, particular attention should be paid to the hazards associated with the freezing of overboard discharge arrangements, air pipes, ballast system valves together with their means of control, and the build up of ice on deck; and
- .19 personnel safety, including precautions which may be required when personnel are required to work on deck at night, in heavy weather, when ballast water overflows the deck, and in freezing conditions. These concerns may be related to the risks to the personnel of falling and injury, due to the slippery wet surface of the deck plate, when water is overflowing on deck, and to the direct contact with the ballast water, in terms of occupational health and safety.

5.5 During ballast water exchange sequences there may be times when, for a transitory period, one or more of the following criteria cannot be fully met or are found to be difficult to maintain:

- .1 bridge visibility standards (SOLASV/22);
- .2 propeller immersion; and
- .3 minimum draft forward.

5.6 As the choice of acceptable ballast water exchange sequences is limited for most ships, it is not always practicable to dismiss from consideration those sequences where transitory noncompliance may occur. The practical alternative would be to accept such sequences provided an appropriate note is placed in the Ballast Water Management Plan to alert the ship's master. The note would advise the master of the nature of the transitory non-compliance, that additional planning may be required and that adequate precautions need to be taken when using such sequences.

5.7 In planning a ballast water exchange operation that includes sequences which involve periods when the criteria for propeller immersion, minimum draft and/or trim and bridge visibility cannot be met, the Master should assess:

- .1 the duration(s) and time(s) during the operation that any of the criteria will not be met;
- .2 the effect(s) on the navigational and manoeuvring capabilities of the ship; and
- .3 the time to complete the operation.

5.8 A decision to proceed with the operation should only be taken when it is anticipated that:

- .1 the ship will be in open water;
- .2 the traffic density will be low;
- .3 an enhanced navigational watch will be maintained including if necessary an additional look out forward with adequate communications with the navigation bridge;
- .4 the manoeuvrability of the vessel will not be unduly impaired by the draft and trim and or propeller immersion during the transitory period; and
- .5 the general weather and sea state conditions will be suitable and unlikely to deteriorate.

5.9 On oil tankers, segregated ballast and clean ballast may be discharged below the water line at sea by pumps if the ballast water exchange is performed under the provisions of Regulation D-1.1 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, provided that the surface of the ballast water has been examined either visually or by other means immediately before the discharge to ensure that no contamination with oil has taken place.

6 CREW TRAINING AND FAMILIARIZATION

6.1 Appropriate training for ships' masters and crews should include instructions on the safety issues associated with ballast water exchange based upon the information contained in these Guidelines. Instruction should be provided on the ships' Ballast Water Management Plan including the completion of required records.

6.2 Ships' officers and crew engaged in ballast water exchange at sea should be trained in and be familiar with the following as appropriate:

- .1 the ship's ballast pumping and piping arrangements, positions of associated air and sounding pipes, positions of all compartment and tank suctions and pipelines connecting them to ship's ballast pumps and, in the case of use of the flow through method of ballast water exchange, the openings used for release of water from the top of the tank together with overboard discharge arrangements;
- .2 the method of ensuring that sounding pipes are clear, and that air pipes and their non-return devices are in good order;
- .3 the different times required to undertake the various ballast water exchange operations including the time to complete individual tanks;
- .4 the method(s) in use for ballast water exchange at sea if applicable with particular reference to required safety precautions; and
- .5 the need to continually monitor ballast water exchange operations.

7 FUTURE CONSIDERATIONS IN RELATION TO BALLAST WATER EXCHANGE

7.1 These Guidelines may be revised and updated in the light of possible technical evolutions with the ballast water exchange methods and of new ballast water management options.

RESOLUTION MEPC.162(56)
adopted on 13 July 2007

**GUIDELINES FOR RISK ASSESSMENT UNDER REGULATION A-4
OF THE BWM CONVENTION (G7)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that regulation A-4 of the Convention stipulates that a Party or Parties, in waters under their jurisdiction, may grant exemptions to any requirements to apply regulation B-3 or C-1, in addition to those exemptions contained elsewhere in this Convention, but only when they are, *inter alia*, granted based on the Guidelines on risk assessment developed by the Organization.

NOTING ALSO that the International Conference on Ballast Water Management for Ships, in its resolution 1, invited the Organization to develop the Guidelines for uniform application of the Convention as a matter of urgency,

HAVING CONSIDERED, at its fifty-sixth session, the draft Guidelines for risk assessment under regulation A-4 (G7) of the BWM Convention developed by the Ballast Water Working Group, and the recommendation made by the Sub-Committee on Bulk Liquids and Gases at its eleventh session,

1. ADOPTS the Guidelines for risk assessment under regulation A-4 (G7) of the BWM Convention as set out in the annex to this resolution;
2. INVITES Governments to apply the Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep the Guidelines under review.

* * *

ANNEX

**GUIDELINES FOR RISK ASSESSMENT UNDER REGULATION A-4
OF THE BWM CONVENTION (G7)**

1 PURPOSE

- 1.1 The purpose of these Guidelines is to assist Parties to ensure that provisions of regulation A-4 of the Convention are applied in a consistent manner, and based on scientifically robust risk assessment, which ensures that the general and specific obligations of a Party to the Convention are achieved.

- 1.2 An additional purpose is to provide assurance to affected States that exemptions granted by a Party meet the regulation A-4.3 obligations.
- 1.3 The Guidelines outline three risk assessment methods that will enable Parties to identify unacceptable high risk scenarios and acceptable low risk scenarios, and advise Parties on procedures for granting and withdrawing exemptions in accordance with regulation A-4.

2 INTRODUCTION

2.1 Regulation A-4 of the Convention states that a Party or Parties, in waters under their jurisdiction may grant exemptions to any requirements to apply regulation B-3 or C-1, in addition to those exemptions contained elsewhere in the Convention, but only when they are:

- .1 granted to a ship or ships on a voyage or voyages between specified ports or locations; or to a ship which operates exclusively between specified ports or locations;
- .2 effective for a period of no more than five years subject to intermediate review;
- .3 granted to ships that do not mix ballast water or sediments other than between the ports or locations specified in paragraph 2.1.1; and
- .4 granted based on the Guidelines that have been developed by the Organization.

2.2 These Guidelines provide advice and information regarding risk assessment principles and methods, data needs, advice on application of risk assessment methods, procedures for granting exemptions, consultation and communication processes, information for reviewing exemptions and advice regarding technical assistance, co-operation and regional co-operation.

2.3 These Guidelines also provide advice regarding the roles of the Organization, shipping industry, port States and other States that might be affected by granting an exemption in accordance with regulation A-4 of the Convention.

2.4 Scientifically robust risk assessment underpins the process of Parties granting exemptions under regulation A-4 of the Convention. The assessment must be sufficiently robust to distinguish between unacceptable high risk scenarios and acceptable low risk scenarios where the discharge of ballast water not meeting regulations B-3 and C-1 is unlikely to impair or damage the environment, human health, property or resources of the granting Party and of adjacent or other States.

2.5 Risk assessments should be based on best available scientific information.

2.6 The Guidelines should be kept under review in order to incorporate experiences gained during their application and any new scientific and technical knowledge.

3 APPLICATION

3.1 These Guidelines apply to Parties granting exemptions to ships under regulation A-4 of the Convention.

3.2 Shipowners or operators wanting to seek an exemption under regulation A-4 should also consult these Guidelines.

4 DEFINITIONS

4.1 For the purposes of these Guidelines, the definitions in the Convention apply.

4.2 “Anadromous”: species that spawn/reproduce in freshwater environments, but spend at least part of their adult life in a marine environment.

4.3 “Biogeographic region”: a large natural region defined by physiographic and biologic characteristics within which the animal and plant species show a high degree of similarity. There are no sharp and absolute boundaries but rather more or less clearly expressed transition zones.

4.4 “Catadromous”: species that spawn/reproduce in marine environments, but spend at least part of their adult life in a freshwater environment.

4.5 “Cryptogenic”: species that are of unknown origin, i.e. species that are not demonstrably native or introduced to a region.

4.6 “Donor Port”: port or location where the ballast water is taken onboard.

4.7 “Euryhaline”: species able to tolerate a wide range of salinities.

4.8 “Eurythermal”: species able to tolerate a wide range of temperatures.

4.9 “Freshwater”: water with salinity lower than 0.5 psu (practical salinity units).

4.10 “Marine water”: Water with salinity higher than 30 psu.

4.11 “Non-indigenous species”: any species outside its native range, whether transported intentionally or accidentally by humans or transported through natural processes.

4.12 “Recipient port”: port or location where the ballast water is discharged.

4.13 “Target species”: species identified by a Party that meet specific criteria indicating that they may impair or damage the environment, human health, property or resources and are defined for a specific port, State or biogeographic region.

5 RISK ASSESSMENT PRINCIPLES

5.1 Risk assessment is a logical process for assigning the likelihood and consequences of specific events, such as the entry, establishment, or spread of harmful aquatic organisms and pathogens. Risk assessments can be qualitative or quantitative, and can be a valuable decision aid if completed in a systematic and rigorous manner.

5.2 The following key principles define the nature and performance of risk assessment:

- .1 **Effectiveness** – That risk assessments accurately measures the risks to the extent necessary to achieve an appropriate level of protection.
- .2 **Transparency** – That the reasoning and evidence supporting the action recommended by risk assessments, and areas of uncertainty (and their possible consequences to those recommendations), are clearly documented and made available to decision-makers.
- .3 **Consistency** – That risk assessments achieve a uniform high level of performance, using a common process and methodology.
- .4 **Comprehensiveness** – That the full range of values, including economic, environmental, social and cultural, are considered when assessing risks and making recommendations.
- .5 **Risk Management** – That low risk scenarios may exist, but zero risk is not obtainable, and as such risk should be managed by determining the acceptable level of risk in each instance.
- .6 **Precautionary** – That risk assessments incorporate a level of precaution when making assumptions, and making recommendations, to account for uncertainty, unreliability, and inadequacy of information. The absence of, or uncertainty in, any information should there-

fore be considered an indicator of potential risk.

- .7 **Science based** – That risk assessments are based on the best available information that has been collected and analysed using scientific methods.
- .8 **Continuous improvement** – Any risk model should be periodically reviewed and updated to account for improved understanding.

5.3 In undertaking risk assessment when considering granting an exemption, the risk assessment principles should be carefully applied. The lack of full scientific certainty should be carefully considered in the decision making process. This is especially important under these Guidelines, as any decision to grant an exemption will allow for the discharge of ballast water that does not meet the standards of regulation D-1 or D-2.

6 RISK ASSESSMENT METHODS

6.1 General

6.1.1 There are three risk assessment methods outlined in these Guidelines for assessing the risks in relation to granting an exemption in accordance with regulation A-4 of the Convention:

- Environmental matching risk assessment
- Species' biogeographical risk assessment
- Species-specific risk assessment

6.1.2 Environmental matching risk assessment relies on comparing environmental conditions between locations, species' biogeographical risk assessment compares the overlap of native and non-indigenous species to evaluate environmental similarity and to identify high risk invaders, while species-specific risk assessment evaluates the distribution and characteristics of identified target species. Dependent on the scope of the assessment being performed, the three approaches could be used either individually or in any combination, recognizing that each approach has its limitations.

6.1.3 Environment matching and species' biogeographical risk assessment may be best suited to assessments between biogeographic regions. Species-specific risk assessment may be best suited to situations where the assessment can be conducted on a limited number of harmful species within a biogeographic region.

6.2 Environmental matching risk assessment

6.2.1 Environmental matching risk assessments compare environmental conditions including temperature and salinity between donor and recipient regions. The degree of similarity between the locations provides an indication of the likelihood of survival and the establishment of any species transferred between those locations.

6.2.2 Since species are widely distributed in a region, and are rarely restricted to a single port the environmental conditions of the source region should be considered.

6.2.3 These regions are typically defined as biogeographic regions. Noting that all of the existing biogeographical schemes were derived for different purposes than proposed here, it is suggested that the Large Marine Ecosystems (LME) scheme (<http://www.edc.uri.edu/lme>) be used based on best available information at this time, with local and regional adaptation as necessary. It is recognized that the suggested biogeographical scheme may not be appropriate in certain circumstances and in this case other recognized biogeographical schemes may need to be considered ¹.

6.2.4 Environmental matching should therefore compare environmental conditions between the donor biogeographic region and the recipient port to determine the likelihood that any species found in the donor biogeographic region are able to survive in the recipient port in another biogeographic region. The environmental conditions that may be considered for environmental matching include salinity, temperature or other environmental conditions, such as nutrients or oxygen.

6.2.5 The difficulty in using environmental matching risk assessments is identifying the environmental conditions that are predictive of the ability of the harmful species to successfully establish and cause harm in the new location, and in determining whether the risk of ballast water discharge is sufficiently low to be acceptable. Environmental matching risk assessments have limited value where the differences between a donor biogeographic region and a recipient port are small as high similarity is likely to indicate high likelihood of successful establishment.

6.2.6 Environmental conditions should also be compared between the donor and recipient ports. Similarity in key environmental conditions between the two ports is a stronger indication that species entrained in ballast water in the donor port could survive when released into the waters of the recipient port. The environmental conditions that may be considered for environmental matching include salinity, temperature or other environmental conditions, such as nutrients or oxygen.

6.2.7 The data necessary to enable a risk assessment using environmental matching includes, but is not limited to:

- .1 Origin of the ballast water to be discharged in recipient port.
- .2 Biogeographic region of donor and recipient port(s).
- .3 The average and range of environmental conditions, in particular salinity and temperature.

This information is used to determine the degree of environmental similarity between the donor and recipient environments. In many cases, it should be possible to use existing data for part or all of these environmental profiles.

6.2.8 The following should be considered in gathering data on the environmental conditions:

- .1 The seasonal variations in surface and bottom salinities and temperatures at the recipient port and the larger water body the port is contained within (e.g., estuary or bay). Surface and bottom values are needed to determine the full range of environmental conditions available for a potential invader (e.g., low salinity surface waters allowing the invasion of a freshwater species). Salinity and temperature depth profiles are not required if available data indicates the waters are well mixed over the entire year.
- .2 In recipient ports with strong tides or currents, the temporal variations in salinity should be determined over a tidal cycle.
- .3 In areas with seasonal or depth variations, the salinity should be determined on a seasonal and/or depth basis.
- .4 Any anthropogenic influences on freshwater flow that could temporarily or permanently alter the salinity regime of the recipient port and surrounding waters.
- .5 The seasonal temperature variation of coastal waters for the biogeographic region of the recipient port. Consideration should be given to both surface waters and to how temperature varies with depth.

6.2.9 It is recommended that the analysis of environmental conditions be followed by a consideration of the species known to be in the donor region that can tolerate extreme environmental differences. If present,

a species-specific approach should be used to evaluate the risks associated with these species. Such species include:

- species that utilize both fresh and marine environments to complete their life-cycle (including anadromous (e.g., Sea Lamprey) and catadromous (e.g., Chinese Mitten crab) species);
- species with a tolerance to a wide range of temperatures (eurythermal species) or salinities (euryhaline species).

6.3 Species' biogeographical risk assessment

6.3.1 Species' biogeographical risk assessment compares the biogeographical distributions of nonindigenous, cryptogenic, and harmful native species that presently exist in the donor and recipient ports and biogeographic regions. Overlapping species in the donor and recipient ports and regions are a direct indication that environmental conditions are sufficiently similar to allow a shared fauna and flora. The biogeographical analysis could also be used to identify high risk invaders. For example, native species in the donor biogeographic region that have successfully invaded other similar biogeographic regions but that are not found in the recipient biogeographic region could be considered high risk invaders for the recipient port or location. The larger the number of biogeographic regions that such species have invaded, the greater the potential that those species would be able to become established in the recipient port or biogeographic region if introduced by ballast water not meeting regulation B-3 or C-1. Another general indicator of risk would be if the donor biogeographic region is a major source of invaders to other areas.

6.3.2 The data necessary to enable a risk assessment using a species biogeographical approach includes but may not be limited to:

- .1 records of invasion in the donor and recipient biogeographic regions and ports;
- .2 records of native or non-indigenous species that could be transferred through ballast water in the donor biogeographic region that have invaded other biogeographic regions and the number and nature of biogeographic regions invaded;
- .3 records of native species in the donor region that have the potential to affect human health or result in substantial ecological or economic impacts after introduction in the recipient region through ballast water transfer.

6.3.3 The species' biogeographical risk assessment could also be used to identify potential target species in the donor regions as indicated by native species with wide biogeographical or habitat distributions or which are known invaders in other biogeographic regions similar to that of the recipient port.

6.4 Species-specific risk assessment

6.4.1 Species-specific risk assessments use information on life history and physiological tolerances to define a species' physiological limits and thereby estimate its potential to survive or complete its life cycle in the recipient environment. That is, they compare individual species characteristics with the environmental conditions in the recipient port, to determine the likelihood of transfer and survival.

6.4.2 In order to undertake a species-specific risk assessment, species of concern that may impair or damage the environment, human health, property or resources need to be identified and selected. These are known as the target species. Target species should be selected for a specific port, State, or geographical

¹ Watling and Gerkin (<http://marine.rutgers.edu/OBIS/index.html>) based on Briggs (1953) and Springer (1982); IUCN bioregion system; Briggs (1953) and Ekman (1974; 1995); Longhurst provinces.

region, and should be identified and agreed on in consultation with affected States.

6.4.3 To determine the species that are potentially harmful and invasive, parties should initially identify all species (including cryptogenic species) that are present in the donor port but not in the recipient port. Target species should then be selected based on criteria that identify the species that have the ability to invade and become harmful. The factors to consider when identifying target species include, but should not be limited to:

- evidence of prior introduction;
- demonstrated impacts on environment, economy, human health, property or resources;
- strength and type of ecological interactions, e.g. ecological engineers;
- current distribution within biogeographic region and in other biogeographic regions; and
- relationship with ballast water as a vector.

6.4.4 Species-specific risk assessments should then be conducted on a list of target species, including actual or potentially harmful non-indigenous species (including cryptogenic species). As the number of species included in the assessment increases the number of low risk scenarios decreases. This is justified if the species assessments are accurate. The difficulty arises when the assessments are conservative due to lack of data. It should be recognized however, that the fewer the number of species analyzed, the greater the uncertainty in predicting the overall risk. The uncertainty associated with limiting the analysis to a small number of species should therefore be considered in assessing the overall risk of invasion.

6.4.5 It should be noted that there are limitations involved with using a target species approach. Although some data and information can be obtained to support decision making, identifying species that may impair or damage the environment, human health, property or resources is subjective and there will be a degree of uncertainty associated with the approach. For example, it is possible that species identified as harmful in some environments may not be harmful in others and vice versa.

6.4.6 If species-specific risk assessments are undertaken when the donor and recipient ports are within different biogeographic regions, Parties should identify and consider any uncertainties resulting from lack of data on the presence of potentially harmful species in the donor location.

6.4.7 The data necessary to enable a risk assessment using the species-specific approach includes, but is not limited to:

- .1 biogeographic region of donor and recipient port(s);
- .2 the presence of all non-indigenous species (including cryptogenic species) and native species in the donor port(s), port region and biogeographic region, not present in the recipient port, to allow identification of target species;
- .3 the presence of all target species in the recipient port(s), port region, and biogeographic region;
- .4 the difference between target species in the donor and recipient ports, port region, and biogeographic region;
- .5 life history information on the target species and physiological tolerances, in particular salinity and temperature, of each life stage; and
- .6 habitat type required by the target species and availability of habitat type in the recipient port.

6.4.8 If a target species is already present in the recipient port, it may be reasonable to exclude that species from the overall risk assessment for that port unless that species is under active control. It is important to recognize, however, that even when a non-indigenous species or cryptogenic species has been reported from the donor and recipient ports, its continual introduction into the recipient ports could increase the probability that it will become established and/or achieve invasive population densities.

6.4.9 A risk assessment can take different forms. A simple assessment can be undertaken as outlined in paragraph 6.4.7 of whether a target species is present in the donor port but not in a recipient port and can be transported through ballast water. However, if considered appropriate, the likelihood of target species surviving each of the following stages may be assessed, including:

- .1 Uptake – probability of viable stages entering the vessel’s ballast water tanks during ballast water uptake operations;
- .2 Transfer – probability of survival during the voyage;
- .3 Discharge – probability of viable stages entering the recipient port through ballast water discharge on arrival; and
- .4 Population establishment – probability of the species establishing a self-maintaining population in the recipient port.

6.4.10 To determine the likelihood of transfer and survival of a harmful species, the probability of each species surviving each of the stages contained in paragraph 6.4.9 may be assessed. To the extent possible the different life stages of the target species may also be assessed considering seasonal variations of life stage occurrence in donor port with seasonal conditions in the recipient port. The overall risk assessment for the discharge of unmanaged ballast water is therefore determined based on the assessment of all target species surviving all these stages.

6.4.11 In assessing whether a species will survive in the recipient port, physiological tolerances of all life stages need to be considered.

- .1 The ability of the adults to survive would be indicated by the physiological limits for both temperature and salinity that fall within the environmental ranges observed in the recipient port and larger water body. As a check, a comparison could be made with the native and/or introduced ranges of the species to determine if the predicted tolerances (based on lab or field studies) reflect actual distributions.
- .2 For other life stages the physiological requirements of each stage in the life cycle should be compared against the environmental conditions during the season(s) of reproduction, noting that these stage(s) may live in different habitats to complete their life cycle (e.g., coastal pelagic larvae of estuarine benthic invertebrates). Data should be collected as appropriate.
- .3 Comparisons of known physiological tolerances for other conditions should be conducted if the data are available and relevant.

6.4.12 To evaluate whether the species-specific risk assessment approach is sufficiently robust to predict invaders, the approach could be used to estimate the probabilities of invasion for a suite of existing invaders within the recipient port. Failure to accurately predict existing invaders may indicate that the model under predicts the risk.

6.5 Evaluation and decision-making

6.5.1 The port State granting exemptions shall, in both the evaluation and consultation processes, give special attention to regulation A-4.3 which states that any exemptions granted under this regulation shall not impair or damage the environment, human health, property or resources of adjacent or other States.

Regulation A-4.3 also states that States that may be adversely affected shall be consulted, and Parties should refer to section 8 regarding consultation.

6.5.2 It is important for the transparency and consistency of the risk assessments to define a priori criteria to distinguish between unacceptable high risk scenarios and acceptable low risk scenarios where the risk of ballast water not meeting regulations B-3 and C-1 is unlikely to impair or damage the environment, human health, property or resources of the granting Party and of adjacent or other States. The specific criteria depend upon the risk assessment approach, as well as the uncertainty in the analysis.

6.5.3 For an environmental matching risk assessment:

- .1 A high-risk scenario could be indicated if the environmental conditions of the donor ports overlap the environmental conditions of the recipient region.
- .2 A low-risk scenario could be indicated if the environmental conditions of the donor port do not overlap the environmental conditions of the recipient region.

6.5.4 For the species' biogeographical risk assessment:

- .1 A high-risk could be indicated if the recipient port presently contains non-indigenous species whose native range includes the donor biogeographic region.
- .2 A high-risk could be indicated if the donor and recipient ports share non-indigenous species whose source is from other biogeographic regions.
- .3 A moderate to high risk could be indicated if the recipient biogeographic region presently contains non-indigenous species whose native range includes the donor biogeographic region.
- .4 A moderate to high risk could be indicated if the donor biogeographic region is a major source for invaders for other biogeographic regions.

6.5.5 For a species-specific risk assessment, an assessment could be deemed high risk if it identifies at least one target species that satisfies all of the following:

- likely to cause harm;
- present in the donor port or biogeographic region;
- likely to be transferred to the recipient port through ballast water; and
- likely to survive in the recipient port.

6.5.6 The overall probability of a successful invasion also depends in part on the number of organisms and the frequency with which they are introduced over the entire period of the exemption. Therefore, it is recommended that a risk assessment should consider estimates of at least the following four factors:

- .1 the total volume of water discharged
- .2 the volume of water discharged in any event (voyage)
- .3 the total number of discharge events
- .4 the temporal distribution of discharge events.

6.5.7 In all cases, the level of uncertainty needs to be considered in evaluating the extent of risk. High levels of uncertainty in the biogeographical distributions and/or physiological tolerances of a target species may be sufficient in themselves to classify the risk as high. Additionally, the potential ecological impact of

the target species should be considered in deciding the level of acceptable risk. The absence of, or uncertainty in, any information should not be considered a reason to grant an exemption to regulation B-3 or C-1.

6.5.8 Once the level of risk and the extent of uncertainty have been assessed, the result can be compared to the levels a Party(s) is willing to accept in order to determine whether an exemption can be granted.

6.5.9 Ships on a voyage(s) or route(s) that satisfy the requirements of regulation A-4.1 and that pass(es) the terms of acceptance in the risk assessment may be granted an exemption.

6.5.10 It is recommended that an independent peer review of the risk assessment method, data and assumptions be undertaken in order to ensure that a scientifically rigorous analysis has been conducted. The peer review should be undertaken by an independent third party with biological and risk assessment expertise.

7 PROCEDURES FOR GRANTING EXEMPTIONS

7.1 The purpose of this section is to provide guidance for Parties, Administrations and ships, engaged in the process of applying for, evaluating and/or granting exemptions in accordance with the provisions of regulation A-4. The appendix also identifies minimum information required for an exemption application.

7.2 Parties may undertake the risk assessment themselves in order to grant exemptions, or require the shipowner or operator to undertake the risk assessment. In any event the Party granting an exemption is responsible for evaluating the risk assessment, verifying the data and information used, and ensuring the risk assessment is conducted in a thorough and objective manner in accordance with the Guidelines. The recipient port State(s) should reject any application for exemption found not to be in accordance with these Guidelines, and should provide reasons as to why the application was not accepted.

7.3 Shipowners or operators wanting to seek an exemption should contact the relevant Parties to ascertain the risk assessment procedures to be undertaken and the information requirements of these procedures.

7.4 Where a Party has determined that the shipowner or operator should undertake the risk assessment, the Party should provide relevant information, including any application requirements, the risk assessment model to be used, any target species to be considered, data standards and any other required information. The shipowner or operator should follow these Guidelines and submit relevant information to the Party.

7.5 The port State shall ensure that, as required by regulation A-4.1.3, exemptions are only granted to ships that do not mix ballast water or sediments other than between the locations specified in the exemption. The port State should require evidence of the specific measures undertaken to ensure compliance with this regulation at the time the exemption is granted and over the duration of the exemption. Non-compliance during the period of exemption should result in prompt suspension or revocation of the exemption.

7.6 An exemption shall not be effective for more than 5 years from the date granted. The approval may contain seasonal and time-specific or other restrictions within the time of validity.

7.7 The result of the risk assessment should be stated as:

- .1 The voyage(s) or route(s) represent(s) an acceptable risk. The application for an exemption is granted.
- .2 The voyage(s) or route(s) may represent an unacceptable risk. Further consideration is required.
- .3 The voyage(s) or route(s) represent(s) an unacceptable risk. The exemption from the ballast water management requirements of regulation B-3 or C-1 of the Convention is not granted.

8 CONSULTATION

8.1 In accordance with regulation A-4.3, Parties shall consult any State that may be adversely affected from any exemptions that may be granted. This should include adjacent States and any other States that may be affected, including those located in the same biogeographic region as the recipient port(s). States should exchange information and endeavour to resolve any identified concerns. Sufficient time must be given for affected States to consider proposed exemptions carefully.

8.2 Affected States should be provided with information on: the risk assessment method applied; the quality of the information used in the assessment; uncertainties in the model, model inputs and/or risk assessments; the rationale for the proposed exemption; and any terms or conditions applicable to the exemption.

8.3 The risk assessment should document the following elements as appropriate:

- Criteria or reference for defining target species in the risk method.
- The inventories of native, non-indigenous, and cryptogenic species used in the species' biogeographical risk assessment.
- Acceptance criteria applied in each step of the analysis. The risk assessment has to be put in a relevant context to enable determination of whether the risk level is acceptable or not. The only transparent verifiable way of doing this is to compare the actual risk level with clear predefined acceptance criteria in paragraphs 6.5.2 to 6.5.8.

8.4 In addition, the criteria or scientific methods used in defining and delimiting the biogeographic regions shall be presented if a scheme other than that recommended in paragraph 6.2.3 is used.

8.5 The invitation for comments should contain one of the two following options for the affected State's response:

- .1 Supported without comments or conditions.
- .2 Supported with comments and/or conditions.

8.6 The deadline for comments from the affected State(s) should be specified in the invitation. If no response within the given time-limit is received, this may be regarded as "Accepted without comments or conditions".

8.7 If an affected State does not support the granting of the exemption(s), the appropriate reasons should be provided. Any conditions or limitations which an affected State believes to be necessary to enable them to support an exemption should be clearly identified.

9 COMMUNICATION OF INFORMATION

9.1 Each Party to the Convention that has indicated it will grant exemptions should establish a point or points of contact for receipt of applications. Relevant contact details should be submitted to the Organization. In the absence of such information from a Party, the IMO MEPC contact point should be regarded as the contact point for the purpose of these Guidelines.

9.2 The Organization should circulate the list of contacts, and keep this list updated on a regular basis.

9.3 The decision of the recipient port State(s) shall be communicated to the shipowners or operators, the affected State(s), and the Organization as soon as possible before the effective date of the exemption. The decision should explain the basis for granting the exemption and how any comments from affected States were addressed and specify the voyage or voyages in which the exemption is granted, including the

specified ports or location(s), the duration of the exemption and details of any conditions or limitations on the exemption.

9.4 Exemptions granted in accordance with regulation A-4 of the Convention, shall be effective after communication to the Organization and circulation of relevant information to Parties.

9.5 Any exemption granted shall also be recorded in the ballast water record book in accordance with regulation A-4.4.

9.6 Where exemptions have been granted for a specific voyage, any changes in voyage plans must be communicated to the Party that has granted the exemption prior to undertaking the voyage or prior to discharge of ballast water.

10 REVIEW OF RISK ASSESSMENT AND WITHDRAWAL OF EXEMPTIONS

10.1 It is recommended that information used in the risk assessment be reviewed regularly as data and assumptions used in the assessment can become outdated.

10.2 It is recommended that an intermediate review be undertaken within 12 months but in any circumstances no later than 36 months after permission is granted. A recipient port State may require several reviews to be taken during the period the exemption is granted for, but more frequent than annual reviews generally should not be required.

10.3 Renewal of an exemption following the initial 60 months must not be granted without a thorough review of the risk assessment, consultation with affected States, and notice of the decision to the Organization under regulation A-4.2.

10.4 An exemption granted under regulation A-4 of the Convention may need to be withdrawn where the actual risk associated with a voyage has increased substantially since the risk assessment was conducted. This would include emergency situations such as outbreaks, incursions, infestations, or proliferations of populations of harmful aquatic organisms and pathogens (e.g., harmful algal blooms) which are likely to be taken up in ballast water (regulation C-2 of the Convention).

10.5 When a port State notifies mariners of areas under its jurisdiction where ships should not uptake ballast water due to an emergency or other high risk situation, all exemptions should be withdrawn from ships that take up ballast water in the defined area. In such circumstances the shipowners or operators should be notified of the decision to withdraw the exemption as soon as possible.

10.6 Guidelines for additional measures regarding ballast water management including emergency situations (G13) adopted by resolution MEPC.161(56) provide guidance to rapidly identify appropriate additional measures whenever emergency situations occur in relation to ballast water operations.

11 TECHNICAL ASSISTANCE, CO-OPERATION AND REGIONAL CO-OPERATION

11.1 Article 13 of the Convention provides that Parties undertake, directly or through the Organization and other international bodies, to provide support for those Parties which request technical assistance, that Parties undertake to co-operate and that Parties shall endeavour to enhance regional co-operation.

11.2 With regard to these risk assessment Guidelines, assistance should include provision of data and information required to undertake a risk assessment, technical assistance regarding the methods for undertaking risk assessment and acceptance criteria.

**

APPENDIX

APPLICATION TO PORT STATE

An application for exemption to the port State should as a minimum contain information on the points listed below.

1 GENERAL INFORMATION

- Period for which an application is sought; from month and year to month and year.
- Why an exemption under regulation A-4 is sought.

2 SHIP'S INFORMATION

- Ship name
- IMO number
- Port of registry
- Gross Tonnage
- Owner
- Call sign
- Ballast water management option usually undertaken by ship, including ballast water treatment technology, if installed
- A copy of the Ship's Ballast Water Management Plan should be submitted
- The Administration may also require ballast water and sediment management history for a determined period

3 ROUTE INFORMATION

- Route of application, given as donor port(s) and recipient port for ballast water discharge.
- If single voyage: Date and time of departure and arrival.
- If multiple voyages: Voyage frequency, regularity and estimated amount of ballast water discharged during the exemption period. Estimated time and dates for departures and arrivals.
- Any voyages the ship plans to take to ports other than the specified ports during the duration of the exemption.
- If multiple voyages, the estimated total number of voyages and the amount of ballast water discharged under the duration of the exemption.

RESOLUTION MEPC.174(58)
adopted on 10 October 2008

GUIDELINES FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS (G8)*

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

NOTING that regulation D-3 of the Annex to the Ballast Water Management Convention provides that ballast water management systems used to comply with this Convention must be approved by the Administration, taking into account Guidelines developed by the Organization,

NOTING ALSO resolution MEPC.125(53) by which the Committee adopted the Guidelines for approval of ballast water management systems (G8),

NOTING FURTHER that by resolution MEPC.125(53), the Committee resolved to keep Guidelines (G8) under review in the light of experience gained,

HAVING CONSIDERED, at its fifty-eighth session, the recommendation made by the Ballast Water Review Group,

1. ADOPTS the revised Guidelines for approval of ballast water management systems (G8), as set out in the Annex to this resolution;
2. INVITES Member Governments to give due consideration to the revised Guidelines (G8) when type approving ballast water management systems;
3. AGREES to keep the revised Guidelines (G8) under review in the light of experience gained;
4. URGES Member Governments to bring the aforementioned Guidelines to the attention of manufacturers of ballast water management systems and other parties concerned with a view to encouraging their use; and
5. REVOKES the Guidelines adopted by resolution MEPC.125(53).

* Note of the editor: G8 Guidelines are under review.

ANNEX

GUIDELINES FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS (G8)

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GUIDELINES FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS (G8)

1 INTRODUCTION

General

1.1 These Guidelines for approval of ballast water management systems are aimed primarily at Administrations, or their designated bodies, in order to assess whether ballast water management systems meet the standard as set out in regulation D-2 of the “International Convention for the Control and Management of Ships’ Ballast Water and Sediments,” hereafter referred to as the “Convention”. In addition, this document can be used as guidance for manufacturers and shipowners on the evaluation procedure that equipment will undergo and the requirements placed on ballast water management systems. These Guidelines should be applied in an objective, consistent and transparent way and their application should be evaluated periodically by the Organization.

1.2 Articles and regulations referred to in these Guidelines are those contained in the Convention.

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.

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

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

1.6 The operation of ballast water management systems should not impair the health and safety of the ship or personnel, nor should it present any unacceptable harm to the environment or to public health.

1.7 Ballast water management systems are required to meet the standards of regulation D-2 and the conditions established in regulation D-3 of the Convention. These Guidelines serve to evaluate the safety, environmental acceptability, practicability and biological effectiveness of the systems designed to meet these standards and conditions. The cost effectiveness of type-approved equipment will be used in determining the need for revisions of these Guidelines.

1.8 These Guidelines contain recommendations regarding the design, installation, performance, testing environmental acceptability and approval of ballast water management systems.

1.9 To achieve consistency in its application, the approval procedure requires that a uniform manner of testing, analysis of samples, and evaluation of results is developed and applied. These Guidelines should be applied in an objective, consistent, and transparent way; and their suitability should be periodically evaluated and revised as appropriate by the Organization. New versions of these Guidelines should be duly circulated by the Organization. Due consideration should be given to the practicability of the ballast water management systems.

Goal and purpose

1.10 The goal of these Guidelines is to ensure uniform and proper application of the standards contained in the Convention. As such the Guidelines are to be updated as the state of knowledge and technology may require.

1.11 The purposes of these Guidelines are to:

- .1 define test and performance requirements for the approval of ballast water management systems;
- .2 assist Administrations in determining appropriate design, construction and operational parameters necessary for the approval of ballast water management systems;
- .3 provide a uniform interpretation and application of the requirements of regulation D-3;
- .4 provide guidance to Administrations, equipment manufacturers and shipowners in determining the suitability of equipment to meet the requirements of the Convention and of the environmental acceptability of treated water; and
- .5 assure that ballast water management systems approved by Administrations are capable of achieving the standard of regulation D-2 in land-based and shipboard evaluations and do not cause unacceptable harm to the vessel, crew, the environment or public health.

Applicability

1.12 These Guidelines apply to the approval of ballast water management systems in accordance with the Convention.

1.13 These Guidelines apply to ballast water management systems intended for installation on board all ships required to comply with regulation D-2.

Summary of requirements

1.14 The land-based and shipboard approval requirements for ballast water management systems specified in these guidelines are summarized below.

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. This information should be the basis for a first evaluation of suitability by the Administration.

1.16 The ballast water management system should be tested for Type Approval in accordance with the procedures described in Parts 2 and 3 of the annex.

1.17 Successful fulfilment of the requirements and procedures for Type Approval as outlined in Parts 2 and 3 of the annex should lead to the issuance of a Type Approval Certificate by the Administration.

1.18 When a Type Approved ballast water management system is installed on board, an installation survey according to section 8 should be carried out.

2 BACKGROUND

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

2.2 Regulation D-2 stipulates that ships meeting the requirements of the Convention by meeting the ballast water performance standard must discharge:

- .1 less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension;
- .2 less than 10 viable organisms per millilitre less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension; and
- .3 less than the following concentrations of indicator microbes, as a human health standard:
 - .1 Toxicogenic *Vibrio cholerae* (serotypes O1 and O139) with less than 1 Colony Forming Unit (cfu) per 100 millilitres or less than 1 cfu per 1 gramme (wet weight) of zooplankton samples;
 - .2 *Escherichia coli* less than 250 cfu per 100 millilitres; and
 - .3 Intestinal *Enterococci* less than 100 cfu per 100 millilitres.

3 DEFINITIONS

For the purpose of these Guidelines:

- 3.1 Active Substance means a substance or organism, including a virus or a fungus that has a general or specific action on or against harmful aquatic organisms and pathogens.
- 3.2 Ballast Water Management System (BWMS) means any system which processes ballast water such that it meets or exceeds the ballast water performance standard in regulation D-2. The BWMS includes ballast water treatment equipment, all associated control equipment, monitoring equipment and sampling facilities.
- 3.3 The Ballast Water Management Plan is the document referred to in regulation B-1 of the Convention describing the ballast water management process and procedures implemented on board individual ships.
- 3.4 Ballast Water Treatment Equipment means equipment which mechanically, physically, chemically, or biologically processes, either singularly or in combination, to remove, render harmless, or avoid the uptake or discharge of harmful aquatic organisms and pathogens within ballast water and sediments. Ballast water treatment equipment may operate at the uptake or discharge of ballast water, during the voyage, or at a combination of these events.
- 3.5 Control Equipment refers to the installed equipment required to operate and control the ballast water treatment equipment.
- 3.6 The Convention means the International Convention for the Control and Management of Ships' Ballast Water and Sediments.
- 3.7 Monitoring Equipment refers to the equipment installed for the assessment of the effective operation of the ballast water treatment equipment.
- 3.8 Sampling Facilities refers to the means provided for sampling treated or untreated ballast water as needed in these Guidelines and in the "Guidelines for ballast water sampling (G2)" developed by the Organization.
- 3.9 Shipboard Testing is a full scale test of a complete BWMS carried out on board a ship according to Part 2 of the annex to these Guidelines, to confirm that the system meets the standards set by regulation D-2 of the Convention.
- 3.10 Treatment Rated Capacity (TRC) is the maximum continuous capacity expressed in cubic metres

per hour for which the BWMS is type approved. It states the amount of ballast water that can be treated per unit time by the BWMS to meet the standard in regulation D-2 of the Convention.

3.11 Land-based Testing is a test of the BWMS carried out in a laboratory, equipment factory or pilot plant including a moored test barge or test ship, according to Parts 2 and 3 of the annex to these Guidelines, to confirm that the BWMS meets the standards set by regulation D-2 of the Convention.

3.12 Viable Organisms are organisms and any life stages thereof that are living.

4 TECHNICAL SPECIFICATIONS

4.1 This section details the general technical requirements which a BWMS should meet in order to obtain Type Approval.

Ballast water management systems

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

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

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

4.5 To avoid interference with the BWMS, the following items should be included:

- .1 every access of the BWMS beyond the essential requirements of paragraph 4.4, should require the breaking of a seal;
- .2 if applicable, the BWMS should be so constructed that a visual alarm is always activated whenever the BWMS is in operation for purposes of cleaning, calibration, or repair, and these events should be recorded by the control equipment;
- .3 in the event of an emergency, suitable by-passes or overrides to protect the safety of the ship and personnel should be installed; and
- .4 any bypass of the BWMS should activate an alarm, and the bypass event should be recorded by the Control Equipment.

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

Ballast water treatment equipment

4.7 The ballast water treatment equipment should be robust and suitable for working in the shipboard environment, should be of a design and construction adequate for the service for which it is intended and should be so installed and protected as to reduce to a minimum any danger to persons on board, due regard being paid to hot surfaces and other hazards. The design should have regard to materials used in construction, the purpose for which the equipment is intended, the working conditions to which it will be subjected and the environmental conditions on board.

4.8 The ballast water treatment equipment should be provided with simple and effective means for its operation and control. It should be provided with a control system that should be such that the services needed for the proper operation of the ballast water treatment equipment are ensured through the necessary automatic arrangements.

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

Control and monitoring equipment

4.10 The BWMS should incorporate control equipment that automatically monitors and adjusts necessary treatment dosages or intensities or other aspects of the BWMS of the vessel, which while not directly effecting treatment, are nonetheless required for proper administration of the necessary treatment.

4.11 The control equipment should incorporate a continuous self-monitoring function during the period in which the BWMS is in operation.

4.12 The monitoring equipment should record the proper functioning or failure of the BWMS.

4.13 To facilitate compliance with regulation B-2, the control equipment should also be able to store data for at least 24 months, and should be able to display or print a record for official inspections as required. In the event the control equipment is replaced, means should be provided to ensure the data recorded prior to replacement remains available on board for 24 months.

4.14 It is recommended that simple means be provided aboard ship to check on drift by measuring devices that are part of the control equipment, repeatability of the control equipment devices, and the ability to re-zero the control equipment meters.

5 TYPICAL DOCUMENT REQUIREMENTS FOR THE PLAN APPROVAL PROCESS

5.1 The documentation submitted for approval should include at least the following:

- .1 a description of the BWMS. The description should include a diagrammatic drawing of the typical or required pumping and piping arrangements, and sampling facilities, identifying the operational outlets for treated ballast water and any waste streams as appropriate and necessary. Special considerations may have to be given to installations intended for ships that have unusual pumping and piping arrangements;
- .2 equipment manuals, supplied by manufacturers, containing details of the major components of the BWMS and their operation and maintenance;
- .3 a generic operations and technical manual for the complete BWMS. This manual should cover the arrangements, the operation and maintenance of the BWMS as a whole and should specifically describe parts of the BWMS which are not covered by the manufacturer's equipment manuals;
- .4 the operations section of the manual including normal operational procedures and procedures for the discharge of untreated water in the event of malfunction of the ballast water treatment equipment, maintenance procedures, and emergency action necessary for securing the ship;
- .5 methods for the conditioning of treated water prior to discharge should be provided, and assessment of discharged water should include a description of the effect of treatment on the ship's ballast water, in particular the nature of any treatment residuals and by-products and the water's suitability for discharge into coastal waters. A description should also be provided of any actions necessary to monitor, and if necessary "condition", treated water prior to

discharge in order that it meets applicable water quality regulations; if it can reasonably be concluded that the treatment process could result in changes to the chemical composition of the treated water such that adverse impacts to receiving waters might occur upon discharge, the documentation should include results of toxicity tests of treated water. The toxicity tests should include assessments of the effects of hold time following treatment, and dilution, on the toxicity. Toxicity tests of the treated water should be conducted in accordance with paragraphs 5.2.3 to 5.2.7 of the Procedure for approval of ballast water management systems that make use of Active Substances (G9), as revised, (resolution MEPC.169(57));

- .6 a description of BWMS side streams (e.g., filtered material, centrifugal concentrate, waste or residual chemicals) including a description of the actions planned to properly manage and dispose of such wastes;
- .7 a technical section of the manual including adequate information (description and diagrammatic drawings of the monitoring system and electrical/electronic wiring diagrams) to enable faultfinding. This section should include instructions for keeping a maintenance record;
- .8 a technical installation specification defining, inter alia, requirements for the location and mounting of components, arrangements for maintaining the integrity of the boundary between safe and hazardous spaces and the arrangement of the sample piping; and
- .9 a recommended test and checkout procedure specific to the BWMS. This procedure should specify all the checks to be carried out in a functional test by the installation contractor and should provide guidance for the surveyor when carrying out the on board survey of the BWMS and confirming the installation reflects the manufacturer's specific installation criteria.

6 APPROVAL AND CERTIFICATION PROCEDURES

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 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.

6.2 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.

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 2, 3 and 4 of the annex.

6.4 An Administration may issue a Type Approval Certificate of BWMS based on separate testing or on testing already carried out under supervision by another Administration.

6.5 The Type Approval Certificate of BWMS should:

- .1 identify the type and model of the BWMS to which it applies and identify equipment assembly drawings, duly dated;
- .2 identify pertinent drawings bearing model specification numbers or equivalent identification details;
- .3 include a reference to the full performance test protocol on which it is based, and be accompanied by a copy of the original test results; and

- .4 identify if it was issued by an Administration based on a Type Approval Certificate previously issued by another Administration. Such a certificate should identify the Administration that conducted the tests on the BWMS and a copy of the original test results should be attached to the Type Approval Certificate of BWMS.

6.6 An approved BWMS may be Type Approved by other Administrations for use on their vessels. Should a system approved by one country fail Type Approval in another country, then the two countries concerned should consult one another with a view to reaching a mutually acceptable agreement.

7 INSTALLATION REQUIREMENTS

Sampling facilities

7.1 The BWMS should be provided with sampling facilities so arranged in order to collect representative samples of the ship's ballast water.

7.2 Sampling facilities should in any case be located on the BWMS intake, before the discharging points, and any other points necessary for sampling to ascertain the proper functioning of the equipment as may be determined by the Administration.

8 INSTALLATION SURVEY AND COMMISSIONING PROCEDURES

8.1 Verify that the following documentation is on board in a suitable format:

- .1 a copy of the Type Approval Certificate of BWMS;
- .2 a statement from the Administration, or from a laboratory authorized by the Administration, to confirm that the electrical and electronic components of the BWMS have been type-tested in accordance with the specifications for environmental testing contained in Part 3 of the annex;
- .3 equipment manuals for major components of the BWMS;
- .4 an operations and technical manual for the BWMS specific to the ship and approved by the Administration, containing a technical description of the BWMS, operational and maintenance procedures, and backup procedures in case of equipment malfunction;
- .5 installation specifications;
- .6 installation commissioning procedures; and
- .7 initial calibration procedures.

8.2 Verify that:

- .1 the BWMS installation has been carried out in accordance with the technical installation specification referred to in paragraph 8.1.5;
- .2 the BWMS is in conformity with the Type Approval Certificate of BWMS issued by the Administration or its representative;
- .3 the installation of the complete BWMS has been carried out in accordance with the manufacturer's equipment specification;
- .4 any operational inlets and outlets are located in the positions indicated on the drawing of the pumping and piping arrangements;
- .5 the workmanship of the installation is satisfactory and, in particular, that any bulkhead penetrations or penetrations of the ballast system piping are to the relevant approved standards; and
- .6 the control and monitoring equipment operates correctly.

ANNEX

This annex provides detailed test and performance specifications for a BWMS and contains:

- PART 1 – Specifications for Pre -test Evaluation of System Documentation**
- PART 2 – Test and Performance Specifications for Approval of Ballast Water Management Systems**
- PART 3 – Specification for Environmental Testing for Approval of Ballast Water Management Systems**
- PART 4 – Sample Analysis Methods for the Determination of Biological Constituents in Ballast Water**

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

1.1 Adequate documentation should be prepared and submitted to the Administration as part of the approval process well in advance of the intended approval testing of a BWMS. Approval of the submitted documentation should be a pre-requisite for carrying out independent approval tests.

General

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

Readiness evaluation

1.3 The readiness evaluation should examine the design and construction of the BWMS to determine whether there are any fundamental problems that might constrain the ability of the BWMS to manage ballast water as proposed by the manufacturer, or to operate safely, on board ships. The latter concern should, in addition to basic issues related to the health and safety of the crew, interactions with the ship's systems and cargo, and potential adverse environmental effects, also consider the potential for 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.

1.4 The evaluation should also address the degree, if any, to which the manufacturer's/developer's efforts during the research and development phase tested the performance and reliability of the system under operational shipboard conditions and should include a report of the results of those tests.

Test proposal evaluation

1.5 Evaluation of the test proposal should examine all of the manufacturer's stated requirements and procedures for installing, calibrating, and operating (including maintenance requirements) the BWMS during a test. This evaluation should help the test organization to identify any potential health or environmental safety problems, unusual operating requirements (labour or materials), and any issues related to the disposal of treatment by-products or waste streams.

Documentation

1.6 The documentation to be submitted should include at least the following:

- .1 **Technical Manual** – The technical description should include:
 - product specification;
 - process description;

- operational instructions;
 - details (including Certificates where appropriate) of the major components and materials used;
 - technical installation specifications in accordance with manufacturers' specific installation criteria;
 - system limitations; and
 - routine maintenance and trouble-shooting procedures.
- .2 **BWMS Drawings** – Diagrammatic drawings of the pumping and piping arrangements, electrical/electronic wiring diagrams, which should include reference to any waste streams and sampling points;
- .3 **Link to the Ballast Water Management Plan** – Information regarding the characteristics and arrangements in which the system is to be installed as well as the scope of the ships (sizes, types and operation) for which the system is intended. This information can later form the link between the system and the ship's ballast water management plan; and
- .4 **Environmental and Public Health Impacts** – Potential hazards for the environment should be identified and documented based on environmental studies performed to the extent necessary to assure that no harmful effects are to be expected. 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. The system should then ensure that dosage of the Active Substance and the maximum allowable discharge concentration is kept under the approved criteria at all times. In the case of ballast water management systems that do not make use of Active Substances or Preparations, but which could reasonably be expected to result in changes to the chemical composition of the treated water such that adverse impacts to receiving waters might occur upon discharge, the documentation should include results of toxicity tests of treated water as described in paragraph 5.1.5 of these Guidelines.

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

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

The Administration decides the sequence of land-based and shipboard testing.

2.1 Quality Assurance and Quality Control Procedures

2.1.1 The testing body performing the tests should have implemented appropriate quality control measures in accordance with recognized international standards acceptable to the Administration.

2.1.2 The approval testing process should contain a rigorous quality control/quality assurance program, consisting of:

- .1 Both a Quality Management Plan (QMP) and a Quality Assurance Project Plan (QAPP).

Guidance on preparation of these plans, along with other guidance documents and other general quality control information are available from appropriate international organizations¹.

- .2 The QMP addresses the quality control management structure and policies of the testing body (including subcontractors and outside laboratories).
- .3 The QAPP is a project specific technical document reflecting the specifics of the BWMS to be tested, the test facility, and other conditions affecting the actual design and implementation of the required experiments.

2.2 Shipboard tests

2.2.1 A shipboard test cycle includes:

- .1 the uptake of ballast water of the ship;
- .2 the storage of ballast water on the ship;
- .3 treatment of the ballast water in accordance with paragraph 2.2.2.3 by the BWMS, except in control tanks; and
- .4 the discharge of ballast water from the ship.

Success criteria for shipboard testing

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

- .1 Test plan to be provided prior to testing.
- .2 Documentation that the BWMS is of a capacity within the range of the treatment rated capacity for which it is intended.
- .3 The amount of ballast water tested in the test cycle on board should be consistent with the normal ballast operations of the ship and the BWMS should be operated at the treatment rated capacity for which it is intended to be approved.
- .4 Documentation of the results of three consecutive, valid test cycles showing discharge of treated ballast water in compliance with regulation D-2.
- .5 Valid tests are indicated by uptake water, for both the control tank and ballast water to be treated, with viable organism concentration exceeding 10 times the maximum permitted values in regulation D-2.1 and control tank viable organism concentration exceeding the values of regulation D-2.1 on discharge.
- .6 Sampling regime:
 - .1 For the control tank:
 - .1 three replicate samples of influent water, collected over the period of uptake (e.g., beginning, middle, end); and
 - .2 three replicate samples of discharge control water, collected over the period of discharge (e.g., beginning, middle, end).

¹ Such as ISO/IEC 17025.

- .2 For treated ballast water:
 - .1 Three replicate samples of discharge treated water collected at each of three times during the period of discharge (e.g., 3 x beginning, 3 x middle, 3 x end).
- .3 Sample sizes are:
 - .1 For the enumeration of organisms greater than or equal to 50 micrometres or more in minimum dimension, samples of at least one cubic metre should be collected. If samples are concentrated for enumeration the samples should be concentrated using a sieve no greater than 50 micrometres mesh in diagonal dimension.
 - .2 For the enumeration of organisms greater than or equal to 10 micrometres and less than 50 micrometres in minimum dimension, samples of at least one litre should be collected. If samples are concentrated for enumeration the samples should be concentrated using a sieve no greater than 10 micrometres mesh in diagonal dimension.
 - .3 For the evaluation of bacteria a sample of at least 500 millilitres should be taken from the influent and treated water. In the absence of laboratory facilities on board the toxicogenic test requirements should be conducted in an appropriately approved laboratory. However, this may limit the applicability of this test.
- .7 The test cycles including invalid and unsuccessful test cycles are to span a trial period of not less than six months.
- .8 The applicant is requested to perform three consecutive test cycles that comply with regulation D-2 and which are valid in accordance with paragraph 2.2.2.5. Any invalid test cycle does not affect the consecutive sequence.
- .9 The source water for test cycles shall be characterized by measurement of salinity, temperature, particulate organic carbon and total suspended solids.
- .10 For system operation throughout the trial period, the following information should also be provided:
 - .1 documentation of all ballast water operations including volumes and locations of uptake and discharge, and if heavy weather was encountered and where;
 - .2 the possible reasons for the occurrence of an unsuccessful test cycle, or a test cycle discharge failing the D-2 standard should be investigated and reported to the Administration;
 - .3 documentation of scheduled maintenance performed on the system;
 - .4 documentation of unscheduled maintenance and repair performed on the system;
 - .5 documentation of engineering parameters monitored as appropriate to the specific system; and
 - .6 documentation of functioning of the control and monitoring equipment.

2.3 Land-based testing

2.3.1 The test set-up including the ballast water treatment equipment should operate as described in the provided documentation during at least 5 valid replicate test cycles. Each test cycle should take place over a period of at least 5 days.

2.3.2 A land-based test cycle should include:

- .1 the uptake of ballast water by pumping;
- .2 the storage of ballast water for at least 5 days;
- .3 treatment of ballast water within the BWMS, except in control tanks; and
- .4 the discharge of ballast water by pumping.

2.3.3 Testing should occur using different water conditions sequentially as provided for in paragraphs 2.3.17 and 2.3.18.

2.3.4 The BWMS should be tested at its rated capacity or as given in paragraphs 2.3.13 to 2.3.15 for each test cycle. The equipment should function to specifications during this test.

2.3.5 The analysis of treated water discharge from each test cycle should be used to determine that the average of discharge samples does not exceed the concentrations of regulation D-2 of the Convention.

2.3.6 The analysis of treated water discharge from the relevant test cycle(s) should also be used to evaluate the toxicity of the discharged water for BWMS that make use of Active Substances and also for those BWMS that do not make use of Active Substances or Preparations but which could reasonably be expected to result in changes to the chemical composition of the treated water such that adverse impacts to receiving waters might occur upon discharge. Toxicity tests of the treated water discharge should be conducted in accordance with paragraphs 5.2.3 to 5.2.7 of the Procedure for approval of ballast water management systems that make use of Active Substances, as revised (resolution MEPC.169(57)).

Land-based testing objectives, limitations and criteria for evaluation

2.3.7 The land-based testing serves to determine the biological efficacy and environmental acceptability of the BWMS under consideration for Type Approval. The approval testing aims to ensure replicability and comparability to other treatment equipment.

2.3.8 Any limitations imposed by the ballast water management system on the testing procedure described here should be duly noted and evaluated by the Administration.

Land-based set-up

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

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

2.3.10 The control and treated simulated ballast tanks should each include:

- .1 a minimum capacity of 200 m³ ;
- .2 normal internal structures, including lightening and drainage holes;

- .3 standard industry practices for design, construction and surface coatings for ships; and
- .4 the minimum modifications required for structural integrity on land.

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

2.3.12 The test set-up will include facilities to allow sampling as described in paragraphs 2.3.26 and 2.3.27 and provisions to supply influents to the system, as specified in paragraph 2.3.19 and/or 2.3.20. The installation arrangements should conform in each case with those specified and approved under the procedure outlined in section 7 of the main body to these Guidelines.

Ballast water treatment equipment scaling

2.3.13 In-line treatment equipment may be downsized for land-based testing, but only when the following criteria are taken into account:

- .1 equipment with a TRC equal to or smaller than 200 m³/h should not be downscaled;
- .2 equipment with a TRC larger than 200 m³/h but smaller than 1,000 m³/h may be downscaled to a maximum of 1:5 scale, but may not be smaller than 200 m³/h; and
- .3 equipment with a TRC equal to, or larger than, 1,000 m³/h may be downscaled to a maximum of 1:100 scale, but may not be smaller than 200 m³/h.

2.3.14 The manufacturer of the equipment should demonstrate by using mathematical modelling and/or calculations, that any downscaling will not affect the ultimate functioning and effectiveness on board a ship of the type and size for which the equipment will be certified.

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

2.3.16 Larger scaling may be applied and lower flow rates used than provided for in 2.3.13, if the manufacturer can provide evidence from full-scale shipboard testing and in accordance with 2.3.14 that scaling and flow rates will not adversely affect the ability of the results to predict full-scale compliance with the standard.

Land-based test design – inlet and outlet criteria

2.3.17 For any given set of test cycles (5 replicates is considered a set) a salinity range should be chosen. Given the salinity, the test water used in the test set up described above should have dissolved and particulate content in one of the following combinations:

	Salinity		
	> 32 PSU	3 – 32 PSU	< 3 PSU
Dissolved Organic Carbon (DOC)	> 1 mg/l	> 5 mg/l	> 5 mg/l
Particulate Organic Carbon (POC)	> 1 mg/l	> 5 mg/l	> 5 mg/l
Total Suspended Solids (TSS)	> 1 mg/l	> 50 mg/l	> 50 mg/l

2.3.18 At least two sets of tests cycles should be conducted, each with a different salinity range and associated dissolved and particulate content as prescribed in paragraph 2.3.17. Tests under adjacent salinity ranges in the above table should be separated by at least 10 PSU².

2.3.19 Test organisms may be either naturally occurring in the test water, or cultured species that may be added to the test water. The organism concentration should comply with paragraph 2.3.20 below.

2.3.20 The influent water should include:

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

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

- .1 Coliform;
- .2 Enterococcus group;
- .3 *Vibrio cholerae*; and
- .4 Heterotrophic bacteria.

2.3.22 If cultured test organisms are used, then it should be ensured that local applicable quarantine regulations are taken into account during culturing and discharge.

Land-based monitoring and sampling

2.3.23 Change of numbers of test organisms by treatment and during storage in the simulated ballast tank should be measured using methods described in Part 4 of the annex, paragraphs 4.5 to 4.7.

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

2.3.25 Environmental parameters such as pH, temperature, salinity, dissolved oxygen, TSS, DOC, POC and turbidity (NTU)³ should be measured at the same time that the samples described are taken.

2.3.26 Samples during the test should be taken at the following times and locations: immediately before the treatment equipment, immediately after the treatment equipment and upon discharge.

2.3.27 The control and treatment cycles may be run simultaneously or sequentially. Control samples are to be taken in the same manner as the equipment test as prescribed in paragraph 2.3.26 and upon influent and discharge. A series of examples are included in figure 1.

² For example, if one set of test cycles is carried out at >32 PSU and a second set at 3-32 PSU, the test cycle in the 3-32 PSU range needs to be at least 10 PSU less than the lowest salinity used in the test cycle in the >32 PSU range.

³ NTU=Nominal Turbidity Unit

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

2.3.29 Samples described in paragraphs 2.3.26 and 2.3.27 should be collected in triplicate on each occasion.

2.3.30 Separate samples should be collected for:

- .1 organisms of greater than or equal to 50 micrometres or more in minimum dimension;
- .2 organisms greater than or equal to 10 micrometres and less than 50 micrometres in minimum dimension;
- .3 for coliform, enterococcus group, *Vibrio cholerae* and heterotrophic bacteria; and
- .4 toxicity testing of treated water, from the discharge, for BWMS that make use of Active Substances and also for those BWMS that do not make use of Active Substances or Preparations but which could reasonably be expected to result in changes to the chemical composition of the treated water such that adverse impacts to receiving waters might occur upon discharge.

2.3.31 For the comparison of organisms of greater than or equal to 50 micrometres or more in minimum dimension against the D-2 standard, at least 20 litres of influent water and 1 cubic metre of treated water, in triplicate respectively, should be collected. If samples are concentrated for enumeration, the samples should be concentrated using a sieve no greater than 50 micrometres mesh in the diagonal dimension.

2.3.32 For the evaluation of organisms greater than or equal to 10 micrometres and less than 50 micrometres in minimum dimension, at least 1 litre of influent water and at least 10 litres of treated water should be collected. If samples are concentrated for enumeration, the samples should be concentrated using a sieve no greater than 10 micrometres mesh in the diagonal dimension.

2.3.33 For the evaluation of bacteria, at least 500 millilitres of influent and treated water should be collected in sterile bottles.

2.3.34 The samples should be analysed as soon as possible after sampling, and analysed live within 6 hours or treated in such a way so as to ensure that proper analysis can be performed.

2.3.35 The efficacy of a proposed system should be tested by means of standard scientific methodology in the form of controlled experimentation, i.e. “experiments”. Specifically, the effect of the BWMS on organism concentration in ballast water should be tested by comparing treated ballast water, i.e. “treated groups”, to untreated “control groups”, such that:

- .1 one experiment should consist of a comparison between control water and treated water. Multiple samples, but at a minimum of three, of control and treated water within a single test cycle should be taken to obtain a good statistical estimate of the conditions within the water during that experiment. Multiple samples taken during a single test cycle should not be treated as independent measures in the statistical evaluation of treatment effect, to avoid “pseudo-replication”.

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

2.3.37 Statistical analysis of BWMS performance should consist of t-tests, or similar statistical tests, comparing control and treated water. The comparison between control and treated water will provide a test of unexpected mortality in the control water, indicating the effect of an uncontrolled source of mortality in the testing arrangement.

2.4 Reporting of test results

2.4.1 After 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.

2.4.2 The results of biological efficacy testing of the BWMS should be accepted if during the land-based and shipboard testing conducted as specified in sections 2.2 and 2.3 of this annex it is shown that the system has met the standard in regulation D-2 in all test cycles as provided in paragraph 4.7 below.

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

Test specifications

3.1 The electrical and electronic sections of BWMS in the standard production configuration should be subjected to the programme of environmental tests set out in this specification at a laboratory approved for the purpose by the Administration or by the competent authority of the manufacturer's home country.

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

Test specification details

3.3 Equipment should operate satisfactorily on completion of each of the operating environment tests listed below.

Vibration tests

3.4 A resonance search should be made over the following ranges of oscillation frequency and amplitude:

- .1 2 to 13.3 Hz with a vibration amplitude of 1 mm; and
- .2 13.2 to 80 Hz with an acceleration amplitude of 0.7 g.

This search should be made in each of the three orthogonal planes at a rate sufficiently low to permit resonance detection.

3.5 The equipment should be vibrated in the above-mentioned planes at each major resonant frequency for a period of two hours.

3.6 In the absence of any resonant frequency, the equipment should be vibrated in each of the planes at 30 Hz with an acceleration of 0.7 g for a period of two hours.

3.7 After completion of the tests specified in paragraph 3.5 or 3.6 a search should again be made for resonance and there should be no significant change in the vibration pattern.

Temperature tests

3.8 Equipment that may be installed in exposed areas on the open deck, or in an enclosed space not environmentally controlled should be subjected, for a period of not less than two hours, to:

- .1 a low temperature test at -25°C ; and
- .2 a high temperature test at 55°C .

3.9 Equipment that may be installed in an enclosed space that is environmentally controlled including an engine-room should be subjected, for a period of not less than two hours, to:

- .1 a low temperature test at 0°C ; and
- .2 a high temperature test at 55°C .

3.10 At the end of each of the tests referred to in the subparagraphs above, the equipment should be switched on and it should function normally under the test conditions.

Humidity tests

3.11 Equipment should be left switched off for a period of two hours at a temperature of 55°C in an atmosphere with a relative humidity of 90%. At the end of this period, the equipment should be switched on and should operate satisfactorily for one hour under the test conditions.

Tests for protection against heavy seas

3.12 Equipment that may be installed in exposed areas on the open deck should be subjected to tests for protection against heavy seas in accordance with 1P 56 of publication IEC 529 or its equivalent.

Fluctuation in power supply

3.13 Equipment should operate satisfactorily with:

- .1 a voltage variation of +/- 10% together with a simultaneous frequency variation of +/- 5%; and
- .2 a transient voltage of +/- 20% together with a simultaneous frequency transient of +/- 10%, with a transient recovery time of three seconds.

Inclination test

3.14 The BWMS should be designed to operate when the ship is upright and when inclined at any angle of list up to and including 15° either way under static conditions and 22.5° under dynamic conditions (rolling) either way and simultaneously inclined dynamically (pitching) 7.5° by bow or stern. The Administration may permit deviation from these angles, taking into consideration the type, size and service conditions of the ship and operational functioning of the equipment. Any deviation permitted is to be documented in the Type Approval Certificate.

Reliability of electrical and electronic equipment

3.15 The electrical and electronic components of the equipment should be of a quality guaranteed by the manufacturer and suitable for their intended purpose.

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

Sample processing and analysis

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

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

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

4.4 Given the complexity in samples of natural and treated water, the required rarity of organisms in treated samples under regulation D-2, and the expense and time requirements of current standard methods, it is likely that several new approaches will be developed for the analyses of the composition, concen-

tration, and viability of organisms in samples of ballast water. Administrations/Parties are encouraged to share information concerning methods for the analysis of ballast water samples, using existing scientific venues, and papers distributed through the Organization.

Sample analysis for determining efficacy in meeting the discharge standard

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

4.6 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.

4.7 A treatment test cycle should be deemed successful if:

- .1 it is valid in accordance with paragraph 2.2.2.5 or 2.3.36 as appropriate;
- .2 the average density of organisms greater than or equal to 50 micrometres in minimum diameter in the replicate samples is less than 10 viable organisms per cubic metre;
- .3 the average density of organisms less than 50 micrometres and greater than or equal to 10 micrometres in minimum diameter in the replicate samples is less than 10 viable organisms per millilitre;
- .4 the average density of *Vibrio cholerae* (serotypes O1 and O139) is less than 1 cfu per 100 millilitres, or less than 1 cfu per 1 gramme (wet weight) zooplankton samples;
- .5 the average density of *E. coli* in the replicate samples is less than 250 cfu per 100 millilitres; and
- .6 the average density of intestinal *Enterococci* in the replicate samples is less than 100 cfu per 100 millilitres.

4.8 It is recommended that a non-exhaustive list of standard methods and innovative research techniques be considered⁴.

Sample analysis for determining eco-toxicological acceptability of discharge

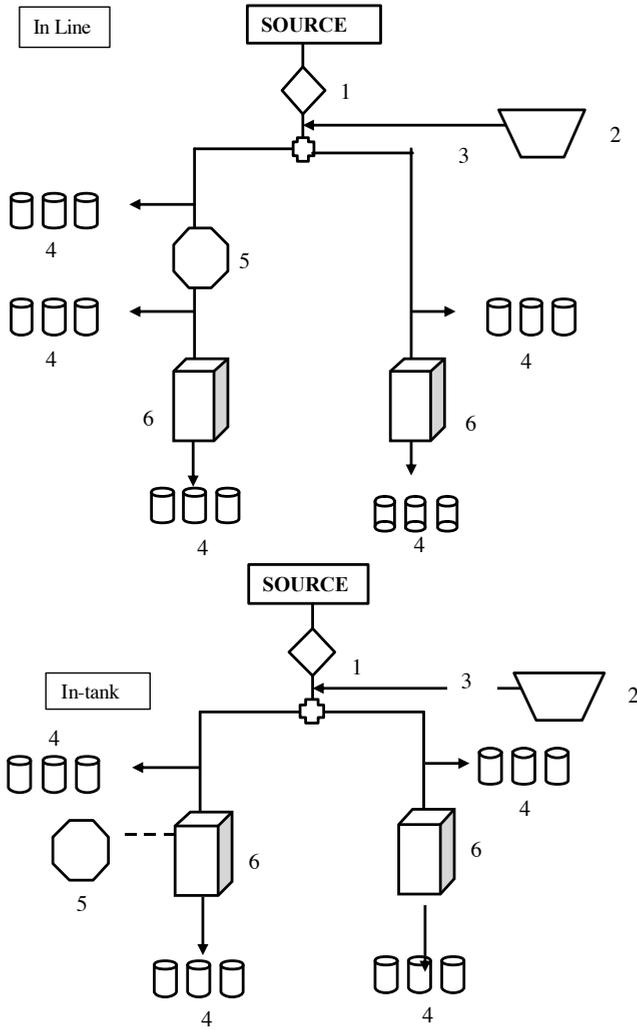
4.9 Toxicity tests of the treated water discharge should be conducted in accordance with paragraphs 5.2.3 to 5.2.7 of the Procedure for approval of ballast water management systems that make use of Active Substances, as revised (resolution MEPC.169(57)).

* *

⁴ Suggested sources may include but not be limited to:

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

Figure 1 Diagrammatic arrangement of possible land-based tests



- | | |
|--------------|---------------------------------|
| 1. Pump | 4. Sample tanks |
| 2. Feed Tank | 5. Treatment System |
| 3. Feed Line | 6. Simulated Ballast Water Tank |

RESOLUTION MEPC.169(57)**adopted on 4 April 2008****PROCEDURE FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS THAT MAKE USE OF ACTIVE SUBSTANCES (G9)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

NOTING that regulation D-3.2 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 provides that ballast water management systems that make use of Active Substances or Preparations containing one or more Active Substances used to comply with this Convention, shall be approved by the Organization based on a Procedure developed by the Organization,

NOTING ALSO resolution MEPC.126(53) by which the Committee adopted the Procedure for Approval of ballast water management systems that make use of Active Substances (G9),

NOTING FURTHER that by resolution MEPC.126(53), the Committee resolved to keep the Procedure (G9) under review in the light of experience gained,

HAVING CONSIDERED, at its fifty-seventh session, the recommendation made by the Ballast Water Review Group,

1. ADOPTS the revised Procedure for approval of ballast water management systems that make use of Active Substances (G9), as set out in the Annex to this resolution;
2. INVITES Member Governments to give due consideration to the revised Procedure (G9) when evaluating ballast water management systems that make use of Active Substances before the submission of proposals for approval to the Committee;
3. AGREES to keep the revised Procedure (G9) under review in the light of experience gained;
4. URGES Member Governments to bring the aforementioned Procedure to the attention of manufacturers of ballast water management systems and other parties concerned with a view to encouraging its use;
5. REVOKES the Procedure adopted by resolution MEPC.126(53).

ANNEX**PROCEDURE FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS THAT MAKE USE OF ACTIVE SUBSTANCES (G9)****Contents**

- 1 INTRODUCTION**
- 2 DEFINITIONS**
- 3 PRINCIPLES**
- 4 GENERAL REQUIREMENTS**
 - Identification
 - Data-set for Active Substances and Preparations
 - Assessment report

5 RISK CHARACTERIZATION

Screening for persistency, bioaccumulation and toxicity
 Toxicity testing of the treated ballast water
 Risk characterization and analysis

6 EVALUATION CRITERIA

Ship and personnel safety
 Environmental protection

7 REGULATION OF THE USE OF ACTIVE SUBSTANCES AND PREPARATIONS

Handling of Active Substances and Preparations
 Hazard documentation and labelling
 Procedures and use

8 APPROVAL

Basic Approval
 Final Approval
 Notification of approval
 Modification
 Withdrawal of approval

Appendix - Approval Scheme for Active Substances or Preparations and ballast water management systems that make use of Active Substances

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

1 INTRODUCTION

1.1 This procedure describes the approval and withdrawal of approval of ballast water management systems that make use of Active Substances to comply with the Convention and their manner of application as set out in regulation D-3 of the “International Convention for the Control and Management of Ships’ Ballast Water and Sediments”. The Convention requires that at withdrawal of approval, the use of the relevant Active Substance or Substances shall be prohibited within 1 year after the date of such withdrawal.

1.2 To comply with the Convention, ballast water management systems that make use of Active Substances or Preparations containing one or more Active Substances shall be approved by the Organization, based on a procedure developed by the Organization.

1.3 The objective of this procedure is to determine the acceptability of Active Substances and Preparations containing one or more Active Substances and their application in ballast water management systems concerning ship safety, human health and the aquatic environment. This procedure is provided as a safeguard for the sustainable use of Active Substances and Preparations.

1.4 This procedure is not intended for the evaluation of the efficacy of Active Substances. The efficacy of ballast water management systems that make use of Active Substances should be evaluated in accordance with the Guidelines for approval of ballast water management systems (G8).

1.5 The goal of the procedure is to ensure proper application of the provisions contained in the Convention and the safeguards required by it. As such the procedure is to be updated as the state of knowledge and technology may require. New versions of the procedure will be circulated by the Organization following their approval.

2 DEFINITIONS

- 2.1 For the purposes of this procedure, the definitions in the Convention apply and:
- .1 “Active Substance” means a substance or organism, including a virus or a fungus that has a general or specific action on or against harmful aquatic organisms and pathogens.
 - .2 “Ballast Water Discharge” means the ballast water as would be discharged overboard.
 - .3 “Preparation” means any commercial formulation containing one or more Active Substances including any additives. This term also includes any Active Substances generated onboard for purposes of ballast water management and any relevant chemicals formed in the ballast water management system that make use of Active Substances to comply with the Convention.
 - .4 “Relevant Chemicals” means transformation or reaction products that are produced during and after employment of the ballast water management system in the ballast water or in the receiving environment and that may be of concern to the ship’s safety, aquatic environment and/or human health.

3 PRINCIPLES

3.1 Active Substances and Preparations may be added to the ballast water or be generated on board ships by technology within the ballast water management system using an Active Substance to comply with the Convention.

3.2 Active Substances and Preparations accomplish their intended purpose through action on harmful aquatic organisms and pathogens in ships’ ballast water and sediments. However, if the ballast water is still toxic at the time of discharge into the environment, the organisms in the receiving water may suffer unacceptable harm. Both the Active Substance or Preparation as well as the ballast water discharge should be subjected to toxicity testing in order to protect the receiving environment or human health from toxic effects due to the discharges. Toxicity testing is needed to determine if an Active Substance or Preparation can be used and under which conditions the potential of harming the receiving environment or human health is acceptably low.

3.3 Any system which makes use of, or generates, Active Substances, Relevant Chemicals or free radicals during the treatment process to eliminate organisms in order to comply with the Convention should be subject to this Procedure.

3.4 Ballast water management systems that make use of Active Substances and Preparations must be safe in terms of the ship, its equipment and the personnel to comply with the Convention.

3.5 The approval of Active Substances and Preparations using viruses or fungi for use in ballast water management systems is not addressed in this procedure. The approval of such substances for ballast water management should require an additional consideration by the Organization in compliance with regulation D-3 of the Convention if the use of such substances is proposed.

3.6 Administrations should check the quality and completeness of any Basic Approval or Final Approval submission, against the latest version of the Methodology for information gathering and the conduct work of the Technical Group agreed by the Organization, prior to its submission to the MEPC.

4 GENERAL REQUIREMENTS

4.1 Identification

4.1.1 The proposal for approval of an Active Substance or a Preparation should include a chemical identification and description of the chemical components even if generated on board. A chemical identification should be provided for any Relevant Chemicals.

4.2 Data-set for Active Substances and Preparations

4.2.1 A proposal for approval should include information on the properties or actions of the Preparation including any of its components as follows:

- .1 Data on effects on aquatic plants, invertebrates, fish, and other biota, including sensitive and representative organisms:
 - acute aquatic toxicity;
 - chronic aquatic toxicity;
 - endocrine disruption;
 - sediment toxicity;
 - bioavailability/biomagnification/bioconcentration; and
 - food web/population effects.
- .2 Data on mammalian toxicity:
 - acute toxicity;
 - effects on skin and eye;
 - chronic and long-term toxicity;
 - developmental and reproductive toxicity;
 - carcinogenicity; and
 - mutagenicity.
- .3 Data on environmental fate and effect under aerobic and anaerobic conditions:
 - modes of degradation (biotic; abiotic);
 - bioaccumulation, partition coefficient, octanol/water coefficient;
 - persistence and identification of the main metabolites in the relevant media (ballast water, marine and fresh waters);
 - reaction with organic matter;
 - potential physical effects on wildlife & benthic habitats;
 - potential residues in seafood; and
 - any known interactive effects.
- .4 Physical and chemical properties for the Active Substances and Preparations and the treated ballast water, if applicable:
 - melting point;
 - boiling point;
 - flammability;

- density (relative density);
- vapour pressure, vapour density;
- water solubility/dissociation constant (pKa);
- oxidation/reduction potential;
- corrosivity to the materials or equipment of normal ship construction;
- autoignition temperature; and
- other known relevant physical or chemical hazards.

.5 Analytical methods at environmentally relevant concentrations.

4.2.2 A proposal for approval should include the above data set either for the Preparation or for each component separately, and a list of the name and relative quantities (in volumetric percentages) of the components should be also attached. As described in section 8.1, all proprietary data should be treated as confidential.

4.2.3 The tests for Active Substances and Preparations should be carried out in accordance with internationally recognized guidelines¹.

4.2.4 The testing process should contain a rigorous quality control/quality assurance programme consisting of:

- .1 Both a Quality Management Plan (QMP) and a Quality Assurance Project Plan (QAPP). Guidance on preparation of these plans, along with other guidance documents and other general quality control information are available for download from the International Organization for Standardization (ISO) (www.iso.org).
- .2 The QMP addresses the quality control management structure and policies of the Test Organization (including subcontractors and outside laboratories).
- .3 The QAPP is a project specific technical document reflecting the specifics of the system to be tested, the test facility, and other conditions affecting the actual design and implementation of the required experiments.

4.2.5 Dossiers already used for registration of chemicals can be submitted by the applicant to satisfy the required data needed for the evaluation of Active Substances and Preparations according to this procedure.

4.2.6 The proposal should describe the manner of application of the Preparation for ballast water management, including required dosage and retention time.

4.2.7 A proposal for approval should include (Material) Safety Data Sheets ((M)SDS).

4.3 Assessment report

4.3.1 A proposal for approval should include an assessment report. The assessment report should address the quality of the test reports, the risk characterization and a consideration of the uncertainty associated with the assessment.

¹ Preferably Organization for Economic Co-operation and Development (OECD) Guidelines for Testing of Chemicals (1993) or other equivalent tests.

5 RISK CHARACTERIZATION

5.1 Screening for persistency, bioaccumulation and toxicity

5.1.1 An assessment on the intrinsic properties of the Active Substance and/or Preparation such as persistency, bioaccumulation and toxicity should be conducted (see Table 1 in section 6).

- .1 Persistence tests:
Persistence should preferably be assessed in simulation test systems that determine the half-life under relevant conditions. Biodegradation screening tests may be used to show that the substances are readily biodegradable. The determination of the half-life should include assessment of relevant chemicals.
- .2 Bioaccumulation tests:
The assessment of the (potential for) bioaccumulation should use measured bioconcentration factors in marine (or freshwater) organisms. Where these tests are not applicable, or if $\log P_{ow} < 3$, Bio Concentration Factor (BCF) values may be estimated using (Quantitative) Structure-Activity Relationship ((Q)SAR) models.
- .3 Toxicity tests:
Acute and/or chronic ecotoxicity data, ideally covering the sensitive life stages, should in principle be used for the assessment of the toxicity criterion.

5.2 Toxicity testing of the treated ballast water

5.2.1 Toxicity testing is necessary for the Active Substance, or Preparations (see sections 4.2.1 and 5.3) and the treated ballast water discharge as covered in this section. The advantage of conducting toxicity testing on the ballast water discharge is that it integrates and addresses the potential for interactions of the Active Substances and Preparations with the possible by-products:

- .1 For the Basic Approval process, the discharge testing should be performed in a laboratory using techniques and equipment to simulate ballast water discharge following treatment by the Preparation.
- .2 For Final Approval, the discharge testing should be performed as part of the land-based type approval process using the treated ballast water discharge.

5.2.2 The applicant should provide both acute and chronic toxicity test data using standardized test procedures to determine the toxicity of the Preparation and Relevant Chemicals as used in conjunction with the ballast water management system. This testing approach should be performed on the treated ballast water discharge, as the ballast water management system could either mitigate or enhance the adverse effects of the Preparation or Relevant Chemicals.

5.2.3 The discharge toxicity tests should be conducted on samples drawn from the land-based test set-up, which would be representative of the discharge from the ballast water management system.

5.2.4 These toxicity tests should include chronic test methods with multiple test species (a fish, an invertebrate and a plant) that address the sensitive life-stage. The preference is to include both a sub-lethal endpoint (growth) and a survival endpoint. Either freshwater or marine test methods should be tested¹.

¹ Currently there is no compelling physiological or empirical proof that marine organisms are more sensitive than freshwater organisms or vice versa. Should this however be demonstrated for the substance under consideration, this should be taken into account.

5.2.5 The test results to be provided include: acute 24-hour, 48-hour, 72-hour, and 96-hour Lethal Concentration at which $x\%$ of the test organisms die (LC_x), No Observed Adverse Effect Concentrations (NOAECs), chronic No Observed Effect Concentration (NOEC) and/or Effect Concentration at which $x\%$ of test organisms show effect (EC_x), as appropriate based on the experimental design.

5.2.6 A dilution series including a 100% ballast water discharge would be tested to determine the no adverse effect level using the statistical endpoints (NOEC or EC_x). An initial analysis could use a conservative approach where the dilution capacity would not be taken into consideration (no modelling or plumes analysis would be used). The rationale for taking a conservative approach is that there could be multiple discharges into one location (even though this is not necessarily the case).

5.2.7 The acute and chronic toxicity test data in conjunction with the information in section 4.2.1 should be used to determine the holding time necessary to achieve the no adverse effect concentration upon discharge. Knowing the half-life (days), decay rate, dosage rate, volume of system and toxicity tests with time series, then a computational model can be used to determine the amount of time needed to hold the treated ballast water before discharge.

5.2.8 Information on Total Residual Oxidants (TRO) and Total Residual Chlorine (TRC) should be provided as part of the application for evaluation, for both the ballast water treatment process and the ballast water discharge.

5.3 Risk characterization and analysis

5.3.1 For the Basic Approval process, fate and effect testing should be performed in the laboratory with Active Substances and Preparations. This section lists information that could be useful for a preliminary risk characterization.

5.3.2 Both the Active Substance or Preparation as well as the treated ballast water discharge should be subject to toxicity testing in order to protect the receiving environment from toxic effects due to discharges.

5.3.3 The reaction with organic matter of Active Substances and Preparations that produce free radicals, should be addressed qualitatively so as to identify products of concern to the environment.

5.3.4 The rate and route of abiotic and biotic degradation of the Active Substances and Preparations under aerobic and anaerobic conditions should be assessed, resulting in the identification of relevant metabolites in the relevant media (ballast water, marine and fresh waters).

5.3.5 The rate of abiotic and biotic degradation of the Active Substances and Preparations under aerobic and anaerobic conditions should be assessed, resulting in the characterization of the persistence of the Active Substances, Preparations and Relevant Chemicals in terms of degradation rates under specified conditions (e.g., pH, redox, temperature).

5.3.6 The partition coefficients (solids-water partition coefficient (K_d) and/or organic carbon normalized distribution coefficient (K_{oc})) of the Active Substances, Preparations and Relevant Chemicals should be determined.

5.3.7 For Active Substances and Preparations, the potential for bioaccumulation should be assessed in marine or freshwater organisms (fish or bivalves) if the logarithm octanol/water partition coefficient (logP_{ow}) is >3.

5.3.8 Based on the information on fate and behaviour of Active Substances and Preparations, the discharge concentrations at selected time intervals should be predicted.

5.3.9 The effect assessment of the Active Substances, Preparations and Relevant Chemicals is initially

based on a dataset of acute and/or chronic ecotoxicity data for aquatic organisms, being primary producers (algae or sea grasses), consumers (crustaceans), predators (fish), and should include secondary poisoning to mammalian and avian top-predators, as well as data for sediment species.

5.3.10 An assessment of secondary poisoning is redundant if the substance of concern demonstrates a lack of bioaccumulation potential (e.g., BCF <500 L/kg wet weight for the whole organism at 6% fat).

5.3.11 An assessment of sediment species is redundant if the potential of the substance of concern to partition into the sediment is low (e.g., K_{oc} <500 L/kg).

5.3.12 The effect assessment of the Active Substances, Preparations and Relevant Chemicals should include a screening on carcinogenic, mutagenic and endocrine disruptive properties. If the screening results give rise to concerns, this should give rise to a further effect assessment.

5.3.13 The effect assessment of the Active Substances, Preparations and Relevant Chemicals, taking the indicated information into account, should be based on internationally recognized guidance¹.

5.3.14 The results of the effect assessment are compared to the results of the discharge toxicity testing. Any unpredicted results (e.g., lack of toxicity or unexpected toxicity in the discharge assessment) should give rise to a further elaboration on the effect assessment.

5.3.15 An analytical method suitable for monitoring Active Substances and Preparations in ballast water discharges should be available.

6 EVALUATION CRITERIA

The Organization should evaluate the application for approval based on the criteria in this section.

6.1 The information that has been provided should be complete, of sufficient quality and in accordance with this Procedure.

6.2 That this information does not indicate possible unacceptable adverse effects to environment, human health, property or resources.

6.3 Ship and personnel safety

6.3.1 In order to protect the ship and personnel safety the Technical Group should evaluate the physical and chemical hazards (see paragraph 4.2.1.4) to ensure that potential hazardous properties of the Active Substances, Preparations or Relevant Chemicals formed in the treated ballast water should not create any unreasonable risk to the ship and personnel. Proposed procedures for the use and technical equipment introduced needs to be taken into account.

6.3.2 For the protection of personnel involved in the handling and storage of the Active Substances and Preparations, the proposal should include relevant ((M)SDS). The Organization should evaluate (M)SDS, mammalian toxicity data and chemical properties hazards (see paragraphs 4.2.1.2 and 4.2.1.4) and ensure that potential hazardous properties of the Active Substances, Preparations or Relevant Chemicals should not create any unreasonable risk to the ship or personnel. This evaluation should take into account the different circumstances that a ship or personnel may face in its trade (e.g., ice, tropical, humidity, etc.).

6.3.3 A Human Exposure Scenario (HES) should be provided by the applicant as part of the Risk Assessment procedure for ballast water management systems.

¹ Such as relevant OECD guidelines or equivalent.

6.4 Environmental protection

6.4.1 In order to approve the application, the Organization should determine that the Active Substances, Preparations or Relevant Chemicals are not Persistent, Bioaccumulative and Toxic (PBT). Preparations that exceed all these criteria (Persistence, Bioaccumulation and Toxicity) in the table below are considered PBT.

Table 1 Criteria for identification of PBT substances

Criterion	PBT criteria
Persistence	Half-life: > 60 days in marine water, or > 40 days in freshwater [*] , or > 180 days in marine sediment, or > 120 days in freshwater sediment [*]
Bioaccumulation	BCF > 2,000 or $\text{Log}_{\text{Poctanol/water}} \geq 3$
Toxicity	Chronic NOEC < 0.01 mg/l

^{*}For the purpose of marine environmental risk assessment half-life data in freshwater and freshwater sediment can be overruled by data obtained under marine conditions.

6.4.2 The Organization should determine the overall acceptability of the risk the Preparation may pose in its use for ballast water management. It should do so by comparing the information provided and the undertaken assessment of PBT and the discharge with scientific knowledge of the Active Substances, Preparations and Relevant Chemicals concerned. The risk evaluation should qualitatively take into account cumulative effects that may occur due to the nature of shipping and port operations.

6.4.3 The risk evaluation should consider the uncertainties involved in the application for approval, and as appropriate, provide advice on how these uncertainties can be dealt with.

6.4.4 An Emission Scenario Document (ESD) should be provided by the applicant as part of the Risk Assessment procedure for ballast water management systems. The ESD should be based on the worst-case discharge scenario and should be regarded as the first stage of a stepped approach to the development of a full ESD, when more data on potential discharges and technologies becomes available.

7 REGULATION OF THE USE OF ACTIVE SUBSTANCES AND PREPARATIONS

7.1 Handling of Active Substances and Preparations

7.1.1 The proposal for approval of Active Substances and Preparations should include information on their intended use and application. The quantity of Active Substances and Preparations to be added to the ballast water and the maximum allowable concentration of the Active Substances therein should be described in the instructions provided by the manufacturer. The system should ensure that the maximum dosage and maximum allowable discharge concentration are not exceeded at any time.

7.1.2 An assessment should be undertaken to ensure the safe on-board handling and storage of chemicals used to treat ballast water, using the existing IMO Conventions, Codes and guidance as a basis.

7.2 Hazard documentation and labelling

7.2.1 The proposal should include ((M)SDS) as required. The (M)SDS should describe appropriate stor-

age and handling together with the effects of degradation and chemical reactivity during storage and should be included in the instructions provided by the manufacturer.

7.2.2 Documentation of hazards or the (M)SDS should conform to the UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS) and the relevant IMO regulations (e.g., the IMDG Code) and guidelines (e.g., the GESAMP Hazard Evaluation Procedure). Where these regimes are not applicable, relevant national or regional regimes should be followed.

7.3 Procedures and use

7.3.1 Detailed procedures and information for safe application of Active Substances and Preparations on board should be developed and supplied, taking into consideration existing IMO Conventions, Codes and guidance. The procedures should comply with the approval conditions such as maximum allowable concentration and maximum discharge concentration, if any.

8 APPROVAL

8.1 Basic Approval

8.1.1 All proprietary data should be treated as confidential by the Organization and its Technical Group, the Competent Authorities involved, and the evaluating regulatory scientists, if any. However, all information related to safety and environmental protection, including physical/chemical properties, environmental fate and toxicity, should be treated as non-confidential.

8.1.2 Procedure to be followed:

- .1 The manufacturer should evaluate the Active Substances or Preparations and the potential discharge in accordance with the approval criteria specified in this procedure.
- .2 Upon completion, the manufacturer should prepare an Application on the Active Substances and Preparations and submit it to the Member of the Organization concerned. An application should only be made once the ballast water management system, Active Substance or Preparation has been sufficiently designed, progressed and tested to provide the full data necessary for a Basic Approval.
- .3 The Administration having received a satisfactory application should as soon as possible propose an approval to the Organization.
- .4 Members of the Organization may propose an approval.
- .5 The Organization should announce and set the time frame for the evaluation of Active Substances and Preparations.
- .6 Parties, Members of the Organization, the United Nations and its Specialized Agencies, intergovernmental organizations having agreements with the Organization and non-governmental organizations in consultative status with the Organization may submit information that is relevant to the evaluation.
- .7 The Organization should establish a Technical Group in accordance with its rules of procedure ensuring that proprietary data should be treated as confidential.
- .8 The Technical Group should review the comprehensive proposal along with any additional data submitted and report to the Organization whether the proposal has demonstrated a potential for unreasonable risk for environment, human health, property or resources in accordance with the criteria specified in this procedure.

- .9 The Technical Group's report should be in written form and circulated to the Parties, Members of the Organization, the United Nations and its Specialized Agencies, intergovernmental organizations having agreements with the Organization and non-governmental organizations in consultative status with the Organization, prior to its consideration by the competent Committee.
- .10 The Committee of the Organization should decide whether to approve any proposal, introduce any modifications thereto, if appropriate, taking into account the Technical Group's report.
- .11 The Member of the Organization that submitted the application to the Organization should inform in writing the applicant about the decision made with regard to the respective Active Substance or Preparation and their manner of application.
- .12 Active Substances or Preparations receiving Basic Approval by the Organization may be used for prototype or type approval testing based on the guidelines developed by the Organization². Subject to evaluation against the criteria developed by the Organization, an Active Substance or Preparation may be used for Prototype or Type Approval testing for the approval of different BWMS.
- .13 An applicant seeking to take advantage of an Active Substance or Preparation's Basic Approval should provide in its application a written agreement from the applicant whose Active Substance or Preparation has been granted the initial Basic Approval.

8.2 Final Approval

8.2.1 In accordance with regulation D-3.2, a ballast water management system using an Active Substance or Preparation to comply with the Convention (which received Basic Approval) must be approved by the Organization. For this purpose, the Member of the Organization submitting an application should conduct the Type Approval tests in accordance with Guidelines for approval of ballast water management systems (G8). The results should be conveyed to the Organization for confirmation that the residual toxicity of the discharge conforms to the evaluation undertaken for Basic Approval. This would result in Final Approval of the ballast water management system in accordance with regulation D-3.2. Active Substances or Preparations that have received Basic Approval by the Organization may be used for evaluation of ballast water management systems using Active Substances or Preparations for Final Approval.

8.2.2 It is to be noted that from the Guidelines (G8) land-based testing only the results of the residual toxicity tests should be included in the proposal for Final Approval in accordance with Procedure (G9). All other Guidelines (G8) testing remains for the assessment and attention of the Administration. Although Basic Approval under Procedure (G9) should not be a pre-requisite of Type Approval testing, as an Administration can regulate discharges from its own ships in its own jurisdiction. Basic Approval would still be required, and the specific technology could not be used in vessels in another jurisdiction without Basic Approval.

8.2.3 It should be noted that once a system has received Final Approval under this Procedure, then the respective applicant should not have to retrospectively submit new data if there is a change in the Methodology agreed by the Organization.

8.3 Notification of approval

8.3.1 The Organization will record the Basic and Final Approval of Active Substances and Preparations and ballast water management systems that make use of Active Substances and circulate the list once a year including the following information:

2 Guidelines for approval and oversight of prototype ballast water treatment technologies (G10) and Guidelines for approval of Ballast Water Management Systems (G8).

- Name of ballast water management system that make use of Active Substances and Preparations;
- Date of approval;
- Name of manufacturer; and
- Any other specifications, if necessary.

8.4 Modification

8.4.1 Manufacturers should report any modifications in names, including trade and technical name, composition or use of the Active Substances and Preparations in the ballast water management systems approved by the Organization, to the Member of the Organization. The Member of the Organization should inform the Organization accordingly.

8.4.2 Manufacturers intending to significantly change any part of a ballast water management System that has been approved by the Organization or the Active Substances and Preparations used in it should submit a new application.

8.5 Withdrawal of approval

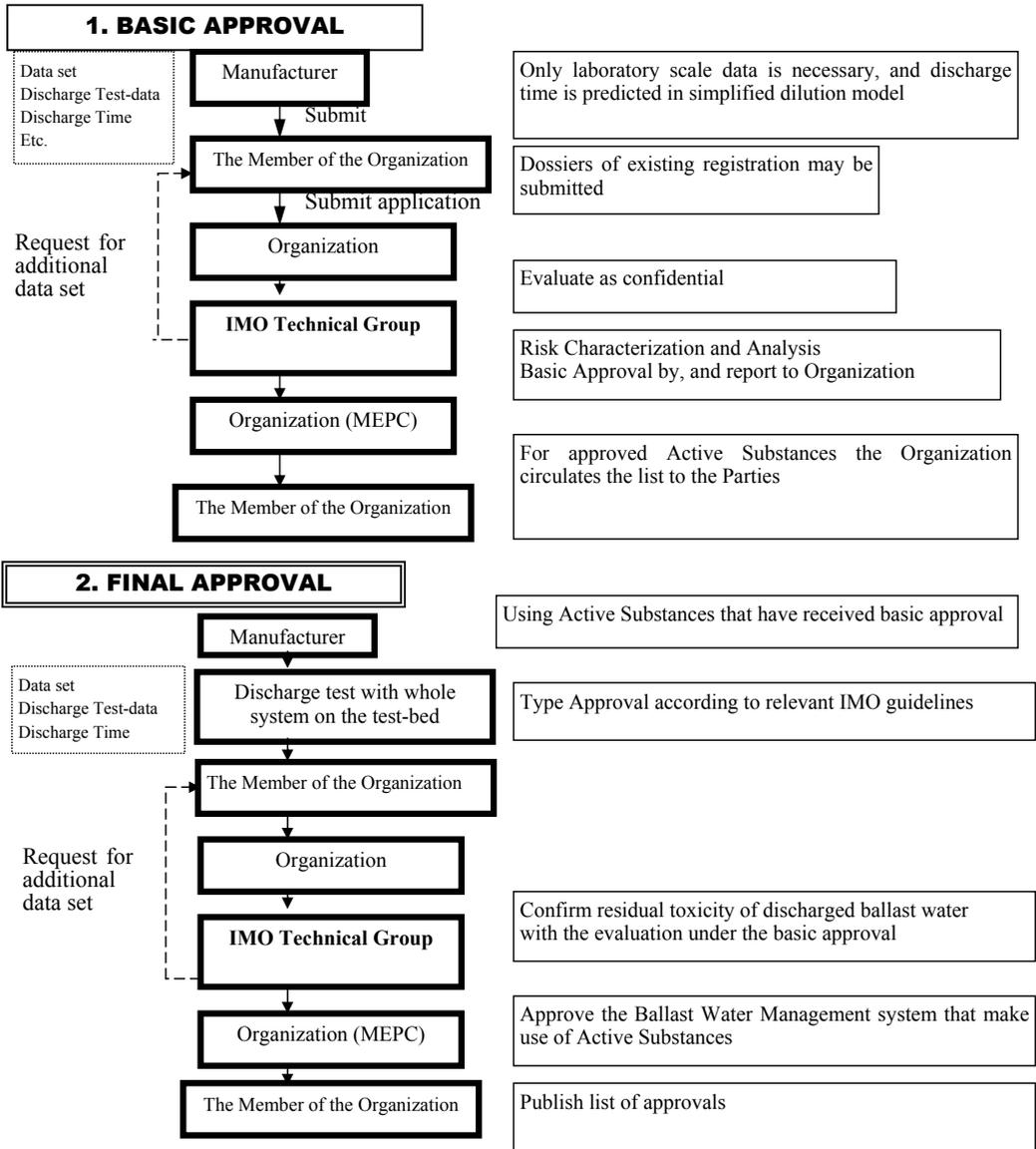
8.5.1 The Organization may withdraw any approval in the following circumstances:

- .1 If the Active Substances and Preparations or ballast water management system that make use of Active Substances no longer conforms to requirements due to amendments of the Convention.
- .2 If any data or test records differ materially from data relied upon at the time of approval and are deemed not to satisfy the approval condition.
- .3 If a request for withdrawal of approval is made by the Member of the Organization on behalf of the manufacturer.
- .4 If unreasonable harm to environment, human health, property or resources is demonstrated by any Member of the Organization or observer to have been caused by the approved ballast water management system that make use of Active Substances or Preparations.

**

Appendix

Approval Scheme for Active Substance or Preparation and Ballast Water Management systems that make use of Active Substances



RESOLUTION MEPC.140(54)

adopted on 24 March 2006

GUIDELINES FOR APPROVAL AND OVERSIGHT OF PROTOTYPE BALLAST WATER TREATMENT TECHNOLOGY PROGRAMMES (G10)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that regulation D-4.3 of the Ballast Water Management Convention provides that, in establishing and carrying out any programme to test and evaluate promising Ballast Water technologies, Parties shall take into account Guidelines developed by the Organization,

NOTING ALSO that resolution 1 adopted by the International Conference on Ballast Water Management for Ships invited the Organization to develop these Guidelines as a matter of urgency,

HAVING CONSIDERED, at its fifty-fourth session, the draft Guidelines for approval and oversight of prototype ballast water treatment technology programmes developed by the Ballast Water Working Group,

1. ADOPTS the Guidelines for approval and oversight of prototype ballast water treatment technology programmes as set out in the annex to this resolution;
2. INVITES Governments to apply the Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep the Guidelines under review.

* * *

ANNEX

GUIDELINES FOR APPROVAL AND OVERSIGHT OF PROTOTYPE BALLAST WATER TREATMENT TECHNOLOGY PROGRAMMES (G10)

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**GUIDELINES FOR APPROVAL AND OVERSIGHT OF PROTOTYPE BALLAST
 WATER TREATMENT TECHNOLOGY PROGRAMMES (G10)**

1 INTRODUCTION**General**

1.1 These Guidelines provide recommendations for Administrations on the approval and oversight of programmes for prototype ballast water treatment technologies in accordance with regulation D-4 of the “International Convention for the Control and Management of Ships’ Ballast Water and Sediments, 2004” (the Convention). The intention of regulation D-4 is to provide opportunities to test and evaluate promising ballast water treatment technologies aboard ships with the potential to meet or exceed the performance standards in regulation D-2 of the Convention. The document may also assist manufacturers, ship owners and other stakeholders undertaking development activities in the area of ballast water treatment. The Guidelines also make recommendations on criteria for approval of such programmes. Recommendations outlined in these Guidelines should be applied in an objective, consistent and transparent way and their application should be evaluated periodically by the Organization.

1.2 Regulations referred to in these Guidelines are those contained in the Convention.

1.3 The Guidelines include general recommendations on design and construction, technical procedures for overall performance testing and evaluation, procedures for the issuance of a Statement of Compliance in accordance with regulation D-4 and Administration oversight responsibilities.

1.4 As the level of ballast water management knowledge, experience and subsequently technological achievements continue to develop, these Guidelines may require updating. Periodical review of their content in light of such developments should be carried out and any revisions duly circulated by the Organization.

Purpose

- 1.5 The main purpose of these Guidelines is to:
- .1 assist Administrations to approve or reject proposed programmes and in cases where approval is granted, to issue a Statement of Compliance under regulation D-4;
 - .2 describe the responsibilities of the Administration in the oversight of the programme's execution; and
 - .3 encourage a uniform interpretation and application of regulation D-4.

Applicability

1.6 These Guidelines apply to programmes established to test and evaluate promising ballast water treatment technologies in accordance with regulation D-4.

Programme requirements

1.7 The Programme for prototype ballast water treatment technologies in accordance with these Guidelines should contain the following three main steps:

- .1 **Programme Application, Submission and Approval:** The submission should include a detailed plan describing the prototype technology and implementation of the programme as described in Section 3. Further, the applicant should include evidence on the potential of the prototype technologies meeting or exceeding the performance standard in regulation D-2. If the prototype ballast water treatment technology makes use of Active Substances, or preparations containing one or more Active Substances, the substances should have received Basic Approval, as described by the Procedure for the Approval of Ballast Water Management systems that make use of Active Substances (G9). All of the above information should be the basis for the Administration in its evaluation and approval of the submitted programme. In the case where a programme is approved, the applicant may proceed in accordance with the approved programme taking into account any conditions set by the Administration.
- .2 **Installation Survey and Statement of Compliance:** The installation of the prototype ballast water treatment technology in accordance with the approved Programme should be verified by an installation survey. Provided that this survey confirms adherence to the approved programme, including any applicable conditions set by the Administration, a Statement of Compliance under regulation D-4 may be issued by the Administration.
- .3 **Performance Evaluations and Reporting:** During the test and evaluation period, a prototype ballast water treatment technology should be subjected to on-going experimental testing and evaluation according to the approved programme to evaluate both the engineering and biological performance under shipboard operating conditions. Reporting to the Administration should be of the form and schedule in accordance with the approved programme.

2 DEFINITIONS

2.1 Prototype Ballast Water Treatment Technology - means any integrated system of ballast water treatment equipment as under regulation D-4, participating in a programme for testing and evaluation with the potential of meeting or exceeding the ballast water performance standard in regulation D-2 including treatment equipment, all associated control equipment, monitoring equipment and sampling facilities. A prototype ballast water treatment technology may be a mechanical, physical, chemical, or biological unit process, either singularly or in combination that may or may not use Active Substances that remove, render

harmless, or avoid the uptake or discharge of Harmful Aquatic Organisms and Pathogens within ballast water and sediments. Prototype ballast water treatment technologies may operate at the uptake or discharge of ballast water, during the voyage or in any combination of these phases.

2.2 Ballast Water Management Plan - is the document referred to in regulation B-1 of the Convention describing the ballast water management processes and procedures on board individual ships.

2.3 Active Substances - means a substance or organism, including a virus or a fungus that has a general or specific action on or against Harmful Aquatic Organisms and Pathogens.

2.4 Control Equipment - refers to the installed equipment required for proper functioning of the prototype ballast water treatment technology.

2.5 Monitoring Equipment - refers to the equipment installed for assessment of the correct operation of the prototype ballast water treatment technology.

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

2.7 Sampling Facilities - refers to the means provided for sampling treated or untreated ballast water as needed in these Guidelines.

3 PROGRAMME APPLICATION REQUIREMENTS

3.1 This section provides the detailed elements and documentation that should be included in a Programme and Programme Application as defined in section 1.7.1. The Programme Application should contain information on the following aspects:

- .1 participants
- .2 ballast water treatment technology description
- .3 ship description
- .4 installation and installation survey description
- .5 performance test and evaluation description
- .6 time schedule and reporting

3.2 All relevant and requested documentation describing the Programme for which the applicant is applying for approval should be submitted to the Administration. The application should only encompass one prototype ballast water treatment technology and should not normally result in installations in more than three ships. Prototype installations onboard more than one ship should be justified in the application and may rest upon technology development requirements related to, for example:

- capacity issues;
- geographical areas of operation;
- specific onboard conditions varying as a function of ship type; and
- refit to existing vessels versus installations onboard new vessels.

3.3 The Programme Application should also take into account safety and environmental regulations which have to be met by the ship so as to ensure that other international and/or national requirements are not compromised by the prototype ballast water treatment technology.

3.4 The Programme should implement appropriate quality control measures in accordance with recognized international standards to which all participants specified in Section 3.5 should be required to comply.

Participants

3.5 The Programme should provide an overview of the different participants included in the Programme Application including, as appropriate:

- the ship owner or operator;
- the manufacturer(s); and
- the testing institution or any laboratories, institution(s) or companies carrying out elements of or the entire programme or advising the manufacturer in carrying out the programme.

3.6 The roles and responsibilities of each of the identified participants should be clearly described within the Programme Application.

Ballast water treatment technology description

3.7 The Programme Application should include information regarding design, construction, operation and functioning of the proposed ballast water treatment technology. The information should also include any foreseen conditions limiting its application with respect to voyage duration, ship type, capacity (flow rate and/or volume) or any other such condition if relevant.

3.8 The Programme Application should contain documentation on the potential of the prototype technologies meeting or exceeding the performance standard in regulation D-2. Recognized scientific and statistical practices should have been utilized in the preparation of this documentation.

3.9 The construction, operation and maintenance of the technology should be adequately described to allow for consideration by the Administration and this should include:

- .1 The prototype ballast water treatment technology should have a configuration and construction suitable for shipboard installation and normal onboard operation;
- .2 Design, construction and material should be suitable for the purpose for which the equipment is intended, the working conditions to which it should be subjected and the environmental conditions onboard. This should include considerations of:
 - .1 vibration – to ensure that there are no potential resonance occurring;
 - .2 temperature – to assure safe and proper operations and performance of the technology over a range of temperatures applicable for shipboard installations;
 - .3 humidity – to ensure the suitability of equipment exposed to humidity/ water as applicable to shipboard installations;
 - .4 power fluctuation – to ensure proper functioning over a voltage/frequency variation; and
 - .5 inclination – to assure that the technology should operate during those scenarios it is intended for, taking into account the motion of the vessel and that it should remain safe and not represent any danger to crew or ship onboard during inclination.
- .3 Routine maintenance of the prototype ballast water treatment technology and trouble-shooting procedures should be clearly described by the manufacturer in a operating and maintenance manual.
- .4 The prototype ballast water treatment technology should be provided with simple and effective means for its operation and control.
- .5 In case of a failure compromising the proper operation of the prototype ballast water treatment technology, audible and visual alarm signals are to be activated at all stations from where ballast water operations may be controlled.
- .6 The prototype ballast water treatment technology programme should provide for record keeping of the entire ballast water operations including:

- .1 record of operations and any malfunctioning during operations;
 - .2 record of all essential parameters necessary to ensure proper functioning;
 - .3 date and time of start and end of the ballast operation; and
 - .4 ballast operation mode (loading, discharge, transfer).
- .7 The prototype ballast water treatment technology should allow for sampling such that representative samples of the ship's ballast water can be collected as described in the experimental design as described in the Programme Application.

3.10 The Programme Application should include descriptions of the working principles, use if any Active Substances, operational conditions and application feasibility of the prototype ballast water treatment technology.

3.11 The Programme Application should include an assessment of the potential effects upon other personnel, shipboard systems and structure, highlighting any special safety provisions than maybe necessary due to the characteristics of the installation and/or operation of the prototype ballast water treatment technology.

Ship description

3.12 The Programme Application should include a full and complete description of the ship(s) in which the prototype ballast water treatment technology is to be installed. This description should include:

- ships' name;
- date of construction;
- flag;
- port of registry;
- gross tonnage;
- dead weight;
- IMO number;
- length (bp);
- beam;
- international call sign;
- deepest ballast drafts (normal and heavy weather);
- total ballast capacity of the ship in cubic metres and other units if applicable to the ship.

3.13 The description should also include normal operational ballast flow rates and volumes, and, to the extent possible, typical voyage lengths and routes.

Installation and installation survey description

3.14 The Programme Application should fully describe the manner in which the equipment should be integrated into the ship and should provide the following for the onboard installation:

- .1 process flow diagram of the prototype ballast water treatment technology;
- .2 "equipment arrangement" drawings of the proposed prototype ballast water treatment installation. These should show scaled lay-outs of the spaces and important mechanical and structural features such as major propulsion and electrical components, bulkheads and pillars, and doors and other means of access/egress;
- .3 "piping arrangement" drawing of the prototype ballast water treatment system installation, including ballast and cross-connected piping systems, sample piping, and the operational outlets for treated effluent and any waste streams;

- .4 information relating to onboard safety matters;
- .5 an assessment of the potential effects upon other shipboard systems and the ship's structure, highlighting those aspects of the design and operation of the system, and its integration into the ship, to be put in place to prevent any compromises to crew and ship safety;
- .6 assurance of adequate safety interlocks and failsafe measures to ensure subdivision boundaries, structural integrity, and vessel stability are not compromised;
- .7 assurance that new piping and flows should not result in unsafe ballasting or deballasting situations, e.g., overpressure;
- .8 assurance that escape arrangements in manned spaces are not compromised;
- .9 arrangements for maintaining the integrity any boundary between safe and hazardous spaces;
- .10 attention to restrictions related to the use of electrical equipment in hazardous areas; and
- .11 a provision for safe storage and use of Active Substances.

3.15 The installation survey description should contain a listing of those items which should be validated at the survey and these include, as a minimum, the following:

- .1 updated, as-installed diagrammatic drawings of any additional pumping and piping arrangements, identifying the operational outlets for treated effluent and any waste streams. Special consideration may have to be given to installations on ships that have unusual pumping and piping arrangements, as well as restrictions related to the use of electrical equipment in hazardous areas;
- .2 equipment manuals, supplied by manufacturers, which should contain details of the major components of the treatment system;
- .3 operations and technical manual for the complete installed prototype ballast water treatment. This manual should cover the arrangements and operation of the system as a whole and should specifically describe the parts of the system which may not be covered by the manufacturer's equipment manuals. The operations section of the manual should include normal operational procedures and procedures for the discharge of untreated water in the event of malfunction of the equipment. The technical section of the manual should include adequate information (description and diagrammatic drawings of the pumping and piping arrangements, of the monitoring system and electrical/electronic wiring diagrams) to enable fault finding and should include instructions for keeping a maintenance record;
- .4 the installation should comply with manufacturer's specific installation criteria. A technical installation specification defining, inter alia, the location and mounting of components, arrangements for maintaining the integrity of any boundary between safe and hazardous spaces, and the arrangement of the sample piping;
- .5 the Ballast Water Management Plan; and
- .6 any other conditions required by the Administration.

3.16 The Programme Application should provide a recommended test and survey procedure. This procedure should specify all the checks to be carried out in a functional test and should provide guidance for the surveyor when carrying out the on-board survey of the treatment system. This procedure may be amended as necessary prior to the survey and with the concurrence of the Administration.

Performance test and evaluation description

3.17 A full description of the onboard tests and evaluations to be undertaken should be provided. When available standard methods for the collection, handling (including concentration), storage, and analysis of samples should be applied. These methods should be clearly referenced and described in test plans and in reports. This includes methods for detecting, concentrating, enumerating, and identifying organisms and for determining viability. When non-standard methods are used they should be validated, documented and reported. A description of the experimental design and sampling procedure should be provided.

3.18 The Programme should evaluate:

- .1 the biological efficacy of the installed prototype ballast water treatment technology;
- .2 the operational performance which should include, but not be limited to:
 - unplanned maintenance and manning requirements
 - operational data relative to manufacturer's specification
 - consideration of the environmental conditions identified in section 3.9.2;
- .3 the effects upon the ship's systems and structure; and
- .4 any other characteristics identified by the participants or the Administration.

3.19 Experimental Design and Protocols should include:

- .1 a general description of the experimental test including the experimental hypotheses being tested and methods for the determination of biological efficacy and operational performance. The Programme Application should identify the test locations, source waters, and relevant environmental water conditions, to the extent possible. The overall study plan should take full advantage of the range of locations provided by the vessel's operations, to the extent practicable;
- .2 a detailed description for each of the experiments including:
 - .1 ballast water sample collection for each treatment and control, identification and number of replicate tanks, ballast water samples and time points encompassed in the test;
 - .2 description of test runs: replicate tests (tests at same location and environmental conditions) and comparative tests (tests at different locations or environmental conditions). Description of how the efficacy of the treatment process should be evaluated; include a description of how the efficacy should be quantified, as well as a description of the comparison of biological efficacies;
 - .3 the plan should address statistical analysis (including power analysis) and data confidence issues. Fully describe the intended statistical tests, use of controls, and replicates for each experiment; and
 - .4 how the experiment accounts for the range of seasons, organic matter content, turbidity, pH, salinity, etc. likely to be encountered in operation and, to the extent possible, describe the range of these variables;
- .3 the experimental design should address the operation of the ship's systems whose arrangements (e.g., cross connections) have the potential to confound the resulting data.

Time schedule and reporting

3.20 The Programme Application should include procedures and schedules for reporting the progress and status of the Programme through all phases. Reporting to the Administration should occur on a regular

basis throughout the Programme. In addition, reporting should include the results and evaluation of all conducted experiments.

3.21 The Programme Application should present an overall time schedule compliant with project management standards. This schedule should include an estimation of major task element time lines. Each of these should have an anticipated period of performance and execution and include events such as approval of the Programme by the Administration, the installation survey, experimental and progress reports. Major task elements should include the installation of the prototype ballast water treatment technology into the ship, initiation and execution of experiments and maintenance periods.

4 INSTALLATION SURVEY AND STATEMENT OF COMPLIANCE

Installation survey

4.1 Following approval of the Programme Application, the Programme may proceed to installing the onboard prototype ballast water treatment technology.

4.2 Following installation a survey should be performed by the Administration, or any designated body appointed by the Administration to act on its behalf, to verify that the system installation has been carried out in accordance with the approved Programme and that the workmanship of the installation is satisfactory.

Statement of Compliance

4.3 Upon successful completion of the Installation Survey a Statement of Compliance may be issued by the Administration, or by a person or organization duly authorized by the Administration. In every case, the Administration assumes full responsibility for the Statement of Compliance. The recommended format for the Statement of Compliance is given in the Appendix.

4.4 The Statement of Compliance should be valid until five years after the dates specified in regulations D-4.1 and D-4.2, as appropriate.

5 PERFORMANCE REQUIREMENT FOR ALREADY INSTALLED SYSTEMS

5.1 Ships with already installed prototype ballast water treatment technologies that wish to make use of the provision of regulation D-4, may do so provided that a Programme Application is approved by the Administration.

6 PROGRAMME OVERSIGHT

6.1 The Administration or any designated body appointed by the Administration to act on its behalf should ensure that the Programme as approved is followed.

6.2 The Administration should revoke the Statement of Compliance if the ship fails to follow the approved Programme or otherwise does not comply with the conditions of regulation D-4.4.

* *

APPENDIX 1

Statement of Compliance for a Prototype Ballast Water Treatment Technology

(Official seal)

Issued under the provisions of

**GUIDELINES FOR APPROVAL AND OVERSIGHT OF PROTOTYPE BALLAST WATER
TREATMENT TECHNOLOGY PROGRAMMES (G10)**

(Resolution MEPC.140(54)),

under the authority of the Government of *(full designation of country)*

by *(full designation of the competent person or organization recognized by the Administration)*

Particulars of ship

Name of ship

IMO Number*

Distinctive number or letters

Port of registry

Gross tonnage

Ballast Water Capacity, Volume and Flow Rates

Date on which keel was laid or ship was at a similar stage of construction or, (in the case of a converted ship) date on which conversion was commenced

Date by which the ship is required to comply with regulation D-2

Date on which the prototype ballast water treatment system was installed

Name and address of prototype ballast water treatment technology manufacturer

Trade name of technology

Serial number or other identifying marking

Name of Active Substance and details of Basic Approval

Brief description of the prototype technology

THIS ISTO CERTIFY:

1. That the ship has a prototype ballast water treatment system which is subject to a programme approved in accordance with regulation D-4 by the Government of *(insert Government title)* on *(insert date of approval of programme)*.
2. That the prototype ballast water treatment technology installation has been surveyed in accordance with Section 4 of the annex to resolution MEPC.140(54).
3. A copy of the approved programme is on board the ship together with equipment, operations and maintenance manuals for the prototype ballast water treatment technology.

This Statement is valid until *(date)*

(Place of issue of Statement)

(Date of issue)

(Signature of authorized official issuing the Statement)

(Seal or stamp of the authority, as appropriate)

* IMO Ship Identification Number Scheme adopted by the Organization by resolution A.600(15).

**RESOLUTION MEPC.149(55)
adopted on 13 October 2006**

**GUIDELINES FOR BALLAST WATER EXCHANGE DESIGN AND CONSTRUCTION
STANDARDS (G11)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that Regulation D-1 of the Ballast Water Management Convention stipulates that ships performing ballast water exchange shall do so with an efficiency of at least 95 per cent volumetric exchange of ballast water and that MEPC 51 identified the need for additional guidance on design and construction standards for ships conducting ballast water exchange,

NOTING ALSO that resolution 1 adopted by the International Conference on Ballast Water Management for Ships invited the Organization to develop the Guidelines for uniform application of the Convention as a matter of urgency,

HAVING CONSIDERED, at its fifty-fifth session, the draft Guidelines for ballast water exchange design and construction standards (G11) developed by the Ballast Water Working Group, and the recommendation made by the Sub-Committee on Bulk Liquids and Gases at its tenth session,

1. ADOPTS the Guidelines for ballast water exchange design and construction standards (G11);
2. INVITES Governments to apply the Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep the Guidelines under review.

* * *

ANNEX

GUIDELINES FOR BALLAST WATER EXCHANGE DESIGN AND CONSTRUCTION STANDARD (G11)

1 INTRODUCTION

Purpose

1.1 These Guidelines outline recommendations for the design and construction of ships to assist compliance with Regulation D-1 (*Ballast Water Exchange Standard*) of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Convention).

1.2 These Guidelines have been developed to give guidance to shipbuilders, ship designers, owners and operators of ships in designing safe, environmentally acceptable, technically achievable, practicable, and cost effective ballast water exchange as required in Regulation D-1.

1.3 These Guidelines should be applied without compromising the ship's safety and operational efficiency and taking into account the design of ship types, which may have special safety considerations for example container ships and bulk carriers.

2 DEFINITIONS

2.1 For the purposes of these Guidelines, the definitions in the Convention apply and:

- .1 "Ballast Water Tank" – means any tank, hold or space used for the carriage of ballast water as defined in Article 1 of the Convention.
- .2 "Sequential Method" – means a process by which a ballast tank intended for the carriage of ballast water is first emptied and then re-filled with replacement ballast water to achieve at least a 95 per cent volumetric exchange.
- .3 "Flow-through Method" – means a process by which the replacement ballast water is pumped into a ballast tank intended for the carriage of ballast water, allowing water to flow through overflow or other arrangements.
- .4 "Dilution Method" – means a process by which replacement ballast water is filled through the top of the ballast tank intended for the carriage of ballast water with simultaneous discharge from the bottom at the same flow rate and maintaining a constant level in the tank throughout the ballast exchange system.

3 BALLAST WATER EXCHANGE – DESIGN AND CONSTRUCTION CONSIDERATIONS

General considerations

3.1 When designing and constructing a ship that will operate with ballast water exchange the following considerations should be taken into account:

- .1 maximizing the efficiency of ballast water exchange;
- .2 increasing the range of sea conditions under which ballast water exchange may be conducted safely;
- .3 shortening the time to complete ballast water exchange (thereby increasing the types of voyages under which ballast water exchange can be undertaken safely); and
- .4 minimizing the accumulation of sediments (refer to Guidelines on design and construction to facilitate sediment control on ships (G12)).

Consideration at the design phase of new ships

3.2 When designing new ships the following aspects related to ballast water management equipment should be considered:

- .1 ballast water management and the processes chosen to achieve it, should be considered as a component of the ship's design;
- .2 design and installation of the ballast water pumping and piping system should ensure that ease of operation and maintenance is maximized;
- .3 ballast tank design should facilitate all aspects of ballast water management;
- .4 installation of monitoring and/or recording equipment for all ballast water operations and treatment processes. If any records are automatically recorded by the equipment they should be in a format that can easily be retained and be made readily available to appropriate authorities;
- .5 remote data management;
- .6 the design of the ballast water exchange system should be such that it facilitates future compliance of the standards set in Regulation D-2 of the Convention, minimizing the need to install new equipment/retrofitting and to carry out dry-docking and/or hot work. It should reduce, as far as possible, the costs of any adaptation for this purpose. Special consideration should be given to the feasibility of combining ballast water exchange methods with ballast water treatment technologies, aiming at meeting, in the future, the standards of Regulation D-2. Adequate spaces for new complementary equipment and pipelines, which may be necessary to meet future standards D-2, should also be considered and planned.

3.3 Where designing new ships ballast water systems designs should take special account of the need for sampling the ballast water by port State control or other authorized organizations. The arrangements should be such that samples as required by the Guidelines for ballast water sampling (G2) can be taken. The sampling arrangements should enhance the quality and ease of sampling of ballast water or sediments, without the need to enter potentially dangerous spaces or partially filled ballast tanks.

3.4 Where ballast water exchange at sea is the chosen method, when designing new ships the following aspects should be considered:

- .1 design of ship structures to enable ballast water exchange to be conducted at various sea states/swell conditions and provide to the ship information on the maximum sea state that ballast water exchange can be conducted;
- .2 minimize the burden on ships crew (e.g. minimize the number of operational steps, the number of partially loaded tanks and the time taken);
- .3 minimize the risk of tank over/under pressurization;
- .4 minimize the flow of ballast water on deck;
- .5 maintaining bridge visibility standards (SOLAS V/22), propeller immersion and minimum draft forward at any stage of a designed ballast water exchange operation;
- .6 the consequences of ballast water exchange at sea, including stability, hull girder strength, shear forces, torsional stresses, resonance, sloshing, slamming and propeller immersion.

3.5 The ballast water exchange methods currently in use are the sequential, flow-through (tank over-flow) and dilution methods:

- .1 where the sequential method is to be used, particular attention should be given to the ballast tank layout, total ballast capacity, individual tank configuration and hull girder strength. If the plan requires simultaneously emptying and refilling closely matched diagonal tanks then consequential torsional stresses should be considered. Still water bending moments, shear forces and stability should remain at or within safe limits;
- .2 where the flow through method is to be used adequate provision should be made to avoid the risk of over pressurization of ballast tanks or ballast piping. The installation of additional air pipes, access hatches (as an alternative to deck manholes), internal overflow pipes (to avoid flowing over the deck) and interconnecting ballast trunks between tanks where applicable and possible may be considered. Water on decks and/or direct contact poses a safety and occupational health hazard to personnel. The design should, where possible, be such that it avoids water overflowing directly on to decks to avoid the direct contact by personnel with the ballast water;
- .3 where the dilution method is to be used adequate provision should be made for appropriate piping arrangements to facilitate the ballast water pumping into the previously ballasted tanks through the top of the ballast tank and, simultaneously, discharging the ballast water through the bottom of the tank at the same flow rate while maintaining a constant ballast water level in the tank throughout the exchange operation. Adequate provision should also be made to avoid the risk of over pressurization of ballast tanks or ballast piping. The hydrodynamic performance of the ballast tank is crucial to ensure full water exchange and sediment scouring.

4 DESIGN CONSIDERATIONS TO ENHANCE MANAGEMENT, CONTROL AND OPERATIONAL STRATEGIES

Sea chests

- 4.1 The following should be considered:
 - .1 sea chest design should be such that sediment accumulation is minimized; and
 - .2 provision of a high sea chest.

Ballast tanks

- 4.2 The design of ballast tanks should also take account of the Guidelines on design and construction to facilitate sediment control on ships (G12).

Ship-to-shore ballast transfer arrangements

- 4.3 If consideration is given to providing ship-to-shore connections to transfer ballast to shore-based ballast water reception facilities, the arrangements should be compatible with a recognized standard such as those in the Oil Companies International Marine Forum (OCIMF) "Recommendations for Oil Tankers Manifolds and Associated Equipment". It is recognized that this standard was originally produced for oil transfer connections, however the general principles in this standard can be applied to connections for ballast transfer in particular the sections related to flanges and connection methods.

RESOLUTION MEPC.209(63)

adopted on 2 March 2012

**2012 GUIDELINES ON DESIGN AND CONSTRUCTION TO FACILITATE
SEDIMENT CONTROL ON SHIPS (G12)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING ALSO that regulation B-5.2 of the Ballast Water Management Convention provides that ships constructed in or after 2009 should, without compromising safety or operational efficiency, be designed and constructed with a view to minimize the uptake and undesirable entrapment of sediments, facilitate removal of sediments, and provide safe access to allow for sediment removal and sampling taking into account the guidelines developed by the Organization,

NOTING FURTHER resolution MEPC.150(55) by which the Committee adopted the Guidelines on design and construction to facilitate sediment control on ships (G12) and resolved to keep these guidelines under review,

HAVING CONSIDERED, at its sixty-third session, a revised text of the Guidelines on design and construction to facilitate sediment control on ships (G12), developed by the Ballast Water Review Group of the Committee at its sixty-second session,

1. ADOPTS the 2012 Guidelines on design and construction to facilitate sediment control on ships (G12), as set out in the Annex to this resolution;
2. INVITES Member Governments to apply the 2012 Guidelines (G12) as soon as possible or when the Convention becomes applicable to them; and
3. REVOKES the Guidelines (G12) adopted by resolution MEPC.150(55).

* * *

ANNEX

**2012 GUIDELINES ON DESIGN AND CONSTRUCTION TO FACILITATE
SEDIMENT CONTROL ON SHIPS (G12)**

1 PURPOSE

1.1 Regulation B-5.2 of the Convention requires that ships described in regulations B-3.3 to B-3.5 should, without compromising safety or operational efficiency, be designed and constructed with a view to minimize the uptake and undesirable entrapment of sediments, facilitate removal of sediments and provide

safe access to allow for sediment removal and sampling, taking into account these Guidelines. Ships described in regulation B-3.1 of the Convention should, to the extent practicable, also comply with regulation B-5.2, taking into account these Guidelines.

1.2 The purpose of these Guidelines is to provide guidance to ship designers, shipbuilders, owners and operators in the development of ship structures and equipment to achieve the objectives of paragraph 1.1 and, thereby, reduce the possibility of introducing harmful aquatic organisms and pathogens.

1.3 There may be a conflict between preventing accumulation of sediments and preventing the discharge of harmful aquatic organisms and pathogens.

2 INTRODUCTION

2.1 Water taken up as ships' ballast can contain solid alluvial matter that, once the water is becalmed in a ship's ballast tank, will settle out onto the bottom of the tank and other internal structures.

2.2 Aquatic organisms can also settle out of the ballast water and can continue to exist within the sediment. These organisms can survive for long periods after the water they were originally in has been discharged. They may thereby be transported from their natural habitat and discharged in another port or area where they may cause injury or damage to the environment, human health, property and resources.

2.3 Regulation B-5.1 of the Convention requires that all ships remove and dispose of sediments from spaces designated to carry ballast water in accordance with the Ballast Water Management Plans. These Guidelines are to assist ship designers, shipbuilders, owners and operators to design ships to minimize the retention of sediment. Guidance on the management of sediment is contained in the Guidelines for ballast water management and development of ballast water management plans (G4).

3 DEFINITIONS

3.1 For the purposes of these Guidelines, the definitions in the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004+ (the Convention) apply.

3.2 **Ballast water tank** – For the purposes of these Guidelines, a ballast water tank is any tank, hold or space used for the carriage of ballast water as defined in Article 1 of the Convention.

4 DESIGN FOR REDUCING ACCUMULATION OF SEDIMENT

4.1 Ballast water tanks and their internal structure should be designed to avoid the accumulation of sediment in a ballast tank. The following should, as far as is practicable, be taken into account when designing ballast tanks:

- .1 horizontal surfaces to be avoided wherever possible;
- .2 where longitudinals are fitted with face bar stiffeners, consideration should be given to fit the face bar stiffeners below the horizontal surfaces to aid drain off from the stiffeners;
- .3 arrange for induced flows of water, either by pump forces or gravitational forces, to wash along horizontal or near horizontal surfaces so that it re-suspends already settled sediment;
- .4 where horizontal stringers or webs are required, drainage holes to be as large as possible, especially if edge toe-stops are fitted where horizontal stringers are used as walkways, to encourage rapid flow of water off them as the water level in the tank falls;
- .5 internal girders, longitudinals, stiffeners, intercostals and floors, where fitted, should incorporate extra drain holes which allow water to flow with minimal restriction during discharge and stripping operations;

- .6 where inner members butt against bulkheads, their installation should be such as to prevent the formation of stagnant pools or sediment traps;
 - .7 scallops should be located at the joints of the inner bottom (tank top) longitudinals or inter-costals and floors to allow for good airflow, and thus drying out of an empty tank. This will also allow air to escape to the air pipe during filling so that minimum air is trapped within the tank;
 - .8 pipeline systems should be designed such that, when deballasting, disturbance of the water in the tank is as powerful as possible, so that the turbulence re-suspends sediment; and
 - .9 flow patterns in ballast water tanks should be studied (for example by the use of Computational Fluid Dynamics (CFD)) and considered, so that internal structure can be designed to provide effective flushing. The amount of internal structure in double bottom tanks will reduce the scope for improving flow patterns. The hydrodynamic performance of the ballast tank is crucial to ensure sediment scouring.
- 4.2 Any designs depending upon water flow to re-suspend sediment should, as far as possible, be independent of human intervention, in order that the workload of ships' crews is minimal when operating the system.
- 4.3 The benefits of design concepts for reducing sediment accumulation are that there is likely to be good sediment removal while deballasting, with minimum retention of sediment in the tanks, and therefore a reduction or no need for removal by other means.
- 4.4 The design of all ships should provide safe access to allow for sediment removal and sampling.
- 4.5 The design of ballast water systems should, as far as practicable, facilitate installation of high sea suction points on each side of the ship.
- 4.6 When practical, equipment to remove suspended matter at the point of uptake should be installed.

RESOLUTION MEPC.161(56)**adopted on 13 July 2007****GUIDELINES FOR ADDITIONAL MEASURES REGARDING BALLAST WATER
MANAGEMENT INCLUDING EMERGENCY SITUATIONS (G13)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that Section C of the Annex to the International Convention for the Control and Management of Ships' Ballast Water and Sediments provides that, if a Party, individually or jointly with other Parties, determines that measures in addition to those in Section B of the Convention are necessary to prevent, reduce, or eliminate the transfer of harmful aquatic organisms and pathogens through ships' ballast water and sediments, such Party or Parties may, consistent with international law, require ships to meet a specified standard or requirement taking into account the Guidelines developed by the Organization,

NOTING ALSO that resolution 1 adopted by the International Conference on Ballast Water Management for Ships invited the Organization to develop these Guidelines as a matter of urgency,

HAVING CONSIDERED, at its fifty-sixth session, the draft Guidelines for additional measures regarding ballast water management including emergency situations (G13) developed by the Ballast Water Working Group,

1. ADOPTS the Guidelines for additional measures regarding ballast water management including emergency situations (G13) as set out in the annex to this resolution;
2. INVITES Governments to apply these Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep these Guidelines under review.

ANNEX**GUIDELINES FOR ADDITIONAL MEASURES REGARDING BALLAST WATER
MANAGEMENT INCLUDING EMERGENCY SITUATIONS (G13)****1 INTRODUCTION**

1.1 The International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004, hereafter referred to as the "Convention", regulates the transfer of harmful aquatic organisms and pathogens from ships' ballast water and sediments.

1.2 These Guidelines have been developed pursuant to regulation C-1 of the Convention. These Guidelines provide guidance under regulation C-1 for a Party or Parties to use when determining if measures in addition to those in Section B of the Convention are necessary in order to prevent, reduce or eliminate the transfer of harmful aquatic organisms and pathogens through ships' ballast water and sediments.

1.3 The Guidelines should be kept under review in order to make use of experiences gained in their application.

2 ASSESSMENT WHEN A STATE INTENDS TO INTRODUCE ADDITIONAL MEASURES

2.1 General

2.1.1 The Convention, in regulation C-1 Additional Measures, provides that a Party individually or jointly with other Parties, may introduce measures in addition to those in Section B. A Party or Parties may require ships, in accordance with international law, to meet or exceed a specified standard or requirement.

2.1.2 A Party intending to introduce additional measures should take these Guidelines into account, and endeavour to make available all appropriate services for ships to facilitate their compliance with any additional measures.

2.2 The assessment

2.2.1 Before a Party, individually or jointly with other Parties, intends to introduce additional measures in accordance with regulation C-1 of the Convention, it should assess the need for and nature of the measures, which should include:

- .1 identification of the concern, i.e., the potential harm from the introduction of harmful aquatic organisms and pathogens in the area to be covered by the additional measures;
- .2 description of the cause(s) of the identified concern;
- .3 identification of potential additional measures to be introduced; and
- .4 identification of potential effects and consequences, beneficial and detrimental, resulting from introduction of the proposed additional measure(s).

2.2.2 A Party should assess the character of the concern. Such an assessment may include a consideration of such things as:

- .1 What are the probabilities or consequences of future introductions of harmful aquatic organisms and pathogens on the environment, human health, property, or resources?
- .2 If harmful aquatic organisms or pathogens have already been introduced, what effects are they already having on the environment, human health, property or resources, and how might this be affected by future introductions?
- .3 Whether ballast water from ships is a vector for the introduction of harmful aquatic organisms and pathogens?

Identification of the additional measures to be introduced

2.2.3 The additional measure(s) to be introduced shall be in accordance with Article 7.2 and regulation C-1.3 of the Convention, and should be clearly identified in respect of:

- .1 the area(s) where the additional measure(s) is/are applicable defined by precise co-ordinates;
- .2 the operational and/or technical requirement(s) which applies to ships in the area(s), and the requirement(s) to provide documentation for compliance if needed;

- .3 the arrangements which may be provided to facilitate ships' compliance with the additional measure(s);
- .4 the effective date and duration of the measure(s); and
- .5 any other requirements and services in relation to the additional measure(s).

Effects and consequences of introduction of the proposed measure(s)

2.2.4 The economic consequences resulting from the introduction of the additional measure(s) should be taken into account. In this respect the following aspects may be relevant:

- .1 the economic benefits and possible costs, including costs to the industry, associated with the additional measure(s); and
- .2 any other effects and consequences.

2.3 Procedures to follow when establishing additional measures

2.3.1 A Party or Parties intending to introduce additional measures in accordance with regulation C-1 of the Convention should consult adjacent States and other States that may be affected before the additional measures are decided upon so that such consultations can, where appropriate, meaningfully inform decision making. The Assessment as outlined in section 2.2 of these Guidelines should be presented to affected States, and States should be invited to comment on the draft assessment, if appropriate.

- .1 In regulation C-1 of the Convention two procedures for introducing additional measures are possible – one procedure which requires IMO approval, and another procedure which only requires IMO notification.
- .2 The Party or Parties should ensure that any additional measure(s) shall not compromise the safety and security of the ship and in any circumstances not conflict with any other conventions or customary international law with which the ship must comply.
- .3 The legal determination upon which the additional measure(s) is submitted should be identified.
- .4 In introducing additional measures, the Party or Parties should, *inter alia*, provide the following information to the Organization, in particular the Marine Environment Protection Committee (hereafter known as the “MEPC”):
 - .1 the Assessment as outlined in section 2.2;
 - .2 the identification of the legal determination upon which each additional measure(s) is submitted; and
 - .3 the following additional details:
 - .1 if the additional measure(s) is already provided under an existing IMO instrument; or
 - .2 if the additional measure(s) does not yet exist but could become available through amendment of any IMO instrument or adoption of a new IMO instrument; or
 - .3 if the additional measure(s) is proposed for adoption in the territorial sea¹ or pursuant to the United Nations Convention on the Law of the Sea where existing measures or a generally applicable measure would not adequately address the concern identified in section 2.2.
- .5 Where a Party or Parties may seek to introduce additional measures through the notifying procedure, the IMO should be notified at least 6 months prior to the projected date of im-

plementation, except in emergency circumstances in accordance with regulation C-1.3.2 of the Convention.

- .6 In the case where a Party or Parties intend to introduce additional measure(s) that requires approval by the Organization under international law as reflected in UNCLOS (see regulation C-1.3.3 of the Convention), the Party or Parties should, in accordance with the rules adopted by the MEPC for submission of papers, submit the application to introduce additional measure(s) to the MEPC for its approval.
- .7 In considering additional measures that require the approval of the Organization, the MEPC should be expected to consider an application submitted to it by a proposing Party or Parties on a case-by-case basis. In assessing each proposal, the MEPC should be expected in particular to consider:
 - .1 whether such additional measures are in accordance with Article 7.2 and regulation C-1.3 of the Convention;
 - .2 whether the proposed additional measures are appropriate to prevent, reduce, or eliminate the identified potential harm from the introduction of harmful aquatic organisms and pathogens in the area to be covered by the additional measures;
 - .3 whether such measures might result in an increased potential for significant adverse effects by international shipping activities on the environment outside the area to be covered by the additional measures; and
 - .4 whether such measures might, *inter alia*, result in any impact on the safety and commercial aspect of international shipping activities.
- .8 In the case where an application is submitted for approval, if the MEPC approves the application, the additional measure(s) may be implemented. If the application is not approved, the additional measure(s) cannot be implemented. The proposing Party or Parties may submit a revised application to the Marine Environment Protection Committee for approval subsequently.

2.4 Communication of information

2.4.1 A Party or Parties intending to introduce additional measures should inform adjacent States and other States that may be affected, the shipping industry in general and ships entering the areas concerned as soon as possible, and in the case of those measures requiring approval of the Organization, as soon as the proposal has been so approved. The information should at least contain:

- .1 the precise co-ordinates where and applicable date when additional measure(s) is/are applicable;
- .2 the need and reasoning for the application of the additional measure(s), including, whenever possible, benefits;
- .3 a description of the additional measure(s); and
- .4 any arrangements that may be provided to facilitate ships' compliance with the additional measures.

2.4.2 Communications in accordance with regulation C-1 of the Convention shall be submitted to the

¹ This provision does not derogate from the rights and duties of coastal States in the territorial sea as provided for in the United Nations Convention on the Law of the Sea.

Marine Environment Protection Committee. Except in emergency situations, the intention to establish such additional measures is required by regulation C-1.3 to be communicated to the Organization at least six months prior to the projected date of implementation. In emergency situations, additional measures should be communicated to the Organization as soon as possible.

2.4.3 In both cases (approval/non-approval), in due time before the introduction of the additional measure(s) a Party or Parties intending to introduce additional measures should inform affected States, the shipping industry in general and ships entering the areas concerned, the following should be communicated:

- .1 the precise co-ordinates where additional measure(s) is/are applicable;
- .2 the operational and/or technical requirement(s) which applies or apply to ships in the area(s), and the requirement(s) to provide documentation for compliance if needed;
- .3 the arrangements which may be provided to facilitate ships' compliance with the additional measure(s);
- .4 the effective date and duration of the measure(s); and
- .5 any other requirements and services in relation to the additional measure(s).

2.4.4 The Organization shall issue circulars or post relevant information on the website in accordance with the provisions of the Convention.

3 EMERGENCY OR EPIDEMIC SITUATION

3.1 A Party or Parties may adopt an additional measure(s) to address an emergency or epidemic situation.

3.2 If such a measure is adopted, a Party or Parties should, as soon as possible, notify adjacent and other States that may be affected, the shipping industry in general, and ships operating in the areas of concern. Such information should contain:

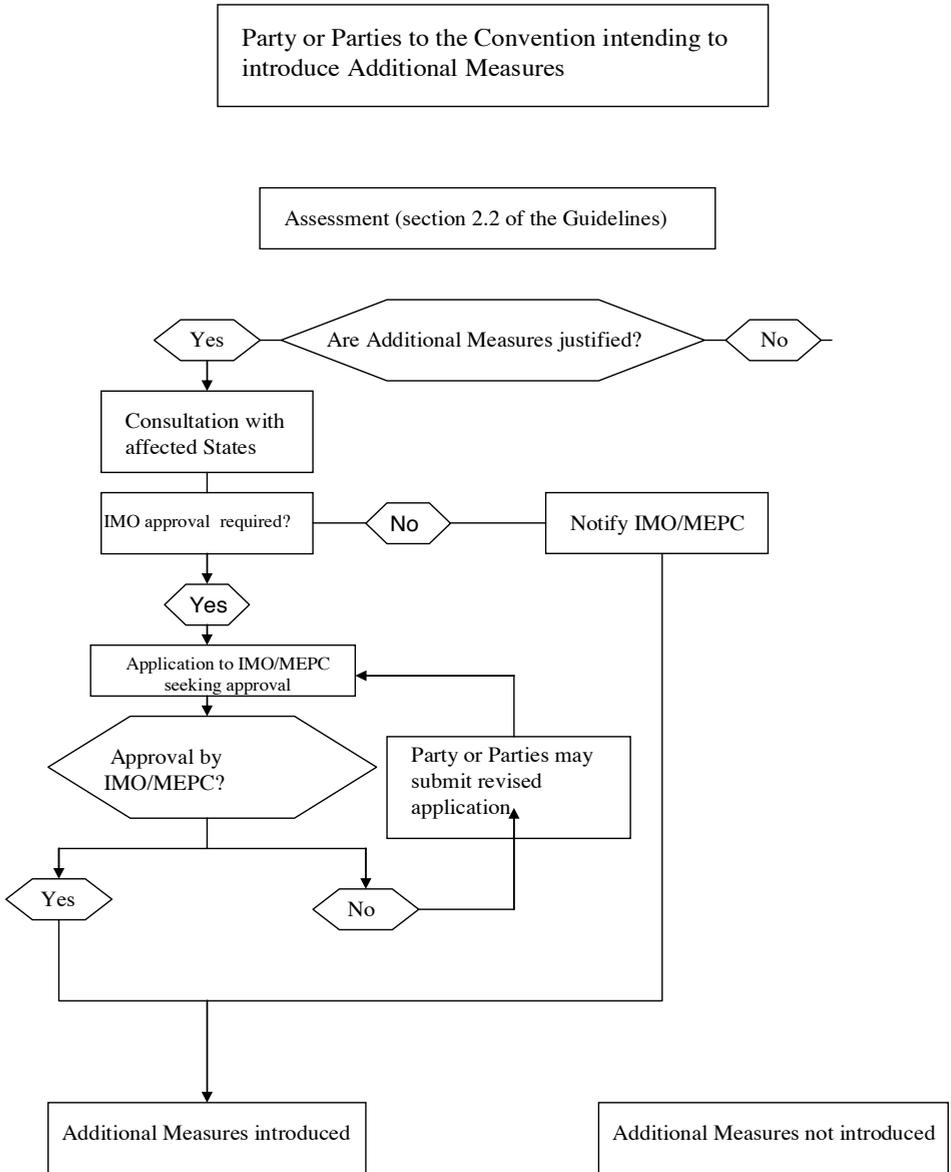
- .1 the precise co-ordinates of the area;
- .2 the need for such additional measure(s);
- .3 a description of the additional measure(s);
- .4 any arrangements that may be provided to facilitate ships' compliance with the additional measure(s); and
- .5 the effective date when the measure(s) applies and when the measure(s) is no longer in effect.

3.3 In an emergency or epidemic situation, the additional measure(s) adopted should be communicated to the Organization as soon as possible. The Organization shall post relevant information on its website and retain such information for dissemination to the Committee.

**

APPENDIX

FLOW CHART – PROCEDURE FOR INTRODUCING ADDITIONAL MEASURES



RESOLUTION MEPC.151(55)**adopted on 13 October 2006****GUIDELINES ON DESIGNATION OF AREAS FOR BALLAST WATER EXCHANGE (G14)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that regulation B-4.2 of the Convention stipulates that in sea areas where the distance from the nearest land or the depth does not meet the parameters described in Regulation B-4.1, the port State may designate areas, in consultation with adjacent or other States, as appropriate, where a ship may conduct ballast water exchange and MEPC 52 identified the need for additional guidance on the designation of areas for ballast water exchange,

NOTING ALSO that resolution 1 adopted by the International Conference on Ballast Water Management for Ships invited the Organization to develop the Guidelines for uniform application of the Convention as a matter of urgency,

HAVING CONSIDERED, at its fifty-fifth session, the draft Guidelines on designation of areas for ballast water exchange (G14) developed by the Ballast Water Working Group, and the recommendation made by the Sub-Committee on Bulk Liquids and Gases at its tenth session,

1. ADOPTS the Guidelines on designation of areas for ballast water exchange (G14) as set out in the Annex to this resolution;
2. INVITES Governments to apply the Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep the Guidelines under review.

* * *

ANNEX

GUIDELINES ON DESIGNATION OF AREAS FOR BALLAST WATER EXCHANGE (G14)

1 PURPOSE

1.1 The purpose of these Guidelines is to provide guidance to port States for the identification, assessment and designation of sea areas where ships may conduct ballast water exchange in accordance with Regulation B-4.2 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Convention).

2 INTRODUCTION

2.1 Regulation B-4.2 of the Convention allows port States to designate areas, in consultation with adjacent or other States, as appropriate, where ships may conduct ballast water exchange.

2.2 These Guidelines provide generic guidance to promote uniform application of Regulation B-4.2 in designating areas for ballast water exchange to minimize the risk of introduction of harmful aquatic organisms and pathogens. Party or Parties designating an area according to Regulation B-4.2 should endeavour not to impair or damage their environment, human health, property or resources or those of other States (under Article 2.6 of the Convention).

3 APPLICATION

3.1 These Guidelines are intended for port States considering and intending to designate areas for ballast water exchange in accordance with Regulation B-4.2. Regulation B-4.2 states that "in sea areas where the distance from the nearest land or the depth does not meet the parameters described in paragraph 1.1 or 1.2, the port State may designate areas, in consultation with adjacent or other States, as appropriate, where a ship may conduct Ballast Water exchange".

4 DEFINITIONS

4.1 For the purposes of these Guidelines, the definitions in the Convention apply.

5 PROCESS FOR THE DESIGNATION OF SEA AREAS FOR BALLAST WATER EXCHANGE

5.1 There are three integral steps to designating an area as a ballast water exchange area: identification, assessment and designation. The Guidelines provide criteria to address and consider for each of these steps (see sections 7, 8 and 9), however these criteria are not intended to be exhaustive.

5.2 A port State considering designating ballast water exchange areas shall do this in accordance with its rights and obligations under international law.

6 CONSULTATION AND REGIONAL CO-OPERATION

6.1 The port State should consult with adjacent or other States, as appropriate, when identifying, assessing and designating potential ballast water exchange areas. It must be recognized that some States may not be a Party to the Convention, however this should not negate the consultation process. The port State initiating the consultation process should exchange information and should take into account all views and comments of the adjacent and other States as far as practicable. States should endeavour to resolve any identified concerns.

6.2 If multiple Parties wish to jointly designate ballast water exchange areas, they could do so under Article 13.3 of the Convention through a regional agreement.

7 IDENTIFICATION OF POTENTIAL SEA AREAS FOR BALLAST WATER EXCHANGE

7.1 Depending upon the nature of the seas surrounding the port State, it may be considered appropriate for single or multiple ballast water exchange areas to be identified.

7.2 The following considerations should be taken into account when identifying potential sea area(s) for undertaking ballast water exchange:

Legal aspects

7.2.1 Any national or international legal requirements or obligations should be considered in identifying potential sea areas for designation under Regulation B-4.2.

7.2.2 Sea areas beyond the jurisdiction of a port State may provide the most practical and appropriate area for ballast water exchange. A Party should not designate ballast water exchange areas in waters under the jurisdiction of another State, without its agreement and consultation with adjacent and other States. Consultation should be initiated as soon as possible in the process to facilitate exchange of information and agreement for the designation of the ballast water exchange area (see section 6).

Important resources and protected areas

7.2.3 In the designation of ballast water exchange area, Parties should consider and avoid, to the extent practicable, potential adverse impact in aquatic areas protected under national or international law, as well as other important aquatic resources including those of economic and ecological importance.

Navigational constraints

7.2.4 Any designation of ballast water exchange areas should take into account navigation impacts, including the desirability of minimizing delays, as appropriate, taking into consideration the following:

- .1 the area should be on existing routes if possible,
- .2 if the area cannot be on existing routes, it should be as close as possible to them.

7.2.5 Constraints to safe navigation must be considered when selecting the location and size of the ballast water exchange area. Such considerations should include, but are not limited to:

- .1 increased shipping traffic congestion;
- .2 proximity to other vessel traffic (small craft, offshore platforms, etc.);
- .3 adequate aids to navigation;
- .4 security of the area; and
- .5 shipping lanes/routeing systems.

8 ASSESSMENT OF IDENTIFIED SEA AREAS

8.1 Risk assessment is a logical process for objectively assigning the likelihood and consequences of specific events. Risk assessments can be qualitative or quantitative, and can be a valuable decision aid if completed in a systematic and rigorous manner.

8.1.1 The following key principles define the nature and performance of risk assessment:

- .1 **Effectiveness** – That risk assessments accurately measure the risks to the extent necessary to achieve an appropriate level of protection.
- .2 **Transparency** – That the reasoning and evidence supporting the actions recommended by risk assessments, and areas of uncertainty (and their possible consequences to those recommendations), are clearly documented and made available to decision-makers.

- .3 **Consistency** – That risk assessments achieve a uniform high level of performance, using a common process and methodology.
- .4 **Comprehensiveness** – That the full range of values, including economic, environmental, social and cultural, are considered when assessing risks and making recommendations.
- .5 **Risk Management** – Low risk scenarios may exist, but zero risk is not obtainable, and as such risk should be managed by determining the acceptable level of risk in each instance.
- .6 **Precautionary** – That risk assessments incorporate a level of precaution when making assumptions, and making recommendations, to account for uncertainty, unreliability, and inadequacy of information. The absence of, or uncertainty in, any information should therefore be considered an indicator of potential risk.
- .7 **Science based** – That risk assessments are based on the best available information that has been collected and analysed using scientific methods.
- .8 **Continuous improvement** – Any risk model should be periodically reviewed and updated to account for improved understanding.

8.2 The identified ballast water exchange area(s) should be assessed in order to ensure that its designation will minimize any threat of harm to the environment, human health, property or resources taking into account but not limited to the following criteria:

8.2.1 **Oceanographic** (e.g., currents, depths)

- Currents, upwellings or eddies should be identified and considered in the evaluation process. Sea areas where currents disperse discharged ballast water away from land should be selected where possible.
- Areas where tidal flushing is poor or where a tidal stream is known to be turbid, should be avoided where possible.
- The maximum water depth available should be selected where possible.

8.2.2 **Physico-chemical** (e.g., salinity, nutrients, dissolved oxygen, chlorophyll 'a')

- High nutrient areas should be avoided where possible.

8.2.3 **Biological** (e.g., presence of Harmful Aquatic Organisms and Pathogens, including cysts; organisms density)

- Areas known to contain outbreaks, infestations, or populations of Harmful Aquatic Organisms and Pathogens (e.g. harmful algal blooms) which are likely to be taken up in Ballast Water, should be identified and avoided where possible.

8.2.4 **Environmental** (e.g., pollution from human activities)

- Sea area(s) that may be impacted by pollution from human activities (e.g., areas nearby sewage outfalls) where there may be increased nutrients or where there may be human health issues, should be avoided where possible.
- Sensitive aquatic areas should be avoided to the extent practicable.

8.2.5 **Important resources** (e.g., fisheries areas, aquaculture farms)

- Location of important resources, such as key fisheries areas and aquaculture farms should be avoided.

8.2.6 **Ballast water operations** (e.g., quantities, source, frequency)

- A foreseen estimation of the quantities, sources and frequencies of ballast water discharges from vessels that will use the designated sea area should be considered in the assessment of such area.

8.3 An assessment of the most appropriate size of the designated ballast water exchange area needs to take into account the above considerations.

9 DESIGNATION OF SEA AREAS FOR BALLAST WATER EXCHANGE

9.1 The location and size that provide the least risk to the aquatic environment, human health, property or resources should be selected for designation. The spatial limits of the ballast water exchange area/s should be clearly defined and shall be in accordance with international law. It may also be possible for the designation of a ballast water exchange area to apply over specified timeframes, and these should be clearly defined.

9.2 A baseline evaluation should be conducted to aid future monitoring and review. The process of identification and assessment may provide sufficient information for the baseline.

10 COMMUNICATION

10.1 A Party or Parties intending to designate areas for ballast water exchange under Regulation B-4.2 should communicate this intention to the Organization prior to the implementation of the designated ballast water exchange area. Such communication should include:

- .1 The precise geographical co-ordinates, depth limit and/or distance from nearest land that defines the designated ballast water exchange area.
- .2 Other information that may be relevant to facilitate ships' identification of the designated ballast water exchange area, for example navigation aids.
- .3 Details of the characteristics of the designated ballast water exchange area that may be relevant to assist ships plan their voyage, including: use of area by other traffic, current and tidal flow, wind and swell conditions, seasonal events (cyclones, typhoons, ice, etc.).

10.2 The Organization shall circulate information regarding designated ballast water exchange areas to the Members of the Organization.

10.3 Port States should provide adequate advice to ships on the location and terms of use of the designated ballast water exchange area. Such advice may include exchanging as many tanks as possible under regulation B-4.1, as far as practicable taking into account regulation B-4.3, before utilizing the designated ballast water exchange area.

11 MONITORING AND REVIEW

11.1 The use of the designated ballast water exchange area and any impacts on the aquatic environment, human health, property or resources of the port State or those of other States should be monitored and reviewed on a regular basis.

11.2 One reason for monitoring may be to document the occurrence of harmful aquatic organisms in such areas which may be introduced by ballast water exchange. In case harmful aquatic organisms are found to be introduced, the designated ballast water exchange area may be closed to avoid promoting the spread of such newly occurring species to other regions.

2.3 Other IMO resolutions and guidelines related to the implementation of the BWM Convention

RESOLUTION MEPC.252(67)
adopted on 17 October 2014

GUIDELINES FOR PORT STATE CONTROL UNDER THE BWM CONVENTION

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

RECALLING FURTHER that article 9 of the Ballast Water Management Convention prescribes that ships to which the Convention applies may, in any port or offshore terminal of another Party, be subject to inspection by officers duly authorized by that Party for the purpose of determining whether the ship is in compliance with the Convention,

NOTING that article 3.3 of the Ballast Water Management Convention prescribes that Parties to the Convention shall apply its requirements as may be necessary to ensure that no more favourable treatment is given to ships of non-Parties to the Convention,

HAVING CONSIDERED, at its sixty-seventh session, *Guidelines for port State control under the BWM Convention*, developed by the Sub-Committee on Implementation of IMO Instruments, at its first session,

1. ADOPTS the *Guidelines for port State control under the BWM Convention*, as set out in the annex to this resolution;
2. INVITES Governments to apply the Guidelines when exercising port State control inspections;
3. AGREES to keep the Guidelines under review, following the trial period associated with the *Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)* (BWM.2/Circ.42) and in the light of experience gained with their application.

* * *

ANNEX

GUIDELINES FOR PORT STATE CONTROL UNDER THE BWM CONVENTION

CHAPTER 1

GENERAL

1.1 Purpose

- 1.1.1 These Guidelines are intended to provide basic guidance for the conduct of a port State control (PSC) inspection to verify compliance with the requirements of the International Convention for the Control and Management of Ship's Ballast Water and Sediments, 2004 (BWM Convention). They are not intended to limit the rights the port State has in verifying compliance with the BWM Convention.
- 1.1.2 The Marine Environment Protection Committee, at its sixty-fifth session (May 2013), approved the Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2) (BWM.2/Circ.42) and agreed in principle with the recommendations related to the trial period for reviewing, improving and standardizing the Guidance, as set out in annex 6 to document BLG 17/18.

1.2 Definitions and abbreviations

- 1.2.1 For the purpose of these guidelines, the definitions in the BWM Convention and in BWM.2/Circ.42 apply.
- 1.2.2 For the purpose of these guidelines, the following abbreviations apply:
- IBWMC: International Ballast Water Management Certificate;
- BWMP: Ballast Water Management Plan;
- BWRB: Ballast Water Record Book;
- BWMS: Ballast Water Management System;
- FSUs: Floating Storage Units; and
- FPSOs: Floating Production, Storage and Offloading unit.

1.3 Application

- 1.3.1 These guidelines apply to ships as stipulated in article 3 of the BWM Convention.
- 1.3.2 The regulations of the BWM Convention contain the following compliance provisions:
- .1 the discharge of ballast water shall only be conducted in accordance with the regulations of the BWM Convention (regulation A-2);
 - .2 an IBWMC is required for all ships of 400 GT or above, excluding floating platforms, FSUs and FPSOs, as identified in regulation E-2;
 - .3 a ship is required to have on board and implement a BWMP approved by the Administration;
 - .4 a ship is required to have on board and maintain a BWRB which shall at least contain the information specified in appendix II of the BWM Convention, for a minimum period of two years after the last entry has been made (regulation B-2);

- .5 a ship is required to meet either the ballast water exchange standard (regulation D-1) or ballast water performance standard (regulation D-2) in accordance with regulation B-3. The PSCO, however, should only enforce this in accordance with the schedule in resolution A.1088(28);
 - .6 ballast water exchange is conducted at least 200 nm from the nearest land and in water at least 200 m in depth, or in cases where the ship is unable, at least 50 nm from the nearest land and in water at least 200 m in depth, or in a designated ballast water exchange area and is required to be conducted in accordance with regulation B-4;
 - .7 sediment is removed and disposed from spaces designated to carry ballast water in accordance with the provisions of the ship's BWMP;
 - .8 officers and crew shall be familiar with their duties in the implementation of ballast water management particular to the ship and ship's BWMP (regulation B-6);
 - .9 any exemptions from the BWM Convention shall be recorded in the BWRB (regulation A-4.4) as well as records of any accidental and exceptional discharges (regulation B-2.3) and instances where ballast water was not exchanged in accordance with the BWM Convention (regulation B-4.5);
 - .10 a ship is required to report accidents or defects that affect its ability to manage ballast water to the flag State and the port State (regulation E-1.7);
 - .11 the condition of a ship, and its equipment, systems and processes shall be maintained to conform with the BWM Convention (regulation E-1.9); and
 - .12 after any survey of a ship under regulation E-1.1 has been completed, no change shall be made in the structure, equipment, fittings, arrangements or material associated with the BWMP and covered by the survey without the sanction of the Administration, except the direct replacement of such equipment or fittings (regulation E-1.10).
- 1.3.3 The regulations of the BWM Convention contain the following exceptions to the specific compliance provisions detailed below:
- .1 exception to ballast water management requirements in the case of uptake or discharge of ballast water and sediments necessary for the purpose of ensuring the safety of a ship in emergency situations or saving life at sea (regulation A-3.1);
 - .2 exception to ballast water management requirements under certain conditions in the case of the accidental discharge or ingress of ballast water and sediments resulting from damage to a ship or its equipment (regulation A-3.2);
 - .3 exception to ballast water management requirements in the case of the uptake and discharge of ballast water and sediments when being used for the purpose of avoiding or minimizing pollution incidents from the ship (regulation A-3.3);
 - .4 exception to the ballast water management requirements in the case of the uptake and subsequent discharge on the high seas of the same ballast water and sediments (regulation A-3.4);
 - .5 exception to the ballast water management requirements in the case of the discharge of ballast water and sediments from a ship at the same location where the whole of the ballast and those sediments originated and provided that no mixing with unmanaged ballast water and sediments from other areas has occurred (regulation A-3.5);

- .6 exception to the ballast water management requirements in the case of the discharge of ballast water to a reception facility designed taking into account the Guidelines for ballast water reception facilities (G5) (regulation B-3.6); and
- .7 exception to the ballast water exchange requirements in the case where the master reasonably decides that such exchange would threaten the safety or stability of the ship, its crew, or its passengers because of adverse weather, ship design or stress, equipment failure, or any other extraordinary condition (regulation B-4.4).

1.3.4 With respect to ships of non-parties to the BWM Convention, port State control officers (PSCO) of Parties should apply the same requirements to ensure that no more favourable treatment is given to such ships.

1.3.5 The BWM Convention provides for a transition between two standards of ballast water management: from the ballast water exchange standard (regulation D-1) to the ballast water performance standard (regulation D-2). Resolution A.1088(28) on *Application of the International Convention for the Control and Management of Ships' Ballast Water and Sediments*, 2004 should be used by the PSCO instead of the schedules of regulation B-3 for the purpose of enforcing compliance with the ballast water performance standard.

CHAPTER 2

INSPECTIONS OF SHIPS REQUIRED TO CARRY THE BALLAST WATER MANAGEMENT (BWM) CERTIFICATE

2.1 Four-stage inspection

The PSC procedure can be described as a four-stage inspection:

- .1 the first stage, the “initial inspection”, should focus on documentation and ensuring that an officer has been nominated for ballast water management on board the ship and to be responsible for the BWMS, and that the officer has been trained and knows how to operate it;
- .2 the second stage – the “more detailed inspection” where the operation of the BWMS is checked and the PSCO clarifies whether the BWMS has been operated adequately according to the BWMP and the self-monitored operational indicators verified during type approval procedures. Undertaking a detailed inspection is dependent on the conditions of article 9.2 of the BWM Convention;
- .3 the third stage – sampling is envisaged to occur during this stage of PSC which relies on indicative analysis, to identify whether the ship is meeting the ballast water management performance standard described in regulation D-2, or whether detailed analysis is necessary to ascertain compliance; and
- .4 the fourth stage, if necessary, incorporates detailed analysis to verify compliance with the D-2 standard.

2.2 Initial inspection

2.2.1 An initial inspection will, as a minimum and to the extent applicable, examine the following:

- .1 check that a valid IBWMC is on board, based on article 9.1(a);
- .2 check the BWMP is on board and approved by the flag State, based on regulation B-1;

- .3 check the BWRB is on board and meets the requirements of the BWM Convention, based on regulation B-2;
- .4 check that the details of any ballast water operations carried out are recorded in the BWRB together with any exemptions granted, based on regulation B-2 and appendix II of the BWM Convention, as well as notations of any accidental and exceptional discharges (regulation B-2.3) and instances where ballast water was not exchanged in accordance with the BWM Convention (regulation B-4.5). The BWRB should be in an approved format (which may be an electronic record system, which may be integrated into another record book or system) and should be kept on board the ship for a minimum of two years after the last entry. The officer in charge of the operation should sign each entry in the BWRB and the master should sign each completed page;
- .5 in conducting the initial inspection, PSCO should conduct a visual check of the overall condition of the ship and the equipment and arrangements detailed in the IBWMC and the BWMP, including the BWMS if the use of one is required;
- .6 in the case of a ship subject to the ballast water exchange standard, check that the BWRB indicates that the required exchange was undertaken, or alternatively, the ship has taken steps to meet the ballast water performance standard described in regulation D-2;
- .7 check that the ship has taken steps to meet the ballast water performance standard described in regulation D-2 once required to do so by resolution A.1088(28);
- .8 check that an officer has been designated to be responsible for the BWMP;
- .9 check that designated officers and crew are familiar with essential BWM procedures, including the operation of BWMS; and
- .10 in the case of a ship claiming an exception under regulation A-3.1 (safety of the ship or saving life), regulation A-3.2 (accidental discharge or ingress resulting from damage), regulation A-3.3 (avoiding or minimizing pollution) or regulation B-4.4 (unsafe conditions for exchange), the master should provide proof of the need for the relevant exception.

2.2.2 The performance of a ballast water management system (BWMS) is key to protecting the environment, human health, property and resources of the port State. While this performance may be verified directly by sampling the ship's ballast water (as per article 9.1(c) and Guidelines for ballast water sampling (G2)), both the port State and the ship may benefit from a document check to more readily establish the validity of the BWMS during the initial inspection. To this end, the PSCO may ask to check the Type Approval Certificate for the BWMS, to determine whether the BWMS is used in accordance with any limiting conditions on the Type Approval Certificate. While carriage and presentation of the Type Approval Certificate is not mandatory, the PSCO may also consult the BWMP to obtain ship-specific information on the BWMS and its use, and may refer to type-approval information shared with the Organization pursuant to the Information reporting on type approved ballast water management systems (resolution MEPC.228(65)).

2.2.3 If the IBWMC is valid, the approved BWMP is on board, entries in the BWRB are appropriate and the PSCO's general impressions and visual observations on board confirm a good standard of maintenance with regard to the BWM Convention, the PSCO should generally confine the initial inspection to reported deficiencies.

2.2.4 *Clear grounds*

2.2.4.1 When a PSCO inspects a foreign ship which is required to hold an IBWMC, and which is in a port or an offshore terminal under the jurisdiction of the port State, any such inspection should be limited to verifying that there is on board a valid certificate and other relevant documentation and the PSCO

forming an impression of the overall condition of the ship, its equipment and its crew, unless there are “clear grounds” for believing that the condition of the ship or its equipment does not correspond substantially with the particulars of the certificate.

2.2.4.2 “Clear grounds” to conduct a more detailed inspection include:

- .1 BWMC is missing, not valid, or has expired;
- .2 absence of a BWMP approved by the flag State;
- .3 absence of a BWRB or a BWRB that does not meet the requirements of the BWM Convention;
- .4 entries in the BWRB do not reflect the actual ballast water situation on board;
- .5 condition of the ship or its equipment does not correspond substantially with the particulars of the IBWMC and the BWMP or has not been maintained;
- .6 no officer has been designated in accordance with regulation B-1.5;
- .7 information or evidence that the master or designated crew is not familiar with their duties and essential shipboard operations relating to the implementation of the ballast water management or that such operations have not been carried out;
- .8 information from third parties such as a report or complaint concerning violation of the BWM Convention;
- .9 if the BWMP requires the use of a BWMS evidence, or observation that the BWMS has not been used in accordance with its operational instructions;
- .10 evidence or observation of unreported accidents or defects that affect the ability of the ship to manage ballast water (regulation E-1.7);
- .11 evidence or observation that ballast water has been discharged other than in accordance with the regulations of the BWM Convention (regulation A-2); and
- .12 the master has not provided the proof referenced in paragraph 2.2.1.10.

2.2.4.3 If the ship does not carry valid certificates, or if the PSCO, from general impressions or observations on board, has clear grounds for believing that the condition of the ship or its equipment does not correspond substantially with the particulars of the certificates or the BWM Convention, or that the master or designated crew is not familiar with, or have not implemented essential shipboard procedures, a more detailed inspection should be carried out. Where a more detailed inspection is to be carried out, the port State will take such steps to ensure the ship will not discharge ballast water until it can do so in accordance with article 9.3 of the BWM Convention (see notification requirements in paragraph 3.3 below).

2.3 More detailed inspection

2.3.1 When carrying out a more detailed inspection, the PSCO may utilize, but not be limited to, the following questions to ascertain the extent of compliance with the BWM Convention:

- .1 Is the ballast water management on board the ship in accordance with the operations outlined in the ship’s BWMP? In particular:
 - .1 Is the crew following specific operational or safety restrictions associated with safe tank entry, if needed?

- .2 Is the crew managing ballast water sediments in accordance with the BWMP?
- .3 Are designated officers following their duties as set out in the BWMP?
- .4 Are the record-keeping requirements in accordance with the BWMP?
- .2 Since the time of the survey of the ship under regulation E-1.1, has an unsanctioned change been made to the structure, equipment, fittings, arrangements or material associated with the BWMP, except the direct replacement of such equipment or fittings (regulation E-1.10)?
- .3 If the BWMP requires the use of a BWMS:
 - .1 Is the BWMS and associated equipment in good working order, (this could include filters, pumps, and back flushing equipment)?
 - .2 Is the crew following safety procedures associated with operation of the BWMS?
 - .3 Is the treatment process fully operational (this could include, reference to the self-monitoring system of a BWMS)?
 - .4 Does the BWRB align with the onboard control equipment, including the self-monitoring device of the BWMS?
 - .5 Is the BWMS being operated according to the operational instructions?
 - .6 Can the designated officer demonstrate the necessary knowledge of the BWMS and how it operates?
 - .7 Has the BWMS been bypassed?
 - .8 Where required, are any needed Active Substances present in adequate supply on board the ships, and where present, are they being introduced into the BWMS?

2.3.2 The PSCO may examine any element of the ballast water system in order to check that it is working properly.

2.3.3 More detailed inspection may result in sampling.

2.4 Sampling

2.4.1 PSCO should carry out an indicative analysis first. However, the time required to conduct the indicative analysis should not unduly delay the operations, movement or departure of the ship. If the result of indicative analysis for the D-2 standard exceeds the D-2 standard by a threshold specific to the validated indicative analysis method being used as set out in the Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2) (BWM.2/Circ.42)¹, a detailed analysis can be carried out.

2.4.2 The quantity of the sampling water to be taken and location in the ship chosen should be in accordance with the Guidelines for ballast water sampling (G2) and associated guidance developed by the Organization. Every effort should be made to avoid any undue delays to the ship.

2.4.3 The PSCO should not delay the operation, movement or departure of the ship while waiting for the

¹ The validation on a specific method is to be carried out through the process of review and revision of the *Guidance on sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)* (BWM.2/Circ.42).

results of detailed analysis.

2.5 Violations and control of ships

Stopping the discharge due to sampling as a control action

2.5.1 If the sampling described above leads to a result, or supports information received from another port or offshore terminal, indicating that the ship poses a threat to the environment, human health, property or resources, the Party in whose waters the ship is operating should prohibit such ship from discharging ballast water until the threat is removed (see notification requirements in paragraph 3.3 below).

Detainable deficiencies

2.5.2 If a ship has violated the BWM Convention, the PSCO may take steps to warn, detain or exclude the ship or grant such a ship permission to leave to discharge ballast water elsewhere or seek repairs. The PSCO should use professional judgment to determine whether to detain the ship until any noted deficiencies are corrected, or to permit a ship to sail with deficiencies that do not pose an unreasonable threat of harm to the marine environment, human health, property or resources (see notification requirements in paragraphs 3.3 to 3.6 below).

2.5.3 In order to assist the PSCO in the use of these guidelines, there follows a non-exhaustive list of deficiencies which are considered to be of such a serious nature that they may warrant the detention of a ship:

- .1 absence of an IBWMC;
- .2 absence of a BWMP;
- .3 absence of a BWRB;
- .4 indication that the ship or its equipment does not correspond substantially with the particulars of the IBWMC and BWMP;
- .5 absence, serious deterioration or failure of proper operation of equipment required under the BWMP;
- .6 the designated officers or crew are not familiar with essential ballast water management procedures including the operation of BWMS and all associated BWMS equipment;
- .7 no ballast water management procedures have been implemented on board;
- .8 no designated officer has been nominated;
- .9 the ship has not complied with the BWMP for management and treatment of ballast water;
- .10 result of non-compliance by sampling; or
- .11 ballast water has been discharged other than in accordance with the regulations of the BWM Convention (regulation A-2).

Control actions

2.5.4 If a ship is detected to have violated the BWM Convention, the port State may take steps to warn, detain or exclude the ship. The port State, however, may grant such a ship permission to leave the port or offshore terminal for the purpose of discharging ballast water or proceeding to the nearest appropriate repair yard or reception facility available, provided doing so does not present a threat of harm to the environment, human health, property or resources (see notification requirements in paragraphs 3.3 to 3.6 below).

2.5.5 Port States should refrain from applying criminal sanctions or detaining the ship, based on sampling during the trial period. This does not prevent the port State from taking preventive measures to protect its environment, human health, property or resources.

2.5.6 The ship should have evidence that the ballast water management system is type approved and has been maintained and operated in accordance with the ships' Ballast Water Management Plan.

2.5.7 As an alternative to warning, detention or exclusion of the ship, the PSCO may wish to consider the following alternative measures, providing doing so does not present a threat to the environment, human health, property or resources:

- .1 retention of all ballast water on board;
- .2 require the ship to undertake any repairs required to the BWMS;
- .3 permit the ship to proceed to exchange ballast water in a location acceptable to the port State, providing ballast water exchange is still an acceptable practice for the specific ship and such areas are established in accordance with the *Guidelines on designation of areas for ballast water exchange (G14)*;
- .4 allow the ship to discharge ballast to another ship or to an appropriate shipboard or land-based reception facility; or
- .5 allow the ship to manage the ballast water or a portion of it in accordance with a method acceptable to the port State.

CHAPTER 3

REPORTING REQUIREMENTS

3.1 Port State authorities should ensure that, at the completion of an inspection, the master of the ship is provided with a document showing the results of the inspection, details of any action taken by the PSCO and a list of any corrective action to be initiated by the master and/or company. Such reports should be made in accordance with the format in appendix 13 of the *Procedures for port State Control* (resolution A.1052(27), paragraph 4.1.1).

3.2 If a ship has been inspected as a result of a request for investigation from another State, the inspection report should be sent to the requesting State and the flag State (article 10.4).

3.3 In the event that an action is taken in accordance with paragraphs 2.2.4.3, 2.5.1 or 2.5.5:

- .1 the port State should inform, in writing, the flag State of the ship concerned, or if this is not possible, the consul or diplomatic representative of the ship concerned, of all the circumstances in which the action was deemed necessary. In addition, the recognized organization responsible for the issue of certificates should be notified (article 11.2); and
- .2 in the event that the PSCO is unable to take the intended action, or if the ship has been allowed to proceed to the next port of call, the authorities of the port State should communicate all the facts to the authorities of the country of the next appropriate port of call, to the flag State, and to the recognized organization, where appropriate (article 11.3; resolution A.1052(27), paragraph 4.1.4).

3.4 In the event of a violation of the BWM Convention, the notifications in paragraph 3.3 should be made. In addition, the ship should be notified of the violation and the report forwarded to the flag State should include any associated evidence (article 11.1).

3.5 Where, in the exercise of port State control, a Party denies a foreign ship entry to the ports or offshore terminals under its jurisdiction, whether or not as a result of information about a substandard ship, it should forthwith provide the master and flag State with reasons for the denial of entry (resolution A.1052(27), paragraph 4.1.2).

3.6 In the case of a detention, at least an initial notification should be made to the flag State as soon as practicable. If such notification is made verbally, it should be subsequently confirmed in writing. As a minimum, the notification should include details of the ship's name, the IMO number, copies of Forms A and B as set out in appendix 13 of the Procedures for port State Control, time of detention and copies of any detention order. Likewise, the recognized organizations which have issued the relevant certificates on behalf of the flag State should be notified, where appropriate. The Parties above should also be notified in writing of the release of detention. As a minimum, this information should include the ship's name, the IMO number, the date and time of release and a copy of Form B as set out in appendix 13 of the *Procedures for Port State Control* (resolution A.1052(27), paragraph 4.1.3).

RESOLUTION MEPC.253(67)
adopted on 17 October 2014

**MEASURES TO BE TAKEN TO FACILITATE ENTRY INTO FORCE OF THE
INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS'
BALLAST WATER AND SEDIMENTS, 2004**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

NOTING that regulation D-3 of the Annex to the Convention provides that ballast water management systems used to comply with the Convention must be approved by the Administration, taking into account guidelines developed by the Organization, and that regulation D-2 of the same Annex defines the performance standard for ships' ballast water management,

NOTING ALSO resolution MEPC.174(58) by which the Committee adopted the *Guidelines for approval of ballast water management systems (G8)* (Guidelines (G8)),

NOTING IN PARTICULAR that, by resolution MEPC.174(58), the Committee agreed to keep the Guidelines (G8) under review in the light of experience gained with their application,

NOTING FURTHER resolution MEPC.252(67), by which the Committee adopted the *Guidelines for port State control under the BWM Convention*,

RECOGNIZING the concerns of the shipping industry regarding the potential penalization of those owners and operators that have installed and operate ballast water management systems that have been type approved in accordance with Guidelines (G8),

BEING CONSCIOUS of the need to provide certainty and confidence in the application of the Convention, thereby assisting shipping companies, shipowners, managers, ships' crews and operators, as well as the shipbuilding and equipment manufacturing industries, in the timely planning of their operations; and the need to encourage the early installation of ballast water management systems,

HAVING CONSIDERED, at its sixty-seventh session, the recommendation made by the Ballast Water Review Group,

1. AGREES to immediately begin a comprehensive review of Guidelines (G8), which should, at a minimum, address the issues contained in the annex to this resolution;
2. AGREES that the existing Guidelines (G8) should continue to be applied until the application of revised Guidelines (G8) following completion of the review, and that Parties to the Convention should ensure the Guidelines are fully adhered to in any approval application;
3. AGREES that shipowners that have installed type-approved ballast water management systems prior to the application of the revised Guidelines (G8), should not be penalized;
4. AGREES that port States should refrain from applying criminal sanctions or detaining a ship, based on sampling during the trial period described in the report of BLG 17 (BLG 17/18, annex 6) associated with the *Guidance for sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)* (BWM.2/Circ.42). This does not prevent the port State from taking preventive measures to protect its environment, human health, property or resources.

ANNEX

ELEMENTS TO BE INCLUDED IN THE REVIEW OF GUIDELINES (G8)

The following elements will be included, as a minimum, as a part of the review of Guidelines (G8), taking into account the associated guidance (resolution MEPC.228(65), BWM.2/Circ.43, BWM.2/Circ.33 and BWM.2/Circ.28):

- .1 testing being performed using fresh, brackish and marine waters;
- .2 testing considering the effect of temperature in cold and tropical waters on operational effectiveness and environmental acceptability;
- .3 specification of standard test organisms for use in testing;
- .4 challenge levels set with respect to suspended solids in test water;
- .5 type approval testing discounting test runs in the full-scale testing that do not meet the D-2 standard and the results of test runs being “averaged”;
- .6 type approval testing realistically representing the flow rates the system is approved for;
- .7 any differences between type approval protocols of Member States; and
- .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 Convention and any other relevant information provided within the timeline for the review of Guidelines (G8).

RESOLUTION MEPC.228(65)
adopted on 17 May 2013

INFORMATION REPORTING ON
TYPE APPROVED BALLAST WATER MANAGEMENT SYSTEMS

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

RECALLING FURTHER that, on entry into force, the Ballast Water Management Convention will require ships to install ballast water management systems, which meet the D-2 standard stipulated therein,

RECOGNIZING that the collection and dissemination of accurate information on type-approved ballast water management systems (BWMS) will be beneficial for all interested stakeholders,

NOTING resolution MEPC.175(58) by which the Committee adopted the Information reporting on type-approved ballast water management systems,

HAVING CONSIDERED the recommendation made by the Sub-Committee on Bulk Liquids and Gases at its seventeenth session, on the need to revise resolution MEPC.175(58),

1. INVITES Member States, when approving a ballast water management system in accordance with the Guidelines for approval of ballast water management systems (G8), to report the following information to the Organization:

- .1 approval date;
- .2 name of the Administration;
- .3 name of the BWMS;
- .4 a copy of the Type Approval Certificate and any appendices which includes details on all imposed limiting conditions on the operation of the BWMS in accordance with paragraph 6.1 of the Guidelines for approval of ballast water management systems (G8) (resolution MEPC.174(58)) as follows: Such limiting conditions to 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 an annex to the Type Approval Certificate which contains 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;
- .6 the protocol according to which testing was undertaken, including details on:
 - .1 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 the shipboard test protocol including the operating parameters of the system during successful treatment operations, for example dosage rates, UV intensity and electrical current applied;
 - .3 energy consumption of the BWMS under normal or tested Treatment Rated Capacity (TRC), if available;
 - .4 the full test report of the land-based test including all unsuccessful, failed and invalid tests;
 - .5 the full test report of the shipboard test including all unsuccessful, failed and invalid tests, and detailed information of the test set up and actual flow rate at each test cycle;
 - .6 QA/QC documentation of the testing facility or body; and
 - .7 national accreditation of the test facility, if appropriate;
 - .7 a description of the Active Substance(s), if employed; and
 - .8 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);
2. INSTRUCTS the Secretariat to make such information available by an appropriate means;
 3. REVOKES resolution MEPC.175(58).

RESOLUTION MEPC.206(62)

adopted on 15 July 2011

**PROCEDURE FOR APPROVING OTHER METHODS OF BALLAST WATER
MANAGEMENT IN ACCORDANCE WITH REGULATION B-3.7
OF THE BWM CONVENTION**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

RECALLING ALSO the adoption by the International Conference on Ballast Water Management for Ships, held at the Organization's Headquarters in 2004, of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (hereinafter "the BWM Convention"),

RECALLING FURTHER that regulation A-2 of the BWM Convention requires that discharge of ballast water shall only be conducted through ballast water management in accordance with the provisions of the Annex to the Convention,

NOTING that regulation B-3.7 of the BWM Convention permits the use of "Other Methods" of ballast water management to achieve at least the same level of protection to the environment, human health, property or resources as described in regulations B-3.1 to B-3.5,

RECOGNIZING that such "Other Methods" should take into account safety considerations relating to the ship and the crew, environmental acceptability, practicality, cost-effectiveness, economics and biological effectiveness and should be approved in principle by the Marine Environment Protection Committee,

HAVING CONSIDERED, at its sixty-second session, the draft Procedure for approving Other Methods of ballast water management in accordance with regulation B-3.7 of the BWM Convention, developed by the Sub-Committee on Bulk Liquids and Gases at its fifteenth session,

1. ADOPTS the Procedure for approving Other Methods of ballast water management in accordance with regulation B-3.7 of the BWM Convention, as set out in the annex to the present resolution;
2. INVITES Administrations to apply the annexed Procedure as soon as possible, or when the Convention becomes applicable to them;
3. URGES Member States to bring the annexed Procedure to the attention of shipowners, shipbuilders and manufacturers of ballast water management systems, as well as any other parties concerned; and
4. AGREES to keep the Procedure under review.

* * *

ANNEX

**PROCEDURE FOR APPROVING OTHER METHODS OF BALLAST WATER
MANAGEMENT IN ACCORDANCE WITH
REGULATION B-3.7 OF THE BWM CONVENTION**

1 INTRODUCTION

1.1 Regulation B-3.7 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the BWM Convention) permits the use of Other Methods of ballast water management to achieve at least the same level of protection to the environment, human health, property or resources as described in regulations B-3.1 to B-3.5, and approved in principle by the MEPC.

1.2 Those developing Other Methods should also take into account: safety considerations relating to the ship and the crew; environmental acceptability (i.e. not causing greater environmental impacts than they solve); practicality (i.e. compatibility with ship design and operations); cost-effectiveness and economics; and biological effectiveness.

1.3 The Procedure for approving Other Methods of ballast water management in accordance with regulation B-3.7 of the BWM Convention (hereafter referred to as "the Procedure"), aims at providing criteria for the evaluation and approval of Other Methods of ballast water management (hereafter referred to as "Other Methods").

1.4 This Procedure has been developed to ensure that these Other Methods provide at least the same level of protection to the environment, human health, property or resources as those methods permitted under regulations B-3.1 to B-3.5.

1.5 Other Methods of ballast water management are to be approved in principle by the Committee prior to approval of an Other Method by the Administration.

1.6 Systems based on an Other Method where Active Substances and Preparations are added to the ballast water, or are generated on board ships by the system, should also be subject to the approval by the Committee in accordance with the Procedure for approval of ballast water management systems that make use of Active Substances (G9).

1.7 All shipboard systems based on an Other Method will also have to gain Type Approval or Prototype Approval, as appropriate, under the Guidelines for approval of ballast water management systems (G8), or Guidelines for approval of prototype ballast water treatment technologies (G10).

1.8 Where an Other Method cannot be type approved due to the nature of the method, the Administration should recommend to the Committee an appropriate method of recognition or certification.

1.9 The environmental impacts of any chemical by-products and/or physical effects formed by an Other Method will also have to be evaluated by the Administration during the approval process, with respect to safety to the environment.

1.10 The Procedure identifies the information to be provided, identifies the responsible parties for providing such information and outlines the approval processes required by the Committee.

1.11 The use of Other Methods of ballast water management should be consistent with the objectives of the Convention – "to prevent, minimize and ultimately eliminate the risks to the environment, human health, property and resources arising from the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments, as well as to avoid unwanted side effects from that control, and to encourage developments in related knowledge and technology". Depending on the new technology used in the Other Method, verifications for approval could be different from those specified in paragraph 1.7 but keep the same level of protection.

1.12 Other Methods using organisms are not within the scope of this Procedure.

2 PURPOSE

2.1 The Procedure aims to ensure that any Other Methods approved provide an equivalent level of protection to the standards contained in the BWM Convention. The Procedure will be kept under review and updated by the Committee in light of the experience gained during its application and as the state of knowledge and technology may require.

2.2 The purpose of the Procedure is to:

- .1 provide a uniform interpretation and application of the requirements for the approval of Other Methods permitted under regulation B-3.7;
- .2 ensure that Other Methods approved by an Administration are capable of at least achieving equivalence to the level of protection provided by the standards of the BWM Convention with respect to the prevention of the transfer of harmful aquatic organisms and pathogens as required by regulations B-3.1 to B-3.5;
- .3 assist in determining the information necessary for the approval in principle of Other Methods under regulation B-3.7 of the BWM Convention and identify the roles and responsibilities in providing such information;
- .4 assist Administrations in conducting the approval of an Other Method;
- .5 provide guidance to manufacturers, shipowners and other interested parties involved in determining the suitability of an Other Method to meet the requirements of the BWM Convention; and
- .6 provide the approval process used by the Committee.

3 DEFINITIONS

3.1 For the purposes of this Procedure, the definitions in the Convention apply and:

- .1 **Method** means a process developed and designed to reduce the transfer of harmful aquatic organisms through ships' ballast water to meet the requirements specified under regulations B-3.1 to B-3.5 of the BWM Convention.
- .2 **Other Method** means an alternative to a Method defined in paragraph 3.1.1 above, which provides a level of protection equivalent to the requirements specified in regulations B-3.1 to B-3.5 of the BWM Convention.

4 APPLICABILITY

4.1 The Procedure applies to all Administrations, Parties to the BWM Convention and other IMO Member States, seeking approval in principle for an Other Method under regulation B-3.7 or assessing or granting approval for such Other Methods. This Procedure is also for the use of the Committee when considering approval in principle.

4.2 Equipment manufacturers wanting to seek approval for an Other Method should also consult this Procedure.

4.3 Ballast water management methods subject to regulation A-4.1 of the BWM Convention are not subject to this procedure or to regulation B-3.7.

5 APPLICATION TO THE COMMITTEE FOR APPROVAL IN PRINCIPLE OF AN OTHER METHOD

5.1 The information provided to support the application for approval in principle should be complete, of sufficient quality and in accordance with this Procedure.

5.2 The applicant for approval in principle of an Other Method should provide independently validated and/or operational proof that the Other Method being submitted:

- .1 provides a level of protection at least equivalent to that provided by the requirements specified in regulations B-3.1 to B-3.5 of the BWM Convention; and
- .2 is capable of providing a consistent level of protection at all times in all environments/locations.

Equivalence and benchmark criteria for an application for approval in principle of an Other Method

5.3 Applications for Other Methods should contain a fully developed independently validated approach for assessing the level of protection provided by that Other Method against the transfer of harmful aquatic organisms and pathogens and its equivalence to the requirements in regulations B-3.1 to B-3.5 of the BWM Convention and the additional requirements outlined in this Procedure, as appropriate. A possible starting point for such an approach could be a comparison of the level of protection ensured by ballast water management in compliance with regulations B-3.1 to B-3.5 and the level of protection ensured by the Other Method if used on comparable ships.

5.4 Other Methods should demonstrate by risk assessment, independently validated physical and biological modelling, operational testing of this modelling and full-scale operational testing, where applicable, that the Other Method is capable of meeting at all times a level of protection that is at least equivalent to the level of protection with respect to the prevention of the transfer of harmful aquatic organisms and pathogens via discharge of ballast water compared to existing requirements. The risk assessment should be at least to the same level of rigour as stipulated in Guidelines (G7).

5.5 Applications for Other Methods should specify the benchmark against which the performance of any systems based on that particular Other Method can be measured. The benchmark would:

- .1 enable a transparent comparison by the Committee of the level of protection provided by the Other Method with that provided by the requirements in regulations B-3.1 to B-3.5 of the BWM Convention;
- .2 be measurable and able to be evaluated for approval (similar to the requirements of the Convention, i.e. D-1 being a process evaluation, while D-2 is a measurable performance standard);
- .3 be verifiable by port and flag States through sampling, records or other processes (to be properly defined, listed and technically explained/clarified, in the pertinent application, in terms of proposed verifications for flag State or port State control inspections to be carried out on board);
- .4 need to be contained in the application, agreed by the Committee and then be used for consideration of approval through compliance testing by Port State Control;
- .5 provide an assurance that systems based on an Other Method are providing the same level of protection for the environment as the Other Method that has received the approval in principle from the Committee; and

- .6 be based on a recognized international standard, where appropriate, so long as they can be proved as equivalent to the existing requirements.

5.6 An Other Method may provide the same level of protection for the environment, human health, property or resources where:

- .1 the ballasting and de-ballasting process does not transfer harmful aquatic organisms and pathogens; or
- .2 the ballast water discharge contains no harmful aquatic organisms and pathogens.

Sampling protocol criteria for an application for approval in principle of an Other Method

5.7 The application for an Other Method should contain a ballast water sampling and analysis protocol that should be consistent with the Guidelines for ballast water sampling (G2).

Ship and personnel safety criteria for an application for approval in principle of an Other Method

5.8 The application should include a Formal Safety Assessment or a Safety Case to ensure that the Other Method or system based on an Other Method is safe for installation on board ship and any risks to the ship's crew resulting from the system are identified and adequately addressed. This Formal Safety Assessment or Safety Case should be consistent with part 3 of the annex to the Guidelines for approval of ballast water management systems (G8) and approved by the Administration.

6 SUBMISSION PROCESS

6.1 The applicant should evaluate the Other Method against the benchmark according to a protocol that is approved by an Administration.

6.2 The applicant should then prepare an application for the Other Method and submit it to the Member State concerned.

6.3 The Administration should review the application to ensure it is satisfactory (i.e. contains all of the information that is required and the information provided is of a sufficient standard to enable a decision to be made by the Committee). If the application is satisfactory, the Member State should submit a proposal for approval in principle to the Committee taking into account the deadlines prior to the MEPC at which approval in principle is to be sought.

6.4 When in session, the Committee should decide if the proposal is acceptable for consideration by the Committee and set the time frame for the evaluation of the proposal as follows:

- .1 the Committee may commission an independent review of the risk assessment method, data and assumptions in order to ensure that a scientifically rigorous analysis has been conducted. The review should be undertaken by independent experts with ecological, aquatic biology, ship design and operation, and risk assessment expertise; and
- .2 the reviewers' report should be in written form and circulated to the Parties, Members of the Organization, the United Nations and its Specialized Agencies, intergovernmental organizations having agreements with the Organization and non-governmental organizations in consultative status with the Organization, prior to its consideration by the Committee.

6.5 All proprietary data should be treated as confidential by the Committee, the competent authorities involved, and the independent reviewers, if any. However, all information related to safety and environmental protection, including physical/chemical properties and data on environmental fate and toxicity, should be treated as non-confidential.

6.6 The Committee should evaluate the application for approval in principle of an Other Method in accordance with this Procedure.

7 ASSESSMENT OF EQUIVALENCE

7.1 The Committee should review the benchmarks detailed in the application and, as appropriate, take them into account when assessing equivalence to the level of protection for the environment, human health, property or resources as provided for in regulations B-3.1 to B-3.5.

7.2 Other Methods designed to provide at least an equivalent level of protection with respect to the prevention of the transfer of harmful aquatic organisms and pathogens via discharge of ballast water should demonstrate by risk assessment, independently validated physical and biological modelling, operational testing of this modelling and full-scale operational testing, where applicable, that the Other Method is capable of meeting a level of protection at all times that is, at least equivalent to, or better than, the applicable requirements contained in the BWM Convention.

7.3 Risk assessment is the logical process for assigning the likelihood and consequences of specific events, such as entry, establishment or spread of harmful aquatic organisms and pathogens in situations where a direct comparison of application benchmarks with the D-1 and D-2 standards is not possible.

7.4 In undertaking risk assessment to consider and evaluate the equivalence of an Other Method with the existing standards, the risk assessment principles outlined in the Guidelines for risk assessment under regulation A-4 of the BWM Convention (G7) should be carefully applied. The lack of full scientific certainty should be carefully considered in the decision-making process.

Equivalence with the D-1 standard

7.5 Other Methods designed to provide equivalence to the D-1 standard can be used only until the ship type, under the BWM Convention, is required to comply with the D-2 standard (unless the system proves it can also provide equivalence to the D-2 standard):

- .1 these methods should demonstrate through risk assessment, independently validated physical and biological modelling, operational testing of this modelling and full-scale operational testing of systems based on Other Methods, where applicable, that the Other Method is capable of meeting at all times a level of protection that is, at least equivalent to, or better than, regulation D-1 of the BWM Convention;
- .2 if there is a question about the environmental impact of an Other Method during its development, such approval should be split in the same way as it is in Procedure (G9). That is, Other Methods should be approved by the Administration and Committee based on independently validated data prior to being tested at sea; and
- .3 the relevant water quality parameters (e.g., suspended solids, salinity, oxygen concentration, particulate organic matter) should be reasonably the same in the incoming as well as in the outflowing water.

Equivalence with the D-2 standard

7.6 Other Methods designed to provide equivalence to the D-2 standard should demonstrate through risk assessment, independently validated physical and biological modelling, operational testing of this modelling and full-scale operational testing of systems based on Other Methods, where applicable, that the Other Method is capable of meeting at all times a level of protection that is at least equivalent to, or better than, regulation D-2 of the BWM Convention, as follows:

- .1 where appropriate, benchmarks should be based on recognized international standards as long as they can be proven to provide an equivalent level of protection to the D-2 standard;

- .2 the description of the main characteristics of the ballast water as well as the absence/presence of harmful aquatic organisms is to be supported by independent verification; and
- .3 onboard test results, equipment specification and quality assurance should be available.

8 APPROVAL

8.1 The approval takes place in two steps:

- .1 an approval in principle of the Other Method following review and evaluation by the Committee (regulation B-3.7); and
- .2 an approval of the Other Method in a manner analogous to Guidelines (G8) and (G10), by the Administration.

Assessment for approval in principle

8.2 The application for approval in principle should be assessed by the Committee to ascertain whether:

- .1 the application for approval in principle is complete, of sufficient quality, and in accordance with this Procedure;
- .2 the Other Method does not cause any unacceptable adverse effects to environment, human health, property or resources;
- .3 the Other Method does not contravene other regulations in the BWM Convention, or any other convention or code applicable to the ship type;
- .4 the Other Method ensures at least the same level of protection to the environment, human health, property or resources as those methods permitted under regulations B-3.1 to B-3.5; and
- .5 the Procedure for approval set out by the Administration is appropriate.

8.3 The application should not be granted approval in principle when there is absence of information or significant uncertainty.

8.4 The Committee should decide whether to approve in principle the proposal, introduce any modifications thereto, if appropriate, taking into account the reviewers' report.

8.5 The Administration that submitted the application to the Committee should inform in writing the applicant about the decision made with regard to the Other Method.

Approval by the Administration

8.6 An Other Method, having received approval in principle from the Committee, is to be approved by an Administration.

8.7 A shipboard system may need to be assessed for Type Approval.

8.8 The Administration should evaluate an Other Method for safety to the environment, human health, property, or resources.

9 NOTIFICATION OF APPROVAL

9.1 The Committee will record the approval in principle of Other Methods and circulate the list once a year including the following information:

- the document reference of the approval in principle of the Other Method by the Committee;
- name and brief description of the Other Method;
- name of ballast water management system that makes use of the Other Method if appropriate;
- date of approval;
- name of applicant;
- the benchmark that the Other Method is designed to meet, and the methods of assessing compliance to this benchmark;
- copies of or access routes to test reports, test methods, etc. (as resolution MEPC.175(58)); and
- any other specifications, if necessary.

9.2 Administrations, when approving an Other Method should report to the Committee in a manner consistent with resolution MEPC.175(58) “Information reporting on Type Approved ballast water management systems”.

10 MODIFICATION

10.1 The holder of an Other Method approval should report any modifications to the Administration.

10.2 Any modifications to an approved Other Method should be re-evaluated in accordance with this Procedure.

11 WITHDRAWAL OF APPROVAL

11.1 The Committee may withdraw any approval in principle in the following circumstances:

- .1 if the Other Method or system based on an Other Method no longer conforms to requirements due to amendments of the BWM Convention;
- .2 if any data or test records differ materially from data relied upon at the time of approval and are deemed not to satisfy the approval criteria;
- .3 if a request for withdrawal of approval is made by the Administration on behalf of the holder of an Other Method approval; and
- .4 if unreasonable harm to environment, human health, property or resources is determined to have been caused by an approved Other Method.

11.2 The decision to withdraw an approval in principle should specify all necessary further details, including the date upon which the withdrawal takes effect.

12 USE ON SHIPS

12.1 Ships using an Other Method under regulation B-3.7 of the BWM Convention, to meet their obligations under this Convention, can only do so once the Other Method has been approved in principle by the Committee and has been approved by an Administration.

RESOLUTION MEPC.188(60)
adopted on 24 March 2010

**INSTALLATION OF BALLAST WATER MANAGEMENT SYSTEMS ON NEW SHIPS IN
ACCORDANCE WITH THE APPLICATION DATES CONTAINED IN THE BALLAST
WATER MANAGEMENT CONVENTION (BWM CONVENTION)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

RECALLING ALSO the adoption by the International Conference on Ballast Water Management for Ships, held at the Organization's Headquarters in 2004, of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (hereinafter "the BWM Convention"),

RECALLING FURTHER that, on entry into force, the BWM Convention will require ships to install ballast water management systems, which meet the D-2 standard stipulated therein,

NOTING that the Assembly, at its twenty-fifth session in November 2007, adopted resolution A.1005(25) on the "Application of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004", which calls on States that have not yet ratified the BWM Convention to do so as soon as possible, and recommends that ships subject to regulation B-3.3 constructed in 2009 should not be required to comply with regulation D-2 until their second annual survey, but no later than 31 December 2011, if type-approved technology is not immediately available to achieve the D-2 standard set forth in the BWM Convention,

NOTING ALSO that resolution A.1005(25) requests the Committee to keep this resolution under review and, in particular, to review the issue of a ship subject to regulation B-3.3 constructed in 2010 and the immediate availability of type-approved technology for such a ship to meet the D-2 standard,

NOTING FURTHER that at its fifty-ninth session the Committee concluded that there are sufficient type-approved ballast water treatment technologies available for ships subject to regulation B-3.3 constructed in 2010 and that no changes to Assembly resolution A.1005(25) are needed,

RECOGNIZING that while the requirements of regulation B-3.3 cannot be enforced before the entry into force of the BWM Convention, it should be clearly understood that the ballast water management systems installed on ships constructed in 2010 will have to meet these requirements once the BWM Convention enters into force,

1. CALLS ON States which have not yet ratified, accepted, approved or acceded to the BWM Convention to do so at their earliest convenience;
2. INVITES Administrations to encourage the installation of ballast water management systems on new ships in accordance with the application dates contained in the BWM Convention; and
3. INVITES Member States to bring this resolution to the attention of shipowners, shipbuilders, and manufacturers of ballast water management systems, as well as any other parties concerned.

RESOLUTION MEPC.163(56)
adopted on 13 July 2007

GUIDELINES FOR BALLAST WATER EXCHANGE IN THE ANTARCTIC TREATY AREA

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

MINDFUL of Article 13 of the Ballast Water Management Convention which provides that in order to further the objectives of the Convention, Parties with common interests to protect the environment, human health, property and resources in a given geographical area, in particular, those Parties bordering enclosed and semi-enclosed seas, shall endeavour, taking into account characteristic regional features, to enhance regional co-operation, including through the conclusion of regional agreements consistent with the Ballast Water Management Convention,

BEING AWARE of the designation of Antarctica as a Special Conservation Area and of the measures adopted under the Antarctic Treaty to protect the Antarctic environment and dependent and associated ecosystems,

BEING AWARE ALSO of the requirements of Annex II to the Protocol on Environmental Protection to the Antarctic Treaty regarding conservation of Antarctic fauna and flora and in particular of the precautions taken to prevent the introduction of non-native species to the Antarctic Treaty area,

NOTING that Article 18 of the Ballast Water Management Convention provides that it shall enter into force twelve months after the date on which not less than thirty States, the combined merchant fleets of which constitute not less than thirty-five percent of the gross tonnage of the world's merchant shipping, have become Parties to it in accordance with Article 17 of the Convention and noting further that the Ballast Water Management Convention is yet to enter into force,

CONSCIOUS of the potential for invasive marine organisms to be transported into, or moved between biologically distinct regions within the Antarctic Treaty area by ships in their ballast water,

HAVING CONSIDERED the draft Guidelines for ballast water exchange in the Antarctic Treaty area and the recommendation made by the Sub-Committee on Bulk Liquids and Gases at its eleventh session,

1. ADOPTS the Guidelines for ballast water exchange in the Antarctic Treaty area as set out in the annex to this resolution;
2. INVITES Governments to apply the Guidelines as soon as possible, as an interim measure for all ships entering Antarctic Treaty area before the Ballast Water Management Convention comes into force; and
3. AGREES to keep the Guidelines under review.

* * *

ANNEX

**GUIDELINES FOR BALLAST WATER EXCHANGE IN THE
ANTARCTIC TREATY AREA**

- 1 The application of these Guidelines should apply to those vessels covered by Article 3 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Ballast Water Management Convention), taking into account the exceptions in regulation A-3 of the Convention. These Guidelines do not replace the requirements of the Ballast Water Management Convention, but provide an interim Ballast Water Regional Management Plan for Antarctica under Article 13(3).
- 2 If the safety of the ship is in any way jeopardized by a ballast exchange, it should not take place. Additionally these guidelines do not apply to the uptake or discharge of ballast water and sediments for ensuring the safety of the ship in emergency situations or saving life at sea in Antarctic waters.
- 3 A Ballast Water Management Plan should be prepared for each vessel with ballast tanks entering Antarctic waters, specifically taking into account the problems of ballast water exchange in cold environments and in Antarctic conditions.
- 4 Each vessel entering Antarctic waters should keep a record of ballast water operations.
- 5 For vessels needing to discharge ballast water within the Antarctic Treaty area, ballast water should first be exchanged before arrival in Antarctic waters (preferably north of either the Antarctic Polar Frontal Zone or 60°S, whichever is the furthest north) and at least 200 nautical miles from the nearest land in water at least 200 metres deep. (If this is not possible for operational reasons then such exchange should be undertaken in waters at least 50 nautical miles from the nearest land in waters of at least 200 metres depth).
- 6 Only those tanks that will be discharged in Antarctic waters would need to undergo ballast water exchange following the procedure in paragraph 5. Ballast water exchange of all tanks is encouraged for all vessels that have the potential/capacity to load cargo in Antarctica, as changes in routes and planned activities are frequent during Antarctic voyages due to changing meteorological and sea conditions.
- 7 If a vessel has taken on ballast water in Antarctic waters and is intending to discharge ballast water in Arctic, sub-Arctic, or sub-Antarctic waters, it is recommended that ballast water should be exchanged north of the Antarctic Polar Frontal Zone, and at least 200 nautical miles from the nearest land in water at least 200 metres deep. (If this is not possible for operational reasons then such exchange should be undertaken in waters at least 50 nautical miles from the nearest land in waters of at least 200 metres depth.)
- 8 Release of sediments during the cleaning of ballast tanks should not take place in Antarctic waters.
- 9 For vessels that have spent significant time in the Arctic, ballast water sediment should preferably be discharged and tanks cleaned before entering Antarctic waters (south of 60°S). If this cannot be done then sediment accumulation in ballast tanks should be monitored and sediment should be disposed of in accordance with the ship's Ballast Water Management Plan. If sediments are disposed of at sea, then they should be disposed of in waters at least 200 nautical miles from the shoreline in waters at least 200 metres deep.
- 10 Governments are invited to exchange information on invasive marine species or anything that will change the perceived risk associated with ballast water.

RESOLUTION A.1088(28)
adopted on 4 December 2013

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

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention of the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety and the prevention and control of marine pollution from ships,

RECALLING ALSO the adoption by the International Conference on Ballast Water Management for Ships, held at the Organization's Headquarters in 2004, of the *International Convention for the Control and Management of Ships' Ballast Water and Sediments* (hereinafter referred to as "the Convention"),

RECALLING FURTHER resolution A.1005(25) concerning the application of the Convention, and expressing its renewed desire to ensure that the Convention enters into force without further delay so as to provide for accrual of benefits as soon as possible to the aquatic environment from its early, wide and effective implementation,

BEING CONSCIOUS of the need to provide certainty and confidence in the application of the Convention, thereby assisting shipping companies, shipowners, managers and operators, as well as the shipbuilding and equipment manufacturing industries, in the timely planning of their operations; and the need to encourage the early installation of ballast water management systems,

BEARING IN MIND that the International Conference on Ballast Water Management for Ships adopted regulation B-3 to ensure a smooth transition to the D-2 performance standard of the Convention between the years 2009 and 2019,

RECOGNIZING that the passage of time since adoption of the Convention has resulted in uncertainty for ships regarding the application of regulation B-3, and that such uncertainty can be mitigated through the application of an appropriate timeline for enforcement of regulations D-1 (ballast water exchange standard) and D-2 (ballast water performance standard), upon entry into force of the Convention,

1. CALLS ON States that have not already done so to ratify, accept, approve or accede to the Convention as soon as possible;

2. RECOMMENDS that, notwithstanding the schedule set forth in regulation B-3, upon entry into force of the Convention, each Party enforce the standards in regulations D-1 and D-2 in accordance with the following schedule:

.1 a ship subject to regulations B-3.3 or B-3.5, constructed before the entry into force of the Convention, will not be required to comply with regulation D-2 until its first renewal survey following the date of entry into force of the Convention;

.2 a ship subject to regulations B-3.1.1, B-3.1.2 or B-3.4 will not be required to comply with regulation D-2 until its first renewal survey following the anniversary date of delivery of the ship in the year of compliance with the standard applicable to the ship;

.3 notwithstanding paragraph 2.2, where the Convention enters into force after the year 2014, a ship subject to regulation B-3.1.1 will not be required to comply with regulation D-2 until its first renewal survey following the date of entry into force of the Convention;

.4 notwithstanding paragraph 2.2, where the Convention enters into force after the year 2016, a ship

subject to regulations B-3.1.2 or B-3.4 will not be required to comply with regulation D-2 until its first renewal survey following the date of entry into force of the Convention;

.5 a ship referred to in paragraphs 2.1 to 2.4 will be required to comply with either regulation D-1 or regulation D-2 until such time as regulation D-2 is enforced;

.6 the renewal survey referred to in paragraphs 2.1 to 2.4 is the renewal survey associated with the International Oil Pollution Prevention Certificate under MARPOL Annex I;

3. REQUESTS that the Marine Environment Protection Committee keep this resolution under review and report back to the Assembly as appropriate;

4. RECOMMENDS that, as soon as possible after entry into force of the Convention, regulation B-3 be amended consistent with the understanding reflected in paragraph 2 of this resolution, with the date of acceptance of the amendment to occur as soon as practicable after its adoption;

5. REVOKES resolution A.1005(25).

2.4 IMO BWM circulars related to the implementation of the BWM Convention

IMO BWM.2/Circ.52 of 15 April 2014**Guidance on entry or re-entry of ships into exclusive operation within waters under the jurisdiction of a single Party**

1. The Marine Environment Protection Committee, at its sixty-sixth session (31 March to 4 April 2014), approved the Guidance on entry or re-entry of ships into exclusive operation within waters under the jurisdiction of a single Party as set out in the annex.

2. Member Governments are invited to bring the Guidance to the attention of all parties concerned.

ANNEX**GUIDANCE ON ENTRY OR RE-ENTRY OF SHIPS INTO EXCLUSIVE OPERATION WITHIN WATERS UNDER THE JURISDICTION OF A SINGLE PARTY****Background**

1 Article 3 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention), identifies the ships to which the Convention applies and does not apply. Article 3.1 of the Convention includes all ships entitled to fly the flag of a Party, and ships not entitled to fly the flag of a Party, but that operate under the authority of a Party, except as provided otherwise in the Convention.

2 Articles 3.2(b) to 3.2(d) set out conditions under which the Convention does not apply to a ship of a Party that operates only in waters under the jurisdiction of that Party, or another Party, or in such waters and on the high seas, respectively. Such ships should be subjected to the appropriate national policies, strategies or programmes for ballast water management of the Party or Parties established pursuant to article 4.2.

3 Ships operating pursuant to articles 3.2(b) to 3.2(d) that cease to operate exclusively in the relevant waters lose their exclusion from the Convention, which then fully applies to them on an ongoing basis, except as provided in this Guidance.

Purpose

4 The purpose of this Guidance is to provide advice on entry or re-entry into exclusive operation pursuant to articles 3.2(b) to 3.2(d), which will assist Administrations with respect to a number of situations, including:

- .1 ships (e.g. mobile offshore units) that may be assigned to extended operations in waters under the jurisdiction of a single Party following an international voyage or voyages; and
- .2 ships whose operations are usually within waters under their jurisdiction, but who may occasionally need to leave these waters and return (e.g. to visit a dry-dock). Such ships may consider that regulations A-4, B-3.6 and B-3.7 provide options that are particularly attractive for short-term compliance with the Convention.

5 The provisions of this Guidance that pertain to entry into exclusive operation do not apply to a ship that is launched into the waters of the Party within which it is constructed until it requires an International Ballast Water Management Certificate.

Guidance

6 Subject to the conditions of articles 3.2(b) to 3.2(d) concerning the environment, human health, property and resources, the application of the Convention to a ship of a Party may cease:

- .1 pursuant to article 3.2(b), if the ship enters or re-enters into exclusive operation in waters under the jurisdiction of that Party;
- .2 pursuant to article 3.2(c), if the ship enters or re-enters into exclusive operation in waters under the jurisdiction of another Party, subject to the authorization of the latter Party for such cessation; and
- .3 pursuant to article 3.2(d), if the ship enters or re-enters into exclusive operation in waters under the jurisdiction of one Party and on the high seas, unless the ship has not been granted an authorization pursuant to article 3.2(c).

7 Before ceasing application of the Convention to a ship referenced in paragraph 4, the Administration (and authorizing Party, if applicable) should verify that the ship:

- .1 is in compliance with the Convention, and holds a valid International Ballast Water Management Certificate if required to do so;
- .2 has fully discharged all ballast water, including any residual ballast water, and has completely removed and disposed of all sediments, in accordance with the Convention and the ship's approved ballast water management plan;
- .3 has a procedure in its approved ballast water management plan for thoroughly cleaning its ballast water tanks, piping and equipment that is satisfactory to the Administration (and authorizing Party, if applicable); and
- .4 has carried out the procedure described in subparagraph 7.3, above, to the satisfaction of the Administration (and authorizing Party, if applicable).

8 Upon cessation of the application of the Convention to a ship, any International Ballast Water Management Certificate issued to the ship should be withdrawn.

BWM.2/Circ.46 of 31 May 2013**Application of the BWM Convention to Mobile Offshore Units**

1. The Marine Environment Protection Committee, at its sixty-fifth session (13 to 17 May 2013), approved the circular on Application of the BWM Convention to Mobile Offshore Units, as set out in the annex.
2. Member Governments are invited to bring this circular to the attention of all parties concerned.

ANNEX**APPLICATION OF THE BWM CONVENTION TO MOBILE OFFSHORE UNITS**

International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004

Article 1.12 "Ship means a vessel of any type whatsoever operating in the aquatic environment and includes submersibles, floating craft, floating platforms, FSUs and FPSOs."

Regulation A-3

Exceptions

"The requirements of regulation B-3, or any measures adopted by a Party pursuant to article 2.3 and section C, shall not apply to:

- .5 the discharge of ballast water and sediments from a ship at the same location where the whole of that ballast water and those sediments originated and provided that no mixing with unmanaged ballast water and sediments from other areas has occurred. If mixing has occurred, the ballast water taken from other areas is subject to ballast water management in accordance with this annex."

INTERPRETATION**At the location of operation**

1 Preload tanks – for preloading of self-elevating units' (SEU) leg foundation, seawater is taken on board into the preload tanks. This seawater may be discharged, without management, at the same location provided that no mixing with unmanaged seawater and sediments from other areas has occurred.

2 Column stabilized units (CSU) – at its location of operation, seawater is taken on board the CSU into the ballast tanks to achieve the required operational draft. The seawater and sediment in the ballast tanks may be discharged, without management, at the same location provided that no mixing with unmanaged seawater and sediments from other areas has occurred.

3 Management of residual seawater and sediment in preload tanks of SEUs and ballast tanks of CSUs – residual seawater and sediments in the tanks should be managed if these tanks are to be ready for a different area of operation. A possible method for management is by means of internal recirculation. Other methods of ballast water management capable of achieving the D-2 standard are also acceptable.

Transit to other areas

4 SEUs and CSUs take on board ballast water and discharge it for transit to other areas. The transit

ballast water and sediments remaining in the preload and operational ballast tanks of the mobile offshore units may be treated by an appropriately approved internal circulation method. Other methods of ballast water management, capable of providing the same level of protection to the environment, human health, property or resources as described in regulations B-3.1 to B-3.5, may also be acceptable.

Regulation D-2

Ballast Water Performance Standard

“1 Ships conducting ballast water management in accordance with this regulation shall discharge less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension and less than 10 viable organisms per millilitre less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension; and discharge of the indicator microbes shall not exceed the specified concentrations described in paragraph 2.

2 Indicator microbes, as a human health standard, shall include:

- .1 Toxicogenic *Vibrio cholerae* (O1 and O139) with less than 1 colony-forming unit (cfu) per 100 millilitres or less than 1 cfu per 1 gram (wet weight) zooplankton samples;
- .2 *Escherichia coli* less than 250 cfu per 100 millilitres;
- .3 Intestinal Enterococci less than 100 cfu per 100 millilitres.”

INTERPRETATION

Internal circulation method

5 Treatment of any residual seawater, and sediments as well as any transit ballast water using a ballast water management system, approved in accordance with the Convention, incorporating internal circulation may be accepted. This method does not treat the ballast water during the uptake or discharge cycles, but would treat the water only after it has been pumped into the tanks. Other methods of ballast water management, capable of providing the same level of protection to the environment, human health, property or resources as described in regulations B-3.1 to B-3.5, may also be acceptable. If the ballast water management system employs Active Substances, measures such as neutralization may be needed prior to final discharge of the managed ballast water.

Regulation E-1

Surveys

“1 Ships of 400 gross tonnage and above to which this Convention applies, excluding floating platforms, FSUs and FPSOs, shall be subject to surveys specified below:

2 The Administration shall establish appropriate measures for ships that are not subject to the provisions of paragraph 1 in order to ensure that appropriate provisions of this Convention are complied with.”

INTERPRETATION

6 Mobile offshore units should comply with the provisions of the Convention and should be surveyed and issued with an International Ballast Water Management Certificate, according to regulations E-1 and E-2 of the Convention, as applicable.

IMO BWM.2/Circ.45 of 30 May 2013

Clarification of "major conversion" as defined in regulation A-1.5 of the BWM Convention

1. The Marine Environment Protection Committee, at its sixty-fourth session (1 to 5 October 2012), concurred with the clarification proposed by Japan (document MEPC 64/2/11) with regard to the definition of "major conversion" contained in regulation A-1.5 of the BWM Convention, and instructed the Secretariat to prepare a draft circular to facilitate the dissemination of this clarification for consideration by MEPC 65.
2. The Marine Environment Protection Committee, at its sixty-fifth session (13 to 17 May 2013), considered the proposal by IACS (document MEPC 65/2/12), agreed to include a further clarification of "major conversion" with respect to changing of ship type, and approved the text of the circular as set out in the annex.
3. Member Governments are invited to bring this circular to the attention of all parties concerned.

ANNEX

CLARIFICATION OF "MAJOR CONVERSION" AS DEFINED IN REGULATION A-1.5 OF THE BWM CONVENTION

1 Regulations A-1 of the International Convention for Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention) provides:

- "4 **Constructed** in respect of a ship means a stage of construction where:
- .1 the keel is laid; or
 - .2 construction identifiable with the specific ship begins; or
 - .3 assembly of the ship has commenced comprising at least 50 tonnes or 1 per cent of the estimated mass of all structural material, whichever is less; or
 - .4 the ship undergoes a major conversion.
- 5 **Major conversion** means a conversion of a ship:
- .1 which changes its ballast water carrying capacity by 15 per cent or greater, or
 - .2 which change the ship type, or
 - .3 which, in the opinion of the Administration, is projected to prolong its life by ten years or more, or
 - .4 which results in modifications to its ballast water system other than component replacement-in-kind. Conversion of a ship to meet the provisions of regulation D-1 shall not be deemed to constitute a major conversion for the purpose of this annex."

2 The BWM Convention does not, however, stipulate clearly whether the new installation of ballast water management systems should be treated as a "major conversion".

3 The Marine Environment Protection Committee, at its sixty-fourth session, agreed that new installation of ballast water management systems should not be treated as a “major conversion” as defined in regulation A-1.5 of the BWM Convention.

4 The Marine Environment Protection Committee, at its sixty-fifth session, with respect to paragraph 5.2 of regulation A-1, agreed that a change of ship type should be considered to refer to a conversion that:

- .1 substantially alters the dimensions or carrying capacity of the ship; or
- .2 changes the type of cargo carried through a major alteration of the ship.

IMO BWM.2/Circ.44 of 29 May 2013**Options for ballast water management for Offshore Support Vessels in accordance with the BWM Convention**

1. The Marine Environment Protection Committee, at its sixty-fourth session (1 to 5 October 2012), instructed the BLG Sub-Committee to initiate the development of a circular on implementation of the BWM Convention for offshore support vessels.
2. MEPC 65 (13 to 17 May 2013) approved the Options for ballast water management for Offshore Support Vessels in accordance with the BWM Convention, agreed by BLG 17 (4 to 8 February 2013), as set out in the annex.
3. Member Governments are invited to bring this circular to the attention of all parties concerned.

ANNEX**OPTIONS FOR BALLAST WATER MANAGEMENT FOR OFFSHORE SUPPORT VESSELS IN ACCORDANCE WITH THE BWM CONVENTION****1 INTRODUCTION**

1.1 These procedures are intended to relate to the activities of Offshore Support Vessels. Operationally, these vessels differ from the operational models associated with deep-sea trading vessels by being designed to operate in near coastal waters characterized by carrying materials to facilities and vessels working in offshore energy fields.

1.2 The purpose of these procedures is to provide options available for complying with the requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention).

1.3 Ballast water management should be consistent with the objectives of the Convention – “to prevent, minimize and ultimately eliminate the risks to the environment, human health, property and resources arising from the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments, as well as to avoid unwanted side effects from that control, and to encourage developments in related knowledge and technology”. Depending on the option used, verification for approvals could differ from those specified in paragraph 1.7 of resolution MEPC.206(62), but keep the same level of protection.

1.4 Resolution MEPC.127(53) contains the *Guidelines for ballast water management and development of ballast water management plans (G4)*, which includes part A, chapter 1, “Ship operational procedures”.

1.5 The application of the current measures should be decided considering the principles of risk analysis and taking into account the operational condition of the ship.

2 APPLICATION

2.1 The methods of compliance contained in paragraph 3 below are intended to provide options for meeting the functional goals of the Ballast Water Management Convention for Offshore Support Vessels.

2.2 The Offshore Support Vessels' approved Ballast Water Management Plans should meet the requirements and follow the form set out by resolution MEPC.127(53). An Administration approved plan may address circumstances specific to operation in waters under the jurisdiction of another party subject to the authorization of that party with the functional premise describing the vessel and the operational model that the vessel is operating under and present viable methods of complying with the objectives of the Convention.

2.3 In line with the Convention, Administrations may allow other ship types to apply the optional methods identified in this document, if found appropriate.

3 METHODS OF COMPLIANCE

3.1 Generally the options for compliance for Offshore Support Vessels will be identified on the ships' International Ballast Water Management Certificate and in the Ballast Water Management Plan. The general understanding is that the options may include the following:

- .1 use of an "other method" of ballast water management as per regulation B-3.7 of the Convention following resolution MEPC.206(62);
- .2 exemption, as per regulation A-4 of the Convention, following the *Guidelines for risk assessment under regulation A-4 (G7)*;
- .3 use of ballast water determined by the coastal State as being sourced from the "same location" as the point of discharge (as per regulation A-3.5);
- .4 use of temporary ballast water management systems may be allowed for the purposes of undertaking activities outside those considered normal, routine support activities for compliance with the objectives of the Convention. If, or when available, a temporary BWMS appliance is installed, the unit should comply with the relevant approval processes promulgated by the flag Administration in accordance with the Convention and associated guidelines;
- .5 use of permanent or temporary BWMS installed aboard another vessel operating from the same port or locality as a local reception facility, with the approval of the flag Administration and the acceptance of the local coastal State Administration, for the treatment of unmanaged ballast water; and
- .6 meeting the regulation D-2 discharge standard through permanent installation of a Type Approved ballast water management system.

3.2 Drill water or water taken and stored on board for the purpose of protecting low flash point liquid (LFL) tanks, which is not discharged into the environment, is not subject to the requirements of the Convention.

4 SURVEY AND CERTIFICATION REQUIREMENTS

4.1 Generally, the process of survey and certification follows section E of the Convention.

IMO BWM.2/Circ.43 of 29 May 2013

Amendments to the Guidance for Administrations on the type approval process for ballast water management systems in accordance with Guidelines (G8) (BWM.2/Circ.28)

1. The Marine Environment Protection Committee, at its sixty-first session (27 September to 1 October 2010), approved the Guidance for Administrations on the type approval process for ballast water management systems in accordance with Guidelines (G8) developed by the BLG Sub-Committee at its fourteenth session (8 to 12 February 2010) as disseminated in BWM.2/Circ.28.
2. MEPC 65 (13 to 17 May 2013) approved amendments to BWM.2/Circ.28, agreed by BLG 17 (4 to 8 February 2013), as set out in annex 1.
3. For ease of reference, the entire text of the Guidance for Administrations on the type approval process for ballast water management systems in accordance with Guidelines (G8), as amended by MEPC 65, is set out in annex 2.
4. The text of the Guidance, as set out in annex 2, supersedes the text contained in BWM.2/Circ.28.
5. Member Governments are invited to bring this circular to the attention of all parties concerned.

ANNEX 1

AMENDMENTS TO THE GUIDANCE FOR ADMINISTRATIONS ON THE TYPE APPROVAL PROCESS FOR BALLAST WATER MANAGEMENT SYSTEMS IN ACCORDANCE WITH GUIDELINES (G8) (BWM.2/CIRC.28)

- 1 Paragraphs 3.1.14 and 3.1.15 are replaced by the following:
 - “3.1.14 Provided the following, when submitting the Type Approval application:
 - .1 sufficient information to verify operation in different salinity ranges (fresh, brackish and marine water) in which the BWMS will operate;
 - .2 sufficient information to verify operation in the different temperature ranges (cold, temperate and tropical) in which the BWMS will operate;
 - .3 sufficient information to verify operation with the different sediment loads under which the BWMS will operate;
 - .4 sufficient information to verify operation of the minimum effective treatment flow rate as well as the maximum Treatment Rated Capacity (TRC) including the duration of these tests; and
 - .5 suggestions for improvements of the installation related to safety or additional testing R&D,
 - 3.1.15 Made all laboratory-scale and, if appropriate, full-scale land-based test results and documentation available, including all unsuccessful, failed and invalid tests, to the Administration; and”
- 2 A new paragraph 3.1.16 is added as follows:
 - “3.1.16 Made all shipboard test results and documents available, including all unsuccessful, failed and invalid tests as well as detailed information of the test set up and flow rate at each test cycle, to the Administration.”

3 A new paragraph 3.2 is added as follows:

“3.2 In accordance with paragraphs 4.10 to 4.14 of Guidelines (G8), Administrations should ensure that type approved BWMS have a suitable self-monitoring system that will monitor and record sufficient data to verify correct operation of the system. Administrations should make every effort to ensure that newly installed BWMS that have already been granted Type Approval meet this recommendation within one year following approval of this circular. Administrations should issue treatment system particulars, including details of the self-monitoring system (as described in document MEPC 61/INF.19), for all type-approved systems.”

4 Paragraph 5.2.13 is replaced with the following:

“5.2.13 A safety and hazard assessment of the installation, operation and maintenance of the BWMS on the shipboard test is undertaken and approved in line with the technical guidance developed by the Organization (BWM.2/Circ.20), and includes as a minimum:

- .1 any potential impact on the crew health and safety; and
- .2 references to the classification society safety and hazard rules and recommendations.”

5 Paragraph 5.3.4 is replaced with the following:

“5.3.4 In accordance with Guidelines (G8), the appendix of the Type Approval Certificate should include details on all imposed limiting conditions on the operation of the BWMS. Such limiting conditions to 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 Paragraph 5.3.5 is replaced with the following:

“5.3.5 An annex to the Type Approval Certificate should 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.”

7 Paragraph 6.1 is replaced with the following:

“6.1 The Administration should forward a report of the Type Approval process to the Organization including the relevant documentation as specified in resolution MEPC.228(65).”

**

ANNEX 2

GUIDANCE FOR ADMINISTRATIONS ON THE TYPE APPROVAL PROCESS FOR BALLAST WATER MANAGEMENT SYSTEMS IN ACCORDANCE WITH GUIDELINES (G8)

1 PURPOSE

1.1 This document provides guidance for Administrations on the procedure for evaluating an application for Type Approval of a ballast water management system (BWMS), in accordance with the *Guidelines for approval of ballast water management systems (G8)*. This document can act as an aide-memoire for Administrations and is not intended, in any way, to interfere with the authority of an Administration.

1.2 This document provides guidance on interpretation of Guidelines (G8) and does not replace or supersede the requirements of those Guidelines.

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

2 KEY DOCUMENTS

2.1 In evaluating an application for Type Approval of a BWMS, the latest version of the following documents should be consulted:

- The International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention);
- *Guidelines for approval of ballast water management systems (G8)*;
- *Procedure for approval of ballast water management systems that make use of Active Substances (G9)*;
- *Guidelines for ballast water sampling (G2)*;
- *Guidance to ensure safe handling and storage of chemicals and preparations used to treat ballast water and the development of safety procedures for risks to the ship's crew resulting from the treatment process*;
- Resolution MEPC.175(58) – *Information reporting on type-approved ballast water management systems*;
- Methodology for information gathering and conduct of work of the GESAMP-BWWG; and
- Other pertinent ballast water management resolutions, guidance and circulars.

3 RECOMMENDATIONS FOR REQUIREMENTS OF MANUFACTURERS OR THEIR AGENTS

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

1. been informed if the Administration delegates to or utilizes the services of a third party quality assurance organization (e.g. Recognized Organization, nominated body, classification society, surveyors, etc.) in some, or all of the Type Approval processes;
2. understood the steps and requirements of the processes outlined in the documents listed in section 2 of this document;
3. a fully working system built that can be used in the Type Approval process. It should be noted that the construction procedures and materials for the unit tested need to be the same as for the follow-on production units;
4. undertaken preliminary testing to ensure that their BWMS is viable, will meet the D-2 standard of the BWM Convention, will work on board a ship and that the system has been determined not to pose any unacceptable risk to the environment;
5. understood the extent of testing that needs to be completed by a recognized testing facility, including toxicity analysis;
6. provided a description of the preliminary test to the Administration that should at least include the following:

- .1 the test set-up, including sampling points;
- .2 responsible persons/organizations for all or portions of the preliminary testing;
- .3 possible Quality Management Plan (QMP) of the testing facility;
- .4 testing laboratories that will be used;
- .5 Quality Assurance Project Plan (QAPP) for the preliminary test; and
- .6 provision for survey of the test facility, if required;
- .7 provided a detailed report of the preliminary test results including, at least:
 - .1 toxicity data;
 - .2 Active Substances if relevant; and
 - .3 any other chemicals generated during the process;
- .8 an understanding of whether the system under consideration, uses an Active Substance, as defined in the BWM Convention. If it utilizes an Active Substance, the system will require additional approval under Procedure (G9), whilst the systems not using an Active Substance only need approval under Guidelines (G8);
- .9 a contractual agreement to undertake the shipboard testing needed under Guidelines (G8) with the owner of a suitable ship;
- .10 arranged for a trained person to be present at the land-based testing facility to operate the equipment being type approved and ensure that for the shipboard test the ship's crew is familiar with the equipment and sufficiently trained to operate the equipment;
- .11 consulted with the classification society that the ship undertaking the shipboard testing is being registered, where necessary, and obtained approval for installation of the BWMS;
- .12 demonstrated by using mathematical modelling and/or calculations or by full-scale shipboard testing, that any up or down scaling will not affect the ultimate functioning and effectiveness on board a ship of the type and size for which the equipment will be certified. In doing so, the manufacturers should take into account all relevant guidance developed by the Organization;
- .13 prepared a Type Approval application in compliance with Guidelines (G8), annex, part 1, that includes at least the following:
 - .1 detailed description of the design, construction, operation and functioning of the BWMS;
 - .2 preliminary assessment of the corrosion effects of the system proposed;
 - .3 preliminary test results;
 - .4 technical Manual;
 - .5 BWMS piping and instrumentation diagram (P&ID);
 - .6 link to the provisions required in a ballast water management plan;
 - .7 environmental and public health effects; and

- .8 specific salinities to be tested;
- .14 provided the following, when submitting the Type Approval application:
 - .1 sufficient information to verify operation in different salinity ranges (fresh, brackish and marine water) in which the BWMS will operate;
 - .2 sufficient information to verify operation in the different temperature ranges (cold, temperate and tropical) in which the BWMS will operate;
 - .3 sufficient information to verify operation with the different sediment loads under which the BWMS will operate;
 - .4 sufficient information to verify operation of the minimum effective treatment flow rate as well as the maximum Treatment Rated Capacity (TRC) including the duration of these tests; and
 - .5 suggestions for improvements of the installation related to safety or additional testing R&D;
- .15 made all laboratory-scale and, if appropriate, full-scale land-based test results and documentation available, including all unsuccessful, failed and invalid tests, to the Administration; and
- .16 made all shipboard test results and documents available, including all unsuccessful, failed and invalid tests as well as detailed information of the test set up and flow rate at each test cycle, to the Administration.

3.2 In accordance with paragraphs 4.10 to 4.14 of Guidelines (G8), Administrations should ensure that type approved BWMS have a suitable self-monitoring system that will monitor and record sufficient data to verify correct operation of the system. Administrations should make every effort to ensure that newly installed BWMS that have already been granted Type Approval meet this recommendation within one year following approval of this circular. Administrations should issue treatment system particulars, including details of the self-monitoring system (as described in document MEPC 61/INF.19), for all type approved systems.

4 RECOMMENDATIONS FOR FACILITATING A TYPE APPROVAL EVALUATION

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

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

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

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

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

5 APPROVAL PROCESS

5.1 Under the provisions of the BWM Convention, a BWMS is to be approved in accordance with Guidelines (G8) and, where appropriate, Procedure (G9).

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

- .1 a comprehensive explanation of the physical and/or biochemical treatment processes used by the BWMS to meet the D-2 Standard in the BWM Convention. This should be undertaken by the manufacturer and any supporting data should be submitted in writing. Any system which makes use of, or generates, Active Substances, Relevant Chemicals, or free radicals during the treatment process to eliminate organisms in order to comply with the Convention should be submitted to the Organization for review under Procedure (G9), (Procedure (G9), paragraph 3.3);
- .2 whether a BWMS makes use of an Active Substance or not remains the prerogative of the responsible Administration. In making that determination, Administrations should take into account relevant GESAMP-BWWG recommendations and Committee decisions as to whether a system should be subject to approval under Procedure (G9). When an Administration is unsure of whether a BWMS is subject to Procedure (G9), it may choose to submit such system for review under that Procedure (G9) (MEPC 59/24, paragraph 2.16);
- .3 the BWMSs that the Administration determines are not subject to Procedure (G9), as provided in paragraphs 2.3.6 and 2.3.30.4 of the annex to Guidelines (G8), the toxicity testing procedures in paragraphs 5.2.2 to 5.2.7 of Procedure (G9) should be used when the system could reasonably be expected to result in changes to the treated water such that adverse impacts to receiving waters might occur upon discharge;
- .4 the approval documents that should include a piping and instrumentation diagram (P&ID) with parts list and material specification. Furthermore, wiring diagrams, function description of the control and monitoring equipment and description of regulator circuit of the BWMS;
- .5 information on the preliminary testing (methodology, test water composition, salinities tested, sampling, analysis laboratories, etc.);
- .6 accreditation of Guidelines (G8) land-based testing facility or body including their quality management plan (QMP) and quality assurance project plan (QAPP) to be used by the manufacturer for land-based testing;
- .7 approval and subsequent verification of the design, construction, operation and functioning of the equipment used for land-based and shipboard testing;
- .8 approval and subsequent verification of the land-based and shipboard test methodology, including the composition of the test water, and specific salinities to be tested which should be in line with Guidelines (G8), Procedure (G9) and the Methodology for information gathering and conduct of work of the GESAMP-BWWG as appropriate (waiver for multiple testing required);
- .9 approval and subsequent verification of the methodology used to take and store samples, the laboratory testing, the frequency of sampling, and the analysis procedure for samples from land-based and shipboard testing;

- .10 approval and subsequent verification of the design, construction, operation and functioning of the equipment used for testing;
- .11 if the system is using an Active Substance, then the applications for Final Approval will have to be checked and approved by the Administration prior to making a proposal for approval to the Organization. In addition, the cost-recovery fee for the scientific services provided by the GESAMP-BWWG will have to be submitted;
- .12 a safety assessment of the storage and handling of any chemicals is undertaken and approved in line with the technical guidance developed by the Organization;
- .13 a safety and hazard assessment of the installation, operation and maintenance of the BWMS on the shipboard test is undertaken and approved in line with the technical guidance developed by the Organization (BWM.2/Circ.20), and includes as a minimum:
 - .1 any potential impact on the crew health and safety; and
 - .2 references to the classification society safety and hazard rules and recommendations;
- .14 all electrical equipment used to operate the BWMS should be of a certified safety type required by the applicable national or international standard in respect of the hazardous areas where it is located; and
- .15 results of environmental testing as specified in part 3 of the annex to Guidelines (G8).

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

- .1 the validity of the approval should be revisited as appropriate;
- .2 in due time before the expiration of the approval, the manufacturer should prepare a report detailing the experiences with the system, including the results of any scientific research relevant to the system, as well as any results of port State controls, if available;
- .3 the occurrence of any unexpected harmful consequences of the operation of the BWMS should be reported by the manufacturer to the Administration immediately;
- .4 in accordance with Guidelines (G8), the appendix of the Type Approval Certificate should include details on all imposed limiting conditions on the operation of the BWMS. Such limiting conditions to 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 an annex to the Type Approval Certificate should 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;
- .6 the Type Approval Certificate should specify the components of the BWMS that are type approved, including the manufacturer of each component; their operating ranges, including temperature, specific salinity and specify the possibility to use other similar components (like filters for example) and the criteria for allowing such use;
- .7 a separate Type Approval Certificate should be provided for each type or model of the BWMS. However, if Administrations wish to do otherwise, it is recommended that the different types and models are clearly stated, the test each type and model has undergone

clearly referred to with test results, operating ranges, salinity, TRC, etc.;

- .8 all accidents (e.g. accidental exposure, leakage) related to the BWMS should be reported;
- .9 any indications that the system is not performing up to the standards set by the BWM Convention, the guidelines and/or any additional provisions set by the Administration should be reported by the manufacturer to the Administration immediately;
- .10 the Administration should have the opportunity to revoke the approval if these requirements are not met; and
- .11 MSC circular MSC.1/Circ.1221 – “Validity of Type Approval Certification for marine products” should apply.

6 REPORTING OF THE TYPE APPROVAL

6.1 The Administration should forward a report of the Type Approval process to the Organization including the relevant documentation as specified in resolution MEPC.228(65).

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

IMO BWM.2/Circ.42/Rev.1 of 28 May 2015**Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)**

- 1 The Marine Environment Protection Committee, at its fifty-eighth session (October 2008), following the adoption of the *Guidelines for ballast water sampling (G2)* (resolution MEPC.173(58)), instructed the Sub-Committee on Bulk Liquids and Gases (BLG) to develop, as a matter of high priority, a circular to provide sampling and analysis guidance.
- 2 MEPC 65 (13 to 17 May 2013) approved BWM.2/Circ.42 on *Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)*, as agreed by BLG 17 (4 to 8 February 2013).
- 3 MEPC 66 (31 March to 4 April 2014) had invited Member Governments and international organizations to submit further information and proposals related to ballast water sampling, analysis and contingency measures to the Sub-Committee on Pollution Prevention and Response (PPR), with a view to further developing and improving the relevant guidance documents and guidelines.
- 4 MEPC 68 (11 to 15 May 2015) approved the revised *Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)*, as agreed by PPR 2 (19 to 23 January 2015), set out in the annex.
- 5 Member Governments are invited to bring the annexed Guidance to the attention of all parties concerned.
- 6 This circular supersedes BWM.2/Circ.42.

ANNEX 1**GUIDANCE ON BALLAST WATER SAMPLING AND ANALYSIS FOR TRIAL USE IN ACCORDANCE WITH THE BWM CONVENTION AND GUIDELINES (G2)****1 INTRODUCTION**

1.1 The purpose of this guidance is to provide general recommendations on methodologies and approaches to sampling and analysis to test for compliance with the standards described in regulations D-1 and D-2 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention). This guidance is an updated version of the guidance contained in document BLG 16/WP.4, taking into account advances in research since the document was first drafted, and should be read in conjunction with the BWM Convention, the *Guidelines for port State control under the BWM Convention* (resolution MEPC.259(67)) and the *Guidelines for ballast water sampling (G2)* (resolution MEPC.173(58)). Furthermore, and as instructed by MEPC 64, the sampling and analysis procedures to be used for enforcement of the BWM Convention should result in no more stringent requirements than what is required for Type Approval of ballast water management systems (BWMS).

1.2 This guidance consists of two parts,

- .1 a discussion of the principles of sampling, accompanied by a list of recommended methods and approaches for analysis and sampling protocols available for compliance testing to the D-1 and D-2 standards in section 5; and
- .2 background information on sampling and analysis methodologies and approaches, set out in the annex.

1.3 Sampling and analysis for compliance testing is a complex issue. According to the *Guidelines for ballast water sampling (G2)*, testing for compliance can be performed in two steps. As a first step, prior to a detailed analysis for compliance, an indicative analysis of ballast water discharge may be undertaken to establish whether a ship is potentially in compliance with the Convention.

1.4 When testing for compliance, the sampling protocol used should result in a representative sample of the whole discharge of the ballast water from any single tank or any combination of tanks being discharged.

2 DEFINITIONS

For the purpose of this guidance, the definitions in the BWM Convention apply and:

- .1 A *sample* means a relatively small quantity intended to show what the larger volume of interest is like.
- .2 *Representative sampling* reflects the relative concentrations and composition of the populations (organisms and/or chemicals) in the volume of interest. Samples should be taken in accordance with the annex, part 1 and/or part 2 of the *Guidelines on ballast water sampling (G2)*.
- .3 *Analysis* means the process of measuring and determining the concentrations and composition of the populations of interest (organisms and/or chemicals) within the sample.
- .4 An *indicative analysis* means a compliance test that is a relatively quick indirect or direct measurement of a representative sample of the ballast water volume of interest:
 - .1 an indirect, indicative analysis may include measurements whose parameters do not provide a value directly comparable to the D-2 standard, including biological, chemical, or physical parameters (e.g. dissolved oxygen levels, residual chlorine levels, Adenosine triphosphate (ATP), nucleic acid, *chlorophyll a*, and that by variable fluorescence, etc. The practicalities, applicability and limitations of these methods should be understood before they are used in compliance testing;
 - .2 a direct measurement, which is directly comparable to the D-2 standard (i.e. the determination of the number of viable organisms per volume) may also be indicative if it has:
 - .1 a large confidence interval, or
 - .2 high-detection limits; and
 - .3 an indicative analysis is an analysis performed in accordance with sections 4.1 and 4.2.
- .5 A *detailed analysis* means a compliance test that is likely to be more complex than indicative analysis and is a direct measurement of a representative sample used to determine the viable organism concentration of a ballast water volume of interest. The result of such measurement:
 - .1 should provide a direct measurement of viable organism concentration in the ballast

water discharge which is directly comparable to the D-2 standard (number of viable organisms per volume);

- .2 should be of sufficient quality and quantity to provide a precise measurement of organism concentration (+/- [X] organisms per volume) for the size category(ies) in the D-2 standard being tested for; and
- .3 should use a measurement method with an adequate detection limit for the purpose for which it is being applied.

A detailed analysis is an analysis performed in accordance with the methods and approaches in sections 4.3 and 4.4. Detailed analysis should usually be undertaken on a sample taken in accordance with the procedures in section 4.4.

- .6 *Testing for compliance* using indicative analysis and detailed analysis can employ a range of general approaches or standard methods. These approaches or methods are divided into those that sample a small proportion of the volume of interest to indicate or confirm compliance or a larger proportion of the volume of interest that can be utilized to indicate and confirm compliance. Those that provide a wide confidence interval should not be used to confirm compliance unless the result and confidence limit are demonstrably over the D-2 standard as measured directly or indirectly. Approaches/Standards are highlighted in sections 4.1, 4.2 and 4.4 for indicative analysis and sections 4.3 and 4.4 for detailed analysis.
- .7 *Method* means a detailed step-by-step analysis procedure (for indicative or detailed analysis) or sampling methodology, which the laboratory or organization undertaking the work can follow, be audited against and be accredited to.
- .8 *Approach* means a detailed step-by-step analysis procedure (for indicative or detailed analysis) or sampling methodology, which the laboratory or organization undertaking the work can follow. These procedures will not have been validated by an international or national standards organization.
- .9 *General approach* means a conceptual description or broad methodology of sample collection or analysis.
- .10 *The precision* of a measurement system is the degree to which repeated measurements under unchanged conditions show the same results.
- .11 *The detection limit* is the lowest concentration level that can be determined to be statistically different from a blank sample within a stated confidence interval. Limits of detection are method and analysis specific.
- .12 *Plankton* means *phytoplankton* (e.g. diatoms or dinoflagellates) and *zooplankton* (e.g. bivalve larvae or copepods) that live in the water column and are incapable of swimming against a current.
- .13 *Confidence interval* means a statistical measure of the number of times out of 100 that test results can be expected to be within a specified range. For example, a confidence level of 95% means that the result of an action will probably meet expectations 95% of the time.
- .14 *Operational indicator* means a parameter used to monitor and control the operation of the BWMS as defined during testing for Type Approval, e.g. limit values of physical or chemical parameters such as flow rates, dose, etc.
- .15 *Performance indicator* means a biological parameter (e.g. ATP, *chlorophyll a*, direct counts) used to estimate or measure the performance of the BWMS in achieving the D-2 standard.

3 PRINCIPLES FOR SAMPLING AND ANALYSIS FOR BALLAST WATER DISCHARGES

3.1 All samples and analysis carried out to determine whether a ship is in compliance with the BWM Convention should be performed under reliable and verified QA/QC procedures (note that any method, approach or sampling procedure should be rigorously validated and practicability should be assessed).

3.2 The first premise of any sampling and/or any analysis protocol is to identify the purpose of the protocol, i.e. to prove whether the discharge of a ship is meeting the D-1 standard or meeting the D-2 standard. There are many ways in which this can be done; however, they are limited by:

- .1 the requirements of the methodologies available for sampling the ballast water discharge;
- .2 the methods of analysis of samples being collected;
- .3 the methods involved in statistically processing the results of these analyses;
- .4 the specific operation of the ballast water management system (including when the treatment is applied during the ballast cycle and the type of treatment used); and
- .5 the practicalities of sampling a very large volume of water and analysing it for very low concentrations of organisms.

3.3 Successful sampling and analysis is also based on identifying the viable biological population being sampled and its variability. If this population is homogenous, it is much easier to sample than one that is known to be heterogeneous. In the case of ballast water, the sample is drawn from a discharge with a population that can vary significantly. Consequently, the samples collected for indicative or detailed analysis should be representative samples.

3.4 Sampling a ballast water discharge is restricted even further when parts of the ballast water may have already been discharged. Very few inferences can be made on the quality of that ballast water already discharged based on sampling the remaining discharge as it happens. The challenge is to determine the volume of interest and how to sample it.

3.5 The qualitative difference between indicative analysis and detailed analysis often relies on the level of statistical confidence, which, in detailed analysis may be superior.

3.6 Indicative analysis (using operational or performance indicators) can be undertaken at any time throughout the discharge. In cases where indicative analysis identifies that a system is grossly exceeding the D-2 standard, it may be sufficient to establish non-compliance, however, the practicalities, application and limitations of the methodology being used for indicative analysis need to be understood fully.

3.7 Based on the discussion in paragraph 3.3, two different potential detailed sampling approaches can therefore be considered:

- .1 sampling the entire discharge from a vessel during a port visit. During this approach:
 - .1 it will be impossible, by definition, for vessels to discharge prior to sampling;
 - .2 large numbers of samples are likely to be required over a long period of time;
 - .3 large sample volumes may be required over a long period of time; and
 - .4 sampling personnel would be required on the vessel over a significant period of time; and
- .2 collecting a representative sample of the ballast water being discharged during some chosen period of time, e.g. one sample or a sequence of samples. During this approach:

- .1 the sampling can be developed to fit the situation on board the vessel; and
- .2 a representative sample of the discharge can be taken, and that volume can be selected in many ways, providing the opportunity for identifying and sampling specific volumes of the discharge if appropriate, e.g. choosing a percentage of the discharge or sampling duration.

3.8 The D-2 standard expresses a low concentration of organisms to identify in the analysis. The confidence in the result of any sampling and analysis depends on the error inherent in the sampling method and on the error inherent in the method used for analysing the sample. The cumulative error of both must be taken into account when evaluating the result.

3.9 The tables in sections 4.1, 4.2 and 4.3 set out the range of methodologies and approaches, currently identified for use to analyse ballast water discharges and how they relate to the specific sampling protocols in section 4.4. These methodologies and approaches are stand-alone techniques that need to be combined with specific sampling protocols. These protocols should recognize the limitations of each methodology, its inherent sampling requirements, and how it can fit into a comprehensive sampling protocol for compliance testing.

3.10 Although some methodologies and approaches used in type approval testing may also be applicable in compliance testing, the latter, especially indicative sampling, may also require other approaches.

Table 1

Definition and differences between indicative and detailed analysis for the D-2 standard

	Indicative analysis	Detailed analysis
Purpose	To provide a quick, rough estimate of the number of viable organisms	To provide a robust, direct measurement of the number of viable organisms
Sampling		
Volume	Small or large depending on specific analysis	Small or large depending on specific analysis
Representative sampling	Yes, representative of volume of interest	Yes, representative of volume of interest
Analysis method		
Analysis parameters	Operational (chemical, physical) and/or performance indicators (biological)	Direct counts (biological)
Time-consuming	Lower	Higher
Required skill	Lower	Higher
Accuracy of numeric organism counts	Poorer	Better
Confidence with respect to D-2	Lower	Higher

4 METHODOLOGIES FOR COMPLIANCE TESTING UNDER THE BWM CONVENTION

4.1 Table 2: Analysis methods that may provide an indication of compliance with the D-1 standard¹

Indicator	General approach	Standard method	Notes	Level of confidence or detection limit and citation for validation studies
Salinity	Conductivity meter to monitor salinity.	No international standard for ballast water analysis at this time although standard methods for measuring salinity do exist.	External elements can affect the salinity.	To be determined.
Salinity	Refractometer to monitor salinity.	No international standard for ballast water analysis at this time although standard methods for measuring salinity do exist.	Temperature can affect the readings.	To be determined.
Types of organisms in discharge – oceanic, coastal, estuarine or fresh water	Visual identification.	No international standard for ballast water analysis at this time.	Expensive, time-consuming, needs extensively trained personnel; may produce false results if encysted organisms from previous ballasting operations hatch.	To be determined.
Turbidity	Portable turbidity sensors.	No international standard for ballast water analysis at this time.	Requires understanding of turbidity characteristics in relation to the distance from shore.	To be determined.
Dissolved Inorganic and Organic constituents (Nutrients, metals coloured dissolved organic matter (CDOM))	Portable nutrient sensors.	No international standard for ballast water analysis at this time.	Requires understanding of inorganic or organic constituent characteristics in relation to the distance from shore.	To be determined.

¹ Additional information can be found in document BLG 16/4.

4.2 **Table 3: Indicative analysis methods for use when testing for potential compliance with the D-2 standard²**

Indicator	General approach	Standard method	Notes	Level of confidence or detection limit and citation for validation studies
Viable organisms $\geq 50 \mu\text{m}$	Visual counts or stereo-microscopy.	No international standard for ballast water analysis at this time.	Can be expensive and time-consuming, needs moderately trained personnel. (Note that OECD Test Guideline for Testing of Chemicals 202, "Daphnia sp. Acute immobilization test and reproduction test" could be used as basis for standard methodology.)	To be determined.
Viable organisms $\geq 50 \mu\text{m}$	Visual inspection.	No international standard for ballast water analysis at this time.	Visual inspection is likely to only register organisms bigger than 1,000 micro-metres in minimum dimension.	To be determined.
Viable organisms $\geq 10 \mu\text{m}$ and $< 50 \mu\text{m}$	Variable fluorometry.	No international standard for ballast water analysis at this time.	Only monitors photosynthetic phytoplankton and thus may significantly underestimate other planktonic organisms in this size fraction.	To be determined.
Viable organisms $\geq 50 \mu\text{m}$ and $\geq 10 \mu\text{m}$ and $< 50 \mu\text{m}$	Photometry, nucleic acid, ATP, bulk fluorescein diacetate (FDA), <i>chlorophyll a</i> .	No international standard for ballast water analysis at this time.	Semi-quantitative results can be obtained. However, some of these organic compounds can survive for various lengths of time in aqueous solution outside the cell, potentially leading to false positives. Welschmeyer and Maurer (2012).	To be determined.
Viable organisms $\geq 50 \mu\text{m}$ and $\geq 10 \mu\text{m}$ and $< 50 \mu\text{m}$	Flow cytometry.	No international standard for ballast water analysis at this time.	Very expensive.	To be determined.
Enterococci	Fluorometric diagnostic kit.	No international standard for ballast water analysis at this time.	Minimum incubation time 6 h. Semi-quantitative results from portable methods (see paragraph 2.2.2 of annex 1).	To be determined.
<i>Escherichia coli</i>	Fluorometric diagnostic kit.	No international standard for ballast water analysis at this time.	Minimum incubation time 6 h. Semi-quantitative results from portable methods (see paragraph 2.2.2 of annex 1).	To be determined.
<i>Vibrio cholerae</i> (O1 and O139)	Test kits.	No international standard for ballast water analysis at this time.	Relatively rapid indicative test methods are available.	To be determined.
Viable organisms $\geq 50 \mu\text{m}$ and $\geq 10 \mu\text{m}$ and $< 50 \mu\text{m}$	Pulse counting fluorescein diacetate (FDA).	No international standard for ballast water analysis at this time.	Sampling kit can be larger than that for bulk fluorescein diacetate (FDA).	To be determined.

² Additional information can be found in document BLG 15/5/4.

4.3 Table 4: Detailed analysis methods for use when testing for compliance with the D-2 standard

Indicator	General approach	Standard method	IMO citation	Notes	Level of confidence or detection limit and citation for validation studies
Viable organisms $\geq 50 \mu\text{m}$ and $\geq 10 \mu\text{m}$ and $< 50 \mu\text{m}$	Visual counts or stereo-microscopy examination. May be used with vital stains in conjunction with fluorescence + movement.	No international standard for ballast water analysis at this time, but see US EPA ETV Protocol, v. 5.1	BLG 15/5/5 and BLG 15/5/6 BLG 15/INF.6	Can be expensive and time-consuming, needs trained personnel. (Note that OECD Test Guideline for Testing of Chemicals 202, "Daphnia sp. Acute immobilization test and reproduction test" could be used as basis for standard methodology.)	To be determined.
Viable organisms $\geq 10 \mu\text{m}$ and $< 50 \mu\text{m}$	Visual counts with use of vital stains.	No international standard for ballast water analysis at this time, but see US EPA ETV Protocol, v. 5.1	BLG 15/5/10 (method) BLG 15/5/5 and BLG 15/5/6 (approach) MEPC 58 /INF.10	Requires specific knowledge to operate them. It should be noted that there may be limitations using vital stains with certain technologies.	To be determined. Steinberg et al., 2011
Viable organisms $\geq 10 \mu\text{m}$ and $< 50 \mu\text{m}$	Flow cytometers (based on <i>chlorophyll a</i> and vital stains).	No international standard for ballast water analysis at this time.	BLG 15/5/5 and BLG 15/5/6	Expensive and require specific knowledge to operate them. It should be noted that there may be limitation using vital stains with certain technologies.	To be determined
Viable organisms $\geq 50 \mu\text{m}$ and Viable organisms $\geq 10 \mu\text{m}$ and $< 50 \mu\text{m}$	Flow cameras (based on <i>chlorophyll a</i> and vital stains).	No international standard for ballast water analysis at this time.	BLG 15/5/5 and BLG 15/5/6	Expensive and require specific knowledge to operate them. It should be noted that there may be limitations using vital stains with certain ballast water management systems.	To be determined





Indicator	General approach	Standard method	IMO citation	Notes	Level of confidence or detection limit and citation for validation studies
Viable organisms $\geq 50 \mu\text{m}$ and Viable organisms $\geq 10 \mu\text{m}$ and $< 50 \mu\text{m}$	Culture methods for recovery, regrowth and maturation.	No international standard for ballast water analysis at this time.	BLG 15/5/5 and BLG 15/5/6	<p>Require specific knowledge to conduct them.</p> <p>Densities are expressed as Most Probable Numbers (the MPN method).</p> <p>Most species do not manage to grow using this method therefore cannot be used alone. 2-3 weeks incubation time needed.</p>	To be determined
Enterococci	Culture methods.	ISO 7899-1 or ISO 7899-2	BLG 15/5/5 and BLG 15/5/6	Requires specific knowledge to conduct them. At least 44-h incubation time. EPA Standard Method 9230	To be determined.
<i>Escherichia coli</i>	Culture methods.	ISO 9308-3 or ISO 9308-1	BLG 15/5/5 and BLG 15/5/6	Requires specific knowledge to conduct them. At least 24-h incubation time. EPA Standard Method 9213D	To be determined.
<i>Vibrio cholerae (O1 and O139)</i>	Culture and molecular biological or fluorescence methods.	ISO/TS 21872-1/13/	BLG 15/5/5 and BLG 15/5/6	<p>Requires specific knowledge to conduct them.</p> <p>24-48 h incubation time. US EPA ETV Fykse et al., 2012 (semi-quantitative pass/fail-test)</p> <p>Samples should only be cultured in a specialized laboratory.</p>	To be determined.
Enterococci, <i>Escherichia coli</i> , <i>Vibrio cholerae (O1 and O139)</i>	Culture with 11holera11ence-in-situ hybridization (FISH)	No international standard for ballast water analysis at this time.		Requires specific knowledge to conduct them. Quantitative and qualitative results after 8 h. Samples should only be cultured in a specialized laboratory.	To be determined.





Indicator	General approach	Standard method	IMO citation	Notes	Level of confidence or detection limit and citation for validation studies
Viable organisms $\geq 50 \mu\text{m}$ and viable organisms $\geq 10 \mu\text{m}$ and $< 50 \mu\text{m}$	Visual counts using stereo-microscopy examination and flow cytometry.	No international Standard for ballast water analysis at this time.	BLG 17/INF.15	A Sampling Protocol that identifies whether a system is broken or not working and producing a discharge that is significantly above the D-2 standard. Designed to detect gross non-compliance with 99.9% confidence. Needs to be Validated.	To be determined.

4.4 Table 5: General approaches for sampling use when testing for compliance with the BWM Convention

General approaches for sampling	Discharge line or BW tank	Citation for validation study or use	Sample error and detection limit	Relative sample error amongst approaches
Filter skid + isokinetic sampling	Discharge line	Drake et al., 2011; First et al., 2012 (land-based testing); shipboard validation underway, Prototype 01, SGS	To be determined	Lower
Cylinder containing plankton net + isokinetic sampling	Discharge line	MEPC 57/INF.17	To be determined	Lower
Sampling tub containing plankton net + isokinetic sampling	Discharge line	Gollasch, 2006 and Gollasch et al., 2007; Cangelosi et al., 2011	To be determined	Lower
Continuous drip sampler + isokinetic sampling	Discharge line	Gollasch and David, 2010, 2013	To be determined	Lower
Grab sample	BW tank	David and Perkovic, 2004; David et al. 2007, BLG 14/INF.6	To be determined	Higher

4.5 **Table 6: Sampling and analysis methods/approaches for use when testing compliance with the BWM Convention. A checkmark indicates an appropriate combination of sampling and analysis.**

Analysis type size class or indicator microbe analysis method/approach	Filter skid + isokinetic sampling ³	Plankton net + isokinetic sampling	Continuous drip sampler + isokinetic sampling	Grab sample
<u>Indicative Analysis</u> ≥ 50 µm Visual inspection Stereomicroscopy counts Flow cytometry Nucleic acid ATP <i>Chlorophyll a</i> , Bulk FDA	✓	✓		
<u>Indicative Analysis</u> < 50 µm and ≥ 10 µm variable fluorometry Flow cytometry Nucleic acid ATP <i>Chlorophyll a</i> , bulkBulk FDA			✓	✓
<u>Indicative Analysis</u> Enterococci, <i>E. coli</i> Fluorometric diagnostics			✓	✓
<u>Indicative Analysis</u> <i>Vibrio 14holera</i> Test kits Culture methods + microscopy			✓	✓
<u>Detailed Analysis</u> ≥ 50 µm Stereomicroscopy counts Flow cytometry/Flow camera	✓	✓		
<u>Detailed Analysis</u> < 50 µm and ≥ 10 µm Visual counts + vital stain(s) Flow cytometry/Flow camera Culture methods			✓	
<u>Detailed Analysis</u> Enterococci, <i>E. coli</i> Culture methods FISH with pre-cultivation			✓	
<u>Detailed Analysis</u> <i>Vibrio 14holera</i> Culture methods FISH with pre-cultivation			✓	

³ Methods other than using an isokinetic approach as defined in Guidelines (G2) for acquiring a representative sample may be used in certain circumstances. Such methods should be validated prior to use.

4.6 References

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ANNEX 2

TECHNICAL DISCUSSION FOR THE GUIDANCE TO BALLAST WATER SAMPLING AND ANALYSIS IN ACCORDANCE WITH THE BWM CONVENTION AND GUIDELINES (G2)

1 INTRODUCTION

1.1 The purpose of this annex is to provide background information on:

- .1 the development and use of methodologies for both indicative and detailed analysis and appropriate sampling; and
- .2 analysis of the sample at an accredited laboratory.

1.2 This annex highlights the advantages, disadvantages and limitations of many different measures. Although recommendations are given in this document on what methodologies may be used, there are distinct benefits in using certain technologies at certain times. This should not stop the use of any of the methodologies, as long as the limitations are taken into account.

1.3 Any methods for analysis used for assessing compliance with the BWM Convention should be carefully validated under a range of operating conditions.

2 INDICATIVE ANALYSIS: METHODOLOGY AND APPROACHES

2.1 The D-1 standard

2.1.1 The D-1 standard requires the vessel to exchange its ballast water 200 nm from the coastline in waters 200 m deep, or if this cannot be achieved for safety reasons, 50 nm from the coastline in waters of the same depth. Therefore, the water in exchanged ballast water should have a similar salinity to that of mid-ocean water.

2.1.2 Indicative analysis for the D-1 standard of the BWM Convention could rely on the chemical parameters (e.g. salinity) of the water in the ballast water discharge, or on an estimate of species present. However, the latter might need trained personnel. If the ballast water discharge being tested has a salinity significantly less than that of 30 PSU, then it is likely that the ballast water has not been exchanged en route under the conditions required in the D-1 standard, or that the exchange has not been completed successfully.

2.1.3 Two exceptions to this are:

- .1 when ballast water is taken up in port areas that are located in high-salinity environments, above 30 PSU. In such a case ballast water with a PSU of 30 may not originate from mid-ocean waters and therefore the ship may not be compliant with the D-1 standard; or
- .2 when ballast water has been exchanged in designated ballast water exchange areas within 50 nm from the coastline in waters that may be of less salinity than the mid-ocean water. In this case the ballast water exchange would be compliant.

Therefore, the origin of the last ballast water exchange should be known before interpreting the results of salinity analysis.

2.1.4 Checking salinity could be backed up by further analysis of the organisms in the ballast water discharge to determine the origin of the ballast water; however, this would take time and need experienced staff. This can be done in line with the visual analysis methodologies outlined in paragraph 2.4.3 below. However, it should be noted that there are many external factors that could affect the salinity and the organisms in the ballast water, such as wet sediments in the ballast tanks, the state of the tide in the port concerned during its uptake and the fact that exchange may not remove all coastal organisms.

2.1.5 There are many ways to quickly and easily monitor the salinity of water on the market, and generic salinity measures should be used for indicative analysis.

2.2 Bacteria levels in the D-2 standard

2.2.1 Bacterial levels could be tested by a wealth of available portable methods. However, as the D-2 standard for bacteria is measured in colony forming units (CFU), the systems utilized may have to include a specific incubation time of the samples, which for commercially available systems is never shorter than four hours. Therefore, the time it takes for incubation limits the use of such systems for indicative analysis.

2.2.2 Advances in fluorometric diagnostics have resulted in a methodology that identifies the presence or absence of bacteria in a sample of the ballast water discharge. This methodology is based upon the detection of enzymes produced by the target bacteria in unconcentrated fresh water or marine samples and presently easily portable test kits for *E. coli* and Enterococci are available. This method can identify low levels of bacteria in water samples in less than 10 minutes, but the results are only semi-quantitative, i.e. a low level reading equates to a low level of bacteria. However, although the presence of bacteria can be shown, whether or not these organisms are living (i.e. form colonies) cannot be proven with this method at the present time. These diagnostic methods could be used in indicative analysis if very large numbers of organisms are identified.

2.3 Organisms of less than 50 micrometres and greater than or equal to 10 micrometres in minimum dimension⁴ in the D-2 standard

2.3.1 Methods to measure the organisms in this category of the D-2 standard can be divided into two categories as follows:

- .1 the use of biological indicators for organisms:
 - .1 nucleic acid;
 - .2 adenosine triphosphate (ATP), a coenzyme used as the main energy storage and transfer molecule in the cells of all known organisms; and
 - .3 indicators for the presence of organisms, such as *chlorophyll a*;
- .2 the use of direct counts of living organisms (coupling a means to determine viability and manual or automatic counting of individual organisms).

2.3.2 The presence of nucleic acid or ATP in a sample may be taken as an indication of life, but it should be noted that this nucleic acid or ATP could come from any living organism of any size within the sample. There are no definitive methods available to correlate the amount of nucleic acid or ATP with the amount, or viability of organisms in the sample and, therefore, the presence of these chemicals are limited as an indicative analysis methodology. However, zero measurements of these chemicals may indicate that no organisms are in the sample, i.e. the treatment process was successful and in the D-2 standard is being met. Additionally, if nested filters are used to isolate specific size groups, then ATP, which degrades relatively quickly, can provide an indication of the potential presence of a large concentration of organisms in one size class. If linked to thresholds of ATP concentrations, this can be used to indicate samples which are highly likely to be above the standard.

⁴ The “Minimum Dimension” means the minimum dimension of an organism based upon the dimensions of that organism’s body, ignoring e.g. the size of spines, flagellae or antenna. The minimum dimension should therefore be the smallest part of the “body”, i.e. the smallest dimension between main body surfaces of an individual when looked at from all perspectives. For spherical shaped organisms, the minimum dimension should be the spherical diameter. For colony forming species, the individual should be measured as it is the smallest unit able to reproduce that needs to be tested in viability tests. This should be considered whenever size is discussed in this document.

2.3.3 The same problems occur when using other bio-chemical indicators to monitor the number of organisms in this category. As many of the organisms in this size range are likely to be phytoplankton, an obvious step would be to measure the level of *chlorophyll a*, a photosynthetic pigment which is essential for photosynthesis in the sample. Zero concentrations may indicate that there is no phytoplankton in the sample and chlorophyll *a* may also be a good indicator as to whether a BWMS using an oxidizing process was working to design dosages, as it might be expected to bleach such pigments. However, caution has to be exercised as:

- .1 *chlorophyll a* can persist in seawater outside of a cell, therefore, sampling should only be limited to the particulate phase. However, nucleic acid and ATP can exist in dead organisms, detrital material, senescent or dead cells, decomposing macroalgae, plant detritus from terrestrial ecosystems and other non-living particles, etc.;
- .2 there may be zooplankton in the sample being analysed;
- .3 no cell count can be directly measured from a *chlorophyll a* measurement, as many small cells may provide a similar signal strength to that of fewer bigger cells; and
- .4 no size distinction can be made and the *chlorophyll a* could derive from phytoplankton in the larger size category of the D-2 standard.

As a consequence, direct concentration measurements of this chemical would be difficult to use in indicative analysis. A wealth of portable tools exists to document the *chlorophyll a* content in seawater.

2.3.4 One potential exception is the Pulse-Amplitude Modulated Fluorometer (PAM) which measures the *chlorophyll a* fluorescence in living cells by exciting *chlorophyll a* molecules and registering the subsequent fluorescent signal. Such a response is only available in living cells and it should be noted that this method only provides an indirect measurement of those phytoplankton that use *chlorophyll a* in the sample, in both size categories of the D-2 standard. Testing this methodology on ballast water discharges suggests that there is a correlation between the ratio of variable and maximum fluorescence and the number of phytoplankton in this size category. However, the relationship between fluorescence signals and mixed assemblages of phytoplankton from different locations needs to be validated.

2.3.5 For analysis of organisms above 10 microns in minimum dimension, a flow cytometer may also be used. A common element of these systems is that they automatically count objects, including organisms, per size class in a fluid. The more simplified systems cannot separate organisms from sediment and detritus, or living from dead organisms. More sophisticated systems can also assess organism viability for phytoplankton by using organism stains together with flow cytometry. The separation of living phytoplankton from detrital material and zooplankton is based on the presence of auto chlorophyll fluorescence of phytoplankton cells. It should be noted, however, that using *chlorophyll a* fluorescence as an indicator of living organisms may result in over counting, as the molecule can remain intact for a significant amount of time as has been proved in preparing fixed (dead) samples. The practicability to use such devices on board a ship should be carefully assessed before use. To make a stable stream to produce adequate size of water particles, the device should be set in perfectly horizontal. Also any vibration should be isolated for accurate measurement.

2.3.6 Systems using flow cytometry deliver automated results promptly and may be used to assess the number of living phytoplankton in a sample after treatment with a viability stain. However, readings provided by the flow cytometer should also be examined manually to verify the automated readings. Concerns have been raised by users that the viability of smaller algae may not always be categorized correctly in these systems, as the viability signal may be too low for detection. Other concerns include the efficiency of portable versions and the limited ability of some of them to monitor organisms greater than or equal to 50 micrometres in minimum dimension. Although these systems may become a major tool in the future, there are elements, such as the reliability of portable versions of the systems that limit their use at the present time, which is especially the case for organisms greater than or equal to 50 micrometres in minimum dimension. Also, it is not clear if

the time to analyse a sample is greater than can be allotted in compliance testing. These can be overcome by taking the sample off the ship and using a fixed or mobile system near to the ship or the port.

2.3.7 Visual inspection could be another method of indicative analysis that is a quick and simple way to justify the need for detailed analysis. Taking an appropriate sample, concentrating it if necessary, and visually inspecting it against the light may show living organisms in the sample, but it should be noted that without magnification a visual inspection is likely to result in only organisms greater than or equal to 1,000 micrometres in minimum dimension being detected, unless chains or clumps are formed by colony forming organisms or the density of organisms is sufficiently large to colour the water. An assessment of the viability in such an inspection is limited to complete body movements of the organisms as organ activity and antennae or flagella movements may not be seen. As samples from BWMS that are not compliant are likely to contain organism levels that are orders of magnitude above the D-2 performance standard, visual inspections could be used in indicative analysis. However, it is assumed that only organisms bigger than 1,000 micrometres in minimum dimension may be determined in such way, therefore, its use for this size category is limited.

2.3.8 Visual inspection can also be undertaken using a field stereomicroscope with a low magnification (e.g. x 10). However, this methodology may require concentration of the sample and may need analysis by a trained operator to detect viable organisms. It should also be noted that this methodology would be more efficient and practicable for organisms greater than or equal to 50 micrometres in minimum dimension.

2.4 Organisms greater than or equal to 50 micrometres in minimum dimension in the D-2 standard

2.4.1 Many of the methodologies for monitoring organisms less than 50 micrometres and greater than or equal to 10 micrometres in minimum dimension may also be valid for monitoring organism levels in this category. However, nucleic acid and ATP methodologies encounter the same problems as outlined in paragraphs 2.3.2 and 2.3.3; and monitoring *chlorophyll a* levels, through fluorometers or the PAM methodology described above, has limited value for this size category of the D-2 standard, as the majority of organisms in this category are likely to be zooplankton.

2.4.2 Visual inspections may significantly underestimate the number of organisms in this size category due to the issues described in paragraph 2.3.8. However, the method may be robust enough to determine whether the BWMS is working at orders of magnitude above the D-2 standard based on a simple extrapolation from the sample to the D-2 standard. Detailed analysis may be needed to confirm this, especially when levels near the D-2 standard are encountered.

2.4.3 Additionally, stereomicroscopy can also be used to identify viable organisms greater than or equal to 50 micrometres in minimum dimension. The sample should be concentrated appropriately. Viability assessment should be based on movements of intact organisms. This movement may be stimulated. In addition, organ activity should be observed and fully intact non-moving organisms which show organ activity should be counted as living. Stains might also be used to help in viability determination – though methods are still under development. The viable organism numbers should be recorded and the numbers extrapolated up to the total volume of water filtered.

2.4.4 If the results in paragraphs 2.4.2 and 2.4.3 show elevated levels of organisms, then this result will indicate that the D-2 standard is not being met.

2.4.5 Further research must be encouraged; innovative methods for assessing for D-2 compliance, preferably based on in situ, automatic sampling and analytical procedures, should facilitate the most uniform implementation of the BWM Convention.

2.5 Operational indicators

Other indirect parameters and indicators could be used to indicate whether a BWMS is meeting the D-2 standard. These include, but are not limited to, indicators from the electronic self-monitoring of the BWMS

and residual chemicals (or lack of) from the BWMS, such as dissolved oxygen levels, residual chlorine, etc.

3 DETAILED ANALYSIS METHODOLOGIES AND APPROACHES

Once detailed analysis has been instigated by the port State, they should be prepared to undertake full analysis of the sample at an appropriate laboratory.

3.2 Bacteria

3.2.1 There are already international standards in place to analyse for the bacteriological indicators contained within the D-2 standard.

3.2.2 For Enterococci, ISO 7899-1 or 7899-2; or Standard Method 9230 (in the United States) should be used, and ISO 9308-3, ISO 9308-1 or Standard Method 9213D (in the United States) are appropriate for *Escherichia coli*. The methods used should be quantitative and based on a 95-percentile statistical evaluation. The number of laboratory samples should be sufficient to define the mean and standard deviation of Log 10 bacterial enumerations.

3.2.3 For *Vibrio cholerae* ISO/TS 21872-1/13 is appropriate. 100 ml of ballast water should be filtered and incubated according to ISO/TS 21872-1. Analysis needs to be undertaken in a specialist laboratory.

3.3 Organisms of less than 50 micrometres and greater than or equal to 10 micrometres in minimum dimension

3.3.1 Many of the analysis methods used to ascertain the numbers of organisms within this category have already been discussed in section 2. However, section 2 focuses on indicative analysis, rather than the more detailed analysis. Therefore, the following sections examine these methodologies in more detail. Some of these methodologies discussed here also relate to organisms greater than or equal to 50 micrometres in minimum dimension.

3.3.2 Simple upright and inverted microscopes are very useful for the enumeration of morphologically healthy organisms and motile organisms, as well as for measuring the size of organisms. Using this technology needs some skill and experience to evaluate the health of the individual organisms in the sample. However, this technology and experience should be available globally.

3.3.3 Fluorescence generated from photosynthetic pigments can be used for more detailed analysis of the morphological health of organisms and for the evaluation of stained organisms and a microscope with fluorescence capabilities is needed. However, this methodology only identifies phytoplankton (both living and dead) in the sample and makes no size differentiation. Zooplankton should be analysed through the methods highlighted in section 3.4.

3.3.4 Fluorescein di-acetate (FDA), chloromethylfluorescein diacetate (CMFDA) and Calcein-AM vital stains have both been used to determine viability. When non-specific esterases (enzymes found in live cells) are present, they cleave the acetate groups from the stains, and the resultant fluorescein molecules fluoresce green when illuminated with a blue light from an epi-fluorescence microscope. This method works best with live samples. Microscopes with a fluorescence capability and operators with skills and experience of analysis should be available at universities and research laboratories worldwide. However, it should be noted that these stains do not always work on all species or at all salinities and further research to validate this approach may be needed to support the use of these stains for this type of analysis.

3.3.5 Flow cytometers are advanced technologies which can be used in a laboratory to determine size, and viability of organisms in ballast water when a reliable vital stain(s) is (are) used to indicate organism viability. Cytometer detected particles, including organisms, can be processed visually or by a computer to quantify viable organisms in that sample. These systems reduce manual labour, but require specific knowledge to operate them. High particle loads in ballast water may reduce the detection limits of these

methodologies and the volume of samples analysed. At present, portable versions of these technologies have not fully been proven for use on ballast water discharges, however, samples could be taken off the ship and analysed using a fixed or mobile system near to the ship or the port.

3.3.6 Regrowth experiments, in which the visual appearance of photosynthetic organisms in a sample is followed by a specific period in order to quantify the Most Probable Number (MPN), are methods to evaluate the number of organisms in a sample. However, these are slow and are work intensive. In addition, a major drawback of this methodology may be that specific growth factors during the incubation may not be fulfilled, giving a risk of bias. Regrowth and reproduction may be seasonably variable, giving different results at different times. Further, a viable organism may be in good health and reproducing rapidly, or in poor health, not reproducing until health has improved. Finally, this is likely to be time-consuming.

3.3.7 Bulk parameter measurements, such as photosynthetic activity, are also not suitable for detailed analysis (please see paragraphs 2.3.2 and 2.3.3), but can be used as supporting data for other methods used to determine the number of viable organisms in the ballast water samples.

3.3.8 Planktonic organisms may be fragile and samples may need to be concentrated further to aid the accurate quantification of organisms. There are many methods to achieve this, however, care has to be taken to reduce physical stress as this may result in reduced viability levels. A simple, rapid, flexible and cautious method for concentrating plankton cells is the use of transparent membrane filters. If the sample analysis is performed on board the sample can be filtered directly on to this membrane, which can subsequently be placed directly under a microscope for examination. The sample volume to be analysed would need to be adjusted depending on the cell density, however, live, vital stained and fixed organisms within this size category can be evaluated on these filters. If the representative analysis is performed at a laboratory, this process for concentration should be performed at the laboratory just before starting the staining process to avoid under-estimate of viable organisms. Importantly, the loss (if any) of organisms (i.e. those cells passing through the filter and recovered in the filtrate) would need to be determined. Alternatively, a filter mesh may be used to concentrate the sample and the concentrated organisms may, after filtration, be transferred into an observation chamber. Again, the loss of organisms through damage must be quantified.

3.4 Organisms greater than or equal to 50 micrometres in minimum dimension in the D-2 standard

3.4.1 Paragraphs 3.3.2 to 3.3.8 are also applicable to the analysis of organisms in this size category.

3.4.2 In addition, the following issues need to be considered when developing a methodology for analysing organism numbers in this size category:

- .1 testing the sample for movement and response to different stimuli are simple techniques for the examination of viable/dead zooplankton under a stereomicroscope. The observation for organ activity, such as heartbeats, may also contribute to the viability assessment. The use of a filtering mesh (e.g. 50 microns in diagonal dimension) under the Petri dish of the stereomicroscope, or the addition of 50 micron micro beads to the sample, may help with size calculations and vital stains may also add value to these methodologies. Separate guidelines on this issue are being developed through the land-based facilities and the ETV protocol in the United States;
- .2 methods using a combination of flow cytometry and microscopy have the disadvantage of high complexity, high price and small sample sizes, which means the ballast water samples would have to be concentrated further; and
- .3 the storage condition and time before analysis is likely to be critical to reduce mortality in the sample.

3.4.3 It is therefore recommended that simple microscopic examination of organisms in this size category is used for compliance monitoring. The microscopic examination of organisms is a robust, simple and cheap methodology which can be completed in laboratories worldwide.

4 SOURCES OF ERROR

4.1 The ideal method for compliance monitoring is a procedure that:

- .1 detects organisms in the ballast water discharge;
- .2 has an appropriate limit of detection;
- .3 is precise;
- .4 is accurate;
- .5 is economical;
- .6 is quick;
- .7 can be carried out with minimal technical expertise; and
- .8 can be obtained in all parts of the world.

However, any result obtained would have to include confidence limits based on both the sampling error and analytical error.

4.2 Sources of error include, but are not limited to, errors arising within:

- .1 sampling, including:
 - .1 sample loss (e.g. during filtration);
 - .2 incorrect use of equipment;
 - .3 day-to-day variations in the conditions in which the sampling is taking place; and
 - .4 the experience of the technicians;
- .2 processing the sample, including:
 - .1 incorrect use of equipment;
 - .2 day-to-day variations in the conditions in which the sampling is taking place; and
 - .3 the experience [and fatigue] of the technicians;
- .3 analysis of the sample:
 - .1 incorrect use of equipment;
 - .2 the experience [and fatigue] of the technicians;
 - .3 day-to-day variations in the conditions in which the sampling is taking place;
 - .4 the number of organisms counted. The distribution of organisms in a range of samples usually follows the Poisson distribution and higher numbers of samples give a lower relative variation and sample error;

- .5 the inherent variation and errors arising from the methods used for analysis. This is especially so when the evaluation of organism numbers in a sample is based on manual counting methods due to human error. For example, although the definition of the minimum dimension of an organism in Guidelines (G2) is quite detailed, analytical results may be influenced by practical issues. These include situations when the size of an organism is determined on a two dimensional microscope, which cannot view the organism “from all perspectives”; and
- .6 poor harmonization between laboratories and quality control within the laboratory. In the field of chemical analysis, inter-laboratory calibration occurs and is tested. Inter-laboratory calibration of biological samples is also common practice, but the difficulty in the compliance monitoring context is that the viability of the organisms needs to be documented and the viability may be impaired by the mode and duration of sample shipments to different laboratories. Therefore, laboratories should be well managed, and uncertainty limits (the analysis variation) should be calculated for each laboratory. This should be achieved in conjunction with ISO 17025, which provides a standard for the general requirements needed by laboratories to prove they are competent to carry out tests and/or calibrations, including sampling.

4.3 The variation arising from sampling should be added to that from analysis to determine the confidence limits within which the true value of the organism number lies. This has an important bearing on how the result can be used for enforcement of the BWM Convention.

4.4 The sampling uncertainty can be obtained by setting up a null-hypothesis, that is a general or default position that is expected in the results, e.g. the average concentration of organisms is equal to the D-2 standard at a selected level of significance and then the data would be analysed using one of the following tests:

Table 1: Statistical handling of the results

Distribution of the results	Test	Notes
Normal distribution	t-test	It is unlikely this test will be used, as it is not used with “rare” populations, i.e. the expected population of organisms in treated ballast water
A distribution that is not normal	Non-parametric Wilcoxon rank test	Not normal due to the small number of samples
Poisson distribution	Chi-square test	Used when the analytical results are treated as one sample (i.e. the numbers of organisms over the entire volume are very rare [low] and combined).

Ideally, an analysis of the distribution should be performed before the data are statistically evaluated.

4.5 There has been much discussion within IMO on whether the results of the analysis should be averaged to assess compliance or that every result should have to meet the D-2 standard. This is a unique debate at IMO due to the biological nature of the subject matter being analysed, and different States have significantly different views on this issue. Therefore, it will be very difficult to arrive at a conclusion as in the case of non-compliance the results of the analysis are likely to be used in the legal jurisdictions of each IMO Member State, and each of those States may require different evidence to support any enforcement action.

4.6 If the results of detailed analysis are to be averaged, then both the sample variation and the analysis variation need to be calculated and applied to the result. However, some analysis of the sample variation may be needed, as it may be unacceptably high. For example, for five treated ballast water samples, viable

organism number results of 9,9,9,9 and 9 will provide the same average as 0,0,0,0 and 45. Both systems would pass the D-2 standard, if averaged; however, the variation is considerably bigger for the second set of results and may prove to be unacceptable because of the one large value.

4.7 If each of the results is treated as an individual value that has to meet the D-2 standard, then again the confidence limits would have to be calculated from the sampling and analytical errors. Here if all results are less than the D-2 standard, then the sampling has proved that the BWMS is meeting the standard.

4.8 The basic difference between instantaneous and average approaches is that the results of the average approach describe the variations of the concentration of organisms during the deballasting event, whereas the results of the instantaneous approach describes the variation based on the assumptions of the Poisson distribution. However, the average approach, based on the results of a few samples, has the disadvantage that the variation may be too high, is unacceptable and needs to be improved, which could invalidate the evaluation and lead to inconclusive results.

4.9 The instantaneous approach has the disadvantage that variations in the organism levels at different times of the discharge are not taken into account, which should not be a problem if all the samples meet the D-2 standard. If the discharge is not always under the D-2 standard, the problem can be mitigated by using a flow-integrated sample over set periods of time, which, if taken properly, represents an average of the organisms in the treated ballast water over that time when presented with variance estimates and confidence intervals. This constitutes a better representation of the ballast water quality than separate samples. In addition, a lower variation should be obtained because a larger sample is being analysed. The average approach is likely to have the same disadvantages unless the samples are very large and collected over most of the discharge.

4.10 The differences between applying an instantaneous sampling regime or an average sampling regime to the result are less extreme when taking numerous flow-integrated samples. This is because for each discharge there will be a number of results arising from samples that have been averaged over a specific time.

5 DETAILED ANALYSIS: THE SAMPLE PROTOCOL

5.1 Sample protocols for discharges of treated ballast water through a distinct discharge point fall into two categories, the first based on specified and replicated volumes and the second based on flow integration over a specified time. The first entails taking a specific number of set volumes of the ballast water discharge, whilst the second takes a continuous sample over a set time period. The flow integration sampling protocol can be achieved by either continuously sub-sampling a small amount throughout the entire duration of the discharge, therefore, collecting one sample over time, or taking multiple sub-samples over a specific time scale (i.e. 5 minutes, 10 minutes or 15 minutes) repeatedly throughout the discharge, providing a result for each sub-sample.

5.2 However, for sampling protocols based on specified and replicated volumes, defining both the number of samples and their volume to ensure representativeness, takes time. As a representative sampling procedure is needed to ensure compliance with the BWM Convention, then the flow integration protocols based on set times should be implemented.

5.3 Using a sampling protocol that continuously sub-samples small amounts throughout the entire duration of the discharge, may significantly underestimate the amount of larger organisms (i.e. organisms greater than or equal to 50 micrometres in minimum dimension) in the sample due to damage to the organisms held in the cod-end of the filter. If such a system is used then a protocol for replacing the cod end needs to be developed.

5.4 The arrangements for detailed analysis should take into account the requirements of the methods and/or approaches they intend to use for detailed and/or indicative analysis. Special consideration should be given and contingencies arranged for sampling in remote ports, where it is likely to take time to mobilize samplers and sampling resources.

6 DETAILED METHODOLOGY

6.1 As described in paragraph 5.1, there are two distinct ballast water sampling protocols, one based on flow integration and one based on the use of specified and replicated volumes. As they both use filtration and concentration of the sample the following section can apply to both methods.

6.2 For in-line sampling, a sampling system should be set up which:

- .1 collects organisms greater or equal to 50 μm ;
- .2 allows samples of the ballast water to be taken and filtered;
- .3 enables the amount of ballast water sampled to be measured to allow for extrapolation of the results; and
- .4 allows the filtered ballast water to be discharged safely without affecting the stability and safety of the ship, its crew and the samplers or other discharges from the vessel such as bilge water.

IMO BWM.2/Circ.40 of 8 October 2012

Issuance of Ballast Water Management Certificates prior to entry into force of the BWM Convention and Ballast Water Management Plans approved according to resolution A.868(20)

1. The Marine Environment Protection Committee, at its sixty-fourth session (1 to 5 October 2012), recalling the conclusions of MEPC 63, approved the dissemination of a circular on issuance of Ballast Water Management Certificates prior to entry into force of the BWM Convention (MEPC 64/23, paragraph 2.38.8).
2. Member Governments are invited to advise the Organization on the progress made after the conditions for entry into force of the BWM Convention have been met and prior to the actual entry into force of the Convention.
3. Flag States, port States and international organizations are invited to bring the annexed Guidance to the attention of all parties concerned.

ANNEX

ISSUANCE OF BALLAST WATER MANAGEMENT CERTIFICATES PRIOR TO ENTRY INTO FORCE OF THE BWM CONVENTION AND BALLAST WATER MANAGEMENT PLANS APPROVED ACCORDING TO RESOLUTION A.868(20)

1. With regard to the issuance of International Ballast Water Management Certificates prior to entry into force of the BWM Convention, the Committee noted the concern that the Convention allows no phase-in period for ships constructed prior to the entry into force of the Convention to comply with its provisions. This would result in all ships of 400 gross tonnage and above to have on board an approved Ballast Water Management (BWM) Plan and be surveyed and certificated immediately on the entry into force of the Convention.
2. The Committee agreed that it would be impracticable, for those responsible, to prepare, review and approve BWM Plans and survey and certify all ships of 400 gross tonnage and above within the 12-month period between the date when the conditions for entry into force have been satisfied and the actual entry-into-force date of the Convention.
3. To address this impracticality, MEPC 63 endorsed the conclusion of the Ballast Water Review Group with regard to Contracting Governments to the BWM Convention issuing International Ballast Water Management Certificates prior to entry into force of the Convention, provided it is annotated to state that validity begins from the entry-into-force date, combined with a statement issued to the Company when the BWM Plan was received, thereby allowing the vessel to trade for three months with an unapproved BWM Plan on board.
4. Recognizing that regulation B-1 requires the Ballast Water Management Plan to only take into account guidelines developed by the Organization and does not mandate compliance with resolution MEPC.127(53) or resolution A.868(20), and that resolution MEPC.127(53) does not revoke resolution A.868(20), the Committee agreed that whilst the Guidelines adopted after 2004 for the uniform implementation of the BWM Convention have effectively superseded the Guidelines adopted by resolution

A.868(20), for practical reasons, the Ballast Water Management Plans, approved in accordance with resolution A.868(20), should remain valid until the plan requires revision due to the installation of a ballast water management system.

IMO BWM.2/Circ.37 of 14 June 2012**Information that should be made available in proposals for approval of ballast water management systems in accordance with the Procedure for approval of ballast water management systems that make use of Active Substances (G9)**

1. The Marine Environment Protection Committee, at its sixty-third session (27 February to 2 March 2012), concurred with the conclusion of the Ballast Water Review Group regarding the minimum information that should be available in proposals for approval of ballast water management systems in accordance with paragraph 8 of the Procedure for approval of ballast water management systems that make use of Active Substances (G9), as set out in the annex.
2. Member Governments are invited to bring this circular to the attention of all parties concerned.

ANNEX**INFORMATION THAT SHOULD BE MADE AVAILABLE IN THE APPLICATIONS FOR APPROVAL IN ACCORDANCE WITH PARAGRAPH 8 OF THE PROCEDURE FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS THAT MAKE USE OF ACTIVE SUBSTANCES (G9) (THE NON-CONFIDENTIAL INFORMATION TO BE SUBMITTED TO MEPC)**

This document specifies the minimum information that should be contained in an application for Basic or Final Approval in accordance with paragraph 8 of Procedure (G9). It is structured based on the “Methodology for information gathering and the conduct of work of the GESAMP-BWWG” contained in document BWM.2/Circ.13/Rev.1.

The information should be presented in a clear and succinct manner. Tables should be used wherever possible. If it is not possible to submit the relevant information in the proposal for approval due to page limits agreed for MEPC submissions, a separate information document should be used that is submitted at the same time.

1 INTRODUCTION

The terms, definitions and abbreviations used in this document are defined in the “Methodology for information gathering and the conduct of work of the GESAMP-BWWG”, contained in document BWM.2/Circ.13/Rev.1.

2 GENERAL

Whenever literature data is used, full reference information should be provided.

3 APPLICATION DATA SET**3.2 Identification of the Active Substance or Preparation (Procedure (G9))**

- Chemical identification and description of the chemical components even if generated on board.
- A proposal for approval should include a list of the name and relative quantities (in volumetric percentages) of the components.

3.2.1 Preparations

- Name, CAS-number (if applicable), list of components, and concentrations of all hazardous components.

3.2.2 Active Substances

- Name, CAS number, concentration (if applicable: intended minimum and maximum application concentration), purity and identification of impurities (by chemical name and CAS number).

3.2.3 Relevant Chemicals (Procedure (G9), paragraph 2.1.4)

- Results of the chemical analysis of the treated ballast water.
- Name, CAS number, and concentration.
- Provide reasoning why substances were or were not selected for further investigation during risk assessment.

Information on all analysed substances, even if the analytical results were below the detection limits, is desired here. All substances in the treated ballast water that were detected above the detection limit are regarded as Relevant Chemicals and should be evaluated.

Chemical analysis results should be accompanied by a specification of the applied Active Substance concentration, test conditions, characteristics of the test water (temperature (T), pH, salinity, TOC, DOC, TSS), sampling time, handling and storage of samples before analysis, and analytical method.

If chemical analyses were performed during more than one test run, the number of test runs should be stated and results should be reported either in the form of mean values \pm standard deviation or minimum/maximum concentrations measured or individual measurements for each test run. Analytical results should be provided for both treated and control samples.

Reasoning should be provided, based on the documented state of knowledge, on which basis the selection of substances for inclusion in the chemical analysis was made, taking into account the chemical reactivity of the Active Substance and other components of the respective system. For instance, for chlorination systems, a minimal set of potentially relevant substances can be found in document MEPC 59/2/13. A more extensive list can be found in Annex II of the final report of the R&D-project "Proposal for a harmonized Emission Scenario Document on ballast water discharge" (MEPC 62/INF.19).

3.2.4 Other Chemicals

Information on all Other Chemicals (like cleaning agents, chemicals for neutralization, etc.) should be included here.

- Name, CAS number, concentration, and purpose.
- If required (e.g. in case of hazardous properties or qualification according to GHS) a human and an environmental risk assessment should be performed and a justification why such substances are not treated as Relevant Chemicals should be included.

3.3 Data on effects on aquatic plants, invertebrates and fish, and other biota, including sensitive and representative organisms (Procedure (G9), paragraph 4.2.1.1)

The tests for Active Substances, Preparations, Relevant Chemicals and Other Chemicals should be carried out in accordance with internationally recognized guidelines (preferably Organization for Economic Co-operation and Development (OECD) Guidelines for Testing of Chemicals, USA, and other EPA guidelines or other equivalent tests).

3.3.2 Acute aquatic toxicity

- Data (LC50/EC50) for all Active Substances, Relevant Chemicals, Other Chemicals for three different trophic levels for the aquatic compartment (algae, fish, crustaceans), preferably including data on two additional marine taxonomic groups (e.g. echinoderms, molluscs).
- Data should be presented and discussed either on the basis of toxicological tests or existing toxicological knowledge for each end point listed.

3.3.3 Chronic aquatic toxicity

- Data (EC10, NOEC) for all Active Substances, Relevant Chemicals, Other Chemicals for three different trophic levels for the aquatic compartment (algae, fish, crustaceans).
- Data should be presented and discussed either on the basis of toxicological tests or existing toxicological knowledge for each end point listed.

3.3.4 Endocrine disruption

It should be evaluated if any of the substances is an endocrine disrupting chemical using studies or, if none are available, literature data.

3.3.5 Sediment toxicity

To be able to evaluate risk to the sediment data on the partition, coefficient Koc is needed. This is also important for the MAMPEC calculations. If the Koc values are high (trigger: 500 L/kg), it would be desirable to assess sediment toxicity tests or, if these are not available, assess the toxicity using established national or international methods such as the equilibrium partitioning method (EPM) according to the “Technical Guidance Document on Risk Assessment” (TGD) to the European Biocides Directive (Directive 98/83/EC). An evaluation of the PNEC_{sediment} should be included if data indicate the risk of sediment toxicity.

3.3.6 Food web/population effects

The results of section 3.3.6 should be discussed referring to the effects of the substances on the food web here.

3.4 Data on mammalian toxicity (Procedure (G9), paragraph 4.2.1.2)

3.4.1 General

- For proprietary experimental data the applied test method should be specified.
- For each toxicological endpoint, the quality of the available data and the implications of the results should be briefly discussed.

3.4.2 Acute toxicity

- Lethal or limit dose information, exposure route, species.

3.4.3 Effects on skin and eye

- Application form/concentration tested, severity and reversibility of effect, species or in vitro model.
- If tests have not been carried out on account of extreme pH or known or suspected corrosive properties this should be clearly stated and supporting information provided.

3.4.4 Repeated-dose toxicity

- NOAEL or LOAEL, dose range tested, most sensitive effect observed (target organ), test duration, exposure route, species, and sex.

3.4.5 Chronic toxicity

- NOAEL or LOAEL, dose range tested, most sensitive effect observed (target organ), test duration, exposure route, species, and sex.

3.4.6 Developmental and reproductive toxicity

- NOAEL or LOAEL for systemic parental toxicity, effects on reproduction, and developmental effects, dose range tested, most sensitive effect observed, test duration, exposure route, and species.

3.4.7 Carcinogenicity

- NOAEL or LOAEL for tumour and non-tumour effects, dose range tested, most sensitive effect observed, test duration, exposure route, species, and sex.
- If available carcinogenicity classifications are cited, a full verbal description of the relevant classification should be provided as well as the year of the last assessment. It is not appropriate to cite carcinogenicity classifications that have been outdated by more recent relevant experimental data.

3.4.8 Mutagenicity/Genotoxicity

- Experimental model, dose range tested.

3.4.9 Toxicokinetics

3.5 Data on environmental fate and effect under aerobic and anaerobic conditions (Procedure (G9), paragraph 4.2.1.3)

3.5.2 Modes of degradation (biotic; abiotic)

Information on the specific degradation rates (biotic and abiotic) at different salinities and temperatures is desirable for the evaluation of the persistence of all substances and can be used for the MAMPEC calculations. Potential environmental, health and safety consequences of observed degradation rates should be discussed as appropriate.

3.5.3 Persistence and identification of the main metabolites in the relevant media (ballast water, marine and fresh waters)

The results from section 3.5.2 should be discussed here regarding the classification as persistent (PBT-approach) substances. Relevant metabolites should be identified and it should be discussed whether they possess hazardous properties according to the PBT assessment.

3.5.4 Bioaccumulation, partition coefficient, octanol/water partition Coefficient

To be able to evaluate the MAMPEC calculations the octanol-water partition coefficient K_{ow} is needed. The bioaccumulation already is discussed under 3.3.6 and 3.3.7.

3.5.5 Bioavailability/biomagnification/bioconcentration

For the evaluation of the potential for bioaccumulation, the log K_{ow} and/or the bioconcentration factors (BCF) data is needed. Calculation of the K_{ow} according to acknowledged standards, e.g. ACD is acceptable.

A substance is regarded as (potentially) bioaccumulative if the log Kow is >3 and $BCF > 2000$. If the log Kow is above 3, testing of the bioaccumulation potential should be considered. The BCF, for example, could be calculated with the *formulae* 74 and 75 of the TGD (see 3.3.5) using the log Kow. Other established methods for deriving the BCF may be used. Where tests are not applicable, or if $\log Kow < 3$, BCF values may be estimated using (Quantitative) Structure-Activity Relationship ((Q)SAR) models.

3.5.6 Reaction with organic matter

If there are reactions with organic matter these should be discussed. It should be described to what extent this issue was investigated, experimentally or by analysis of available literature data.

3.5.7 Potential physical effects on wildlife and benthic habitats

If there are effects on wildlife and benthic habitats, these should be discussed.

3.5.8 Potential residues in seafood

If there are potential residues in seafood, these should be discussed taking into account the PBT and mammalian toxicity properties of the substances.

3.5.9 Any known interactive effects

It should be described to what extent this issue was investigated, experimentally or by analysis of available literature data. If there are identified or suspected interactive effects, these should be discussed.

3.6 Physical and chemical properties for the Active Substances and Preparations and treated ballast water, if applicable (Procedure (G9), paragraph 4.2.1.4)

3.6.1 To be able to evaluate the fate and behaviour in the environment, a basic data set on the physico-chemical properties of all substances is needed.

3.6.2 Melting point.

3.6.3 Boiling point.

3.6.4 Flammability (flash point).

3.6.5 Density (relative density).

3.6.6 Vapour pressure, vapour density – The Henry's constant in $[Pa \cdot m^3/mol]$ at $20^\circ C$ and the vapour pressure in $[Pa]$ at $20^\circ C$ is needed to be able to evaluate the MAMPEC calculations.

3.6.7 Water solubility/dissociation constant – The solubility in $[g/m^3]$ at $20^\circ C$ is needed to be able to evaluate the MAMPEC calculations.

3.6.8 Oxidation/reduction potential.

3.6.9 Corrosivity to the materials or equipment of normal ship construction.

3.6.10 Auto-ignition temperature.

3.6.11 Explosive properties.

3.6.12 Oxidizing properties.

3.6.13 Surface tension.

3.6.14 Viscosity.

3.6.15 Thermal stability and identity of relevant breakdown products.

3.6.16 Reactivity towards container material.

3.6.17 pH – Since the pH of test waters can influence the formation of disinfection by-products, all chemical analysis results relating to the investigation of by-product formation should be accompanied by a specification of the pH of untreated and treated ballast water.

3.6.18 Salinity – Since the salinity of test waters can influence the formation of disinfection by-products, all chemical analysis results relating to the investigation of by-product formation should be accompanied by a specification of the salinity of untreated and treated ballast water. If water of different sources was mixed or any additives were added to natural test water to achieve the given salinity, this should be specified.

3.6.19 TOC, DOC, % particulate matter – Since the organic carbon and particulate matter content of test waters can influence the formation of disinfection by-products, all chemical analysis results relating to the investigation of by-product formation should be accompanied by a specification of TOC, DOC, and total suspended solids (TSS) of untreated and treated ballast water. If any additives were added to natural test water to achieve the given concentrations, these should be specified.

3.6.20 Other known relevant physical or chemical hazards.

3.7 Analytical methods at environmentally relevant concentrations (Procedure (G9), paragraph 4.2.1.5)

3.7.1 All chemical analysis results should be accompanied by a specification of the applied analytical method, its detection and quantification limits and known potential interferences.

4 USE OF ACTIVE SUBSTANCE OR PREPARATION

4.1 The manner of application

All of the following information is deemed to be relevant for environmental and/or human health protection and should be included in the non-confidential dossier:

- manner of application of the Active Substance or the Preparation, including required dosage and retention time;
- recommended methods and precautions concerning safe handling, use, storage, and transport;
- procedure to be followed in case of fire, and the nature of reaction products, combustion gases, etc.;
- emergency measures in case of an accident;
- an indication of the possibility of destruction or decontamination following release in the marine environment;
- procedures of waste management of the Active Substance;
- the possibility of reuse or recycling;
- the possibility of neutralization;

- conditions for controlled discharge;
- the amount of substance on board ship;
- appropriate risk management measures; and
- an evaluation of proposed risk management measures in respect to the hazards to ship, personnel and the environment.

5 MATERIAL SAFETY DATA SHEETS (Procedure (G9), paragraph 4.2.7)

The classification under GHS should be given for all Active Substances, components of a Preparation, Relevant Chemicals and other by-products. Where a substance is not classified as hazardous under GHS, this should be indicated.

6 RISK CHARACTERIZATION

6.1 Screening for persistence, bioaccumulation and toxicity (Procedure (G9), paragraph 5.1)

This section should include a comparison between the PBT properties of the substances that were already discussed in the sections 3.3.2 (acute toxicity), 3.3.3 (chronic toxicity), 3.5.3 (bioaccumulation) and 3.5.4 (persistence) and the PBT criteria. Again an orientation could be the TGD (section 4.4.2, paragraph 3.5.5). The conclusions from the PBT assessment should be given.

6.2 Evaluation of the treated ballast water (Procedure (G9), paragraph 5.2)

The test conditions should be described in detail (organisms tested, salinities, duration of the test, temperature, organism density, sediment load, etc.). A presentation of the results in tables is desirable. The results should be discussed. In a first step, a conservative approach with no dilution should be discussed; in a second step realistic dilution scenarios (dilution factor according to the GESAMP-BWWG Methodology) should be used. The rationale for taking a conservative approach is that there could be multiple discharges into one location (even though this is not necessarily the case).

The test results to be provided should include all endpoints as appropriate based on the experimental design, e.g. acute 24-hour, 48-hour, 72-hour, and 96-hour Lethal Concentration at which x% of the test organisms die (LCx), No Observed Adverse Effect Concentrations (NOAECs), chronic No Observed Effect Concentration (NOEC) and/or Effect Concentration at which x% of test organisms show effect (ECx).

6.2.3 Determination of holding time

Based on the efficacy, the decay rates and the ecotoxicity tests with treated ballast water the holding time should be determined. It is important to note the range of water temperatures, salinity and other relevant variables at which this holding time is valid.

6.3 Risk characterization and analysis

6.3.1 Prediction of discharge and environmental concentrations

The Predicted Environmental Concentrations (PEC) should be predicted for all substances relevant for the risk assessment preferably using the latest MAMPEC model. The input parameters for the substance properties, the environment and the emission should be stated here. To be able to recalculate the MAMPEC results, screenshots of the input screens are helpful. If no information on the degradation rates is available, no degradation should be assumed in MAMPEC. It should be declared if that was the case. To be able to calculate the PEC/PNEC ratios, the environmental concentrations (maximum concentration) for all substances relevant for the risk assessment should be noted in this section.

6.3.2 Effects assessment

A short summary of the data for ecotoxicity should be provided.

6.3.3 Effects on aquatic organisms

Predicted No Effect Concentrations (PNEC) should be derived using the appropriate assessment factors (AF) according to TGD (section 3.3.1.1). The chosen AFs should be discussed. A tabular overview on the data is desirable.

6.3.4 Comparison of effect assessment with discharge toxicity

A short discussion is eligible whether the discharge toxicity shows any unexpected effects that cannot be explained by the toxicity data of the single substances.

7 RISK ASSESSMENT

7.1 Risk to safety of ship

For corrosion testing, an overview of the evaluation and results should be included and the test duration and the materials and concentrations tested should be clearly stated.

For all potential risks to ship/crew including:

- increased corrosion;
- fire and explosion;
- storage and handling of the substances;
- contact with, or inhalation of, process products; and
- noise.

Minimum relevant information should include the identification and discussion of risks or justification as to why there is no risk.

7.2 Risks to human health

The basic approach followed should be outlined. If specific guidelines were applied, these should be identified. Identified hazards (according to sections 3.2 and 3.4) should be specified.

7.2.2 Health effects in humans

Potential health effects arising from each identified hazard (according to sections 3.2 and 3.4) should be discussed and quantified. Particular attention should be given to the possibility of interactions and/or cumulative effects.

7.2.3 Human exposure scenario

It should be clearly stated which unit operations can be identified for the operation of the BWMS, regardless of their exposure potential. For each unit operation a brief appraisal of the potential of human exposure should be given. Where human exposure cannot be excluded, the exposure scenario should be described in detail and the quantitative exposure estimation should be given for each relevant substance, population group and exposure route, accompanied by information on the input parameters used.

The applied approach for risk characterization should be described and the calculated level of risk should be stated. Envisaged risk reduction measures should be listed together with an evaluation of their effectiveness.

7.3 Risks to the aquatic environment

The calculated PNEC values should be compared with the PECs derived from MAMPEC. A PEC/PNEC ratio greater than 1 indicates a risk for the environment. Appropriate risk mitigation measures should be proposed.

8 ASSESSMENT REPORT (Procedure (G9), paragraph 4.3)

IMO BWM.2/Circ.33 of 8 August 2011

Guidance on scaling of ballast water management systems

1. The Marine Environment Protection Committee, at its sixty-second session (11 to 15 July 2011), approved the Guidance on scaling of ballast water management systems developed by the Sub-Committee on Bulk Liquids and Gases (BLG) at its fifteenth session (7 to 11 February 2011), as set out in the annex.
2. Member Governments and international organizations are invited to bring the annexed Guidance to the attention of all parties concerned.

ANNEX

GUIDANCE ON SCALING OF BALLAST WATER MANAGEMENT SYSTEMS

1 Reference in the Guidelines (G8)

- 1.1 In addition to the definitions given in the Guidelines (G8), the following terms are defined:
 - .1 *Base unit* is a ballast water treatment equipment as defined in the Guidelines (G8).
 - .2 *Scaled unit* is the ballast water treatment equipment that is based on the base unit but has been modified to accommodate a higher or lower treatment rated capacity (TRC).
- 1.2 An equipment review and certification of a scaled system should be undertaken by the Administration. Such a review should be supported by:
 - .1 Mathematical modelling and/or calculations demonstrating that any parameters that would affect system performance are equivalent between base and scaled units; and
 - .2 The results of the environmental tests specified in Part 3 of the Annex to Guidelines (G8), for each configuration of scaled units, should such tests be required by the Administration.
- 1.3 The assumptions made for the scaling of the base unit should be verified for each scaled unit (i.e. discrete models, e.g., 250 m³/h, 500 m³/h, 1,000 m³/h) by testing to the requirements of Part 2 of the Annex to the Guidelines (G8) for shipboard tests (hereafter referred to as shipboard tests). The time required in paragraph 2.2.2.7 of the Guidelines (G8) may be reduced from 6 to 3 months.
- 1.4 The same consideration should be given for scaled systems (i.e. discrete models, e.g., TRC=250 m³/h, 500 m³/h, 1,000 m³/h) that are tested according to the requirements for land-based tests.
- 1.5 In the case where all discrete models are tested according to the requirements for land-based tests, the most vulnerable model should be tested according to the requirements for shipboard tests, to demonstrate the ability of the model to operate in normal ships' conditions.
- 1.6 Combinations of base units and scaled units which have been verified in their performance according to paragraphs 1.2 to 1.5 should be regarded as multiple units mounted in parallel and do not fall within the scope of this document.
- 1.7 Failing to meet the provisions of 1.2 to 1.5, each scaled system should be tested according to the requirements for land-based tests and shipboard tests.

- 1.8 If scaling and shipboard testing is intended to be utilized to type-approve a system beyond its currently approved TRC without land-based testing then the following process applies:
- .1 The documentation specified in paragraph 1.5 should identify the key internal and external performance parameters (e.g., dosage concentration, UV intensity, filter flux density, etc.) required to achieve the system's efficacy, and also specify the physical/environmental conditions and design parameters that affect these.
 - .2 Validated mathematical model and/or calculations should be used to predict that the key performance parameters will be achieved in the scaled unit design and that the fundamental mechanism of operation is not changed.
 - .3 It should be verified through shipboard testing that the scaled unit achieves the critical values of the key performance parameters utilizing the design determined by the model and or calculations identified in subparagraph 1.8.2.
 - .4 Modelling should address the efficacy and environmental impact of the system. The actual chemical analysis for by-products should be performed during shipboard testing, if necessary.
- 1.9 A representative number of scaled systems capacities, taking into account the treatment technology, should be tested according to the requirements for shipboard tests.

2 Reference in the Procedure (G9)

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

3 Issuing of Type Approval for systems using scaled units

- 3.1 The Type Approval Certificate issued by the Administration should include each and every scaled system if the scaling is done according to these procedures.

4 Application to existing Type Approvals involving scaled units

- 4.1 Administrations are encouraged to apply this guidance to systems having received Type Approval involving scaled units prior to the adoption of this guidance to the greatest extent possible.

IMO BWM.2/Circ.32 of 8 August 2011

Applicability of the Ballast Water Management Convention to hopper dredgers

1. The Marine Environment Protection Committee, at its sixty-second session (11 to 15 July 2011), concurred with the conclusion of the Ballast Water Review Group regarding the applicability of the BWM Convention to hopper dredgers and, with a view to facilitating its broad dissemination, approved the text set out in the annex.
2. Member Governments are invited to bring this circular to the attention of all parties concerned.

* * *

ANNEX

APPLICABILITY OF BALLAST WATER MANAGEMENT CONVENTION TO THE WATER IN THE HOPPER AREA OF HOPPER DREDGERS

1. Hopper dredgers can be equipped with one or more large suction pipes, a cargo hold in the form of a hopper, several ballast tanks as well as multiple high-capacity pumps. The “hoppers” are the cargo compartments where the dredged material is contained and transported. Hoppers are not considered to be ballast tanks. For stability requirements, the hoppers are not considered to provide buoyancy. The hopper wall forms part of the vessel hull for construction requirements, and it has the same thickness requirements as the outboard hull.
2. According to Article 1.2 of the Ballast Water Management Convention, **“Ballast Water”** means water with its suspended matter taken on board a ship to control trim, list, draught, stability or stresses of the ship. Water in the hopper is considered as outboard water, i.e. the water is not taken aboard. Furthermore, the water is not used to control trim, list, draught or stresses of the ship. For that reason, water present in the hopper area is not considered as ballast water.
3. Consequently, the Committee concluded that the provisions of the Ballast Water Management Convention are not applicable to the water in the hopper area of hopper dredgers.

IMO BWM.2/Circ.29/Rev.1 of 26 September 2011

**Clarification regarding the application dates contained in regulation B-3
of the BWM Convention**

1. The Marine Environment Protection Committee, at its sixty-first session (27 September to 1 October 2010), approved the amendments to BWM.2/Circ.19 regarding the clarification on the application dates of the ballast water performance standard contained in regulation B-3.1 of the BWM Convention.
2. In considering further clarification on the application schedule of the D-2 standard with regard to ships described in regulation B-3.4, the Marine Environment Protection Committee, at its sixty-second session (11 to 15 July 2011), agreed to add new explanatory text relevant to such ships to Circular BWM.2/Circ.29 and to disseminate the expanded circular as BWM.2/Circ.29/Rev.1. The expanded clarification is set out in the annex.
3. Member Governments are invited to bring this circular to the attention of all parties concerned.

ANNEX

**CLARIFICATION REGARDING THE APPLICATION DATES CONTAINED IN REGULATION
B-3 OF THE BWM CONVENTION**

- 1 Regulation B-3.1 of the Ballast Water Management Convention provides:

“A ship constructed before 2009:

 - .1 with a ballast water capacity of between 1,500 and 5,000 cubic metres, inclusive, shall conduct ballast water management that at least meets the standard described in regulation D-1 or regulation D-2 until 2014, after which time it shall at least meet the standard described in regulation D-2;
 - .2 with a ballast water capacity of less than 1,500 or greater than 5,000 cubic metres shall conduct ballast water management that at least meets the standard described in regulation D-1 or regulation D-2 until 2016, after which time it shall at least meet the standard described in regulation D-2.”
- 2 Regulation B-3.2 of the Ballast Water Management Convention provides:

“A ship to which paragraph 1 applies shall comply with paragraph 1 not later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date of delivery of the ship in the year of compliance with the standard applicable to the ship.”
- 3 The “anniversary date of delivery of the ship in the year of compliance” specified in regulation B-3.2, refers to years 2014 and 2016 indicated in regulation B-3.1. Consequently, ships with a ballast water capacity between 1,500 m³ and 5,000 m³, inclusive, are required to comply with the D-2 standard not later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date of delivery of the ship in 2014 under regulation B-3.1.1; and ships with a ballast water capacity of less than 1,500 or greater than 5,000 m³ are required to comply with D-2 standard not later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date of delivery of the ship in 2016 under regulation B-3.1.2.

4 Regulation B-3.4 of the BWM Convention provides:

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

5 For purposes of implementation, regulation B-3.4 should be interpreted such that ships constructed during or after 2009, but before 2012, with a ballast water capacity of 5,000 cubic metres or more would be required to comply with the D-2 standard not later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date of delivery of the ship in 2016.

IMO BWM.2/Circ.27 of 5 October 2010

Framework for determining when a Basic Approval granted to one ballast water management system may be applied to another system that uses the same Active Substance or Preparation

1. The Marine Environment Protection Committee, at its sixty-first session (27 September to 1 October 2010), approved the Framework for determining when a Basic Approval granted to one ballast water management system may be applied to another system that uses the same Active Substance or Preparation developed by the BLG Sub-Committee at its fourteenth session (8 to 12 February 2010), as set out in the annex.
2. Member Governments are invited to bring this circular to the attention of all parties concerned.

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ANNEX

FRAMEWORK FOR DETERMINING WHEN A BASIC APPROVAL GRANTED TO ONE BALLAST WATER MANAGEMENT SYSTEM MAY BE APPLIED TO ANOTHER SYSTEM THAT USES THE SAME ACTIVE SUBSTANCE OR PREPARATION

1 INTRODUCTION

- 1.1 The “Procedure for approval of ballast water management systems that make use of Active Substances (G9)” (**Procedure (G9)**) provides that, subject to evaluation against the criteria developed by the Organization, an Active Substance or Preparation may be used for Prototype or Type Approval testing for the approval of different ballast water management systems (BWMS).
- 1.2 The objective of this document is to provide guidance for the manufacturers and the Administration, and for other interested parties, in preparing an application based on the use of an original Basic Approval and, for its subsequent evaluation by the GESAMP-BWWG for Final Approval according to Procedure (G9).
- 1.3 An Active Substance or Preparation should be identical to the Active Substance or Preparation that has already received Basic Approval and its treatment concentration should be less than or equal to the original Basic Approval. In addition, any recommendations by the MEPC for the Basic Approval, including neutralization and maximum allowable discharge concentration (MADC) considerations, should be applied.
- 1.4 The document provides a framework including criteria to enable direct comparison of the physical nature of the system, the chemical nature of the Active Substance or Preparation, and the legal and commercially sensitive nature of the information and data being transferred.
- 1.5 When considering an application, the use of an Active Substance or Preparation should be substantially similar to the original application that has gained Basic Approval, as this needs to be considered in the context of the BWMS within which it is used. This is because of the way different systems use the Active Substance or Preparation, that may change the nature of the Active Substance or Preparation itself. For example, hydrogen peroxide can be used as a chemical treatment on its own or as a catalyst in combination with a secondary method.
- 1.6 Any BWMS that has been granted approval to use a Basic Approval from another system is still subject to the Final Approval process, as set out in Procedure (G9).

1.7 Any BWMS seeking to use the Basic Approval from another system should also meet conditions or requirements placed on the original Basic Approval by the Committee.

1.8 Before considering the development of an application to use a Basic Approval from another system, an applicant should consider that the less similarity between the two systems, the more data that will need to be supplied to evaluate the application.

2 DEFINITIONS

For the purpose of this guidance, the definitions in Procedure (G9) apply and:

2.1 **“Applicant”** means any manufacturer or developer working with the Member State or Administration, in the development of a BWMS that intends to use the original Basic Approval for a certain Active Substance in the development of the BWMS.

2.2 **“Substantially similar”** in relation to “use” of an Active Substance or Preparation means the method of application and point of injection of the Active Substance or Preparation to the BWMS are not significantly different to that in the system granted approval.

3 PROCEDURE TO BE FOLLOWED

3.1 The manufacturer seeking to use an original Basic Approval for a BWMS that makes use of an Active Substance or Preparation for the purpose of obtaining a subsequent Final Approval for a BWMS using the same Active Substance or Preparation, should evaluate the extent to which the BWMS meets the criteria specified in this guidance document.

3.2 Proof that legal issues have been properly dealt with should be provided to the Administration by the manufacturer seeking to use the original approval.

3.3 The Administration having received a submission to use an original Basic Approval should review the application, taking into account the guidance in this document. If the Administration is satisfied that such utilization is acceptable, it should advise the Organization of its determination as appropriate. The Organization should circulate the information accordingly.

3.4 The Administration should submit the application for Final Approval to the Organization, as soon as possible in accordance with section 8.2 of Procedure (G9).

3.5 If the GESAMP-BWWG agrees that the application is complete and appropriate, it should proceed to consider the application for Final Approval of the BWMS.

3.6 If the GESAMP-BWWG finds that the application is not complete or is inappropriate, (or both), the GESAMP-BWWG should report their findings, as provided for in Procedure (G9), for consideration by the Committee.

3.7 Under Procedure (G9), the Committee of the Organization will make the final decision on whether to accept the recommendations of the GESAMP-BWWG to reject an approval of any proposal.

4 CRITERIA FOR ASSESSING WHETHER THE ACTIVE SUBSTANCES OR PREPARATIONS ARE IDENTICAL

4.1 The description of Active Substances and Preparations should include chemicals associated with the system, as required by the Procedure (G9) in section 4.1 and listed in detail in relevant sections of the GESAMP-BWWG Methodology, applicable at the time of this assessment.

4.2 If any of the identified chemicals is not listed in the original Basic Approval application, then utilization of Basic Approval is not appropriate.

4.3 The stated concentrations for storage, generation and treatment, as appropriate, of the Active Substances and Preparations should be equal to or less than those in the original Basic Approval application.

4.4 The maximum allowable discharge concentration or the worst case discharge concentration should be equal to or less than those in the original Basic Approval application.

4.5 Analytical data about the composition and structure of the Active Substances or Preparations should be provided to substantiate that the Active Substances and Preparations are identical.

5 MANNER OF APPLICATION OF ACTIVE SUBSTANCE OR PREPARATION

5.1 The BWMS design should be substantially similar including all physical processes used in the system: including method or methodology for dosing ballast water, any mechanical separation used, pumps and pipe work, phase of treatment (e.g., on uptake, discharge or both) and any necessary neutralization.

5.2 Application of the Active Substance and Preparation within the BWMS should be substantially similar, including:

- point of introduction of the Active Substance or Preparation; and
- method of application or generation of the Active Substance or Preparation (e.g., electrolytic generation).

6 GUIDANCE ON LEGAL ISSUES

6.1 A legally binding agreement under which access to information within an original Basic Approval is granted could include:

- .1 name and address of the person to whom the Basic Approval rights are being shared;
- .2 identification of each item of Basic Approval data being shared including:
 - .1 the name of the Active Substance and Preparation or item of data;
 - .2 whether the agreement is an exclusive use agreement, and, if so, when the period of exclusive use protection expires;
 - .3 the name of the person or laboratory that conducted the study;
 - .4 a statement that the applicant and approval holder understand that any false statement may be punishable under international, national or local legislation; and
 - .5 the names, signatures and titles of the applicant and the approval holder, and the date signed;
- .3 in addition, the approval holder should submit to the Administration a notarized statement affirming that the person signing the agreement is authorized by the approval holder to bind the applicant.

6.2 The manufacturer seeking to use the Basic Approval for a BWMS that makes use of an Active Substance or Preparation for the purpose of Final Approval, should ensure that all relevant international, national and local legislation has been complied with.

IMO BWM.2/Circ.21 of 21 July 2009**Engineering Questionnaire on Ballast Water Management Systems**

1. The Sub-Committee on Bulk Liquids and Gases, at its thirteenth session (2 to 6 March, 2009), noted the information provided in document BLG 13/INF.5 (Brazil) regarding an engineering questionnaire on the ballast water management systems.
2. Recognizing that the questionnaire, contained in the annex of document BLG 13/INF.5, might assist interested parties in the evaluation and comparison of different ballast water management systems, BLG 13 agreed that it would be beneficial to prepare a technical circular containing the engineering questionnaire for the information of the interested parties and their future reference.
3. The Marine Environment Protection Committee, at its fifty-ninth session (13 to 17 July 2009), endorsed the view of BLG Sub-Committee and approved the dissemination of the above-mentioned questionnaire through this circular.
4. Member Governments are invited to bring this circular to the attention of all parties concerned.

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ANNEX**ENGINEERING QUESTIONNAIRE ON BALLAST WATER MANAGEMENT SYSTEMS**

The purpose of this Engineering Questionnaire on ballast water management systems is to provide a source of reference to be used by interested parties in order to: select and acquire these systems; develop technical specifications for the purchase and installation of a ballast water management system on board a vessel; design the installation of the ballast water management system for a ship or a group of ships; enable the comparison among different alternatives of ballast water treatment technologies and/or ballast water management systems (applying the same conceptual basis for such purpose); and obtain assistance on other related technical matters.

It is intended to assist ballast water management system manufacturers, vendors or suppliers, and ship designers, shipping companies, shipowners, shipbuilders, ship operators, classification societies, Administrations, etc., to better deal with such tasks, improving and speeding up communication between clients and vendors or manufacturers, which is vital to the required technical consultation and negotiation process. Vendors and manufacturers may opt for the confidentiality of some information collected or provided through the questionnaire (by means of setting confidentiality terms and conditions for the interested parties).

Comments: The questionnaire is not intended to be answered by manufacturers and forwarded to IMO for appraisal. Consequently, it does not require the establishment of a large database to be collated by the Organization, containing all the answers to the questionnaire. The purpose of this questionnaire is merely to provide a source of reference to potential buyers, serving as a technical guide only, so as to enable the required consultation, evaluation and comparison between different alternatives of ballast water treatment technologies.

Part 1 Technical form highlighting the basic characteristics and main data about the ballast water management system

The purpose of this form is to present the main characteristics of the ballast water management system to enable a clear and prompt understanding of its more relevant information. Thus, consideration of the group of questions set below will be facilitated, containing more technical details, when addressing engineering tasks.

The following data should be provided by the ballast water management system manufacturer, vendor or supplier:

- 1.1 System: official, commercial and other name;
- 1.2 Manufacturer and supplier: Name(s), full address(es), including electronics;
- 1.3 Ballast water management system description: main components, materials, technologies, treatment processes, functioning ways and basic diagram;
- 1.4 Flow-rate capacities that can be supplied in m^3/h ; normal and maximum flow rate of the system under consideration to be installed on board a particular ship;
- 1.5 Footprint needed for each flow-rate in m^2 , including the footprint required for the particular ship under consideration on board which the installation is intended; system and components weight.
- 1.6 As regards water treatment, provide the following information on how the system operates:
 - 1.6.1 online during ballasting;
 - 1.6.2 online during deballasting;
 - 1.6.3 both the conditions above;
 - 1.6.4 during voyage, either re-circulating the water or not (give details);
 - 1.6.5 directly in the ballast tanks;
 - 1.6.6 other (explain).
- 1.7 Regarding the ballast water treatment principle:
- 1.8 Does the system use an Active Substance(s)?
 - 1.8.1 If so: What are such Active Substances? Are they generated on board ship or supplied to the ship?
 - 1.8.2 If the system does not use an Active Substance(s) but produces/generates such substances, provide details about this process, pertinent safety precautions and recommendations, as well as technical reference about IMO document(s) on system approval, where more details can be obtained.
 - 1.8.3 If the system does not use or produce an Active Substance(s), please provide details on the following:
 - 1.8.4 Does it modify the composition of the treated ballast water?
- 1.9 Does it require storage and handling of chemical products on board for ballast water treatment purposes?

Note: The above information is related to the concern about potential impact on the environment (deballasting site).

1.10 Regarding the possible assembling arrangements for the system on board ship:

1.10.1 Should the system be placed in a concentrated and unique area? Or

1.10.2 Does it allow for the installation of its modules in different locations, optimizing the existing ship's free spaces? Or

1.10.3 Both assembly arrangements are possible.

1.11 Is the system adequate to be installed in dangerous zones or spaces in tankers (such as pump room and/or main deck)?

1.12 Regarding the process required to obtain the type approval certification for the ballast water management system, provide the following information, dates and reference details related to:

1.12.1 The ballast water management system Basic Approval by IMO/MEPC, informing the GESAMP-BWWG meeting when the system, after the evaluation of its active(s) substance(s), was recommended for this approval, the identification numbers of the related IMO/MEPC report that granted this approval and of the non-confidential IMO document submitted to the MEPC, as well as other available pertinent technical references.

1.12.2 The ballast water management system Final Approval by IMO/MEPC, informing the GESAMP-BWWG meeting when the system, after the evaluation of its active(s) substance(s), was recommended for this approval, the identification numbers of the related IMO/MEPC report that granted this approval and of the non-confidential IMO document submitted to the MEPC, as well as other available pertinent technical references.

Note: It is recommended to also include information that corroborates that all the GESAMP-BWWG and MEPC recommendations were properly attended.

1.12.3 The Type Approval Certification by the Administration, informing the Administration and recognized organization/classification society involved and/or responsible for the approval process, providing copy of the granted Type Approval Certificate.

1.12.4 Specify the last versions of Guidelines (G8) and Procedure (G9) applied in the system approval.

1.12.5 Indicate where the land-based tests required by Guidelines (G8) were carried out (place and name of the responsible institution or laboratory).

1.12.6 Indicate the name, type and deadweight of the ship (or ships) where the shipboard tests required by Guidelines (G8) were carried out.

1.13 On what types of ship this ballast water management system can be used? On what types of vessel, and under what conditions, has the system been tested on board?

1.14 What is the deadweight tonnage and ballast capacity that the system can be applied to? (Specify the minimum and maximum values.)

1.15 Provide a reference list about the ships, shipowners, ship operators and shipyards that have already acquired the ballast water management system (confidential treatment is suggested between the parties in negotiation for this kind of information).

1.16 What kind of information is available, i.e. video, technical leaflet or catalogue, computer presentation (with animation) or other source, such as the manufacturer website, to better describe how the ballast water management system, its equipment, and components operates to treat ballast water? Can this material be provided for the interested clients? (Provide comments and details.)

Part 2 Practicability and compatibility with the ship's design, operation and existing systems, as well as other technical details

- 2.1 What are the performance parameters of the system? (Essential to its control.)
- 2.2 Does the system allow for controlling the performance of the treated water as regards the D-2 Standard during the treatment process? If so, describe it.
- 2.3 How long does it take to treat a given volume of ballast water? At what temperatures?
- 2.4 Are post-treatment residence times required before discharge, and if so, what are the required times?
- 2.5 Does the system require complete re-circulation of the ballast water? If complete re-circulation is needed, how many re-circulations are required to meet the requirements of regulation D-2 of the BWM Convention?
- 2.6 Is the system automated? Completely or partially? (Make comments, providing technical details on the automation level and scope and on the system's controls.)
- 2.7 In case yes, how to control? (Algae and/or organisms detector or monitor, corresponding recorder, etc.)
- 2.8 Would this control system be reliable, accurate and sufficiently capable of dispensing with the collection of ballast water samples to check compliance with the D-2 requirements in the laboratory? (With the understanding and acknowledgement of such capacity by port State control inspectors, and with a pertinent certification for this purpose.)
- 2.9 Is the control system also suitable for adjusting the treatment process (such as, for instance, to intensify or reduce the electric current supply to an electrolytic cell used to generate the Active Substance and/or to dose the Active Substance or chemical injection for water treatment)? (In case yes, please provide details.)
- 2.10 In the case of a ballast water management system that requires the Active Substance to be supplied to the ship, is there a dosing pump for the injection of such substance? Is the control of such injection by the dosing pump automatic?
- 2.11 Is the system supplied with devices that facilitate collecting more representative samples of ballast water (in compliance with the Guidelines (G2))? In case yes, provide details.
- 2.12 When the system needs to receive the Active Substance or chemical, indicate the tank capacity required for that (in cubic metres), show the product supply arrangements to the ship and to the system, as well as other related details.
- 2.13 Provide information about the worldwide net of suppliers capable to provide the required Active Substances used by this ballast water management system to the ship. Inform the main ports where this supply can be effectively and promptly done.
- 2.14 Which were the results of the system's environmental tests required by the Guidelines (G8)? Summarize them.
- 2.15 How the shipboard tests required by Guidelines (G8) were performed? Inform the trip conditions, mentioning the ship's route, the ocean areas and latitudes involved, as well as the season and the total period of time for performing these tests. Inform also on which type of ship the shipboard tests were performed and how many trips were made for this purpose.

2.16 Inform if there were some failures during the system's environmental, land-based (these performed at a land-based testing facility) and shipboard tests, which implied on certain modifications and corrections of the ballast water management system under development, and which were the adjustments done to solve them and to obtain the type approval certification for the system.

2.17 What is the additional workload on board introduced by the ballast water management system and the staffing requirements for the system?

2.18 What is the highest sea state in the Beaufort scale in which the system can still operate?

2.19 Does the ballast water management system's operation affect the corrosion rate and the wastage of tanks, pipelines or any other equipment of the ship's ballast system associated with it?

2.20 Can the system be affected by incrustation that could lead to a drop in pressure and/or to a reduction in the flow rate? If so, indicate the percentages.

2.21 Is the system applicable to existing ships?

2.22 What are the installation requirements for the system? What are the system's requirements for deck space, weather-tight space or machinery room space?

2.22.1 Can the system only be installed during a dry-docking period?

2.22.2 Can the system be installed and evaluated while the vessel is alongside the pier, in service or removed from service?

2.23 What are the maintenance requirements for the system?

2.23.1 Can the system only be maintained during a dry-docking period?

2.23.2 Can the system be maintained available dockside?

2.23.3 Is specialist maintenance expertise required and is this available worldwide?

2.24 Are the ship's other functions and systems independent from the ballast water management system's operation?

2.25 Could the system be integrated into the other ship systems?

2.26 What are the calibration requirements of the system?

2.27 What are the results of the following system's environmental tests and evaluations?

2.27.1 exposure to various environmental extreme conditions including heat, cold, humidity, vibration, more critical conditions of ship's list and trim, and power fluctuations?

2.27.2 reliability and durability?

2.28 What is the expected life of the system?

2.29 Regarding land-based and full-scale shipboard tests, describe the experiments, equipment, and system configurations which were used, as well as provide a list of technical documents to be consulted to get additional information on these issues.

2.30 Has the system been assessed, by a competent Authority and/or by a recognized organization, as suitable for onboard application?

2.30.1 for new ships?

2.30.2 for existing ships?

2.30.3 In affirmative case, list all installation approvals that have been granted with the correspondent granting authority (or recognized organization)? (This question is a complement to the question of Part 1 related to “ballast water management system list of reference”.)

2.31 Are there any individual system requirements, which affect the existing layout of the ship, like watertight envelope, generator capacity, etc.?

2.32 What are the requirements for on board storage of component spares and consumables?

2.33 What are the consistency results of multiple manufactured units of a system?

2.34 What type of supply shall the system need for its functioning on board – such as: electric energy (voltage; frequency; expected power required); compressed air (defining the pressure and flow rate); fresh and/or salt water (respective pressures and flow rates), etc?

2.35 Can the system be considered or categorized as an alternative ballast water management system in accordance with the provisions and purposes of the regulation B-3.7 of the BWM Convention? If so, provide further comments and considerations about this issue.

2.36 Can the system be installed on ships with special arrangements of ballast system, such as: bulk carriers with various overboard discharge points for deballasting; and tankers with one submerged pump inside each ballast tank (ships which do not have pump room too)? If so, indicate how and provide details of these special arrangements for installation of the ballast water management system.

Part 3 Safety

3.1 Do the system and its treatment processes present any risks to the health or safety of the crew, in particular to those responsible for operating the system, or even to the passengers, or risks to ship’s safety? If so, describe the risks involved and specify the risk level as either: High; Medium, Low; Negligible; No Risk.

3.2 Are there, for instance, high voltage components, processes involving high heat, cryogenic processes, use of radiation or lasers, chemical reactions whose constituents or by-products present any risks, or high pressure liquids or gases? If so, what safety provisions are incorporated into the design and operating procedures for the system?

3.3 Does the system involve the use of Active Substances or components with special storage or handling needs? If so, how have these needs been addressed, in the system’s operation and maintenance manuals? Furthermore, provide information on the applicable care to be followed and pertinent precautions to be taken into consideration.

3.4 Has a complete risk assessment, related to the installation of the ballast water management system in the intended ship, such as a HAZOP review, been conducted, by a specialized and competent organization? In affirmative case, what were the major safety findings?

3.5 Are there components with dissimilar metals exposed to saltwater? If so, what safeguards have been incorporated to protect the ship’s structures, pipelines, equipment, valves and accessories against corrosion and excessive wastage? How have these needs been addressed, by the system and in the operation and maintenance manuals?

3.6 If the system operates during ballast operations, including uptake, discharge or transfer, are there adequate safety interlocks and failsafe measures to ensure vessel stability and structure is not compromised?

3.7 In the event of a vessel casualty does the system pose any additional risks?

3.7.1 Are there additional risks in the event of flooding?

3.7.2 Does vessel power loss present any additional risks?

Part 4 Biological efficacy, including pathogens

4.1 Present the findings of the system's biological efficacy tests, related to its approval process to type approval certification and compliance with D-2 standard.

4.2 Beyond D-2 requirements, when additional data are available, provide also the following useful information (considering possible additional/unilateral measures to be met).

4.2.1 System capability for the removal, elimination or inactivation of aquatic organisms for the various taxonomic groups, phytoplankton and zooplankton, beyond standard contained in regulation D-2.1, and for pathogens, beyond standard contained in regulation D-2.2 of BWM Convention.

4.2.2 Does the system eliminate:

4.2.2.1 Cysts? If so, describe and quantify.

4.2.2.2 All species or life stages which may present hazard to the aquatic environment? (A uniform way of presenting this information needs to be established.)

4.3 In case ballast water management is carried out during ballasting:

4.3.1 Could there be a re-growth of the organisms already treated during ballasting within the ballast tanks during the ship's subsequent voyage or time?

4.3.2 If so, what could be the estimated progression of the re-growth after 1, 2, 3, 4, 5 and 6 weeks after treatment? What is the recommended solution to ensure the performance standard of the ballast water at deballasting, as required by regulation D-2?

4.4 Can the system's efficacy be compromised if there is an increase in the ballast water's turbidity? If so, please describe the decrease in system's efficacy and performance.

4.5 Inform the percentage of the reduction in sediments that the system allows.

4.6 Concerning the concentration of solids in suspension in ballast water, what were the worst environmental conditions under which the ballast water management system was tested for approval?

4.7 What type(s) of adjustment(s) shall be required to the ballast water management system when it has to operate in environmental conditions more severe than those it was tested for approval? All the steps of these procedures need to be clearly specified.

Part 5 Cost-benefits, economic aspects and efficiency

5.1 What is the system's Capex (capital expenditure; in US\$)? This answer is to be related to one or more specific flow rates (in m³/h) that the system can contemplate.

5.2 Regarding the composition of Capex, what is the known or estimated cost of the system purchase and installation for vessels at the time of construction, and for the retrofitting of an existing vessel?

5.3 What is the system's Opex (operating expenditure; in US\$/1000 m³)? This answer is to be related to the cost of the system to treat a volume unit of ballast water.

5.4 In case of ballast water management system to be installed on board a ship in dangerous areas, such as the pump room and the main deck of oil carriers, there will be an additional cost in relation to the in-

formed Capex? Provide further comments and details about this, inclusive if the ballast water management system, or part of its modulus and components, will have to be adapted and certified for this purpose as explosion proof or intrinsically safe system/equipment. Furthermore, indicate if such adaptation can take some time and what time is estimated for this entire process to be duly carried out and successfully concluded.

5.5 What is the increase of fuel or oil consumption that is introduced by the use of this system on board? (According to ship's type and ballast capacity.)

5.6 What are the known or estimated maintenance costs on an annual basis?

5.7 What are the estimated costs of component spares and consumables on an annual basis?

5.8 What are the known or estimated disposal costs of any wastes, residuals, components or replacement parts?

5.9 When the treatment is done during ballasting, can all ballast water be treated to meet D-2 standard during the ship ballasting without delaying the ballasting operations? If delays to the ballasting operations are caused, indicate the time percentage or the additional hours needed to complete the ballasting operation.

5.10 What are the ship staffing requirements for system operation?

5.11 Could the system be considered efficient in energetic terms?

5.11.1 Which is its efficiency in terms of energy (expressed as units of energy required for treating each cubic metre of ballast water)?

5.11.1.1 Should the energetic efficiency be expressed as a function of the amount of energy required to treat a determined volume of water, or as a function of the power required to treat a determined flow rate of ballast?

5.11.1.2 Another conceptual way to express this energetic efficiency would be in terms of a percentage related to the energy supplied to the system and the energy effectively used in the treatment process.

5.11.1.3 An equipment certification like that used for refrigerators and a few other domestic appliances, in relation to greater or lower energy consumption, could also be considered.

5.11.1.4 Another current concern is to minimize the emission of pollutants, GHG and, mainly, CO₂, to the atmosphere. Present comments and technical details on the system about this.

5.11.2 It is suggested that the supplier of the ballast water management system gives due technical consideration to these above aspects and provides the best information about these issues.

Note: Lloyd's Register Guide on Ballast Water Treatment Technologies uses power in kW/1000 m³ of treated BW.

5.12 When the ballast system is operating at a flow rate lower than its rated capacity (for instance, using only one of two ballast pumps for deballasting), does the ballast water management system allow for adjustments for operating under these conditions in order to be more economic and efficient from the energy standpoint?

5.13 Can the ballast water management system be considered as a process that uses a more advanced, cleaner and environmentally sound technology? (It can be effective, but, also, it can be effective and efficient.)

Part 6 Environmental acceptability and possible impacts of the system's by-products on the environment, crew, passengers and general public health, and resources

- 6.1 Does the system generate by-products that can have an adverse impact:
- 6.1.1 on the environment?
 - 6.1.2 on human health: (a) ship's crew? (b) ship's passengers? (c) general public health in the areas where the ship operates?
 - 6.1.3 on resources: (a) natural resources? (b) industrial resources? (c) other?
- 6.2 Does the system require any conditioning/neutralization of treated ballast water, prior to discharge it into the environment? If so, include details.
- 6.3 What are the characteristics of any additional air emissions, which result from the use of the treatment system?
- 6.4 Are there waste streams such as the residue of any filtering process or centrifugal concentrate? If so, inform:
- 6.4.1 What are the characteristics of the waste streams?
 - 6.4.2 Are they suitable for discharge or must they be disposed of on shore?
 - 6.4.3 What is the planned disposition of the waste streams?
 - 6.4.4 When BW treatment is done during ship's ballasting, can waste streams be promptly and simultaneously discharged at the ship's ballasting site/port with the ballast water treatment?
 - 6.4.5 When it is adequate to be discharged at sea, how quickly do the waste streams dissipate after discharge; and at what waste flow rate, sea state, marine current speed, tide regime, the discharge dissipation was tested/verified?
- 6.5 What are the system's possible impacts to the environmental, public health and resources, related to?
- 6.5.1 the interaction of the components and processes of its treatment with the environment, as a function of its ordinary use?
 - 6.5.2 an eventual system failure?
 - 6.5.3 its components or processes which, if damaged/affected due to an eventual vessel casualty, could cause problems and losses?
- 6.6 Does the use of the treatment system result in the discharge of ballast water at other than ambient temperature? If so, provide details.
- 6.7 Does the system have components or processes which use or produce Active Substances, produce residuals or by-products which present problems in handling, storage or disposal? If so, provide details. What system's components, such as batteries or lead-containing fixtures, cause special disposal concerns?
- 6.8 The total time required for ballast water management on board should be recorded according to the following table:

**Information and monitoring of the time and re-circulation required
for ballast water management**

Ballast water treatment time	Total time required to treat BW (in hours)	Normal time for (in hours)		Additional time required for the BW treatment (in hours)	
During ballasting		Ship's unloading		Interference beyond the ship discharge normal time	
On voyage		Ship's ballast voyage		Interference beyond the ballast voyage normal time	
During deballasting		Ship's loading		Interference beyond the ship loading time	
Number of times required to re-circulate the BW on board for treatment				Correspondent time for applying the total BW re-circulation	

IMO BWM.2/Circ.20 of 21 July 2009**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**

1. The Marine Environment Protection Committee, at its fifty-ninth session (13 to 17 July 2009), approved 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 developed by the BLG Sub-Committee at its thirteenth session (2 to 6 March 2009), as set out in the annex.
2. Member Governments are invited to bring this circular to the attention of all parties concerned.

* * *

ANNEX**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****INTRODUCTION**

- 1 The purpose of this guidance is to provide technical advice on the development of a methodology to ensure the safe handling and storage of chemicals used to treat ballast water, and the development of safety procedures addressing risks to the ship's crew resulting from the installation of a ballast water management system on a specific ship.
- 2 This guidance provides a framework for ensuring that these risks are addressed by the ballast water treatment or chemical/preparation* supplier and the owner and master of a ship, so that they can be included in the onboard Safety Management System as appropriate.

METHODOLOGY FOR ADDRESSING RISK

- 3 In order to ensure the safe handling and storage of chemicals used to treat ballast water and the development of safety procedures to address the risks to the ship and its crew arising from the treatment process, the following subjects, as appropriate, should be subject to a safety assessment (please note this is not an exhaustive list):
 - the loading and storage of chemicals or preparations onto the ship;
 - the transfer and application of chemicals or preparations from storage to the ballast water management system;
 - the position of the ballast water management system and associated piping;
 - operation of the ballast water management system;
 - maintenance of the ballast water management system;
 - spillages from the ballast water management system; and
 - exposure to treated ballast water, chemicals or preparations.

* Chemicals and preparations can be defined as Active Substances as defined in regulation A-1 of the BWM Convention

4 The safety assessment should be undertaken by the owner/master of the ship in conjunction with the supplier of the ballast water management system and the supplier of the chemical or preparation. This will allow:

- the specific design of the ship;
- the design of the ballast water management system (especially important if the technology is being retrofitted);
- the provisions of any servicing/maintenance contracts; and
- the specific properties and risk of any treatment chemical or preparation, to be identified, assessed and addressed in this appraisal.

5 The role of the supplier of the ballast water management system and the supplier of the chemical or preparation should provide the owner/master with the following information, as appropriate:

- a safety data sheet of the chemicals or preparations used;
- instructions on how any chemical should be loaded on the ship, stored and transferred/applied to the ballast water management system;
- health and safety information on the risks involved in operating the ballast water management system;
- health and safety information on exposure risks associated with operation of the ballast water management system and the use of chemicals or preparations; and
- details of personal protective equipment to be provided on board for use during any of these operations and during emergency situations, including spillage of the chemicals or preparations.

6 Based on the information provided by the supplier of the ballast water management system and the chemicals or preparations, the role of the owner/master in this process is to:

- identify the position and facilities needed to store chemicals, taking into account the risks involved in storing the chemicals and transferring and applying them to the ballast water management system, including fire protection and extinction;
- develop ship-specific health and safety procedures for loading ballast water treatment chemicals onto the ship;
- develop ship-specific health and safety procedures for handling and applying chemicals/preparations into the ballast water management system;
- develop ship-specific health and safety procedures for normal operation of the ballast water management system;
- develop ship-specific health and safety procedures for use in the event of a spillage on board vessels or crew exposure to treated ballast water, chemicals or preparations; and
- provide adequate personal and protective equipment for all operations covered in this guidance.

7 A safety assessment should be undertaken prior to installation of the ballast water management system, so that any mitigation measures identified can be incorporated either prior to, or during, installation.

8 The Safety Management System should be updated when appropriate, to take account of lessons learned during operation of the treatment technology or after any hazardous occurrence.

9 Shipowners and masters should ensure crew are instructed and trained appropriately, specifically to familiarize themselves with the Safety Data Sheet for any chemicals or preparations used in the course of ballast water treatment. Crew should also be made aware of any potentially hazardous by-products (aqueous or gaseous) which may be produced during the ballast water treatment process.

10 Notwithstanding the fact that the International Maritime Dangerous Goods (IMDG) Code does not apply to these chemicals in this context, the Code contains provisions that can be relevant to the safe stowage, handling and carriage of dangerous goods. The IMDG Code also contains requirements for electrical equipment, wiring, fire-fighting equipment, ventilation, smoking provisions and requirements for any special equipment. This could be a good source of information for ballast water treatment chemicals that are also categorized as dangerous goods to ensure appropriate construction, loading, stowage, segregation and carriage provisions are put into place. However, it should be noted that the provisions of the IMDG Code are based on intact and unopened packaging. This aspect should be taken into account when carrying out the safety assessment to ensure an equivalent level of safety is maintained when dangerous goods remain after use.

IMO BWM.2/Circ.17 of 20 October 2008

Guidance document on arrangements for responding to emergency situations involving ballast water operations

1. The Marine Environment Protection Committee (MEPC), at its fifty-fifth session (9 to 13 October 2006), instructed the Sub-Committee on Bulk Liquids and Gases (BLG) to develop a guidance document on arrangements for responding to emergency situations involving ballast water operations to assist Members to rapidly identify appropriate measure(s) whenever emergency situations occur.
2. The Sub-Committee on Bulk Liquids and Gases, at its twelfth session (4 to 8 February 2008), completed the work on the guidance document and invited the fifty-eighth session of the MEPC (6 to 10 October 2008) to approve this guidance and to instruct the Secretariat to issue a technical circular in this respect.
3. MEPC S8 (6 to 10 October 2008) approved the “Guidance document on arrangements for responding to emergency situations involving ballast water operations”, as set out in the annex to this document, and requested the Secretariat to disseminate it through this circular.
4. Member Governments are invited to bring this circular to the attention of all Parties concerned.

* * *

ANNEX

DRAFT GUIDANCE DOCUMENT ON ARRANGEMENTS FOR RESPONDING TO EMERGENCY SITUATIONS INVOLVING BALLAST WATER OPERATIONS

1 Introduction

1.1 The International Convention for the Control and Management of Ships’ Ballast Water and Sediments, 2004 (BWM Convention) regulates the transfer of harmful aquatic organisms and pathogens from ships’ ballast water and sediments. This Convention gives a Party, individually or jointly with other Parties, the right to introduce additional measures (e.g., immediate control measures in emergency or epidemic situations) in accordance with regulation C-1, taking into account the Guidelines for additional measures regarding ballast water management including emergency situations (G13).

1.2 The technical recommendations contained in this document provide guidance for use in emergency/epidemic situations, when specific and rapid measures need to be taken to prevent major threats and damages from the transfer of harmful aquatic organisms and pathogens through ballast water. This guidance would assist a Party to rapidly identify appropriate measure(s) whenever emergency situations occur in relation to ballast water operations. Countries should analyse the risks and nature of the threats that are posed by ballast water transfer in their waters and develop the structure that best suits them, taking into consideration the specific characteristics of the ecosystems involved and the resources available to them. This Guidance is not intended as a mandatory model or a set structure to be followed during potential or actual emergencies.

1.3 Examples of when an emergency situation may arise include:

- the introduction of organisms that may cause significant damage to the human population, human food supply, industry or other economic activities, or an area’s natural biodiversity; or
- the threat of such an introduction through ballast water from a vessel that has come from another emergency area.

1.4 Appropriate and efficiently applied emergency measures are vital to minimizing both the potential damage in an affected area and the risk of other areas being affected. Emergency situations relating to environmental, economic and human health issues may represent an immediate threat to a particular location, or to neighbouring locations, as well as areas to be visited by vessels carrying ballast water from this location.

1.5 Rapid and correct handling of the emergency will also affect the likelihood of normalizing the situation in the longer term. It should be noted, however, that the priority for emergency situations should be the prevention of introduction of harmful aquatic organisms and pathogens. Once a relevant species has gained a foothold in an area, it will be very difficult to eradicate it without causing additional significant environmental or habitat damage. Often terrestrial eradication measures do not transfer easily into the coastal, tidal and marine environment.

2 Objective

2.1 The objective of this document is to provide guidance for the planning and implementation of effective measures in emergency situations related to ballast water operations, in order to minimize damage and to enable rapid normalization of the operation of ports and ships.

3 Application

3.1 This guidance document has been developed for Government agencies, bodies and institutions involved in, and responsible for, regulating and controlling harmful aquatic organisms and pathogens (including ballast water management), ports and other interested parties and stakeholders. However, for them to work, industry co-operation will be needed at the time of the emergency.

4 Emergency response planning

4.1 Emergency planning should be undertaken at the appropriate level for the country concerned, based on the risks faced from the introduction of harmful aquatic organisms and pathogens through ballast water. The appropriate level should be defined by the specific nature of the threat and can be at a national level, or if the threat is justified, at a bioregional, regional, estuary or port level. Alternatively, it could be undertaken on a regional seas level, in conjunction with other Member States. However, a sustainable balance between environmental protection and the social and economic impacts from delays or interruptions to port and ship operations, needs to be obtained.

4.2 Such planning should result in the formation of an Emergency Response Plan based upon identified scenarios. Such scenarios should be provided by undertaking a risk assessment to identify problems that are likely to occur. The size and content of such a Plan should be appropriate to provide a robust response to the high risk problems identified. By adopting this approach, a Member State can identify how to implement rapidly appropriate mitigation measures and establish preventative procedures, allocate resources, and conduct training. Provision of such resources should be based upon the appropriate risk, and be focused on mitigating any high risk scenarios. In practice, such measures are likely to be very simple and may only be identifiable for situations where ballast water discharges from certain vessels need to be prevented. The Party may also wish to broaden the scope of the Plan to cover other potential vectors for harmful aquatic organisms and pathogens, such as bio-fouling or accidental release of aquarium species.

4.3 In order to identify the most appropriate means of reducing the immediate threats represented by the emergency and to limit the longer-term consequences it may cause, an understanding of the threat is critical. The process of identifying and applying the most appropriate response must reflect the nature of the potential incident and its likely occurrence. Planning any response should include:

- identification of the potential source(s) of introduction and emergencies that could occur;
- calculation of the risk that these potential emergency scenarios may occur;

- identification of the impact of each potential scenario, beginning with the emergency that is most likely to occur. This should include the impacts on human health issues, proliferation of diseases and epidemics, damage to biodiversity and economic risk;
- identification of mitigation measures to reduce these risks should they arise;
- identification of measures to be implemented to mitigate an emergency situation, with appropriate coordination and clear identification of responsibilities for actions;
- identification of process to determine limits of the affected area; and
- identification of the responsible parties, including the lead agency, communication links, resources and information that will facilitate this decision making process and the resulting emergency operations.

It should be noted that information and data collection will be an integral part of each of these stages. This could be provided by, amongst others, existing physical, biological and chemical datasets of the environment; local knowledge (especially from fishermen and local boat operators); existing biological, physical and public health prediction programme/models; knowledge of vectors (such as shipping, fishing vessels, and recreational vessels) that could transfer harmful aquatic organisms and pathogens; and, expertise from third parties and other Parties to the Convention.

5 Risk assessment

5.1 A Party should identify the threats its coastal areas are exposed to by vessels discharging ballast water. Assessing such threats may be done by applying a risk assessment model. Such assessments may enable the identification of likely threat scenarios upon which an emergency strategy may be developed, taking into account the specific environmental and human health concerns, socio-economic impacts of an invasion, commitments in relation to any regional agreements, safety and biosecurity. The risk assessment procedure may be based upon the risk assessment principles defined in the Guidelines for risk assessment under regulation A-4 of the BWM Convention (G7).

6 Preparedness

6.1 For the identified higher risk scenarios, an assessment of the appropriate and readily available support and resources should be undertaken and, to the extent possible, a procedure should be set up to obtain such environmental and health-related resources when necessary. It is also recommended that the relevant resources to respond and mitigate these higher risk scenarios are identified along with an assessment of where they can be obtained from. Equipment can be sourced from existing resources, stockpiled resources, call-off contracts or a contract with a third party to provide equipment and/or management of the emergency. It should be noted, however, that the level of resources actually needed, will be a fraction of that needed for an oil or chemical spill, and simple technology should be used to mitigate any impacts. For example, the use of land-based tanks, when available, to receive ballast water from a ship that has arrived from another emergency area.

6.2 Agreements should also be established with capable institutions with relevant resources, experience and knowledge, in order to guarantee the provision of appropriate services and resources in case of an emergency. A network of experts may be identified either within the country, within a region or internationally. It should be noted that these resources should only be identified where the threat is very high, otherwise significant resources could be wasted and sit idle. Information on resource availability and capacity should be regularly updated in the Emergency Response Plan.

6.3 It is recommended that a procedure and a sampling format for emergency situations are developed in the Emergency Response Plan, in line with the IMO's Guidelines for ballast water sampling (G2). Ballast water samples, from one or more ships, as well as from port water, may need to be analysed. It may also

be necessary to establish temporary environmental monitoring in certain areas which should be clearly identified, delimited and defined. These procedures should also make provisions for: sending and receiving samples; correct preservation and packaging; chain of custody arrangements; analysis methodologies; and identifying capable laboratories.

7 Responsibilities

7.1 The Emergency Response Plan should establish an appropriate organizational structure in order to handle those emergency situations deemed likely to occur. Sufficient and appropriate management resources should be identified. Resource capability for emergency response should be available at all times. The ability to quickly cascade information on a particular threat is vital.

7.2 A Lead Agency should be identified (which in reality should be the Administration or another Government body) to take overall responsibility for emergency response. This includes the allocation of responsibilities and competence requirements. This could be done in parallel with oil and chemical spill plans and contingency planning, or in parallel with terrestrial pest and disease response arrangements. The Lead Agency should be authorized to request or to provide assistance whenever necessary.

7.3 The Lead Agency would be responsible for both implementing and standing down the emergency operation. During an incident the area of concern should be identified and be designated with an Emergency Status. This status should be replaced by a note of normalization once the emergency has passed and the response has been stood down. The declaration of an emergency should activate the procedures appropriate to the threats being faced. When these measures have been identified, agreed, and implemented, the emergency operation may enter into an operational phase where the Emergency Status may be lifted. This should happen following proven improvements of the situation where the level of risks and threats can be properly controlled. Criteria for both these options should be identified in the Emergency Response Plan. The Lead Agency should monitor the development of the situation and should lift the Emergency Status as soon as it is deemed appropriate to do so.

7.4 The Lead Agency should develop a responsibility matrix to be incorporated in the Emergency Response Plan. Roles and responsibilities may be defined for the following Parties:

- authorities including maritime, environmental, public health, port, and legal organizations;
- the owner, operator, shipping company, shipping agencies and ships;
- classification societies or recognized organizations;
- any supporting organization, e.g., research centres, universities, consulting and specialized services companies, reception facilities, etc.;
- representatives from the industry, tourism, fishing, aquaculture, etc.;
- analysis laboratories; and
- manufacturers of systems and equipment for treating ballast water.

8 Notification

8.1 The appointed Lead Agency should develop procedures in the Emergency Response Plan for the immediate notification of all stakeholders of any emergency status, or change in that status, in areas under the jurisdiction of the Party. These include mariners, ports, ship agents, local authorities and the International Maritime Organization (the Organization). The notification should identify the area to which the emergency status applies (delimiting the area in terms of latitude and longitude) as well as the cause of the emergency status.

8.2 Ships carrying ballast water away from a declared emergency status area should also be notified. Such notification should be done through the ship's flag State and should include the ship's name, IMO number, call sign, flag and position (in terms of latitude and longitude at the moment of such notification), origin, destination and route. Any relevant port States should also be notified with the estimated time of arrival of the ship in question. Such vessels may be considered of high risk and be subjected to a risk assessment (in accordance with the Guidelines for risk assessment under regulation A-4 of the BWM Convention (G7)). They also may have any exemptions granted under regulation A-4 withdrawn and be subject to additional ballast water management procedures.

8.3 Each State should also notify the Organization about critical areas where uptake and discharge of ballast water is prohibited, presenting their geographical limits, also indicating the motives for such decision, as well as whether the prohibition is temporary or permanent.

8.4 It is recommended that standard format for such notification is developed and, as appropriate, be included in the Emergency Response Plan.

9 Other elements in an Emergency Response Plan

9.1 Communication procedures between the institutions involved in the emergency response operation should be identified and established. A list containing national contact points and any dormant contract arrangements should also be prepared and maintained.

9.2 The Administration should facilitate the immediate entry into the country of resources and experts from other Member States under the same conditions as provided for in IMO's OPRC Convention, so that they can be deployed and give assistance as fast as possible.

10 Preventive actions

10.1 An emergency situation may be caused by vessels arriving from an area subjected to an emergency or epidemic situation (see paragraph 8.2). In such case, a measure may be established to prohibit the ship from discharging ballast water in certain areas (e.g., inside 200 nautical miles from the coast of the Party). In this case, the Party should be responsible for providing proper guidance to the ship's master, identifying alternative ballast water management measures and for sending information to the Organization. In all cases, the safety of the ship and its crew should be a primary consideration. Options for such action should be laid down in the Emergency Response Plan.

10.2 For certain emergency situations, appropriate surveillance methods (e.g., maritime crafts, aircrafts, remote sensing, etc.) should be developed in order to define and monitor the status of areas affected by the growth of toxic algae, or other outbreaks of harmful aquatic organisms and pathogens.

10.3 Examples of the impacts from existing harmful aquatic organisms and pathogens or epidemics that have already occurred should be incorporated in the Emergency Response Plan and the plan should be reviewed regularly to incorporate best practice and lessons learnt. Brief information on how problems have been mitigated could also be included.

11 Technical and scientific co-operation

11.1 Administrations should also share experiences of how they have responded, or are planning to respond, to emergency situations through the Organization, so that best practice can be promulgated. Reports following emergencies should contain descriptions of the problem, mitigation measures, time-scales, source, damages and losses caused, as well as any technical recommendations resulting from these experiences.

IMO BWM.2/Circ.13/Rev.3 of 28 May 2015

Methodology for information gathering and conduct of work of the GESAMP* -BWWG

1. Regulation D-3 of the Ballast Water Management Convention provides that ballast water management systems which make use of Active Substances shall be approved by the Organization. The Marine Environment Protection Committee (MEPC), at its fifty-third session (July 2005), adopted the *Procedure for approval of ballast water management systems that make use of Active Substances (G9)* by resolution MEPC.126(53), and agreed with the establishment of a Technical Group under the auspices of GESAMP, to evaluate such systems and advise the Committee accordingly. At the same session the GESAMP-Ballast Water Working Group was also requested to develop a Methodology for information gathering and conduct of its work (the Methodology).
2. MEPC, at its fifty-sixth session (July 2007), having recognized that the Methodology is a living document, which may be further refined taking into account the best practices and lessons learned during the evaluation process, agreed that the Methodology, as drafted at that time, should be suitable for use as technical guidance by applicants submitting applications for approval of ballast water management systems.
3. Having adopted resolution MEPC.169(57), which revokes resolution MEPC.126(53) and contains the revised *Procedure for approval of ballast water management systems that make use of Active Substances (G9)*, MEPC 57 requested the GESAMP-BWWG to update its Methodology in accordance with the revised Procedure (G9). The updated Methodology was subsequently circulated by means of BWM.2/Circ.13.
4. Taking into account the lessons learned and the experience gained, the GESAMP-BWWG carried out a thorough review of the Methodology and prepared a revised version which was approved by the GESAMP, endorsed by MEPC 63 and circulated as BWM.2/Circ.13/Rev.1. Another version was endorsed by MEPC 66 and subsequently circulated as BWM.2/Circ.13/Rev.2.
5. The GESAMP-BWWG further revised the Methodology at its Sixth Stocktaking Workshop in July 2014, clarifying identified inconsistencies related mainly to the circulation of Derived No-Effect Levels (DNEL) and taking into account lessons learned and experience gained. MEPC, at its sixty-eighth session (May 2015), endorsed the revised Methodology for information gathering and conduct of work of the GESAMP-BWWG, as set out in the annex, and agreed to disseminate it as BWM.2/Circ.13.Rev.3 to supersede BWM.2/Circ.13/Rev.2.
6. MEPC 68 further agreed that the revised Methodology should be applied to all submissions for Basic Approval of ballast water management systems to MEPC 71 and subsequent sessions and to the submissions for Final Approval of those systems.
7. Member Governments are invited to bring the revised Methodology to the attention of all parties concerned and, in particular, manufacturers of ballast water management systems that make use of Active Substances.
8. This circular supersedes circular BWM.2/Circ.13/Rev.2.

* * *

* GESAMP stands for "IMO/FAO/UNESCO-IOC/WMO/IAEA/UN/UNDP/UNEP/UNIDO Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection".

ANNEX

REVISED METHODOLOGY FOR INFORMATION GATHERING AND CONDUCT OF WORK
OF THE GESAMP-BWWG

Endorsed by MEPC 68 on 15 May 2015

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1 INTRODUCTION

This document contains the Methodology for information gathering and conduct of work of the GES-AMP-BWWG when undertaking technical evaluations in accordance with the *Procedure for approval of ballast water management systems that make use of Active Substances (G9)*, as revised (adopted by resolution MEPC.169(57)).

1.1 Terms and definitions

For the purpose of this Methodology, these definitions are intended to supplement those in the Ballast Water Management Convention to facilitate a consistent evaluation of submissions:

- .1 **Ballast Water Management Convention** (the Convention) means the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004.
- .2 **Ballast Water Management** means mechanical, physical, chemical and biological processes – either singularly or in combination – to remove, render harmless, or avoid the uptake or discharge of harmful aquatic organisms and pathogens within ballast water and sediments.
- .3 **Preparation** means any commercial formulation containing one or more Active Substances including any additives. This term also includes any Active Substances generated on board for purposes of ballast water management and any Relevant Chemicals formed in the ballast water management system that makes use of Active Substances to comply with the Convention.
- .4 **Active Substance (AS)** means a substance or organism, including a virus or a fungus, that has a general or specific action (chemical or biological) on or against harmful aquatic organisms and pathogens.
- .5 **Relevant Chemical (RC)** means transformation or reaction product that is produced during and after employment of the ballast water management system in the ballast water or in the receiving environment and that may be of concern to the ship's safety, aquatic environment and/or human health.
- .6 **Other Chemical (OC)** means any other substance, other than the Active Substance(s) or Relevant Chemicals, potentially associated with the system either intentionally or resulting from the treatment of ballast water.
- .7 **Basic Approval (BA)** means the preliminary approval of Active Substances and the ballast water management system that uses them in order to comply with the Ballast Water Management Convention. Basic Approval should confirm that the available information does not indicate possible unacceptable adverse effects or a potential for unreasonable risk to environment, human health, property or resources. This should include consideration of potential risks associated with the Active Substance during full-scale deployment on commercial ships when possible.
- .8 **Final Approval (FA)** means the approval of a ballast water management system using an Active Substance or Preparation to comply with the Convention and includes an evaluation of the whole effluent toxicity (WET) tests performed as part of the land-based Type Approval process in accordance with the Guidelines for approval of ballast water management systems (G8). The review does not include the re-evaluation of efficacy testing results conducted by Administrations under the Guidelines (G8). The Final Approval should confirm that previous evaluations of risks to ship, crew and the environment including storage, handling and application of Active Substances or Preparations remain valid and the concerns

expressed during the Basic Approval process have been addressed, as well as that the residual toxicity of the discharge conforms to the evaluation undertaken for Basic Approval.

- .9 **GESAMP-Ballast Water Working Group (GESAMP-BWWG)**, also being referred to as the Group, means the Technical Group consisting of independent experts acting in their individual capacity that review the proposals for approval of ballast water management systems that make use of Active Substances submitted by the Administration and report, through the GESAMP, to MEPC. When reviewing the proposals, the Group should take account of any other relevant data as well as other relevant information submitted to it, or the Group is aware of, because of its members' expertise.
- .10 **GESAMP** is the IMO/FAO/UNESCO-IOC/WMO/IAEA/UN/UNDP/UNEP/UNIDO Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection, an advisory and multi-disciplinary body consisting of specialized experts nominated by the sponsoring agencies. Experts working for the GESAMP act independently in their individual capacity.

1.2 Abbreviations used in the text

ABBREVIATIONS

<	less than
≤	less than or equal to
>	greater than
≥	greater than or equal to
μg	microgram
AS	Active Substance
ASF	interspecies allometric scaling factor
ASTM	American Society for Testing and Materials
BA	Basic Approval
BCF	bioconcentration factor
BIO _{inh}	bioavailability factor for inhalation
BMD	benchmark dose
b.p.	boiling point
bw	body weight
BWMS	ballast water management system
°C	degree Celsius (Centigrade)
CAS	Chemical Abstracts Service
cc	cubic centimeter
CEC	cation exchange capacity
CF _{abs}	correction factor for absorption
CF _{dr}	correction factor for dose regime
CMR	carcinogenicity, mutagenicity and reproductive toxicity
d	day(s)
DNEL DMEL	Derived No-Effect Level Derived Minimal Effect Level
DOC	dissolved organic carbon
DT ₅₀	half-life of a substance
EC ₅₀	effect concentration, 50% (median effective concentration)
EHC	environmental health criteria

EHS	Evaluation of Hazardous Substances
ESF	observed effect scaling factor
EU	European Union
FA	Final Approval
g	gram
G9	<i>Procedure for approval of ballast water management systems that make use of Active Substances (G9)</i> , as revised, adopted by resolution MEPC.169(57) in April 2008
GESAMP	IMO/FAO/UNESCO-IOC/WMO/IAEA/UN/UNDP/UNEP/UNIDO Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GESAMP-BWWG	GESAMP-Ballast Water Working Group
GHS	Globally Harmonized System
GLP	good laboratory practice
h	hour(s)
HES	human exposure scenario
IARC	International Agency for Research on Cancer
IC ₅₀	inhibition concentration, 50%
IMO	International Maritime Organization
IR	ingestion rate
ISF	intraspecies differences factor
ISO	International Organization for Standardization
IUPAC	International Union of Pure and Applied Chemistry
K _d	sorption coefficient
kg	kilogram
K _{oc}	organic carbon-water partition coefficient
K _{ow}	octanol/water partitioning coefficient (also P _{ow})
K _p	sorption coefficient for ionic substances
L	litre
LC ₅₀	lethal concentration, 50%
LD ₅₀	lethal dose, 50%
LLNA	local lymph node assay
LOAEL	lowest observed adverse effect level
LOD	Limit of Detection
LOEL	lowest observed effect level
Log P _{ow}	logarithm of the octanol/water partition coefficient
MADC	Maximum Allowable Discharge Concentration
MAMPEC	Marine antifoulant model for PEC calculation
MAMPEC-BW	Marine antifoulant model for PEC calculation for ballast water
MARPOL	International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environment Protection Committee
mg	milligram
mL	millilitre
m.p.	melting point

ng	nanogram
NOAEC	No Observed Adverse Effect Concentration
NOEC	No Observed Effect Concentration
NOAEL	No-Observed-Adverse-Effect Level
NOEL	No-Observed-Effect Level
NTP	National Toxicological Programme
OC	Other Chemical
OECD	Organisation for Economic Co-operation and Development
Organization	the International Maritime Organization
OSF	other interspecies scaling factor
PBT	Persistence, Bioaccumulation and Toxicity
PEC	Predicted Environmental Concentration
PNEC	Predicted No Effect Concentration
POC	Particulate organic carbon
POEM	UK Predictive Operator Exposure Model
P_{ow}	Octanol/water partition coefficient (also K_{ow})
PPE	protective personal equipment
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QFC	quantity of fish consumed
QSAR	Quantitative Structure-Activity Relationship
RC	Relevant Chemical
RCR	Risk Characterization Ratio
SF_{dur}	scaling factor for exposure duration
SOLAS	The International Convention for the Safety of Life at Sea
TLV	threshold limit value
TOC	Total Organic Carbon
TRC	total residual chlorine
TRO	total residual oxidant
US EPA	United States Environmental Protection Agency
WET	whole effluent toxicity test
WHO	World Health Organization
wt	Weight

2 GENERAL

2.1 Legal provision

Regulation D-3.2 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004, stipulates that ballast water management systems (BWMS) that make use of Active Substances to comply with the Convention shall be approved by the Organization. During its fifty-third session, the Marine Environment Protection Committee (MEPC) adopted the *Procedure for approval of ballast water management systems that make use of Active Substances (G9)* through resolution MEPC.126(53). Resolution MEPC.169(57) revoked the initial Procedure and provided a revised version of it.

2.2 Principles of acceptability of BWMS that make use of Active Substances

2.2.1 A ballast water management system that makes use of Active Substances accomplishes its intended purpose through action on potentially harmful aquatic organisms and pathogens in ships' ballast water and sediments. However, if the ballast water is still toxic at the time of discharge into the environment, the organisms in the receiving water may suffer unacceptable harm. Both the Active Substance itself or the Preparation, as well as the treated ballast water, should be subjected to toxicity testing in order to determine if an Active Substance or Preparation can be used and under which conditions the potential for harming the receiving environment or human health is acceptably low (G9: 3.2).

2.2.2 Any system that makes use of, or generates, Active Substances, Relevant Chemicals or free radicals during the treatment process to eliminate harmful organisms and pathogens in order to comply with the Convention should be subject to Procedure (G9) (G9: 3.3).

2.2.3 Ballast water management systems that make use of Active Substances and Preparations must be safe in terms of the ship, its equipment and the personnel to comply with the Convention (G9: 3.4).

2.3 Submission of an application for approval

2.3.1 The manufacturer should evaluate the system, the Active Substances or Preparations and the potential discharge in accordance with the approval criteria specified in the *Procedure for approval of ballast water management systems that make use of Active Substances (G9)*.

2.3.2 Upon completion of the evaluation the manufacturer should prepare an application on the system that makes use of Active Substances or Preparations and submit it to the Member of the Organization concerned. An application should only be made when the ballast water management system using Active Substance or Preparations has been sufficiently designed, developed and tested to provide the full data necessary for Basic or Final Approval as appropriate (G9: 8.1.2.2).

2.3.3 For systems that have previously received Basic Approval, the provisions of the "Framework for determining when a Basic Approval granted to one BWMS may be applied to another system that uses the same Active Substance or Preparation" should apply (see BWM.2/Circ.27).

2.3.4 Upon receipt of an application, the concerned Administration should conduct a careful completeness check to ensure that the application satisfies all the provisions contained in Procedure (G9) and that it is presented in the format recommended in this Methodology. Administrations should check the quality and completeness of any application against the latest version of the Methodology for information gathering and conduct of work of the GESAMP-BWWG, agreed by the Organization, prior to its submission to the MEPC. For Final Approval applications, the Administration should ensure that all the recommendations given by the GESAMP-BWWG during the Basic Approval process have been addressed to its complete satisfaction.

2.3.5 When the Administration is satisfied with the application received in accordance with paragraph 3.6 of Procedure (G9), it should submit a proposal for approval to the Organization consisting of the following:

- .1 a description of the ballast water management system containing the non-confidential data in the usual format for dissemination as an MEPC document (preferably less than 50 pages). Administrations should aim at submitting the non-confidential descriptions of their ballast water management systems at the MEPC session, which precedes the MEPC session expected to decide on the approval of the systems. If this is not possible, the non-confidential description should be submitted at the earliest opportunity to the MEPC session expected to decide on the approval of the systems, but not later than the 28-week deadline established as indicated in paragraph 2.3.7 below. Documents containing non-confidential descriptions of

BWMS, which contain more than 20 pages, will not be translated into all working languages in their entirety. They should include, for translation purposes, a summary of the document not longer than four pages, with the technical content submitted as an annex in the language (e.g. English) that may be needed, for example, by working groups. Proponents seeking approval of BWMS that use Active Substances should thoroughly observe the provisions of paragraph 8.1.1 of Procedure (G9), bearing in mind that failure to provide the non-confidential information could result in Member States having insufficient data to approve the proposals when requested by the Committee. INF documents could be used in conjunction with proposals for approval to ensure that all safety and environmental protection data are made available;

- .2 a Letter of Agreement concerning the arrangements between IMO and the submitting Administrations for the evaluation of the respective system. A template of such a letter is provided in appendix 1;
- .3 the complete application dossier in accordance with Procedure (G9) consisting of the full description of the system, tests results, study reports, references and copies of the literature referenced and any other information relevant to that system. A summary of the key data should be provided in a tabular format. The complete application dossier should contain a list of contents indicating the location of the information in the application. Pursuant to paragraphs 4.2.2, 8.1.1 and 8.1.2.7 of Procedure (G9), the information mentioned above will be treated as confidential. It should be noted, however, that all information related to safety and environmental protection, including physical/chemical properties, environmental fate and toxicity, will be treated as non-confidential; and
- .4 the assessment report in accordance with paragraph 4.3 of Procedure (G9).

2.3.6 Proposals for approval of ballast water management systems that make use of Active Substances that need to be evaluated by the GESAMP-BWWG should be addressed to:

Marine Environment Division
International Maritime Organization
4 Albert Embankment
London SE1 7SR
United Kingdom

2.3.7 A non-refundable registration fee to cover the costs related to the services provided by the GESAMP-BWWG should be paid upon receipt of the invoice issued by the Organization in this respect. It should be noted that the evaluation of a proposal for approval cannot be initiated before the payment of the fee mentioned above.

2.3.8 The GESAMP-BWWG aims to hold its meetings 20 weeks before the MEPC session expected to decide on the approval of the proposals made by the Member Governments. Consequently, a 28-week deadline has been established for the submission of the proposal for approval (including the complete application dossier). This allows eight weeks for the preparation of the meeting and enables interested parties to provide information that is relevant to the evaluation in accordance with the provisions of paragraph 8.1.2.6 of Procedure (G9). A timetable used for planning the activities related to the GESAMP-BWWG meetings is shown in appendix 2.

2.3.9 When due to the time constraints the GESAMP-BWWG is not able to evaluate all the proposals for approval submitted before the deadline established as indicated in paragraph 2.3.8 above, an extraordinary meeting of the GESAMP-BWWG may be convened, subject to the availability of the Group and with the authorization of the Secretary-General of the Organization.

2.3.10 The GESAMP-BWWG will endeavour to evaluate as many proposals for approval as possible re-

ceived before the deadline described in paragraph 2.3.8 above. When due to the time limitations between two consecutive sessions of the MEPC, the GESAMP-BWWG is not able to evaluate all the proposals for approval received before the above deadline, the remaining proposals will be evaluated on a “priority basis”, in accordance with the order of submission during the subsequent meetings of the GESAMP-BWWG. Proposals for approval received after the established deadline will be referred to the MEPC session following the session used to establish the deadline and will be considered after any priority proposals not considered at previous meetings.

2.3.11 Upon receipt of a complete proposal for approval, the Organization will issue a confirmation letter indicating the date and the time the proposal has been received. In order to ensure complete transparency and a fair and impartial treatment of all the submissions, the proposals for approval are evaluated in the chronological order of their receipt.

2.3.12 Face-to-face meetings between the GESAMP-BWWG and applicants/ Administrations should be conducted at the request of the Administrations prior to the meeting and solely during Final Approval evaluations. Face-to-face meeting should be limited to one hour per Final Approval application.

2.3.13 Clarification of certain aspects identified during the preparation for, or in the process of, an evaluation of a proposal for approval may be requested by the GESAMP-BWWG, if it becomes evident that clarification is found to be necessary in order to finalize the evaluation. The clarifications should be received in a timely manner so that the GESAMP-BWWG is able to take the information into account during its evaluation of the system. A time limit for response to any request for clarifications should not exceed 12 hours unless otherwise agreed with the GESAMP-BWWG. Applicants may wish to designate a technical representative to provide clarifications on request during the Group’s meeting.

2.3.14 After completion of the GESAMP-BWWG report, relevant annexes containing the results of the evaluation will be forwarded to the respective Administrations for confirmation that no confidential data are being disclosed. Unless the Administration advises otherwise before the deadline indicated in the request for confirmation (normally one week), the Secretariat will assume that the respective evaluation does not contain confidential data and will process the report according to the timetable shown in appendix 2.

2.3.15 If after the revision of the draft report of the GESAMP-BWWG the GESAMP provides comments on the findings of the Group, the Chair of the GESAMP-BWWG, in consultation with the members of the Group, as appropriate, will address the respective comments. The GESAMP provides confirmation of peer review and approval to the Organization for the information of the MEPC.

2.3.16 In case an Administration that has submitted a proposal for approval disagrees with the recommendations of the GESAMP-BWWG, such an Administration should be given the option to submit a document indicating the reasons for disagreement to the session of the MEPC expected to decide on the respective proposal. The explanatory document should be considered by the Committee in conjunction with the GESAMP-BWWG report.

2.3.17 Any supplementary data regarding a proposal not recommended for approval that was provided to the GESAMP-BWWG after the completion of its meeting will be considered as a new proposal, subject to a new deadline for evaluation according to the procedure described in this Methodology and subject to a new registration fee.

2.3.18 The Secretariat will endeavour to forward all the requests for clarification regarding the published reports of the GESAMP-BWWG received from the Administrations concerned to the Chairman of the GESAMP-BWWG and to the IMO consultant responsible for the respective meeting for response as appropriate.

2.4 Confidentiality and data protection

The confidential information in the submitted documents should clearly be identified. All information related to safety and environmental protection, including physical/chemical properties, environmental fate and toxicity, will be treated as non-confidential with the understanding that original proprietary test reports and studies, with the exception of the summary of the results and test conditions to be prepared by the applicant and validated by the GESAMP-BWWG, are considered confidential (G9: 8.1.1). Once an approval procedure is completed and the system using the Active Substance is approved, the following data should not be regarded as confidential:

- .1 the name and address of the Administration;
- .2 the names and addresses of the Administrations of the Active Substance and/or the Preparation (if different);
- .3 the names and amount of the Active Substance(s) in the Preparations and the name of the Preparation;
- .4 the names of other components of Preparations, in particular those that are regarded as dangerous according to the UN GHS or relevant IMO regulations and contribute to the hazard documentation of the Preparation;
- .5 the names of Relevant Chemicals that may be formed during or after application of the BWMS and that may be of concern for the receiving environment or human health;
 - .1 the names of other chemicals that may be formed during or after the application of the BWMS with a technical justification as to why they should not be treated as Relevant Chemicals;
- .6 methods of chemical analysis, including the Limit of Detection (LOD);
- .7 physical and chemical data concerning the Active Substance, the Preparation and its components and Relevant Chemicals;
- .8 a summary of the results of the tests conducted pursuant to section 4.2 of the Procedure (G9) to establish the effects of the substance(s) or Preparation(s) on humans and the environment;
- .9 a summary of the results of the tests conducted on the treated ballast water pursuant to section 5.2 of Procedure (G9);
- .10 recommended methods and precautions against dangers resulting from handling, storage, transport and fire;
- .11 any means of rendering the Active Substance or Preparation harmless;
- .12 methods of disposal of the product and of its packaging;
- .13 procedures to be followed and measures to be taken in the case of spillage or leakage;
- .14 first aid and medical advice to be given in the case of injury to persons;
- .15 Safety Data Sheets, which should contain the information required of items .7 to .14;
- .16 all results of the Persistence, Bioaccumulation and Toxicity (PBT) assessment and the risk characterization pursuant to sections 5.1 and 5.3 of Procedure (G9); and

.17 the uncertainty analysis specified in paragraph 6.4.3 of Procedure (G9).

2.5 Test methods

2.5.1 Tests, which are described in 3.3.2, 3.3.3 and 6.1.3., should be carried out under internationally recognized guidelines (preferably OECD or equivalent) (G9: 4.2.3), and according to an internationally recognized quality assurance system (G9: 4.2.4) (e.g. Good Laboratory Practice (GLP)). Information may be derived from existing data where an acceptable justification is provided. Full copies of sources of data (e.g. literature papers) and relevant documents for QA/QC (i.e. QAPP) should be provided electronically and in hard copy. The relevant document should include validity criteria for all tests.

2.5.2 Care should be taken to provide full supporting references and copies of the appropriate test laboratory reports in support of each application electronically and in hard copy. If submissions are lacking relevant information, it may not be possible for the GESAMP-BWWG to conduct its risk assessment.

2.5.3 Many substances have acquired large databases for many of the hazards concerned and a weight of evidence approach has become necessary to ensure that the rating reflects the body of data rather than simply using the most conservative value. This, however, means that the submission of all available end-point data for Active Substances and Relevant Chemicals is necessary to enable a review.

2.6 Alternatives to testing and non-submission of data

2.6.1 Alternative methods to testing on live organisms, e.g. *in vitro* testing methods, Quantitative Structure-Activity Relationship (QSAR), extrapolation by analogy to known chemicals, or grouping of similar substances, may be used whenever justified. Sufficient documentation or references to documentation on the validity of the method should be provided, as well as documentation that the substance or Preparation lies within the applicability domain of the method.

2.6.2 Information that is not necessary, owing to the nature of the substance, need not be supplied. The same applies where it is not scientifically justified or technically feasible to supply the information. In such cases, a justification for not supplying such information should be submitted.

2.7 Additional data

2.7.1 If, in the course of the review by the GESAMP-BWWG, the Group considers that additional data are found to be necessary to finalize the evaluation, the Group may, in exceptional circumstances, request that such data are provided to facilitate the review.

2.7.2 The applicant should not submit any additional data after the dossier has been submitted to the Organization for evaluation unless such data have been requested by the Group.

2.8 Retrospective requirement

Once a ballast water management system has received Final Approval under this procedure, then the respective applicant should not have to retrospectively submit new data in accordance with this revised Methodology.

3 APPLICATION DATA-SET

3.1 General

3.1.1 The dossier should contain the information specified in Procedure (G9). In cases where information requested in accordance with Procedure (G9) has not been submitted and no justification for non-submission is provided, the GESAMP-BWWG may not be able to judge the reasons for not submitting the information that may influence its evaluation and development of recommendations. A model for the presentation of the application data-set is given in appendix 3.

3.1.2 For Active Substances and/or Preparations, including any of its components as appropriate, data on properties should be included. For Relevant Chemicals, data should be provided as well.

3.1.3 Fate and effect testing should be performed in the laboratory with Active Substances and Preparations (G9: 5.3.1). However, the GESAMP-BWWG notes that normally assessment of fate (including degradation, bioaccumulation) is not feasible for Preparations, but only for individual substances. Therefore, degradation and fate testing of Preparations may not be appropriate. However, fate of individual substances of the Preparation should be demonstrated.

3.1.4 For treated ballast water, the Administration should provide both acute and chronic toxicity data (G9: 5.2.2) at Basic Approval application. The discharge toxicity tests at Final Approval should include acute and chronic toxicity test methods and results performed as part of the land-based type approval process with test species (fish, crustacea and algae). The results should include acute LC50 values and chronic NOECs (G9: 5.2.5). One hundred per cent concentrations of samples of ballast water discharge should be tested (G9: 5.2.6), if appropriate.

3.1.5 Any reference to specific test methods in the following is indicative with the purpose of providing guidance to an Administration on possible methods that may be considered. Any other internationally recognized test method may be used as well.

3.2 Identification of the substance or Preparation (G9: 4.1)

3.2.1 Preparations

3.2.1.1 For each Preparation, the application should include the following information (G9: 4.2.2):

- .1 the Trade name;
- .2 compositional information of the Preparation; including:
 - .1 the chemical (IUPAC) name of each component;
 - .2 the concentration of each component (liquids in g/L; solids in %w/w; gases in %v/v);
 - .3 the CAS number of each component;
 - .4 the UN number and proper shipping name of each component (where relevant);
 - .5 an indication of whether the component is an Active Substance or an additive, e.g. stabilizer or inhibitor or solvent, etc.; and
 - .6 particle size distribution, if in powder and/or granular form, as smaller particles (< 10 µm) present a greater hazard in potential cases of inhalation.

3.2.2 Active Substances

3.2.2.1 For each Active Substance, the applicant should provide the following information:

- .1 the Trade name (where relevant);
- .2 the chemical (IUPAC) name;
- .3 the CAS number;
- .4 the UN number and proper shipping name (where relevant);
- .5 the molecular mass;

- .6 the empirical formula;
- .7 the structural formula;
- .8 the classification in accordance with the UN GHS system;
- .9 the purity of the technical material and identification of impurities (chemical name and CAS-numbers, etc.); and
- .10 the identity of any stabilizers or necessary additives.

3.2.3 *Relevant Chemicals (G9: 2.1.4)*

3.2.3.1 Chemical analysis results should be accompanied by a specification of the applied Active Substance concentration, test conditions, characteristics of the test water (temperature, pH, salinity, TOC, DOC, TSS), sampling time, handling and storage of samples before analysis, and analytical method.

3.2.3.2 If chemical analyses were performed during more than one test run, the number of test runs should be stated and results should be reported in the form of individual measurements for each test run. Analytical results should be provided for both treated and control samples.

3.2.3.4 Reasoning should be provided, based on the documented state of knowledge, on which basis the selection of substances for inclusion in the chemical analysis was made, taking into account the chemical reactivity of the Active Substance and other components of the respective system.

3.2.3.5 Where the process might produce by-products when reacting with ballast water, the applicant should provide the following information for those products deemed to be Relevant Chemicals:

- .1 the Chemical (IUPAC) name;
- .2 the CAS number;
- .3 the molecular mass;
- .4 the empirical formula;
- .5 the structural formula; and
- .6 the classification in accordance with the GHS system.

3.2.4 *Other Chemical*

Unless a justification can be provided for not doing so, the following information should be supplied for Other Chemicals:

- .1 the Chemical (IUPAC) name;
- .2 the CAS number;
- .3 the molecular mass;
- .4 the empirical formula;
- .5 the structural formula;
- .6 the classification in accordance with the GHS system; and

- .7 if relevant particle size distribution, if in powder and/or granular form, as smaller particles (< 10 µm) present a greater hazard in potential cases of inhalation exposure.

3.3 Data on effects on aquatic plants, invertebrates and fish, and other biota, including sensitive and representative organisms (G9: 4.2.1.1)

3.3.1 General

For every Active Substance or Preparation including any of its components, data should be presented and discussed either on the basis of toxicological tests or published toxicological knowledge for each end point listed.

3.3.2 Acute aquatic toxicity

3.3.2.1 Short-term L(E)C50 from freshwater or saltwater representatives of three taxa (algae, crustacea and fish) representing three trophic levels by internationally standardized tests, e.g. OECD guidelines 201 (Algae, Growth Inhibition Test), 202 (*Daphnia* sp. Acute Immobilization Test), 203 (Fish, Acute Toxicity Test), USEPA 850.1035 (Mysid shrimp acute toxicity test), and Mysid shrimp acute toxicity test (USEPA 850.1035) should be accepted. To reduce further any remaining uncertainty, applicants should, preferably, also submit data for two additional marine taxa (e.g. echinoderms, molluscs), ISO 10253 (Micro algae), ISO 7346-2, ISO 7346-3 (fish), and ISO 10706 (*Daphnia*).

3.3.2.2 Such acute aquatic toxicity data should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances;
- .3 Relevant Chemicals; and
- .4 discharged ballast water (G9: 5.2.3).

3.3.2.3 For algal toxicity testing, it is recommended that:

- .1 two species of algae be used in toxicity tested testing at Basic Approval and Final Approval;
- .2 *Skeletonema costatum* be used as one of the test species;
- .3 the second test species is not a diatom; and
- .4 *Phaeodactylum tricoratum* not be used as a test species.

3.3.3 Chronic aquatic toxicity

3.3.3.1 Long-term NOECs or EC10 from three freshwater or saltwater species (normally algae and/or crustacea and/or fish), representing three trophic levels by internationally standardized tests, e.g. OECD guidelines 210, 215, or 212 (fish), and OECD guideline 211 (*Daphnia*), should be acceptable. To reduce any further remaining uncertainty, applicants should preferably also submit two long-term NOECs from additional marine taxa (e.g. echinoderms, molluscs), ISO 10253 (micro algae), ISO 20666 (rotifer), and ISO 10229 (fish).

3.3.3.2 Short-term methods by US EPA and ISO for estimating the chronic toxicity of substances and discharge provide acceptable alternatives, since the identification of the sensitive sub-lethal endpoints and vulnerable life stages is the ultimate aim of the long-term testing.

3.3.3.3 Such chronic aquatic toxicity data should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances;

- .3 Relevant Chemicals; and
- .4 discharged ballast water (fish, invertebrate, plant) (G9: 5.2.3).

3.3.3.4 For the chronic aquatic toxicity testing using discharged ballast water (paragraph 3.1.4), based on the experience gained in the evaluation process of BWMS, it has been shown that, where BWMS using electrolysis and/or ozonation are concerned, there is no need to evaluate the results of chronic ecotoxicity testing using discharged ballast water. This is because the levels of Relevant Chemicals, such as THMs and HAAs, have been found to remain in similar concentration ranges that lead to PEC/PNEC ratios < 1 . It is also recognized that with these types of BWMS, Relevant Chemicals other than the range of well-known chlorinated and brominated low molecular weight substances are not produced. Therefore, it is considered appropriate that such BWMS could fully be evaluated at Basic Approval without the results of chronic ecotoxicity testing. It should be emphasized that this waiver would not apply to BWMSs other than those systems mentioned and this waiver does not extend to Final Approval.

3.3.4 Endocrine disruption

3.3.4.1 Regarding the risks connected to endocrine disruption, non-standardized *in vivo* as well as *in vitro* tests may be conducted as long as no internationally standardized tests are available (e.g. full-life-cycle test on fish or amphibian metamorphosis assay). When substantial evidence on such effects is available, this should be taken into account on a case-by-case basis and in the effect assessment for each compartment of relevance. If there is no indication for endocrine disruption – e.g. due to the structure of the substance or results of other available studies – these tests may be waived.

3.3.4.2 Such information on endocrine disruption should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.3.5 Sediment toxicity

3.3.5.1 Substances that are potentially capable of depositing on or adsorbing to sediments to a significant extent should be assessed for toxicity to sediment-dwelling organisms. Testing is considered relevant only if $\log K_{ow} > 3$ or if there is similar adsorption behaviour and should include a maximum of three long-term tests with species representing different living and feeding conditions, e.g. *Chironomus* sp. (OECD 218), *Lumbriculus variegatus*, including a minimum of two tests with marine species. If sediment toxicity tests are not available, toxicity should be assessed using established internationally recognized methods such as the equilibrium partitioning method (EPM) according to the “Technical Guidance Document on Risk Assessment” (TGD) to the European Biocides Regulation 1107/2009/EC.

3.3.5.2 For substances that are persistent in marine waters or may accumulate in sediments, a specific marine sediment assessment is necessary.

3.3.5.3 Such information on sediment toxicity should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances;
- .3 Relevant Chemicals; and
- .4 discharged ballast water.

3.3.6 Food web/population effects

3.3.6.1 The biomagnification and persistence in the food web should be discussed based on the results from aquatic toxicity testing, mammalian toxicity evaluation and bioaccumulation and biodegradation data.

3.3.6.2 An assessment of secondary poisoning is redundant if, for the substance of concern, the absence of bioaccumulation potential can be demonstrated ($BCF < 500$ L/kg wet weight for the whole organism at 5% fat). If not, testing should include:

- .1 one long-term NOEC based on reproduction studies with a bird species; and
- .2 two NOECs from long-term studies with two mammalian species (from section 3.4 below).

3.3.6.3 Such information related to the food web/population effects should be provided for:

- .1 Active Substances; and
- .2 Relevant Chemicals.

3.4 Data on mammalian toxicity (G9: 4.2.1.2)

3.4.1 General

3.4.1.1 Information that is deemed to be scientifically not justified or technically not feasible need not be supplied. However, in such cases, a scientific justification should be submitted in order to explain why the data have not been provided. In general, testing with vertebrate animals should be avoided if another type of information is available that allows an assessment of hazards and risks to humans. Such alternative information may be obtained by validated *in vitro* methods, Quantitative Structure Activity Relationships (QSAR), and grouping or read-across with similar substances. If available, human cases or epidemiological evidence should be presented and discussed.

3.4.1.2 In general, information should be provided on the Active Substance and the Preparation, including any of its components, as appropriate. Information on Relevant Chemicals formed during or after application of the BWMS should be provided as well.

3.4.2 Acute toxicity

3.4.2.1 The acute toxicity data should be known for at least two routes of exposure, one of which should be the oral route. Active Substances or Preparations that are gases should be assessed in terms of inhalation toxicity.

3.4.2.2 The submission of dermal and/or inhalation studies instead of or in addition to oral studies may be requested depending on the physico-chemical properties of the substance, the proposed or potential application of the substance/products.

3.4.2.3 Such information on acute toxicity should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.4.3 Effects on skin and eye

3.4.3.1 Data should provide information on the degree and nature of skin, eye and associated mucous membrane irritation, especially with regard to the reversibility of responses. Data should provide sufficient information to assess the potential to cause skin sensitization reactions. Submitted data should concern testing with the Active Substance(s) or Preparation(s).

3.4.3.2 Data should include available information concerning a study on acute dermal irritation/corrosion

and a study on acute eye irritation/corrosion. The recommended tests are OECD guidelines 404 (Acute Dermal Irritation/Corrosion) and 405 (Acute Eye Irritation/Corrosion). Results from validated *in vitro* test methods may be submitted.

3.4.3.3 The recommended test guideline for Skin Sensitization is OECD guideline 406. While the guinea-pig Maximization test is considered to be the preferred adjuvant technique in certain cases, there may be good reasons for choosing the Buehler test or OECD TG 442A the Local Lymph Node Assay (LLNA) and OECD TG 442B (Lymph Node Assay: BrdU-ELISA). However, scientific justification should be given when either of the two latter mentioned is used. Information regarding hazard classification as a sensitizer should be submitted, if available.

3.4.3.4 Such information related to the effects on skin and eyes should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.4.4 *Repeated-dose toxicity*

3.4.4.1 Repeated-dose toxicity should be assessed based on data from a sub-chronic toxicity study (90-day) in two species, one rodent and one other mammalian species, using the oral route unless another one is more appropriate.

3.4.4.2 Such information on repeated-dose toxicity should be provided for:

- .1 Preparation including any of its components;
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.4.5 *Chronic toxicity*

3.4.5.1 There is a need for a chronic toxicity assessment based on a study of a minimum duration of 12 months in two species – one rodent and one other mammalian species – unless a full justification demonstrates that this test is not necessary.

3.4.5.2 Any chronic study can be combined with a carcinogenicity study.

3.4.5.3 Such information on chronic toxicity should be provided for:

- .1 Preparation including any of its components;
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.4.6 *Developmental and reproductive toxicity*

3.4.6.1 Data should include information from:

- .1 a two-generation reproduction and fertility study (OECD guideline 416 – Two-Generation Reproduction Toxicity Study); and
- .2 a prenatal developmental toxicity (teratogenicity) study in two species (OECD guideline 414 – Prenatal Developmental Toxicity).

3.4.6.2 However, this information can be waived provided that an argument is submitted based on structural relationships with a known reproductive toxicant, the results of other toxicity studies (including toxicokinetics), and concerns for endocrine disruption. Such information on developmental and reproductive toxicity should be provided for:

- .1 Preparation including any of its components;
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.4.7 *Carcinogenicity*

3.4.7.1 Carcinogenicity data should be submitted based on studies performed with one rodent and one other mammalian species. In case this information is not provided, a scientific justification should be submitted.

3.4.7.2 Such information on carcinogenicity should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.4.8 *Mutagenicity/genotoxicity*

3.4.8.1 This information should address at least three tests: a bacterial gene mutation test, an *in vitro* mammalian cell cytogenicity study and an *in vitro* mammalian cell gene mutation assay. In case of positive or equivocal results, further *in vivo* mutagenicity data are necessary i.e. bone marrow assay for chromosomal damage or a micronucleus test. In case this information is not provided, a scientific justification should be submitted.

3.4.8.2 Such information on mutagenicity and genotoxicity should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.4.9 *Toxicokinetics*

3.4.9.1 Basic data on the toxicokinetics of Active Substances and other components of a Preparation as well as Relevant Chemicals should be included. Information on absorption, distribution, metabolism and elimination (e.g. OECD guideline 417) should be presented, if available, to allow better understanding of toxic effects and a reduction of animal testing. The potential for dermal absorption should be evaluated preferably *in vitro* or by physico-chemical data to reduce the need for any specific dermal toxicity testing.

3.5 **Data on environmental fate and effect under aerobic and anaerobic conditions (G9: 4.2.1.3)**

3.5.1 *General*

3.5.1.1 The rate and route of abiotic and biotic degradation of the Active Substances, components of a Preparation and Relevant Chemicals under aerobic and anaerobic conditions should be assessed, resulting in the identification of relevant metabolites in the relevant media (ballast water, marine and fresh waters) (G9: 5.3.4).

3.5.1.2 The solids-water partition coefficient (K_d) and/or organic carbon normalized distribution coefficient (K_{OC}) of the Active Substances, components of a Preparation and Relevant Chemicals should be determined (G9: 5.3.6).

3.5.1.3 The data submitted in accordance with this paragraph should clarify, in addition to the degradation of the substance, other relevant routes of dispersion in and from water, such as volatilization, adsorption, sedimentation and transformation into bound residues. Accordingly, the exposure of organisms living in water and the sediment should be established.

3.5.2 *Modes of degradation (biotic; abiotic)*

3.5.2.1 Testing should include:

- .1 a study on hydrolysis at pH 5, 7, and 9 under aerobic conditions according to OECD guideline 111;
- .2 a study on ready biodegradability according to OECD guideline 301 (Ready Biodegradability) or equivalent guidelines if the Active Substance is discharged only into fresh water;
- .3 a study on ready biodegradability according to OECD guideline 306 (Biodegradability in Seawater) or equivalent guidelines if the Active Substance is discharged only into marine water;
- .4 studies on ready biodegradability according to OECD guideline 301 (or equivalent guidelines) and OECD guideline 306 (or equivalent guidelines) if the Active Substance is discharged into estuarine water (e.g. inland harbour with contact to seawater); and
- .5 it is recommended to evaluate the fate of Active Substances and Relevant Chemicals in fresh water (PSU < 3) and in marine water (PSU > 32) each at low temperatures (5°C) and higher temperatures (> 25°C).

3.5.2.2 If the Active Substance is not readily biodegradable, then the following higher tier studies should be conducted:

- .1 a study on aerobic and anaerobic transformation in aquatic sediment systems according to OECD guideline 308 (Aerobic and Anaerobic Transformation in Aquatic Sediment Systems) or equivalent guidelines if $K_{oc} > 500$ L/kg, using fresh or marine water depending on the kind of aquatic ecosystem where discharge is intended. At least one system with high organic matter/nutrient content and one with low organic matter/nutrient content should be tested;
- .2 a study on aerobic transformation of low concentrations of organic contaminants according to OECD guideline 309 (Aerobic Mineralization in Surface Water – Simulation Biodegradation Test) or equivalent guidelines, using fresh or marine water depending on the kind of aquatic ecosystem where discharge is intended; and
- .3 where relevant, a study on photo-transformation in water, e.g. US EPA OPPTS 835.2210 (1998) and/or OECD Guidance document on photo-transformation in water (1997).

3.5.2.3 Such information on the modes of degradation should be provided for:

- .1 Active Substances;
- .2 any other components of Preparations; and
- .3 Relevant Chemicals.

3.5.3 *Persistence and identification of the main metabolites in the relevant media (ballast water, marine and fresh waters)*

3.5.3.1 The route of degradation in the higher tier simulation tests specified under section 3.5.2 of this Methodology should be characterized based on a mass balance, including mineralization and formation of bound residues. Reaction or transformation products formed that may be considered as Relevant Chemicals should be identified.

3.5.3.2 Such information on persistence and metabolites should be provided for:

- .1 Active Substances;
- .2 any components of Preparations; and
- .3 Relevant Chemicals.

3.5.4 *Bioaccumulation, partition coefficient, octanol/water partition coefficient*

3.5.4.1 Data should include:

- .1 information on bioconcentration and biomagnification, which have already been detailed earlier in this Methodology;
- .2 a study into the log Pow according to OECD guideline 107 (Partition Coefficient (n-octanol/water): Shake Flask Method), OECD guideline 117 (Partition coefficient – n-octanol/water HPLC Method) or equivalent test guidelines. For very hydrophobic compounds, a slow stirring method is appropriate (e.g. OECD 123 (Partition coefficient – Slow Stirring Method)); and
- .3 the partition coefficient between solids and liquids should be determined, e.g. according to EU Technical Guidance Document on Risk Assessment (2003) for at least three inocula, including fresh water sediment, marine sediment, and particulate matter (sludge) (OECD 106). If no measured data are available for a specific adsorbing material, it is assumed that all adsorption can be related to the organic matter of the medium, viz. standardization to K_{oc}. This is only valid for non-ionic substances. For ionic substances, the K_p values and the test characteristics (% clay, CEC, % o.c., pH) should be reported.

3.5.4.2 Such information on bioaccumulation and partition coefficients should be provided for:

- .1 Active Substances;
- .2 any other components of Preparations; and
- .3 Relevant Chemicals.

3.5.5 *Bioavailability/biomagnification/bioconcentration*

3.5.5.1 If log Pow >3, testing of the bioaccumulation potential should be considered taking into account the following points:

- .1 one bioconcentration factor (BCF) determined in a bioconcentration study (at two dosing levels) with fish (e.g. OECD 305) or bivalves. The BCF should be based on uptake/elimination kinetics (k₁/k₂). The half-life for elimination should be reported. Fat content in marine fish typically ranges between 0.5 and 15% of the whole body weight. BCF should be normalized to 5% fat. The BCF, could e.g. be calculated with formulae 74 and 75 of the TGD (see 3.3.5) using the log K_{ow};

- .2 the biomagnification and persistence in the food web should be discussed based on the results from aquatic toxicity testing, mammalian toxicity evaluation and bioaccumulation and biodegradation data; and
- .3 there are no data provisions on bioavailability since it is considered that the bioavailability in the toxicity test systems is equivalent to the conditions under assessment. If the bioavailability of the Active Substance or Relevant Chemical in the discharge or the receiving environment is to be assessed, consequently, the bioavailability in the toxicity testing is to be reconsidered.

3.5.5.2 Such information on bioavailability/biomagnification/bioconcentration should be provided for:

- .1 Active Substances;
- .2 any components of a Preparation; and
- .3 Relevant Chemicals.

3.5.6 *Reaction with organic matter*

3.5.6.1 The reaction of radicals produced by the action of Active Substances with organic matter should be addressed qualitatively as to identify products of concern to the environment and, where possible, quantitatively as to identify environmental concentrations. In cases where this information is not available, a scientific justification should be submitted.

3.5.6.2 Radical producing chemicals are capable of forming halogenated (chlorinated, brominated) hydrocarbons that may be of concern to environment or human health, in the presence of organic matter. For these substances, the freely and otherwise reasonably available information should be presented and discussed in relation to the proposed manner of application, since they are subject to the decision making criteria.

3.5.6.3 Such information on the reaction with organic matter should be provided for:

- .1 Active Substances; and
- .2 Relevant Chemicals.

3.5.7 *Potential physical effects on wildlife and benthic habitats*

3.5.7.1 Data requirements consisting of physical/chemical properties are also required under other headings. Further guidance can be found in the MEPC-approved hazard evaluation procedure published as GESAMP Reports and Studies No.64. In cases where this information is not available, a scientific justification should be submitted.

3.5.7.2 Such data on the potential physical effects on wildlife and benthic habitats should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances;
- .3 Relevant Chemicals; and
- .4 discharged ballast water.

3.5.8 *Potential residues in seafood*

3.5.8.1 As appropriate, data should be submitted to assess the potential presence of residues of the Active Substance in seafood, the possible impact on consumer safety, and the level of residues that may be tolerated in seafood. Any available monitoring data on residues of the substance in seafood should be submitted.

3.5.8.2 Such data on potential residues in seafood should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.5.9 *Any known interactive effects*

3.5.9.1 Any knowledge (or absence of this knowledge) on interactive effects of the substances identified with the ballast water, with other Preparations to be used in ballast water, with other physical or chemical management of the ballast water, or with the receiving environment, should be reported. In cases where this information is not available, a scientific justification should be submitted.

3.5.9.2 Such information on known interactive effects should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.6 **Physical and chemical properties for the Active Substances and preparations and treated ballast water, if applicable (G9: 4.2.1.4)**

3.6.1 *General*

Data should be submitted for the Active Substances, Preparations including any of its components, the treated ballast water on board and the Relevant Chemicals to allow for the identification of hazards to the crew, the ship and the environment.

3.6.2 *Melting point*

Data on the melting point should be provided for Active Substances.

3.6.3 *Boiling point*

Data on the boiling point should be provided for Active Substances.

3.6.4 *Flammability (flash point)*

Data on the flash point should be provided for:

- .1 Active Substances; and
- .2 Relevant Chemicals.

3.6.5 *Density (relative density)*

Data on the density should be provided for:

- .1 Active Substances; and
- .2 discharged ballast water.

3.6.6 *Vapour pressure, vapour density*

Data on the vapour pressure and vapour density should be provided for:

- .1 Active Substances; and
- .2 Relevant Chemicals.

3.6.7 *Water solubility/dissociation constant*

Data on the water solubility and dissociation constant should be provided for:

- .1 Active Substances; and
- .2 Relevant Chemicals.

3.6.8 *Oxidation/reduction potential*

Data on the oxidation/reduction potentials should be provided for:

- .1 Preparations including any of its components;
- .2 Active Substances;
- .3 Relevant Chemicals; and
- .4 discharged ballast water.

3.6.9 *Corrosivity and chemical influence on the materials or equipment of normal ship construction*

3.6.9.1 For the dataset, at least the corrosivity and chemical influence to low carbon steel and other metals (e.g. stainless steel, Cu alloys and Ni alloys) and non-metals (e.g. gasket, coatings and seal materials) as may be found in a ship's seawater piping, fittings and structures that will be exposed to the Active Substance and Relevant Chemicals should be provided.

Data required for Basic Approval

3.6.9.2 For Basic Approval it is sufficient that the data from publicly available sources are submitted.

Data required for Final Approval

3.6.9.3 For Final Approval evaluation, the risk to the Safety of Ships should be assessed (see chapter 7.1).

3.6.10 *Auto-ignition temperature*

Data on the auto-ignition temperature should be provided for:

- .1 Active Substances; and
- .2 Relevant Chemicals.

3.6.11 *Explosive properties*

Data on the explosive properties should be provided for:

- .1 Active Substance; and
- .2 Relevant Chemicals.

3.6.12 Oxidizing properties

Data on the oxidizing properties should be provided for:

- .1 Active Substances; and
- .2 Relevant Chemicals.

3.6.13 Surface tension

Data on the surface tension should be provided for:

- .1 Active Substances; and
- .2 Relevant Chemicals.

3.6.14 Viscosity

Data on the viscosity should be provided for:

- .1 Active Substances; and
- .2 Relevant Chemicals.

3.6.15 Thermal stability and identity of relevant breakdown products

Data on thermal stability and identity of relevant breakdown products should be provided for Active Substances.

3.6.16 Reactivity towards materials

Data on the reactivity towards materials, e.g. piping, gaskets and containers, should be provided for:

- .1 Preparations
- .2 Active Substances; and
- .3 Relevant Chemicals.

3.6.17 pH

Since the pH of test waters can influence the formation of disinfection by-products, all chemical analysis results relating to the investigation of by-product formation should be accompanied by a specification of the pH. Data on the pH should be provided for uptake water and discharged water.

3.6.18 Salinity

Since the salinity of test waters can influence the formation of disinfection by products, all chemical analysis results relating to the investigation of by-product formation should be accompanied by a specification of the salinity. If water of different sources was mixed or any additives were added to natural test water to achieve the given salinity, this should be specified. Data on the salinity should be provided for uptake water and discharged water.

3.6.19 TOC, DOC, percentage of particulate matter

Since the organic carbon and particulate matter content of test waters can influence the formation of disinfection by-products, all chemical analysis results relating to the investigation of by-product formation should be accompanied by a specification of TOC, DOC, and total suspended solids (TSS). If any additives

were added to natural test water at Basic Approval or Final Approval to achieve the given concentrations, these should be specified. Data on the TOC, DOC and percentage of particulate matter should be provided for uptake water and discharged water.

3.6.20 *Other known relevant physical or chemical hazards*

Data on the any other known relevant physical or chemical hazards should be provided for:

- .1 Active Substances;
- .2 Relevant Chemicals; and
- .3 discharged ballast water.

3.7 Analytical methods at environmentally relevant concentrations (G9: 4.2.1.5)

3.7.1 Recognizing that some methods may only cover a range of chemicals, e.g. TRO, analytical methods at environmentally relevant concentrations should be provided for:

- .1 Active Substance; and
- .2 Relevant Chemicals.

3.7.2 If the BWMS needs any monitoring system for Active Substance, the analytical methods and product name of the monitoring equipment should be provided.

4 USE OF THE ACTIVE SUBSTANCE OR THE PREPARATION

4.1 The manner of application

4.1.1 The proposal for Basic Approval and Final Approval should include the intended minimum and maximum dosage and maximum allowable discharge concentrations of Active Substances, if applicable.

4.1.2 The proposal should also include the manner of application of the Active Substance or the Preparation by the BWMS to ensure the dosage and concentrations mentioned in paragraph 4.1.1 above.

4.1.3 In relation to section 7 of Procedure (G9), the dossier should contain the necessary data addressing the following items:

- .1 the technical manual or instructions by the Administration, including the product specification, process description, operational instructions, details of the major components and materials used, technical installation specifications, system limitations, and routine maintenance should be provided. The technical manual should also clearly specify the dosage to be added to ballast water and the maximum discharge concentration of the Active Substance therein;
- .2 recommended methods and precautions concerning handling, use, storage, and transport;
- .3 procedures to be followed in case of fire, and the nature of reaction products, combustion gases, etc.;
- .4 emergency measures in case of an accident;
- .5 an indication of the possibility of destruction or decontamination following emergency release in the marine environment;
- .6 procedures for the management of wastes that may be generated during the operation of the BWMS;

- .7 the manner or procedure of reuse or recycling of Active Substances or Preparations, if applicable;
- .8 the possibility of neutralization;
- .9 conditions for controlled discharge;
- .10 minimum retention time of treated water on board before discharge;
- .11 the amount of substance on board ship; and
- .12 if an Active Substance is used that is convertible to TRO, the dose should be expressed as mg/L as Cl₂.

4.1.4 Appropriate risk management measures (e.g. for neutralization of the Active Substance in case of emergency or if PEC/PNEC at discharge > 1) should be described. These management measures are an integral part of the ballast water management system and should be evaluated in the assessment.

4.1.5 The risk management measures proposed should be evaluated in respect to the hazards to ship, personnel and the environment.

5 RISK CHARACTERIZATION – HUMAN HEALTH

5.1 In risk characterization for human health, the procedure is to compare the exposure levels to which the target groups are exposed or likely to be exposed with those levels at which no toxic effects from the chemicals are expected to occur.

5.2 A quantitative risk assessment is an iterative process and normally includes four steps:

- .1 **Hazard identification** – what are the substances of concern and what are their effects?
- .2 **Dose (concentration)** – response (effect) relation – what is the relationship between the dose and the severity or the frequency of the effect?
- .3 **Exposure assessment** – what is the intensity, and the duration or frequency of exposure to an agent?
- .4 **Risk characterization** – how to quantify the risk from the above data?

5.3 In assessing an acceptable level of a particular substance, the procedure usually follows moving from animal experiments or preferably human data (e.g. epidemiological studies) giving a No Observed Adverse Effect Level (NOAEL) or a Lowest Observed Adverse Effect Level (LOAEL) to derive an exposure limit above, which humans should not be exposed to (Derived No Effect Level - DNELs). Taking into account the critical health effect that can be exerted by a threshold mode of action, the lowest DNEL for each exposure route should be established by dividing the value of the critical dose descriptor, e.g. N(L)OAEL, by an assessment factor (AF) to allow for extrapolation from experimental data to real human exposure situations. Comparison of this exposure limit with a measured or estimated exposure level is then used to judge whether the situation is satisfactory or whether risk management measures are required.

5.4 Based on the most suitable N(L)OAEL, a DNEL for further risk assessment is derived. Generally, the DNEL is determined by applying an Assessment Factor (AF) according to the formula:

$$\text{DNEL} = \text{N(L)OAEL} / \text{AF}$$

5.5 Two groups of potentially exposed persons are distinguished as follows:

- .1 workers (crew and port State control officers); and
- .2 general public.

5.6 Particularly in case of occupational exposure, it is of primary importance to fully understand the processes and unit operations in which exposure occurs, and the actual activities resulting in exposure (potentially exposed individuals, frequency and duration of the routes of concern, what personal protective equipment and control measures are used to reduce or mitigate exposure, and how effective they are).

5.7 Where data are of an unsatisfactory quality, it is useful to conduct an assessment using “worst-case” assumptions. If this indicates a risk of no concern, the assessment needs no further refinement.

5.8 Exposure should always be assessed in the first instance for the unprotected worker and, if appropriate, a second assessment, should be made taking personal protective equipment (PPE) into account.

5.9 In the risk characterization, these estimates are combined with the results of the effects assessment and conclusions are drawn whether or not there is a concern for any scenarios assessed (Risk Characterization Ratio (RCR) = Exposure/DNEL).

5.10 When a risk assessment results in the conclusion that there is an unacceptable risk ($RCR > 1$), a second tier assessment should be performed by considering specific risk control measures in order to lower this risk to acceptable levels (protective clothing, respirators and self-contained breathing apparatus, crew training, good operational practices, etc.).

5.11 The effect assessment of the Active Substances, Preparations and Relevant Chemicals should include a screening on carcinogenic, mutagenic and endocrine disruptive properties, taking into account available information. There is no requirement for additional testing. If the screening results give rise to concerns, this should give rise to a further assessment.

5.12 As a general rule, exposure in the workplace must be avoided or minimized as far as technically feasible. In addition, a risk for the general public from secondary exposure to a non-threshold carcinogenic substance is also unacceptable.

5.13 Carcinogens can have a threshold or non-threshold mode of action. When it comes to threshold carcinogens, these can be assessed by using a Derived No-Effect Level (DNEL) approach, however in the case of the non-threshold carcinogens a different approach to risk assessment is recommended. In these cases, a Derived Minimal Effect Level (DMEL) should be determined.

5.14 Cancer risk levels between 10^{-4} to 10^{-6} are normally seen as indicative tolerable risk levels when setting DMELs. Where these values are available from internationally recognized bodies, they can be used to set DMELs for risk assessment purposes.

5.15 The assessment of the carcinogenicity, mutagenicity and reproductive toxicity properties of the Active Substance and the Relevant Chemicals takes place as part of the PBT assessment (see 6.1 of this Methodology).

5.16 The procedure followed is described in more detail in appendix 4.

6 RISK CHARACTERIZATION – ENVIRONMENT

The environmental risk assessment approach is set up according to the following principles:

- .1 **Hazard identification** – what are the substances of concern and what are their effects?
- .2 **Dose (concentration)** – response (effect) relation – what is the relationship between the dose and the severity or the frequency of the effect?
- .3 **Exposure assessment** – what is the intensity, and the duration or frequency of exposure to an agent?
- .4 **Risk characterization** – how to quantify the risk from the above data?

6.1 Screening for persistence, bioaccumulation and toxicity (G9: 5.1)

6.1.1 Persistence (G9: 5.1.1.1)

6.1.1.1 Persistence is preferably assessed in simulation test systems to determine the half-life under relevant conditions. Biodegradation screening tests may be used to show that the substances are readily biodegradable. The determination of the half-life should include assessment of Relevant Chemicals.

6.1.1.2 For persistence and degradation data, see sections 3.5.2 and 3.5.4 of this Methodology.

6.1.2 Bioaccumulation (G9: 5.1.1.2)

6.1.2.1 The assessment of the bioaccumulation potential should use measured bioconcentration factors in marine (or freshwater organisms). Where test results are not available, the assessment of the bioaccumulation potential of an organic substance may be based on the log Pow.

6.1.2.2 For bioaccumulation data, see sections 3.3.6 and 3.5.3 of this Methodology.

6.1.3 Toxicity tests (G9: 5.1.2.3)

6.1.3.1 Acute and/or chronic ecotoxicity data, ideally covering the sensitive life stages, should be used for the assessment of the toxicity criterion.

6.1.3.2 For ecotoxicity data, see section 3.3 of this Methodology.

6.1.3.3 It is necessary to consider, whether an effect assessment based on tests in freshwater species offers sufficient certainty that sensitive marine species will be covered by any risk assessment.

6.1.4 Does the Active Substance and/or Preparation meet all three criteria for PBT?

Table 1: Criteria for identification of PBT Substances

Criterion	PBT criteria
Persistence	Half-life: > 60 days in marine water, or > 40 days in fresh water,* or > 180 days in marine sediments, or > 120 days in freshwater sediments
Bioaccumulation	Experimentally determined BCF > 2,000, or if no experimental BCF has been determined, Log Pow ≥ 3
Toxicity (environment) Toxicity (human health, CMR)	Chronic NOEC < 0.01 mg/L carcinogenic (category 1A or 1B), mutagenic (category 1A or 1B) or toxic for reproduction (category 1A, 1B or 2) according to GHS classification.

* For the purpose of marine environmental risk assessment, half-life data in fresh water and freshwater sediment can be overruled by data obtained under marine conditions.

See also table 1 in Procedure (G9).

6.1.4.1 Active Substances, Relevant Chemicals or Preparations identified as PBT substances will not be recommended for approval in accordance with paragraph 6.4.1 of Procedure (G9).

6.1.4.2 The CMR assessment is based on new regulations in several jurisdictions as part of the PBT assessment. This is a new development in the risk assessment methods as applied by jurisdictions to register

pesticides, biocides and industrial chemicals. Therefore, it is considered appropriate that including CMR into the methodology of the evaluation of BWMS is necessary to be in line with these jurisdictions.

6.1.4.3 Based on the appropriate toxicological studies on carcinogenicity, mutagenicity and reproductive toxicity, the Relevant Chemicals should be scored on these three items, using 1 (one) if the substance showed the hazard under consideration and 0 (zero) if the substance did not show the hazard under consideration.

6.1.4.4 For any Relevant Chemical showing at least one of the hazards, carcinogenicity, mutagenicity or reproductive toxicity, exposure should be avoided or relevant risk mitigation measures should be proposed to minimize exposure to an acceptable level using appropriate extrapolation methods.

6.2 Evaluation of the discharged ballast water (G9: 5.2)

6.2.1 General

6.2.1.1 The advantage of toxicity testing on the ballast water discharge is that it integrates and addresses the potential aquatic toxicity of the Active Substance, Preparation including any of its components and Relevant Chemicals formed during and after application of the BWMS.

6.2.1.2 For ecotoxicity data, see sections 3.3.2 and 3.3.3 of this Methodology.

6.2.1.3 The validity criteria should be clearly established during planning and the results of the validation should be stated in the report.

6.2.1.4 For the acute and chronic test using algae, the following three criteria should be taken into account:

- .1 The biomass should increase exponentially by a factor of at least 16 within the 72-hour test period. This corresponds to a specific growth rate of 0.92 d^{-1} .
- .2 The mean coefficient of variation for section-by-section specific growth rates (days 0-1, 1-2 and 2-3, for 72-hour tests) must not exceed 35% (OECD 201).
- .3 The coefficient of variation of average specific growth rates in the replicates during the whole test period must not exceed 7% (ISO10253) or 10% (OECD 201).

6.2.2 Basic Approval

6.2.2.1 Testing should be performed in the laboratory using a sample prepared by simulation of the BWMS (G9: 5.2.1).

6.2.2.2 It is required that the residual toxicity of treated ballast water is assessed in marine, brackish and fresh water to provide certainty as to acceptability when the treated water is discharged because discharge of ballast water may occur in all three salinities and, therefore, risk assessment in three salinities is needed. Any limitations as to environmental acceptability should be clearly indicated in the submission.

6.2.3 Final Approval

6.2.3.1 Toxicity tests (Whole Effluent Toxicity test) with samples of ballast water treated with the BWMS from the land-based test set-up should be conducted (G9: 5.2.1.2, 5.2.2 and 5.2.3).

6.2.3.2 From a pragmatic standpoint, the following information would provide adequate safeguards for the environment and may replace the requirement of the submission of chronic toxicity data on the full-scale WET tests:

- .1 acute toxicity testing using algae (or plants), invertebrates and fish; or

- .2 chemical analysis demonstrating that there are no significant increases in the concentrations of chemical by-products during at least a five-day tank holding time or a holding time in accordance with the sampling scheme under the Guidelines (G8); or
- .3 both chemical analysis and acute aquatic toxicity testing; immediately after treatment and after 24 or 48 hours.

6.2.3.3 Recently gained experience on the data availability of a full chemical analysis of the treated and/or neutralized ballast water in combination with the acute toxicity testing of the WET test would reveal, based on expert judgment, that unacceptable effects on the receiving aquatic environment are not to be expected. In this way, expensive chronic ecotoxicity testing may be avoided with sufficient safety on the potential effects on aquatic organisms.

6.2.4 *Comparison of effect assessment with discharge toxicity*

The results of the effect assessment of the substances that are likely to be present in the treated ballast water at discharge are compared to the results of the toxicity testing of the treated ballast water. Any unpredicted results (e.g. lack of toxicity or unexpected toxicity in the treated ballast water at discharge) should give rise to a further elaboration on the effect assessment (G9: 5.3.14).

6.2.5 *Determination of holding time*

6.2.5.1 The test data should be used to determine the no adverse-effect concentration upon discharge, i.e. the necessary dilution of the treated ballast water. The half-life, decay and dosage rates, system parameters and toxicity should be used to determine the amount of time needed to hold the treated ballast water before discharge (G9: 5.2.7). An indication of the uncertainty of the holding time should be given, taking into account different variables (e.g. temperature, pH, salinity and sediment loading).

6.3 **Risk characterization and analysis**

6.3.1 *Prediction of discharge and environmental concentrations*

6.3.1.1 Based on measured data of the Active Substances, Preparations including any of its components, and Relevant Chemicals, the worst-case concentration at discharge should be established.

6.3.1.2 Environmental concentrations after discharge of treated ballast water under controlled conditions during development and type approval tests should be estimated and provided in the application dossier for Basic Approval.

6.3.1.3 Environmental concentrations, under suitable emission scenarios developed describing typical full-scale use and discharge situations, should also be estimated for treated ballast water, Active Substances, Relevant Chemicals and other components of Preparations, as appropriate.

6.3.1.4 MAMPEC-BW, latest available version, should be used to calculate PEC values with its standard settings. All information about MAMPEC-BW can be found through the information given in appendix 5.

6.3.1.5 The MAMPEC-BW, latest available version, will calculate the stationary concentration in the harbour after discharge of ballast water. To account for local effects, near the ship at discharge, the local concentration at near ship is estimated using the formulae suggested in Zipperle et al., 2011 (Zipperle, A., Gils J. van, Heise S., Hattum B. van, Guidance for a harmonized Emission Scenario Document (ESD) on Ballast Water discharge, 2011):

$$C_{\max} = \frac{C_{BW} + (S - 1) \cdot C_{\text{mean}}}{S}$$

where:

C_{\max}	=	the maximum concentration due to near ship exposure ($\mu\text{g/L}$)
C_{BW}	=	the concentration found in the discharged ballast water ($\mu\text{g/L}$)
S	=	dilution factor based on sensitivity analysis with a higher tier model, default value = 5
C_{mean}	=	the mean concentration as output from MAMPEC-BW

6.3.1.6 The concentration calculated with this formula will be compared to acute toxicity data for the Active Substances and Relevant Chemicals to evaluate the short-term effects on aquatic organisms.

6.3.1.7 It is further recommended that the effect of cold and/or fresh water to the natural degradation process of the Active Substances and Relevant Chemicals is considered.

6.3.1.8 It is not necessary to undertake further assessment of temperature effects on the degradation rate of Active Substances and Relevant Chemicals if the PEC/PNEC ratio is found to be acceptable assuming no degradation.

6.3.1.9 If the PEC/PNEC ratio is not found to be acceptable assuming no degradation, further analysis is required. In the literature, the degradation rate of the Active Substance and Relevant Chemicals is typically determined at 20°C. Because the degradation rate is slower in cold environments, the risk should be assessed at temperatures of 1°C.

6.3.1.10 Extrapolation of the temperature effect for a difference less than or equal to 10°C is generally scientifically accepted when assessed by application of the Arrhenius equation according to the Q10 approach. Extrapolation of the temperature effect for a difference greater than 10°C should also be undertaken as a best estimate using the Arrhenius equation.

6.3.2 *Effects assessment*

6.3.2.1 The effect assessment of the Active Substances, Preparations including any of its components, and Relevant Chemicals is initially based on a data-set of acute and/or chronic ecotoxicity data for aquatic organisms, being primary producers (e.g. algae), consumers (e.g. crustacea), and predators (e.g. fish) (G9: 5.3.9).

6.3.2.2 An effect assessment could also be prepared on secondary poisoning to mammalian and avian top-predators where relevant. Only toxicity studies reporting on dietary and oral exposure are relevant, as the pathway for secondary poisoning refers exclusively to the uptake of chemicals through the food chain. It might be necessary to extrapolate threshold levels for marine species from terrestrial species assuming there are interspecies correlations between laboratory bird species and marine predatory bird species and between laboratory mammals (e.g. rats) and the considerably larger marine predatory mammals. An assessment of secondary poisoning is redundant if the substance of concern demonstrates a lack of bioaccumulation potential (e.g. BCF < 500 L/kg wet weight for the whole organism at 5% fat) (G9: 5.3.10).

6.3.2.3 An assessment of effects to sediment species should be conducted unless the potential of the substance of concern to partition into the sediment is low (e.g. $K_{\text{oc}} < 500 \text{ L/kg}$) (G9: 5.3.11).

6.3.2.4 The effect assessment of the Active Substances, Preparations and Relevant Chemicals, taking the indicated information into account, should be based on internationally recognized guidance (e.g. OECD) (G9: 5.3.13).

6.3.3 *Effects on aquatic organisms*

6.3.3.1 For assessment of effects to the aquatic environment, appropriate Predicted No-Effect Concentrations (PNEC) should be derived. A PNEC is typically derived at a level that, when not exceeded, protects

the aquatic ecosystem against toxic effects of long-term exposures. However, for situations where only short-term exposures are expected, an additional PNEC for short-term (or near ship) exposure may be useful. PNEC values are normally derived from acute and/or chronic aquatic toxicity results for relevant aquatic species by dividing the lowest available effect concentration with an appropriate assessment factor. For the aquatic effect assessment, the assessment factors, given in table 2, should provide guidance although these may be altered on a case-by-case basis based on expert judgment. In cases where a comprehensive data-set is available, the PNEC may be derived with a mathematical model of the sensitivity distribution among species.

Table 2: Assignment of Assessment Factors (AF) used for deriving PNEC values

Data-set	Assessment Factor		Rule number
	PNEC general	PNEC near ship	
Lowest* short-term L(E)C ₅₀ from freshwater or marine species representing one or two trophic levels	10,000	1,000	1
Lowest* short-term L(E)C ₅₀ from three freshwater or marine species representing three trophic levels	1,000	100	2
Lowest* short-term L(E)C ₅₀ from three freshwater or marine species representing three trophic levels + at least two short-term L(E)C ₅₀ from additional marine taxonomic groups	100	10	3
Lowest* chronic NOEC from one freshwater or marine species representing one trophic level, but not including micro-algae	100		4
Lowest* chronic NOEC from two freshwater or marine species representing two trophic levels, which may include micro-algae	50		5
Lowest* chronic NOEC from three freshwater or marine species representing three trophic levels, which may include micro-algae	10		6

- Notes:**
- * .1 If the lowest value is not used, based on expert judgement, a scientific rationale should be submitted.
 - .2 AF assigned to chronic data may be lowered if sufficient (for instance three different trophic levels) acute values are available.
 - .3 See section 3.3.3 of this Methodology for information on suitable chronic testing.
 - .4 For the determination of the assessment factor for the NOEC values in table 2 micro-algae have been excluded because of the short duration of the chronic test for algae (4 days) and, therefore, it is not considered by some jurisdictions as a real chronic test.
 - .5 The rule numbers refer to the GESAMP-BWWG Database containing the 43 substances as indicated in appendix 6 to this Methodology and indicates the relevant Assessment Factors as used for these 43 substances.

6.3.3.2 In some cases, the PNEC_{near ship} may be substantially lower than the PNEC_{harbour} due to insufficient availability of acute ecotoxicity data. In such cases, the PNEC_{Cnear ship} should be set equal to the PNEC_{harbour}. This would still be considered a worst-case PNEC.

6.3.3.3 PNEC values should be derived for any substances that may be found in treated ballast water in concentrations that may be of concern for the aquatic environment. The relevance of deriving PNEC values for Active Substances, any other components of Preparations and/or Relevant Chemicals should thus be considered.

6.3.3.4 Currently there is no compelling physiological or empirical proof that marine organisms are more sensitive than freshwater organisms or vice versa and therefore, an additional assessment factor is not applied. Should this, however, be demonstrated for the substance under consideration, an additional assessment factor should be taken into account.

6.3.3.5 Where data are available for additional marine taxa, for example, rotifers, echinoderms or molluscs, the uncertainties in the extrapolation are reduced and the magnitude of the assessment factor applied to a data-set can be lowered.

6.3.3.6 Because sediment constitutes an important compartment of ecosystems, it may be important to perform an effects assessment for the sediment compartment for those substances that are likely to transfer substantially into the sediment.

6.3.4 *Comparison of effect assessment with discharge toxicity*

The results of the effect assessment of the substances that are likely to be present in the treated ballast water at discharge are compared to the results of the toxicity testing of the treated ballast water. Any unpredicted results (e.g. lack of toxicity or unexpected toxicity in the treated ballast water at discharge) should give rise to a further elaboration on the effect assessment (G9: 5.3.14).

7 RISK ASSESSMENT

7.1 Risk to safety of ship

7.1.1 The potential risk to the safety of the ship and crew raised by the operation of the BWMS should be assessed, taking into account the identified risk mitigation measures to be applied and any relevant legislative requirements such as provided in SOLAS and MARPOL. Potential risks to the ship/crew may include, inter alia:

- .1 increased corrosion;
- .2 fire and explosion;
- .3 storage and handling of the substances;
- .4 contact with, or inhalation of, process products; and
- .5 noise.

7.1.2 The BWMS that make use of an Active Substance (such as hypochlorite electrolysis, chlorine dioxide, sodium hypochlorite, peroxyacetic acid or ozone) may have a direct effect on organic material like epoxy tank coatings. Depending on the dose and degradation rate of Active Substance there could be an impact on the coating system. Particularly, for a BWMS with a TRO dose ≥ 10 mg/L, expressed as TRO as Cl_2 mg/L, compatibility is validated against a coated surface by test described in paragraph 7.1.3.

7.1.3 Testing should be conducted with two series of test panels and the coating shall be applied in accordance with table 1 of the *Performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers* (PSPC) (resolution MSC.215(82)). Each test should be carried out in duplicate. One set of panels should be exposed to untreated ballast water and the other to treated ballast water. Other test conditions are described in the table below.

Parameters	Quantification	Reference ¹ /Remark
The size of each test panel	200 mm x 400 mm x 3 mm	NACE standard TM0112-2012
Depth of immerse	250 ± 10 mm	NACE standard TM0112-2012
Water temperature in tanks for exposure	> 35 ± 2 °C	NACE standard TM0112-2012
The total test duration	More than 6 months	NACE standard TM0112-2012
Ballast water	Natural seawater (> 32 PSU)	Preferred by GESAMP/BWWG but artificial seawater is accepted
Active Substance Dose	At maximum dose, which is evaluated by the Group at Basic Approval	Modified from NACE standard TM0112-2012
Renewal frequency	Every 7 days	Modified from NACE standard TM0112-2012

¹ NACE International has as a point of policy that when one of its standards are made mandatory by a major International governing body then that standard will be available at no cost to the general public by placement on its website outside the firewall. This would apply to NACE standard TM0112-2012 for Ballast Tank Coating evaluation.

7.1.4 Testing of corrosion should take place in the laboratory, but it is recommended to make use of the full-scale BWMS which is to be used for efficacy testing in accordance with Guidelines (G8), for the preparation of treated ballast water for this purpose. However, if it is impractical to maintain the renewal frequency described in the table, ballast water may be prepared by a separate treatment using an identical BWMS.

7.1.5 After the exposure duration, adhesion, blistering, cracking, delamination and corrosion around a scribe should be determined, scored and reported.

Acceptance criteria

7.1.6 In order to determine whether the BWMS has influenced the coating's properties as evaluated according to ISO 4624 and 4628, the principles and acceptance criteria mentioned in 7.1.7 should be employed. Paint coatings evaluation should be made as direct comparisons between samples subject to treated and untreated ballast water, respectively. Only the difference should be used for the final assessment. Paint coatings for BWMS compliance testing will normally be PSPC approved, and the present evaluation should not be a re-evaluation of approved products. "Pass/Fail" is judged by comparison with the "untreated" sample, i.e. the sample that has been exposed to untreated ballast water in parallel with the ballast water management system.

7.1.7 For the BWMS to be found suitable for Final Approval, it should not fail in any test evaluation as specified below:

- .1 ISO 4624: Adhesion: "Fail" if adhesion at treated panel is below 5 MPa and treated panel shows more than 20% reduction compared to untreated panel;
- .2 ISO 4628-2: Blistering: "Fail" if blisters occur;
- .3 ISO 4628-4: Cracking: "Fail" if the density and/or size and/or depth in crease with three or more units from the one exposed by the untreated ballast water; and
- .4 ISO 4628-8: Delamination and corrosion around a scribe: "Fail" if the difference between treated and untreated is greater than 3 mm.

7.1.8 It is recommended that these Pass/Fail criteria be reviewed no later than one year after the implementation of this new chapter to the Methodology (BWM.2/Circ.13/Rev.2).

7.2 Risks to human health

7.2.1 *General*

7.2.1.1 The human health risk assessment should follow generally accepted guidelines including acute/short-term and long-term exposure situations. The risk assessment should entail hazard identification and, as appropriate, dose (concentration) – response (effect) assessment, exposure assessment and risk characterization as indicated in section 5.2 of this Methodology. The population groups deemed to be at risk and so to be examined should include crew, passengers and all personnel, including the public, in ports. Potential health risks connected to the exposure of consumers via seafood or persons at the coast (e.g. beach) after discharge should be evaluated. Special attention should be given to service and repair of the system by technicians and accidental situations on board (e.g. specific personal protection equipment). The evaluation of the risks to human health should include risk reduction (risk management) by specific measures proposed by the manufacturer and of the ballast water management system.

7.2.2 *Health effects in humans*

The effect assessment of the Active Substances, Preparations and Relevant Chemicals should include a screening on carcinogenic, mutagenic and reproductive toxic properties. If the screening results give rise to concerns, this should give rise to a further effect assessment (G9: 5.3.12) (see also section 6.1.4 of this Methodology).

7.2.3 *Human Exposure Scenario*

7.2.3.1 A Human Exposure Scenario (HES) should be provided by the applicant as part of the risk assessment procedure for ballast water management systems, using the guidance contained in appendix 4 of this Methodology (G9: 6.3.3).

7.2.3.2 The risk assessment should include a description of the ballast water treatment process associated with the system as a set of unit operations, i.e. in doing so, identifying clearly which individual system components of a BWMS are likely to lead to human exposure to Active Substances, Relevant Substances and by-products. For each system component, including connecting piping, a description of such exposures needs to be provided, e.g. chemical storage, chemical application, processing of treated ballast water, ballast tank operations, including associated piping, as well as discharge operations and maintenance. The risk assessment should also include the risk reduction measures envisaged for all of the above-defined unit operations, i.e. stating clear Personal Protective Equipment (PPE) requirements for each step in the process.

7.2.3.3 Equipment failure and accident situations should be considered separately from conditions of normal operation.

7.2.3.4 In cases where an exposure/DNEL or exposure/DMEL ratio is not less than 1, then, to demonstrate that there is no unacceptable risk, the applicant should provide scientific justification, which may include potential risk mitigation measures.

7.3 Risks to the aquatic environment

7.3.1 The potential risks to the aquatic environment should be assessed for both Basic and Final Approval.

7.3.2 When no aquatic toxicity of the treated ballast water at discharge is found either through direct testing of the treated ballast water or if the estimated ratios between predicted concentrations of the Active Substance, components of Preparations or Relevant Chemicals, described in 6.3.3 and the respective PEC/PNEC ratios are less than 1, no further assessment of direct toxic effects to the aquatic environment is necessary.

7.3.3 In cases where a PEC/PNEC ratio is not less than 1, then, to demonstrate that there is no unacceptable risk, the applicant should provide scientific justification, which may include potential risk mitigation measures.

8 ASSESSMENT REPORT (G9: 4.3)

The Assessment Report referred to in section 4.3 of Procedure (G9) should be presented by the concerned Administration and should at least provide:

- .1 an overview of the data and endpoints on which the risk characterization according to section 6 of Procedure (G9) is based, including a description of the quality of test reports;
- .2 an assessment of risks to the safety of ships, human health (crew and the general public), the environment and resources in accordance with section 6 of Procedure (G9);
- .3 if any monitoring has been conducted, a summary of the results of that monitoring, including information on the analytical methodology used, ship movements and a general description of the area monitored;
- .4 a summary of the available data on environmental exposure and any estimates of environmental concentrations developed through the application of mathematical models, using all available environmental fate parameters, preferably those that were determined experimentally, along with an identification or description of the modeling methodology;
- .5 an evaluation of the association between the ballast water management system making use of Active Substances or Preparations containing one or more Active Substances to comply with the Convention in question, the related adverse effects and the environmental concentrations, either observed or expected, based on the risk assessment and the effluent testing;
- .6 a qualitative statement of the level of uncertainty in the evaluation referred to under the preceding paragraph; and
- .7 a detailed description of risk management possibilities, e.g. for neutralization of the Active Substance in case of emergency or if PEC/PNEC at discharge > 1 . These management measures are an integral part of the ballast water management system.

9 MODIFICATION TO THE APPLICATION

9.1 Manufacturers should report any modifications in names, including trade and technical name, composition or use of the Active Substances and Preparations in the ballast water management systems approved by the Organization, to the Member of the Organization. The Member of the Organization should inform the Organization accordingly (G9: 8.4.1).

9.2 Manufacturers intending to significantly change any part of a ballast water management system that has been approved by the Organization or the Active Substances and Preparations used in it should submit a new application (G9: 8.4.2).

10 FINAL APPROVAL

10.1 In accordance with paragraph 5.2.1 of Procedure (G9) for Final Approval, the discharge testing should be performed as part of the land-based type approval process using the treated ballast water discharge.

10.2 In order to obtain Final Approval in accordance with section 8.2 of Procedure (G9), the following criteria have to be met:

- .1 Basic Approval has to be granted first;
- .2 the Member of the Organization submitting an application should conduct the Type Approval tests in accordance with the Guidelines for approval of ballast water management systems (G8). The results should be conveyed to the Organization for confirmation that the residual toxicity of the discharge conforms to the evaluation undertaken for Basic Approval. This would result in Final Approval of the ballast water management system in accordance with regulation D-3.2. Active Substances or Preparations that have received Basic Approval by the Organization may be used for evaluation of ballast water management systems using Active Substances or Preparations for Final Approval (G9: 8.2.1) in accordance with the provisions of the framework “For determining when a Basic Approval granted to one BWMS may be applied to another system that uses the same Active Substance or Preparation”;
- .3 it is to be noted that from the Guidelines (G8), paragraph 2.3, on land-based testing, only the results of the residual toxicity tests should be included in the proposal for Final Approval in accordance with Procedure (G9). All other Guidelines (G8) testing remains for the assessment and attention of the Administration. Although Basic Approval under Procedure (G9) should not be a pre-requisite for Type Approval testing, as an Administration can regulate discharges from its own ships in its own jurisdiction, Basic Approval should still be required when the technology is used on ships trading in other States’ jurisdiction (G9: 8.2.2);
- .4 it should be noted that once a system has received Final Approval under Procedure (G9), the respective applicant should not have to retrospectively submit new data if there is a change in the Methodology agreed by the Organization (G9: 8.2.3);
- .5 toxicity testing should be done on two types of water at two appropriate time intervals after treatment (preferably immediately after treatment and after a 24- or 48-hour interval), and organisms normally found in the selected types of water should be used in the toxicity testing. Dependent upon recommendations made at Basic Approval, in many cases only acute toxicity testing will be needed for Final Approval;
- .6 all information related to Total Residual Oxidants (TROs), Total Residual Chlorine (TRC) and the chemicals included in such groupings, including their concentrations, should be provided to the GESAMP-BWWG for Final Approval when requested as part of its evaluation for Basic Approval;
- .7 in addition to the basic data-set needed for the treated ballast water and the individual chemicals produced by the system – as identified in the Methodology for Basic Approval – a generated meaningful PEC/PNEC ratio would be required for Final Approval; and
- .8 the application for Final Approval should address the concerns identified during the consideration for Basic Approval.

* *

APPENDIX 1

LETTER OF AGREEMENT

relating to a ballast water management system that makes use of Active Substances proposed for approval in accordance with regulation D-3, paragraph 2, of the Ballast Water Management Convention

Having received a satisfactory application on [please insert the name of the ballast water management system] produced by [please insert the name of the manufacturer], the undersigned hereby

confirms, on behalf of the maritime Administration of [please insert the name of the submitting country], that the application dossier regarding the ballast water management system that makes use of Active Substance(s) mentioned above is subject to the following conditions:

1. **Financial arrangements:** The fee paid in connection with this proposal for approval is based on the recovery of costs incurred by the International Maritime Organization (Organization) in respect of the services provided by the GESAMP-Ballast Water Working Group. Fees will be invoiced in up to three tranches:
 - US\$50,000 immediately following receipt of this Letter of Agreement by the Organization;
 - an additional US\$ 50,000 immediately following the deadline for submissions, if only one submission has been made; and/or
 - a final invoice to recover costs over the initial cost estimate, if required.

All fees paid as described above will be retained in a Trust Fund established for this purpose.

2. **Intellectual Property Rights:** The Organization and the members of the GESAMP-Ballast Water Working Group will make every reasonable effort to prevent the disclosure of information which is clearly and prominently identified as being subject to an intellectual property right, subject to the condition that sufficient detail must be provided to the Marine Environment Protection Committee (MEPC) of the Organization to enable that body to perform its functions under resolution MEPC.169(57) and, in particular, to approve the proposed ballast water management systems that make use of Active Substances. In this respect the members of the Group will be required to sign a declaration concerning the confidentiality of information acquired as a result of their affiliation with the Group. In any case, neither the Organization nor the members of the GESAMP-Ballast Water Working Group can accept liability for damage or loss, which may result from disclosure of such information in the exercise of their responsibilities.
3. **Settlement of disputes:** The submitting Administration, the Organization, and the GESAMP-Ballast Water Working Group shall use their best efforts to settle amicably any dispute, controversy or claim arising out of, or relating to the process established for reviewing Active Substances used for the management of ballast water or this Letter of Agreement, or the breach, termination or invalidity thereof. Where these parties wish to seek such an amicable settlement through conciliation, the conciliation shall take place in accordance with the UNCITRAL Conciliation Rules then pertaining, or according to such other procedure as may be agreed between the parties. Any dispute, controversy or claim, which is not settled amicably, shall be referred to arbitration in accordance with the UNCITRAL Arbitration Rules then pertaining. The place of the arbitration will be London, England.
4. **Privileges and immunities:** Nothing in or relating to the process established for reviewing Active Substances used for the management of ballast water or this Letter of Agreement shall be deemed a waiver, express or implied, of any of the privileges and immunities of the International Maritime Organization, including its officers, experts or subsidiary organizations or of the privileges and immunities to which the Administration is entitled under international law.

Members of the GESAMP-Ballast Water Working Group, when performing functions in connection with the terms of reference of the Group, shall be considered to be experts of the Organization pursuant to Annex XII of the Convention on Privileges and Immunities of the Specialized Agencies of the United Nations.

Authorized signature on behalf of the maritime Administration:

Typed/Printed name: _____

Title/Position/Organization/Country: _____

Date of signature: _____

Name and address _____

for fees invoicing: _____

* *

APPENDIX 2

TIMETABLE FOR ACTIVITIES RELATED TO THE GESAMP-BWWG MEETINGS

Timeline	Activity
28 weeks before MEPC	Deadline for submission of application dossiers and related documents to be reviewed by the GESAMP-BWWG
(8 weeks)	Preparation of the meeting, including circulation of any relevant information provided by other delegations
20 weeks before MEPC	GESAMP-BWWG meeting
(1 week)	Editing and completion of the draft report of the meeting
(3 weeks)	Review and approval of the report by the GESAMP including response/clarification by the working group
(1 week)	Administrations confirm that no confidential data are contained in the report
(1 week)	Produce the final report addressing the comments by the GESAMP
13 weeks before MEPC	Submission of the report of the meeting of the GESAMP-BWWG in accordance with the 13-week deadline (bulk documents) for MEPC

**

APPENDIX 3

MODEL DOCUMENT FOR THE ANNEX ON NON-CONFIDENTIAL DOSSIER OF AN APPLICATION FOR BASIC APPROVAL AND/OR FINAL APPROVAL OF A BALLAST WATER MANAGEMENT SYSTEM (BWMS)

1 INTRODUCTION

This section should include:

- .1 a brief history of any previous applications; and
- .2 the results of any previous evaluations with references to any pertinent documents;

2 DESCRIPTION OF THE SYSTEM

This section should include:

- .1 a list of all the relevant parts of the BWMS, e.g. filtration, treatment (e.g. U.V. or electrolysis or chemicals), neutralization and any feedback controls;
- .2 a schematic representation of the system showing the component parts; and
- .3 a general description of how the BWMS works and how all the component parts are integrated.

3 CHEMICALS ASSOCIATED WITH THE SYSTEM

3.1 Chemical reactions associated with the system

This section should describe the anticipated chemical reactions associated with the particular system involved and residual chemicals expected to be discharged to the sea.

3.2 Identification of chemicals associated with the ballast water management system

3.2.1 This section should include all Active Substances (AS), Relevant Chemicals (RC) and any Other Chemicals (OC) potentially associated with the system either intentionally or as by-products resulting from the treatment.

3.2.2 A summary of all chemicals analysed in the treated ballast water should be presented in a table, as shown below, including those not actually detected. Where a chemical could not be detected, a less than value (< x mg/L) should be associated with it to indicate the detection limits of the analysis.

Chemical analysis of treated ballast water

Chemical	Concentration in treated ballast water (µg/L)	AS, RC or OC
A		
B		
C		
D		

3.3 For each chemical measured above the detection limits of the system (and above the control levels of untreated ballast water), a separate data sheet (as shown at the end of this appendix) should be included in the application where the chemical has not been evaluated by the GESAMP-EHS or the GESAMP-BWWG and listed in appendix 6 to this Methodology.

Table: Chemical analysis of treated ballast water in different salinities as reported by the applicant

Chemical	Detection limit (µg/L)	Brackish water			Seawater		
		Maximum value (µg/L)	Mean value (µg/L)	Standard deviation (µg/L)	Maximum value (µg/L)	Mean value (µg/L)	Standard deviation (µg/L)
A							
B							
C							
D							

3.4 Unless the applicant disagrees with these data, in which case the applicant should provide reasons for disagreeing and supported replacement data for consideration.

3.5 For the further risk assessment for human health and the environment, the Group selects only the substances that have been detected in a concentration above the detection limit from the table listing all of the potential by-products produced in ballast water. These substances should be considered the Relevant Chemicals for the BWMS. If the detection limit for a substance is determined to be unreasonably high, the substance will be included in the further risk assessment with a value corresponding to the detection limit.

Table: Selected Relevant Chemicals and the concentrations for further risk assessment (RA)

Relevant Chemicals	Concentration in ballast water used in the RA (µg/L)
A	
B	
C	

3.6 The operation of the BWMS is preferably highly automated. A compact description of the control system is to be provided.

4 CONSIDERATION OF CONCERNS EXPRESSED BY THE GROUP DURING ITS PREVIOUS REVIEW

This section should include a copy of each concern raised by the GESAMP-BWWG with an appropriate response from the applicant (valid in case an earlier submission was denied Basic Approval (BA) or Final approval (FA), or in case of an FA submission following a BA approval).

5 HAZARD PROFILE DATA AND EXPOSURE OF CHEMICALS ASSOCIATED WITH THE BWMS

5.1 This section should contain a summary of the hazards to mammals and the environment associated with each chemical associated with or generated by the BWMS. Such a summary should be shown in appendix 1 to this Methodology. Where possible, references have been added.

5.2 The hazards identified will be used to perform a risk assessment of the BWMS on the environment, the ships' crews and the general public.

5.3 In order to assist applicants in providing these summary data, the GESAMP Evaluation of Hazardous Substances Working Group (EHS) and the GESAMP-Ballast Water Working Group (BWWG) have evaluated some of the chemicals commonly associated with Ballast Water Management Systems (BWMS). This means that for the substances indicated in appendix 6, no additional properties on physico-chemistry, ecotoxicology and toxicology have to be submitted, unless the applicant has other, scientifically more relevant data available.

5.4 The reason for this approach is to:

- .1 provide a consistent set of data for all applications;
- .2 assist applicants in collating the data associated with their BWMS; and
- .3 streamline the work of the GESAMP-BWWG in assessing applications.

5.5 The following endpoints should be recorded:

- .1 The proposed PNEC based on the available ecotoxicological data, including the final assessment factor to establish the PNEC. This value will be used in the environmental risk assessment.

5.5.1 Predicted No Effect Concentrations (PNEC)

Table: PNEC values of Chemicals associated with the BWMS and included in the GESAMP-BWWG Database

Relevant Chemicals	Harbour	Near ship
	PNEC (µg/L)	PNEC (µg/L)
A		
B		
C		

Table: PNEC values of Chemicals associated with the BWMS, not included in the GESAMP-BWWG Database

Relevant Chemicals	Harbour			Near ship		
	AF	PNEC (µg/L)	Rule No.	AF	PNEC (µg/L)	Rule No.
A						
B						
C						

- .1 The proposed DNEL and/or DMEL based on the available toxicological data, including the final assessment factor to establish the DNEL and/DMEL to be used in the human risk assessment.

5.5.2 Derived No Effect Levels (DNEL) and/or Derived Minimum Effect Level (DMEL)

Table: CMR properties for selected Relevant Chemicals

	Carcinogenic	Mutagenic	Reprotoxicity	CMR
A	Yes/No	Yes/No	Yes/No	Yes/No
B	Yes/No	Yes/No	Yes/No	Yes/No
C	Yes/No	Yes/No	Yes/No	Yes/No

Table: DNELs and DMELs to be used in the risk assessment for humans

Chemical	DNEL (mg/kg bw/d) Crew	DNEL (µg/kg bw/d) General public	DMEL (µg/kg bw/d)
A			
B			
C			

5.6 Exposure

5.6.1 In order to perform a risk assessment related to both the environment and those people who may be exposed to any chemicals associated with the BWMS, it is necessary to estimate the concentration of such chemicals in:

- .1 the air space in the ship's ballast water tank;
- .2 the atmosphere surrounding the ship;
- .3 leakages and spills when operating the system; and
- .4 in the harbour water.

5.6.2 It is recognized that there are various computer models which can be used to fulfil this requirement and that such models can produce differing results depending on a range of input parameters which can be used. So, in order to provide some standardization and a mechanism for comparing the various systems, it is recommended that applicants use the model of paragraph 5.6.3 associated with the standard inputs described in appendix 5 resulting in a Predicted Environmental Concentration for the Active Substance, all Relevant Chemicals and relevant disinfection by-products.

5.6.3 Predicted Environmental Concentration (PEC)

The Predicted Environmental Concentration (PEC) should be calculated using the MAMPEC-BW 3.0 model or latest available version with the appropriate environment definition and emission input. The results of these calculations should be used to estimate the risk to the crew, port State control, the general public and the environment. See the guidance in appendix 4 for the risk assessment for humans and appendix 5 for the risk assessment for the aquatic ecosystem.

Table: PEC from MAMPEC modelling results from the GESAMP-BWWG Model Harbour

Chemical name	PEC (µg/L)	
	Maximum	Near ship
A		
B		
C		

5.6.4 Concentration of Chemicals associated with the BWMS in the atmosphere

An inventory should be made of the ways humans (crew, port State control and the general public) may be exposed to Relevant Chemicals due to the ballasting and deballasting processes. Guidance to the potential exposure routes is given in appendix 4, together with calculation tools to estimate the worst-case exposure concentration. These resulting concentrations should be used in the risk assessment for humans and reported here.

Table: Resulting concentrations to be used in the risk assessment for humans

Chemical	Crew		General public	
	Concentration in tank ($\mu\text{g/L}$)	Concentration in air (mg/m^3)	Concentration MAMPEC ($\mu\text{g/L}$)	Concentration in air (mg/m^3)
A				
B				
C				

6 WHOLE EFFLUENT TESTING (WET) – (LABORATORY TEST FOR BASIC APPROVAL AND LAND-BASED TEST OR ON-BOARD TEST FOR FINAL APPROVAL)

This section should include:

- .1 a description of the tests carried out; and
- .2 a table of the results, e.g. as shown below:

Species	Species	Endpoint			Comments
		NOEC*		EC ₅₀ *	
Algae		50%		83%	
Crustacea		> 100%		> 100%	
Fish		> 100%		> 100%	

* The values indicated are examples.

7 RISKS TO SHIP SAFETY

This section covers damage to the structure of the ship which might be caused by various effects including:

- .1 explosion;
- .2 fire; and
- .3 corrosion.

8 RISKS TO THE CREW

Risks to the crew may be assumed to be associated with:

- .1 delivery, loading, mixing or adding chemicals to the BWMS;
- .2 ballast water sampling;

- .3 periodic cleaning of ballast tanks;
- .4 ballast tank inspections; and
- .5 normal work on deck.

These situations are covered in the guidance in appendix 4.

8.1 Mixing and Loading/Ballast water sampling/Periodic cleaning of ballast tanks

8.1.1 When considering various work operations, it should be assumed that the exposure routes of concern for the crew and/or port State workers will be inhalation and dermal. In this respect, it is assumed that the crew will be exposed by inhalation to the highest concentration of each chemical in the atmosphere above the treated ballast water at equilibrium and by dermal uptake to the highest concentration of each chemical in the treated ballast water. These approaches are described in appendix 4.

8.1.2 The result from the calculations may be presented as shown in the tables below:

Table: Crew, scenario 1: delivery, loading, mixing or adding chemicals to the BWMS

Chemical	AS concentration	Dermal exposure (mg/kg bw/d)	DNEL (mg/kg bw/d)	RCR
A				
B				
C				

Table: Crew/Port State control, scenarios 2–5

Chemical	Scenario (mg/kg bw/d)		Aggregated exposure (mg/kg bw/d)	DNEL (mg/kg bw/d)	RCR
	Dermal	Inhalation			
A					
B					
C					

Table: Crew/Port State control, scenario: – DMEL approach

Chemical	Scenario (mg/kg bw/d)		Aggregated exposure (mg/kg bw/d)	DMEL (mg/kg bw/d)	RCR
	Dermal	Inhalation			
A					
B					
C					

9 RISKS TO THE GENERAL PUBLIC

Risks to the general public are most likely to occur as a result of:

- .1 ingestion of seafood which has been exposed to chemical by-products in the treated ballast water; and
- .2 swimming in seawater contaminated with treated ballast water where exposure may be via ingestion (accidental swallowing), inhalation and dermal contact.

9.1 The risk to the general public from the oral, dermal and inhalatory exposure of chemical by-products may be calculated according to the guidance in appendix 4.

Table: General public scenario: swimming and consumption of seafood

Chemical	Scenario 10.1.1 and 10.1.2 ($\mu\text{g}/\text{kg bw}/\text{d}$)				Aggregated exposure ($\mu\text{g}/\text{kg bw}/\text{d}$)	DNEL ($\mu\text{g}/\text{kg bw}/\text{d}$)	RCR
	Swimming			Consumption of seafood			
	Oral	Dermal	Inhalation	Oral			
A							
B							
C							

9.2 An indicative risk level may be used to calculate an indicative RCR regarding potential cancer risk. These values can be used to estimate a risk dose based on the probability of increased cancer incidence over a lifetime (10^{-6}) and may be regarded as a DMEL for the general public.

Table: General public scenario: swimming and consumption of seafood – DMEL approach

Chemical	Aggregated exposure ($\mu\text{g}/\text{kg bw}/\text{d}$)	DMEL ($\mu\text{g}/\text{kg bw}/\text{d}$)	Indicative RCR
A			
B			
C			

10 RISKS TO THE ENVIRONMENT

10.1 Assessment of Persistence (P), Bioaccumulation (B) and Toxicity (T)

Based on the half-life, BCF or Log Kow and the chronic NOEC values for each chemical (Procedure (G9), paragraph 6.4), the PBT properties of each chemical should be reflected in a table with the justification in parentheses as shown below:

Chemical by-product	Persistence (P) (Yes/No)	Bioaccumulation (B) (Yes/No)	Toxicity (T) (Yes/No)	PBT (Yes/No)
A	Yes/No	Yes/No	Yes/No	
B	Yes/No	Yes/No	Yes/No	
C	Yes/No	Yes/No	Yes/No	

10.2 Calculation of PEC/PNEC ratios

10.2.1 The ratio of PEC/PNEC is a measure of the risk that each chemical is deemed to present to the environment.

10.2.2 For each chemical the estimation of the PEC/PNEC ratio should be summarized as shown in the table below:

Table: PEC/PNEC ratios [according to the Group]

Chemical name	Maximum/Harbour			Near ship		
	PEC	PNEC	PEC/PNEC	PEC	PNEC	PEC/PNEC
	(µg/L)	(µg/L)	(-)	(µg/L)	(µg/L)	(-)
A						
B						
C						

11 ADDITIONAL HEADINGS

11.1 As part of the report to be made by the Group during its evaluations, the following parts also appear:

11.1.1 CONCLUSIONS AND RECOMMENDATIONS

11.1.1.1 Risks to ship safety

11.1.1.2 Risks to the crew and the general public

11.1.1.3 Risks to the environment

11.1.1.4 Recommendation

DATA ON EACH COMPONENT OF THE PREPARATION AND BY-PRODUCT PRODUCED IN BALLAST WATER

Chemical Name

Where the applicant considers that it is not necessary to complete the data form for a given chemical, a full justification should be given (e.g. the ½-life of the chemical is only a few seconds and so will have disappeared by the time the ballast water is discharged into the sea).

2 EFFECTS ON AQUATIC ORGANISMS

2.1 Acute aquatic toxicity data

	Species	duration*-LC ₅₀ (mg/L)	Reference/comments/justification for missing data
Fish			
Crustacea			
Algae			

* The duration is given in hours (h) or days (d), e.g. 96h-LC₅₀ or 7d-NOEC.

2.2 Chronic aquatic toxicity data

	Species	duration*-LC50 (mg/L) or duration*-NOEC (mg/L)	Reference/comments/justification for missing data
Fish			
Crustacea			
Algae			

* The duration is given in hours (h) or days (d), e.g. 96h-LC₅₀ or 7d-NOEC.

2.3 Information on endocrine disruption

	Species	Information	Reference/comments/justification for missing data
Fish			
Crustacea			
Algae			

2.4 Sediment toxicity

	Species	Information	Reference/comments/justification for missing data
Fish			
Crustacea			
Algae			

2.5 Bioavailability/biomagnification/bioconcentration

	Value	Reference/comments/justification for missing data
Log Pow		
BCF		

2.6 Food web/population effects

2.6.1 A description of potential food web and population effects should be provided supported by a full justification.

3 MAMMALIAN TOXICITY

3.1 Acute toxicity

	Value	Species	Reference/comments/justification for missing data
Oral LD ₅₀ (mg/L)			
Dermal LD ₅₀ (mg/kg bw)			
Inhalation 4h-LC ₅₀ (mg/L)			

3.2 Corrosion/irritation

	Species	Method	Results (including scores where available)	Reference/comments/justification for missing data
Skin				
Eye				

3.3 Sensitization

	Species	Method (e.g. Buehler, M&K)	Results (Sensitizer Y/N)	Reference/comments/justification for missing data
Skin				
Inhalation				

3.4 Repeated-dose toxicity

Exposure route	
Exposure duration	
Exposure dose	
Species	
Method	
Results	
NOAEL	
NOEL	
Reference/comments/justification for missing data	

3.5 Development and reproductive toxicity

Exposure route	
Exposure duration	
Exposure dose	
Species	
Method	
Results	
NOAEL	
NOEL	
Reference/comments/justification for missing data	

3.6 Carcinogenicity

Exposure route	
Exposure duration	
Exposure dose	
Species	
Method	
Results	
NOAEL	
NOEL	
Reference/comments/justification for missing data	

3.7 Mutagenicity

	Method	Dose range	Results	Reference/ comments/ justification for missing data
Bacterial gene mutation				
Mammalian cytogenicity				
Mammalian gene mutation				

3.8 Carcinogenicity/mutagenicity/reproductive toxicity (CMR)

	Results	Reference/comments/ justification for missing data
Carcinogenicity		
Mutagenicity		
Reproductive toxicity		

4 ENVIRONMENTAL FATE AND EFFECT UNDER AEROBIC AND ANAEROBIC CONDITIONS

4.1 Modes of degradation (biotic and abiotic)

	Seawater or fresh water	Test duration	Results	Breakdown products	Reference/ comments/ justification for missing data
Hydrolysis at pH 5					
Hydrolysis at pH 7					
Hydrolysis at pH 9					
Biodegradation					
DT ₅₀					

4.2 Partition coefficients

	Method	Results	Reference/comments/ justification for missing data
Log Pow			
K _{oc}			

4.3 Persistence and identification of main metabolites

	Method	Results	Reference/comments/ justification for missing data
Persistence (d)			

4.4 Reaction with organic matter

4.5 Potential physical effects on wildlife and benthic habitats

4.6 Potential Residues in seafood

4.7 Any known interactive effects

5 PHYSICAL AND CHEMICAL PROPERTIES FOR THE ACTIVE SUBSTANCES,
PREPARATIONS AND TREATED BALLAST WATER, IF APPLICABLE

Property*	Value	Reference/ comments/ justification for missing data
Melting point (°C)		
Boiling point (°C)		
Flammability (flashpoint for liquids; °C)		
Density (20°C; kg/m ³)		
Vapour pressure (Pa at 20°C)		
Relative vapour density (expressed as a ratio by that of air as 1.293 kg/m ³ at 0°C and 10 ⁵ Pa)		
Water solubility (mg/L, temp; effect of pH)		
pH in solution (under the intended concentration for AS)		
Dissociation constant (pK _a)		
Oxidation-reduction potential (V)		
Corrosivity to material or equipment (for AS see paragraph 3.6.9)		
Reactivity to container material (only for AS, which needs storage on board)		
Auto-ignition temperature, also flash point if applicable (°C)		
Explosive properties (narrative)		
Oxidizing properties (narrative)		
Surface tension (N/m)		

* If units are indicated for the property, then these should be considered the preferred unit.



←

Property*	Value	Reference/ comments/ justification for missing data
Viscosity Viscosity (Pa·s), Kinetic viscosity (m ² /s) is also accepted		
Thermal stability and identity of breakdown products (narrative)		
Other physical or chemical properties (narrative)		

6 OTHER INFORMATION

6.1 Analytical methods for measuring the concentration at environmentally relevant concentrations

Method	
Applicability	
Sensitivity	
Reference/comments/justification for missing data	

6.2 Material Safety Data Sheet provided (Yes/No)

6.3 GHS classification

6.4 Risk characterization

Persistent (y/n)	Bioaccumulative (y/n)	Toxic (y/n)	Reference/comments/ justification for missing data

**

APPENDIX 4

HUMAN RISK ASSESSMENT OF BALLAST WATER CHEMICALS

1 INTRODUCTION

1.1 In risk characterization for human health, the procedure is to compare the exposure levels to which the target groups are exposed or likely to be exposed with those levels at which no toxic effects from the chemicals are expected to occur. There are normally four stages when carrying out a quantitative risk assessment:

- 1.1 **Hazard identification** – what are the substances of concern and what are their effects?
- 1.2 **Dose (concentration) – response (effect) relation** – what is the relationship between the dose and the severity or the frequency of the effect?
- 1.3 **Exposure assessment** – what is the intensity, and the duration or frequency of exposure to an agent.

* If units are indicated for the property, then these should be considered the preferred unit.

.4 **Risk characterization** – how to quantify the risk from the above data.

1.2 It is proposed to apply a tiered approach when assessing the risk of the chemicals associated with the BWMS.

1.3 In the first tier, the level of exposure to the substance below which no adverse effects are expected to occur should be derived for the relevant systemic effects. This level of exposure above, which humans should not be exposed to, is designated as the Derived No Effect Level (DNEL). Risks are regarded to be controlled when the estimated exposure levels do not exceed the predicted no effect levels (DNEL).

1.4 A DNEL is a derived level of exposure because it is normally calculated on the basis of available dose descriptors from animal studies such as No Observed Adverse Effect Levels (NOAELs) or benchmark doses (BMDs).

1.5 The DNEL can be considered as an “overall” No-Effect-Level for a given exposure (route, duration, frequency), accounting for uncertainties/variability in these data and the human population exposed by using appropriate Assessment Factors (AFs).

1.6 If an unacceptable level of risk is identified for any of the scenarios in the first tier, a refinement of the exposure assessment and/or the assessment factors might be performed in the second tier giving special attention to route-specific contributions and protection measures.

1.7 In order to determine the risks with chemicals associated with the treatment of ballast water, it is necessary to determine several parameters:

- .1 concentration of each chemical in the ballast water tank (and in the air phase above the water);
- .2 concentration of chemicals after discharging in the sea;
- .3 concentration of chemicals which may be transferred from the aquatic environment into the atmosphere; and
- .4 potential uptake of chemicals by humans through the various routes of exposure.

1.8 For the worker exposure situation in the ballast water tank (while performing sampling or cleaning), it is important to estimate the air concentrations in the ballast tank. The concentration of each chemical in the atmosphere above the water may be calculated using the Henry’s Law Constant.

1.9 For the exposure situation regarding the general public (whilst swimming in the sea or consuming seafood), the calculated concentration of each chemical in the discharged treated ballast water needs to be used. These can be determined using environmental models and the MAMPEC-BW model version 3.0.1 or latest available version written for this purpose is the one preferred. It is normal practice to use the highest values obtained from this model which is the concentration anticipated in the harbour area.

1.10 It is important to note that the methodologies described in this document generally apply to DNELs of chemicals with a systemic and threshold related property, and do not apply to chemicals producing local effects, such as irritation. However, in some cases it is considered appropriate to derive a DNEL for a local effect when a reliable NOAEL is available. For chemicals with a non-threshold effect (i.e. cancer), a DMEL should be used.

1.11 No account has been taken of the naturally occurring background levels of contaminants in seawater, which, it is recognized, will be different in different parts of the world.

1.12 The approach described in this documentation takes into account the EU REACH guidance described in ECHA Guidance on information requirements and chemical safety assessment.

2 HUMAN EXPOSURE ASSESSMENT

2.1 Occupational

2.1.1 The exposure assessment is carried out through an evaluation of different exposure scenarios. An exposure scenario is the set of information and/or assumptions that describes how the contact between the worker and the substance takes place. It is based on the most important characteristics of the substance in view of occupational exposure, e.g. the physico-chemical properties, pattern of use, processes, tasks and controls. An exposure scenario will therefore describe a specific use of the treatment product with a set of specific parameters. Exposure estimates are intended to be used as a screening tool. The following situations have been identified as likely exposure scenarios for workers:

Table 1. Summary of occupational exposure scenarios

Operations involving the crew and/or port state workers			
Operation	Exposure	Frequency/duration/quantity	Approach described in:
Delivery, loading, mixing or adding chemicals to the	Potential dermal exposure and inhalation from	Solids, dermal: scenario to be developed Liquids, dermal: 0.05-	2.1.2
BWMS	leakages and spills.	0.1 mL/container handled Gases/vapours/dusts, inhalation: scenario to be developed	
Ballast water sampling at the sampling facility	Inhalation of air released	2 hours/day for 5 days/week; 45 weeks/year	2.1.3.1
	Dermal exposure to primarily hands	2 hours/day for 5 days/week; 45 weeks/year	2.1.3.4
Periodic cleaning of ballast tanks	Inhalation of air in the ballast water tank	8 hours/day for 5 days/week; 1 event/year	2.1.4.1
	Dermal exposure to the whole body	8 hours/day for 5 days/week; 1 event/year	2.1.4.3
Ballast tank inspections	Inhalation of air in the ballast water tank	3 hours/day for 1 day/month	2.1.5
Normal operations carried out by the crew on BWMS			
Normal work on deck unrelated to any of the above	Inhalation of air released from vents	1 hour/day for 6 months/year	2.1.6

Note: Whilst the above situations have been identified as typical exposure scenarios, it is recognized that there will be other situations when exposure of workers may be greater or less and due consideration should be given to such situations.

2.1.2 *Delivery, loading, mixing or adding chemicals to the BWMS*

2.1.2.1 There is potential for exposure to chemical substances during transfer of concentrated formulations in containers or within closed systems. It is considered that the risks are dealt with through the use of appropriate chemical protective clothing, in particular gloves. The applicant should provide details of the intended methods to be used to transfer Active Substances, Preparations or Other Chemicals, e.g. neu-

tralizers, to the on-board storage and propose the appropriate personal protective equipment to prevent exposure arising from any loss of containment or through contact with contaminated plant and equipment.

2.1.2.2 Dilution of concentrated chemical products is often referred to as mixing and loading. On smaller vessels this process may be performed manually. Exposure through inhalation is considered unlikely for non-volatile or water-based chemical formulations. Potential dermal exposure of the hands can be estimated by several available models. It is recommended to use the UK Predictive Operator Exposure Model (POEM) for this estimation. In this model, the daily level of exposure during the handling of containers depends on the properties of the container (capacity and diameter of the opening) and the number of containers handled per day. Containers with narrow openings (< 45 mm) are not considered for this scenario.

Principal equation:

$$Dose = (1 \ominus f_{RMM}) \cdot \frac{C \cdot N \cdot E \cdot f_{derm} \cdot f_{pen}}{BW}$$

- Dose = skin exposure (mg/kg bw/d)
- f_{RMM} = risk mitigation factor (tier 1 = 0, tier 2 = 0.95)
- C = concentration of Active Substance (mg/L)
- N = number of containers handled, to be determined according to the total volume needed for the specific BWMS (d^{-1})
- E = contamination per container handled (tier 1 = 0.1 mL, tier 2 = 0.05 mL)
- f_{derm} = dermal absorption factor (default = 1)
- f_{pen} = penetration factor (default = 1)
- BW = body weight (default = 60 kg)

The tier 1 assessment is based on the handling of containers with an opening diameter of 45 mm and a volume of 10 L. For this case, UK POEM predicts a hand exposure of 0.1 mL fluid per container handled. The number of containers handled depends on the total volume of liquid that needs to be transferred. The tier 2 assessment is based on the handling of containers with an opening diameter of 63 mm and a volume of 20 L. For this case, UK POEM predicts a hand contamination of 0.05 mL for each container. The total volume handled should be the same as in tier 1, i.e. the number of containers handled is half of that in tier 1. The exposure estimation can be further refined by the use of substance-specific values for the dermal absorption factor or the penetration factor, if available. Exposure can be reduced by the use of gloves. According to UK POEM, suitable gloves will reduce exposure to 5% of the original value. This value is used as a default for tier 2.

2.1.2.3 On larger vessels, transfer of chemicals will more likely occur through closed transfer systems. These systems do not necessarily result in reduced levels of operation exposure. The connection and removal of adaptors may result in similar levels of exposure as those from open pouring operations. Therefore, calculation of exposure by the above equation is recommended also for these systems.

2.1.2.4 Measures to safeguard installations against unintended release of chemicals should be discussed under “Risks to the safety of the ship” (see chapter 7.1 of the Methodology).

2.1.3 Ballast water sampling

2.1.3.1 There is a potential risk for inhalation of chemicals that have evaporated into the air phase while performing the task of taking samples of the ballast water from the sampling facility. The worst concentration of chemicals in the air may theoretically be calculated using the Henry’s Law Constant in the equation presented below:

$$C_{air} = \frac{H}{R \cdot T} \cdot C_{water}$$

where:

- C_{air} = concentration in air (mg/m³)
- H = Henry's Law Constant (Pa m³/mole)
- R = gas constant (8.314 Pa m³/mole K)
- T = absolute temperature (K)
- C_{water} = measured concentration in ballast water (µg/L)

2.1.3.2 If the applicant proposes that the sampling facility be placed in the engine room, a dilution factor of 100 may be introduced to estimate the concentration in the air surrounding test facilities. This is based on the assumption that any air released from the sampling facilities will be diluted by the surrounding air

2.1.3.3 Once a concentration of a volatile component has been estimated, a simple tier 1 exposure assessment can be performed.

$$Dose_{Tier1} = \frac{C_{air} \times ET \times IR}{BW}$$

where:

- $Dose_{Tier1}$ = inhaled dose (mg/kg bw/d)
- C_{air} = concentration of volatile component in air (mg/m³)
- ET = exposure time (2 h/d)
- IR = inhalation rate (default = 1.25 m³/h)
- BW = body weight (default = 60 kg)

2.1.3.4 There is also a potential risk for dermal uptake of chemicals from the ballast water while taking samples from the sampling facility. The dermal uptake may be calculated using the equation below:

$$U_{sd} = \frac{A_{hands} \cdot TH_{dermal} \cdot C_{water} \cdot BIO_{derm}}{BW}$$

where:

- U_{sd} = dermal uptake (mg/kg bw/d)
- A_{hands} = surface area of two hands (0.084 m²)
- TH_{dermal} = thickness of the product area on the skin (0.0001 m)
- C_{water} = concentration of chemical in treated ballast (µg/L)
- BIO_{derm} = dermal bioavailability (default = 1)
- BW = body weight (default = 60 kg)

2.1.3.5 The aggregated uptake, that is the sum of the inhaled dose and the dermal dose, is then compared with the DNEL to assess whether the risk is acceptable or not.

2.1.3.6 If the tier 1 risk assessment indicates an unacceptable risk, a tier 2 exposure assessment can be performed by averaging the short-term daily exposure over an extended period of time, in accordance with a methodology developed by the U.S. EPA¹. For this purpose, employment duration of 20 years is assumed.

¹ U.S. Environmental Protection Agency, 2002. Supplemental guidance for developing soil screening levels for superfund sites. http://www.epa.gov/superfund/health/conmedia/soil/pdfs/ssg_main.pdf

$$\text{where: } Dose_{Tier2} = (1 - f_{RMM}) \frac{C_{air} \times IR \times ET \times EF \times ED}{BW \times AT}$$

Dose_{Tier2} = inhaled dose (mg/kg bw/d)

f_{RMM} = risk mitigation factor

C_{air} = concentration of volatile component in air (mg/m³)

IR = inhalation rate (default = 1.25 m³/h)

ET = exposure time (2 h/d)

EF = exposure frequency (225 d/y)

ED = exposure duration (20 y)

BW = body weight (default = 60 kg)

AT = averaging time (7,300 d (= exposure duration) for non-carcinogenic effects; 25,550 d (= life expectancy) for carcinogenic effects)

The dermal exposure is modified in an analogous manner.

2.1.3.7 For further refinement, the effect of risk mitigation measures may be taken into account using a system-specific risk mitigation factor.

2.1.4 *Periodic cleaning of ballast water tanks*

2.1.4.1 In this scenario a worker works in the emptied ballast tank, where he may be exposed to volatile components arising from treatment of the ballast water that have remained in the tank atmosphere after discharge of the treated ballast water. The concentration of chemicals in the air phase may be calculated in the same manner as in 2.1.3.1. A dilution factor of 10 is introduced based on the assumption that the ballast tank was previously filled to 90 percent capacity and so the air from the headspace will be diluted as the ballast water is discharged and fresh air is drawn in.

2.1.4.2 Once a concentration of a volatile component has been estimated, the tier 1 exposure assessment can be performed as described in 2.1.3.3, using an exposure time of 8 hours/day (see table 1).

2.1.4.3 The dermal uptake of chemicals from the sediment and sludge in the ballast tank may be calculated in the same manner as in 2.1.3.4 taking into account possible exposure to more parts of the body apart from the hands.

2.1.4.4 For risk assessment, the aggregated exposure is calculated according to 2.1.3.5.

2.1.4.5 If necessary, a tier 2 exposure assessment can be performed as described in 2.1.3.6, using an exposure frequency of 5 days/year (see table 1).

2.1.4.6 For this scenario effects of risk mitigation measures may be taken into account as described in the following. The data underlying the UK POEM model suggest that for higher levels of challenge, it is reasonable to assume that impermeable protective coveralls provide 90% protection against aqueous challenge. Protective gloves, for this type of work, are considered to always have the potential to get wet inside and the high-end default value is used as a measure of hand exposure even for the tier 2 assessment (exposure occurs owing to water entering via the cuff). For boots, a lower default value may be selected to represent the worker wearing appropriate impermeable boots.

2.1.5 *Ballast tank inspections*

2.1.5.1 In this scenario a crew member or a port state inspector enters the emptied ballast tank and may be exposed to volatile components arising from treatment of the ballast water. The concentration of chemicals in the air phase may be calculated in the same manner as in 2.1.3.1, using a dilution factor of 10 to account for the dilution by fresh air drawn into the emptied ballast tank.

2.1.5.2 Once a concentration of a volatile component has been estimated, the tier 1 exposure assessment

can be performed as described in 2.1.3.3. Exposure time in this scenario is 3 hours/day (see table 1).

2.1.5.3 No dermal exposure is assumed for this scenario, and the calculated inhaled dose can be directly used for risk assessment.

2.1.5.4 If necessary, a tier 2 exposure assessment can be performed as described in 2.1.3.6, using an exposure frequency of 12 days/year (see table 1).

2.1.5.5 For further refinement, the effect of system-specific risk mitigation measures may be taken into account.

2.1.6 Crew carrying out normal work on deck unrelated to any of the above

2.1.6.1 Exposure in this scenario is through inhalation of air released from the air vents on deck. The concentration of chemicals in the atmosphere surrounding the air vents may be calculated as detailed in 2.1.3.1 and 2.1.3.3, taking into account a dilution factor of 100 for the dilution by the surrounding atmosphere.

2.1.6.2 Once a concentration of a volatile component has been estimated, the tier 1 exposure assessment can be performed as described in 2.1.3.3. Exposure time in this scenario is 1 hour/day (see table 1).

2.1.6.3 No dermal exposure is assumed for this scenario, and the calculated inhaled dose can be directly used for risk assessment.

2.1.6.4 If necessary, a tier 2 exposure assessment can be performed as described in 2.1.3.6, using an exposure frequency of 180 days/year (see table 1).

2.1.6.5 For further refinement, the effect of system-specific risk mitigation measures may be taken into account.

2.2 General public

2.2.1 Indirect exposure of humans via the environment where treated ballast water is discharged may occur by consumption of seafood and swimming in the surrounding area.

2.2.2 The following situations have been identified as likely exposure scenarios for the general public:

Table 2: Summary of exposure scenarios for the general public

Situations in which the general public might be exposed to treated ballast water containing chemical by-products			
Situation	Exposure	Duration/quantity	Approach described in:
Recreational activities in the sea	Inhalation of chemicals partitioning into the air above the sea	5 events of 0.5 hours/day for 14 days of the year	2.2.3.1
	Dermal exposure to chemicals whilst swimming in the sea	5 events/day for 14 days of the year	2.2.3.2
	Swallowing of seawater contaminated with treated ballast water	5 events of 0.5 hours/day for 14 days of the year	2.2.3.3
Eating seafood exposed to treated ballast water	Oral consumption	Once or twice/day equivalent to 0.188 kg/day	2.2.4
Aggregated exposure (through swimming and consumption of seafood)			2.2.5

Note: Whilst the above situations have been identified as typical worst-case exposure scenarios, it is recognized that there will be other situations when exposure of the general public may be greater or less and due consideration should be given to such situations.

In addition, the consumer exposure (general public) is normally assessed as chronic/lifetime risk in order to protect the most vulnerable population groups taking also into account that they would not use protective equipment when exposed to chemicals.

2.2.3 Recreational activities (swimming) in the sea

2.2.3.1 Inhalation of chemicals partitioning into the air above the sea

2.2.3.1.1 Exposure in this scenario is through inhalation of air above the sea while swimming. The concentration of chemicals in the air may be calculated while using the Henry's Law Constant as already described in 2.1.3.1. However in this case the concentration in the water is the PEC harbour value as calculated by MAMPEC, and taking into account a dilution factor of 100 (due to wind, turbulence and insufficient time for the chemical to reach equilibrium).

2.2.3.1.2 The inhaled dose may be estimated using the equation below, while taking into account various assumptions (number of swims, etc.):

$$U_{si} = \frac{C_{air} \cdot IR \cdot n \cdot D \cdot BIO_{inh}}{BW}$$

where:

U_{si} = inhalation intake of chemical during swimming (mg/kg bw/d)

C_{air} = concentration in air (mg/m³)

IR = inhalation rate – light activity assumed (1.25 m³/h)

n = number of swims per day (5/d)

D = duration of each swim (0.5 h)

BIO_{inh} = fraction of chemical absorbed through the lungs (1)

BW = body weight (default = 60 kg)

2.2.3.2 Dermal exposure to chemicals whilst swimming in the sea

Exposure in this scenario is via dermal uptake of chemicals when swimming, while using the following equation:

$$U_{sd} = \frac{C_w \times TH_{dermal} \times n_{swim} \times A_{skin} \times BIO_{dermal}}{BW}$$

where:

- U_{sd} = dermal uptake per day during swimming (mg/kg bw/d)
- C_w = concentration in the water, i.e. PECMAMPEC ($\mu\text{g/L}$)
- TH_{dermal} = thickness of the product layer on the skin (0.0001 m)
- n_{swim} = number of events (5/d)
- A_{skin} = surface area of whole body being exposed to water (1.94 m²)
- BIO_{dermal} = bioavailability for dermal intake (default= 1)
- BW = body weight (kg)

2.2.3.3 Swallowing of seawater contaminated with treated ballast water

The oral uptake via swimming is calculated according to the following:

$$U_{so} = \frac{C_w \cdot IR_{swim} \cdot n_{swim} \cdot Dur_{swim} \cdot BIO_{oral}}{BW}$$

where:

- U_{so} = amount of chemical swallowed ($\mu\text{g/kg bw/d}$)
- C_w = concentration in the water, i.e. PECMAMPEC ($\mu\text{g/L}$)
- IR_{swim} = ingestion rate of water while swimming (0.025 L/h)
- n_{swim} = number of swims per day (5/d)
- Dur_{swim} = duration of each swim (0.5 h)
- BIO_{oral} = bioavailability for oral intake (default = 1)
- BW = body weight (default = 60 kg)

2.2.4 Eating seafood exposed to treated ballast water

2.2.4.1 The concentration of chemicals in the seafood that is being consumed is calculated in this way:

$$C_{fish} = BCF \cdot PEC_{mampec}$$

where:

- C_{fish} = concentration in fish ($\mu\text{g/kg}$)
- BCF = bioconcentration factor (L/kg)
- PEC_{mampec} = concentration of chemical in water derived from MAMPEC ($\mu\text{g/L}$)

2.2.4.2 While taking into account the assumption that people in the area only eat fish that is being caught locally (worst-case scenario), the daily intake may be calculated in the following way:

$$U_{fish} = \frac{QFC \cdot C_{fish} \cdot BIO_{oral}}{BW}$$

where:

- U_{fish} = uptake of chemical from eating fish ($\mu\text{g}/\text{kg bw}/\text{d}$)
- QFC = quantity of fish consumed/day (= 0.188 kg/d (FAO, Japan))
- C_{fish} = concentration of chemical in fish ($\mu\text{g}/\text{kg}$)
- BIO_{oral} = bioavailability for oral intake (default = 1)
- BW = body weight (default = 60 kg)

2.25 Aggregated exposure (through swimming and consumption of seafood)

The total exposure to the general public whilst swimming in the sea and eating fish is the sum of the amount of chemical absorbed through eating fish plus the oral intake, dermal absorption and inhalation absorption whilst swimming.

Swimming (inhalation)	: $\mu\text{g}/\text{kg}/\text{d}$
Swimming (dermal)	: $\mu\text{g}/\text{kg}/\text{d}$
Swimming (oral)	: $\mu\text{g}/\text{kg}/\text{d}$
Eating fish	: $\mu\text{g}/\text{kg}/\text{d}$
Total	: $\mu\text{g}/\text{kg}/\text{d}$

Note: Make sure all values are in the same units.

2.2.6 Concluding remarks

2.2.6.1 It should be noted that whilst the above situations have been identified as typical worst-case exposure scenarios, it is recognized that there will be other situations when exposure of the general public may be greater or less. Due consideration should be given to such situations.

2.2.6.2 In addition, the consumer exposure (general public) is normally assessed as chronic/lifetime risk in order to protect the most vulnerable population groups taking also into account that they would not use protective equipment when exposed to chemicals.

3 CALCULATION OF DERIVED NO-EFFECT LEVELS (DNELS)

3.1 The next step of the risk assessment process includes the definition of toxicologically significant endpoints for comparison with the calculated aggregated exposure doses. These endpoints, for example No Observed Adverse Effect Levels (NOAELs), Lowest Observed Adverse Effect Levels (LOAELs) or Benchmark Doses (BMDs) from experimental animal studies, are then further transformed to Derived No-effect Levels (DNELs) or Derived Minimal Effect Levels (DMELs) for the characterization of toxicological risks to humans.

3.2 The DNEL can be considered as an 'overall' No-Effect-Level for a given exposure (route, duration, frequency). Uncertainties/variability in these data and the human population exposed are taken into account by using appropriate Assessment Factors (AFs) according to this equation:

$$DNEL = \frac{Dose_{descriptor}}{Assessment\ Factor}$$

4 DNELS FOR THE WORKER POPULATION

4.1 For the exposure at the workplace, the following DNELs may be calculated:

- .1 DNEL, short-term exposure (mg/kg bw): the dose descriptor might be an LD50 from an oral or dermal study or an LC50 from an inhalation study.
- .2 DNEL, long-term exposure (mg/kg bw/d): the dose descriptor might be a NOAEL or LOAEL from a sub-acute, sub-chronic or chronic oral or dermal study or a NOAEC or LOAEC from an inhalation study.

4.2 It is also possible to derive DNELs for local effects. This is relevant for instance for corrosive/irritant substances that can produce immediate severe effects at the first site of contact (skin, eyes and/or respiratory tract).

5 DNELS FOR THE GENERAL PUBLIC

5.1 The exposure of the general public is normally assessed as chronic/lifetime risk in order to protect the most vulnerable population groups, taking also into account that they would not use protective equipment when exposed to chemicals.

5.2 Therefore, for the exposure of the general public via swimming or consumption of seafood, only one DNEL is calculated:

- .1 DNEL, general public: (mg/kg bw/d): the dose descriptor might be a NOAEL or LOAEL from a sub-acute, sub-chronic or chronic oral or dermal study or a NOAEC or LOAEC from an inhalation study.

6 DNEL CALCULATION FROM MAMMALIAN TOXICOLOGY ENDPOINTS

6.1 The DNEL may be calculated in accordance with the following equation:

$$DNEL = \frac{Dose_{descriptor} \cdot CF_{dr}}{ASF \cdot OSF \cdot ISF \cdot ESF \cdot SF_{dur} \cdot CF_{abs}}$$

where:

Dose _{descriptor}	=	see 6.3
CF _{dr}	=	experimental dosing regime, see 6.4
ASF	=	interspecies allometric factor, see 6.5
OSF	=	other interspecies scaling factor, see 6.6
ISF	=	intraspecies scaling factor, see 6.7
ESF	=	observed effect scaling factors, see 6.8
SF _{dur}	=	duration scaling factors, see 6.9
CF _{abs}	=	differential absorption factors, see 6.10

6.2 It should be noted that the DNEL is only appropriate for chemicals which cause a threshold systemic effect and is not appropriate for such effects as carcinogenicity for which a **Derived Minimal Effect Level (DMEL)** should be determined (see 7).

6.3 Dose descriptor

6.3.1 If the dose descriptor is a NOAEC or LOAEC from an inhalation study, expressed e.g. as mg/m³, the internal exposure, expressed as mg/kg bw/d, can be calculated using the standard respiratory volume (sRV) of the test species:

$$NOAEL = \frac{NOAEC}{sRV_{animal}}$$

For the rat the sRV is 1.15 m³/kg bw/d

For the mouse the sRV is 1.03 m³/kg bw/d

6.4 Experimental dosing regime (CFdr)

6.4.1 This factor is needed to correct the dose value when the dosing regime in an experimental animal study differs from the exposure pattern anticipated for the human population under consideration.

For example:

- .1 Starting NOAEL/NOAEC adjusted for treatment schedule (if dosing 5 days/week then a factor of 5/7 is applied)

6.5 Interspecies Allometric Scaling Factor (ASF)

6.5.1 Allometric scaling extrapolates doses according to an overall assumption that equitoxic doses (expressed in mg/kg/d) are related to, though not directly proportional to, the body weight of the animals concerned.

6.5.2 The following Allometric Scaling Factors are recommended for use in determining DNELs:

Species	Body Weight (kg)	ASF
Rat	0.25	4
Mouse	0.03	7
Hamster	0.11	5
Guinea pig	0.80	3
Rabbit	2.00	2.4
Monkey	4.00	2
Dog	18.00	1.4

6.6 Other Interspecies Scaling Factor (OSF)

6.6.1 If no substance-specific data are available, the standard procedure for threshold effects would be, as a default, to correct for differences in metabolic rate (allometric scaling) and to apply an additional factor of 2.5 for other interspecies differences, i.e. toxicokinetic differences not related to metabolic rate (small part) and toxicodynamic differences (larger part). In case substance-specific information shows specific susceptibility differences between species, which are not related to differences in basal metabolic rate, the default additional factor of 2.5 for “remaining differences” should be modified to reflect the additional information available.

6.7 Intraspecies scaling factor for the general population (ISF_{gp}) and workers (ISF_w)

6.7.1 Humans differ in sensitivity to exposure to toxic substances owing to a multitude of biological factors such as genetic polymorphism, affecting e.g. toxicokinetics/metabolism, age, gender, health and nutritional status. These differences, as the result of genetic and/or environmental influences, are greater in humans than in the more uniform inbred experimental animal population. Therefore, “intraspecies” in this context refers only to humans, which are divided into the following groups:

- .1 **workers**, which are considered to be reasonably fit and of working age. As a result, the variation in the effect of a chemical on this group is considered to be relatively small, hence:
 - .1 the scaling factor for **workers (ISF_w) = 5**
- .2 **the general population**, which are considered to include children, the elderly as well as the unfit and unwell. As a result, the variation in the effect of a chemical on this group is considered to be greater than that of workers, hence:
 - .1 the scaling factor for the **general population (ISF_{gp}) = 10**

6.8 Observed effect scaling factors (ESF)

6.8.1 For the dose-response relationship, consideration should be given to the uncertainties in the dose descriptor (NOAEL, benchmark dose) as the surrogate for the true no-adverse-effect-level (NAEL), as well as to the extrapolation of the LOAEL to the NAEL (in cases where only a LOAEL is available or where a LOAEL is considered a more appropriate starting point).

6.8.2 The size of an assessment factor should take into account the dose spacing in the experiment (in recent study designs generally spacing of 2-4 fold), the shape and slope of the dose-response curve, and the extent and severity of the effect seen at the LOAEL.

6.8.3 When the starting point for the DNEL calculation is a LOAEL, it is suggested to use an assessment factor of 3. However, the benchmark dose (BMD) approach is, when possible, preferred over the LOAEL-NAEL extrapolation.

6.9 Duration scaling factors (SF_{dur})

6.9.1 In order to end up with the most conservative DNEL for repeated dose toxicity, chronic exposure is the 'worst case'. Thus, if an adequate chronic toxicity study is available, this is the preferred starting point and no assessment factor for duration extrapolation is needed. If only a sub-acute or sub-chronic toxicity study is available, the following default assessment factors are to be applied, as a standard procedure:

Duration	Scaling Factor (SF _{dur})
Sub-chronic to chronic	2
Sub-acute to chronic	6
Sub-acute to sub-chronic	3

"sub-acute" usually refers to a 28 day study

"sub-chronic" usually refers to a 90 day study

"chronic" usually refers to a 1.2-2 year study (for rodents)

6.10 Differential Absorption Factors (CF_{abs})

6.10.1 It is recognized that route-to-route extrapolation is associated with a high degree of uncertainty and should be conducted with caution relying on expert judgement.

6.10.2 For simplicity 100% absorption for the oral and the inhalation route for animals and humans is assumed. On the assumption that, in general, dermal absorption will not be higher than oral absorption, no default factor (i.e. factor 1) should be introduced when performing oral-to-dermal extrapolation.

7 CALCULATION OF DMELS – HOW TO DEAL WITH NON-THRESHOLD CARCINOGENS?

7.1 Background

According to Procedure (G9), paragraph 5.3.12, the effect assessment of the Active Substances, Prepara-

tions and Relevant Chemicals should include a screening on carcinogenic, mutagenic and endocrine disruptive properties. If the screening results give rise to concerns, this should give rise to a further assessment.

7.2 The Linearized approach and the Large Assessment Factor approach

7.2.1 Carcinogens can have a threshold or non-threshold mode of action. When it comes to the threshold carcinogens these can be assessed by using a DNEL approach, however, in the case of the non-threshold carcinogens (i.e. with mutagenic potential) a different approach to risk assessment is recommended.

7.2.2 As a general rule, exposure in the workplace must be avoided or minimized as far as technically feasible. In addition, a risk for the general public from secondary exposure to a non-threshold carcinogenic substance is also unacceptable. However, calculation of an exposure level corresponding to a defined low risk is possible based on a semi-quantitative approach, i.e. a derived minimal effect level (DMEL). In contrast to a DNEL, a DMEL does not represent a safe level of exposure. It is a risk-related reference value that should be used to better target risk management measures.

7.2.3 At the present status of knowledge there are two methodologies which can be applied for deriving a DMEL. The “**Linearized**” approach essentially results in DMEL values representing a lifetime cancer risk considered to be of very low concern and the “**Large Assessment Factor**” approach similarly results in DMEL values representing a low concern from a public health point of view. If data allow, more sophisticated methodologies for deriving a DMEL may be applied. The choice of such alternative methodologies should be justified.

7.2.4 Cancer risk levels between 10^{-4} to 10^{-6} are normally seen as indicative tolerable risk levels when setting DMELs. Where these values are available from internationally recognized bodies, they can be used to set DMELs for risk assessment purposes.

8 RISK CHARACTERIZATION

8.1 General approach

8.1.1 The Risk Characterization Ratios (RCR) compares the exposure levels to various DNELs or DMELs. The RCR is calculated according to the following formula:

$$RCR = \frac{Exposure}{DNEL / DMEL}$$

8.2 Occupational health risks

8.2.1 While considering ballast water sampling and tank cleaning operations, it should be assumed that the exposure routes of concern for Port State control officers and the crew will be inhalation and dermal exposure. The assumption being that the exposure will include inhalation to the highest concentration of each chemical in the atmosphere above the treated ballast water at equilibrium and the dermal uptake to the highest concentration of each chemical in the treated ballast water.

8.2.2 In the other two scenarios, ballast tank inspection and normal work on deck, only inhalation is taken into consideration.

8.3 Health risks for the general public

8.3.1 In the two scenarios applicable for general public, swimming in seawater contaminated with treated ballast water and ingestion of seafood which has been exposed to treated ballast water are taken into consideration.

8.4 Conclusion

8.4.1 If the RCR < 1, the exposure is deemed to be safe.

8.4.2 However, risks are regarded not to be controlled when the estimated exposure levels exceed the DNEL and/or the DMEL, that is, if the RCR ≥ 1.

8.4.3 If the treated ballast water contains two or more chemicals with the same toxicological effect, these should be evaluated as an 'assessment group'. The RCR for an assessment group is calculated by addition of all RCRs of the individual components:

$$RCR_{group} = RCR_A + RCR_B + RCR_C + \dots$$

For the group RCR the same conclusions apply as described above.

8.4.4 If an unacceptable level of risk is identified for any of the scenarios in the first tier, the second tier is applied. If still an unacceptable risk is identified further refinement of the exposure assessment and/or the assessment factors might be performed giving special attention to route-specific contributions and additional RMM.

* *

APPENDIX 5

MAMPEC 3.0 INFORMATION

1 GENERAL

The model Marine Antifoulant Model for PEC calculation for Ballast Water (MAMPEC BW 3.0) or latest available version may be downloaded from the website of Deltares in the Netherlands. The website is:

<http://www.deltares.nl/en/software/1039844/mampec/1232321>

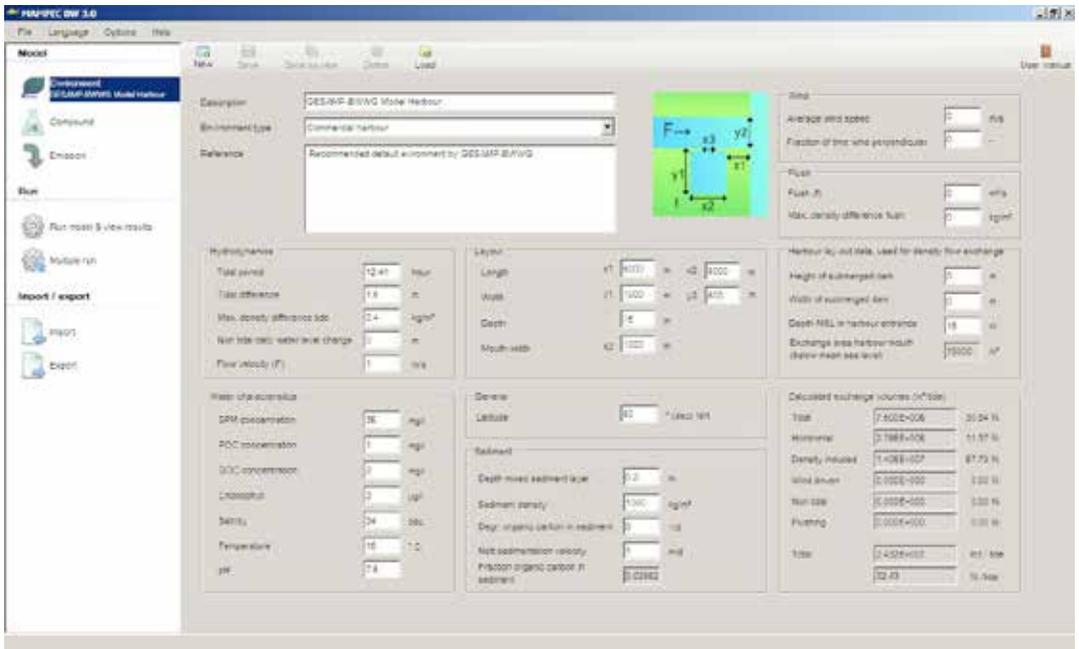
Follow the installation instructions and run the model.

2 CALCULATION OF THE PREDICTED ENVIRONMENTAL CONCENTRATION (PEC)

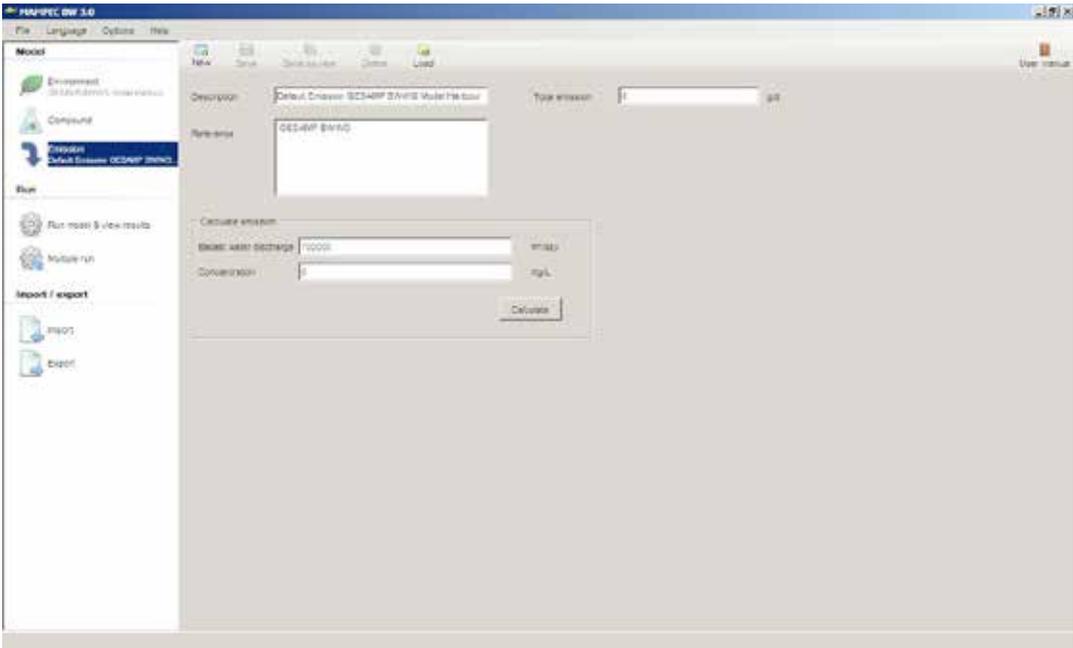
2.1 This procedure is important for carrying out a risk assessment to the environment.

2.2 In order to provide a standard approach, it is recommended that the MAMPEC-BW 3.0 or latest available version is used to determine the PEC for each chemical identified.

2.3 When this model is used, the following the GESAMP-BWWG Harbour Environment should be selected from the options available:



2.4 In addition to the GESAMP-BWWG Harbour Environment shown above, the following standard GESAMP-BWWG emission data need to be included as part of the GESAMP-BWWG Standard model:



2.5 The results of carrying out this procedure for each of the chemicals associated with the BWMS will be a series of PEC values, which should be included in a table with the Predicted No Effect Concentration (PNEC) and the appropriate assessment factor (AF). As a first assessment, the maximum value from the MAMPEC-BW 3.0 or latest available version calculations should be used. If this comparison results in PEC/PNEC ratios above 1.0, the 95%-ile may be used. If the PEC/PNEC ratio is still above 1.0, additional mitigation measures or a scientific reasoning may be proposed for discussion in the GESAMP-BWWG.

2.6 The resulting table should be reported in the main document of the submission.

3 CALCULATION OF THE PEC IN THE VICINITY OF THE SHIP ($PEC_{\text{NEAR SHIP}}$)

3.1 The MAMPEC-BW, latest available version, will calculate the stationary concentration in the harbour after discharge of ballast water. To account for local effects, near the ship at discharge, the local concentration at near ship is estimated using the formulae suggested in Zipperle et al., 2011 (Zipperle, A., Gils J. van, Heise S., Hattum B. van, Guidance for a harmonized Emission Scenario Document (ESD) on Ballast Water discharge, 2011):

$$C_{\text{max}} = \frac{C_{\text{BW}} + (S - 1) \cdot C_{\text{mean}}}{S}$$

where:

- C_{max} = the maximum concentration due to near ship exposure ($\mu\text{g/L}$) = $PEC_{\text{near ship}}$
- C_{BW} = the concentration found in the discharged ballast water ($\mu\text{g/L}$)
- S = dilution factor based on sensitivity analysis with a higher tier model, default value = 5
- C_{mean} = the mean concentration as output from MAMPEC-BW = called average in the MAMPEC results calculated.

3.2 The concentration calculated with this formula will be compared to acute toxicity data for the Active Substances and Relevant Chemicals to evaluate the short-term effects on aquatic organisms according to the ratio:

$$\text{PEC}_{\text{near ship}} / \text{PNEC}_{\text{near ship}}$$

**

APPENDIX 6

DATABASE OF CHEMICALS MOST COMMONLY ASSOCIATED WITH TREATED BALLAST WATER

For the 43 chemicals presented below, the GESAMP-BWWG holds sufficient information from the literature on physico-chemical, ecotoxicological and toxicological properties and no additional supporting information needs to be submitted by applicants. It is recommended that applicants make use of the latest version of the Database, as published by MEPC when preparing their application dossiers.

Substance	CAS-number
Acetaldehyde	75-07-0
Bromate ion	15541-45-4
Bromochloroacetic acid	5589-96-8
Bromochloroacetonitrile	83463-62-1
Chloral hydrate	302-17-0
Chloropicrin	76-06-2
Dalapon	75-99-0
1,2-dibromo-3-chloropropane	96-12-8
Dibromoacetic acid	631-64-1
Dibromoacetonitrile	3252-43-5
Dibromochloroacetic acid	5278-95-5
Dibromochloromethane	124-48-1
1,1-dichloroethane	75-34-3
1,1-dibromoethane	557-91-5
Dibromomethane	74-95-3
Dichloroacetic acid	79-43-6
Dichloroacetonitrile	3018-12-0
Dichlorobromoacetic acid	71133-14-7
Dichlorobromomethane	75-27-4
1,2-dichloroethane	107-06-2
Dichloromethane	75-09-2
1,2-dichloropropane	78-87-5
Formaldehyde	50-00-0
Monobromoacetic acid	79-08-3
Monobromoacetonitrile	590-17-0

→



Substance	CAS-number
Monochloroacetic acid	79-11-8
Monochloroacetonitrile	107-14-2
Monochloroamine	10599-90-3
Potassium bromate	7758-01-2
Sodium bromate	7789-38-0
Sodium hypochlorite	7681-52-9
Sodium thiosulphate	7772-98-7
Tetrachloromethane	56-23-5
Tribromoacetic acid	75-96-7
Tribromomethane	75-25-2
2,4,6-tribromophenol	118-79-6
Trichloroacetic acid	76-03-9
Trichloroacetonitrile	545-06-2
Trichloroethene	79-01-6
1,1,1-trichloroethane	71-55-6
1,1,2-trichloroethane	79-00-5
Trichloromethane	67-66-3
Trichloropropane	96-18-4

IMO BWM.2/Circ.8 of 27 October 2006**Harmonized implementation of
the Guidelines for approval of Ballast Water Management Systems (G8)**

1. The Marine Environment Protection Committee, at its fifty-fifth session (9-13 October 2006), recognizing the need to provide appropriate guidance for the harmonized implementation of the Guidelines for Approval of Ballast Water Management Systems (G8) adopted by resolution MEPC.125(53), approved a guidance note intended to be used during the type approval process as contained in the annex to this circular.
2. Member Governments are invited to use the annexed guidance note when implementing the requirements of resolution MEPC.125(53) regarding the approval of Ballast Water Management Systems and bring the guidance note to the attention of all parties concerned.

ANNEX**GUIDANCE NOTE
FOR THE HARMONIZED IMPLEMENTATION OF THE GUIDELINES FOR APPROVAL
OF BALLAST WATER MANAGEMENT SYSTEMS (GS) ADOPTED BY RESOLUTION
MEPC.125(53)**

- 1 Part 2 of the annex to Guidelines for approval of Ballast Water Management Systems (G8) provides the test and performance specifications required for the approval of such systems.
- 2 The tests carried out in compliance with the above requirements for a specified Treatment Rated Capacity (TRC) should be considered valid for type approval of a Ballast Water Management System with a higher TRC that consists of multiple units of that approved Ballast Water Management System, provided the ultimate functioning and effectiveness of the system on board a ship of the type and size for which the equipment will be certified will not be adversely affected.
- 3 The manufacturer shall give evidence by using mathematical modelling and/or calculations or by full scale shipboard testing that the system and its performance regarding D-2 standard will not be adversely affected and that only the pipe work and flow partitioning are concerned.

IMO BWM.2/Circ.7 of 27 October 2006

Interim Survey Guidelines for the purpose of the International Convention for the Control and Management of Ships' Ballast Water and Sediments under the Harmonized System of Survey and Certification (resolution A.948(23))

1. The Sub-Committee on Flag State Implementation, at its fourteenth session (5 to 9 June 2006), completed the work on the Interim Survey Guidelines for the purpose of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) under the Harmonized System of Survey and Certification (resolution A.948(23)) in accordance with regulation E-1 of the BWM Convention and invited the Marine Environment Protection Committee to consider these Guidelines and take action as appropriate.
2. Recognizing that only survey requirements of instruments that are in force may be integrated in Assembly resolution A.948(23), FSI 14 also agreed to keep these Guidelines in abeyance until the BWM Convention enters into force. Notwithstanding the above, FSI 14 was of the view that it would be beneficial to circulate these Guidelines to the interested parties for information in the interim period prior to the entry into force of the BWM Convention.
3. The Marine Environment Protection Committee, at its fifty-fifth session (9-13 October, 2006), endorsed the view of FSI Sub-Committee and approved these Guidelines in principle for dissemination through this circular. The Guidelines will facilitate the survey of ships which are requested by their Administrations or shipowners to certify compliance with the provisions of the BWM Convention on a voluntary basis.
4. Member Governments are invited to bring this circular to the attention of all parties concerned and, in particular, national authorities or recognized organizations in charge of ship survey and certification.

ANNEX

INTERIM SURVEY GUIDELINES UNDER THE HARMONIZED SYSTEM OF SURVEY AND CERTIFICATION (RESOLUTION A.948(23)) FOR THE PURPOSE OF THE INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS

(All references are to the English text)

1 "Contents"

- 1.1 The following new section 5 is added:

"ANNEX 5

SURVEY GUIDELINES UNDER THE CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS

- (B) 1 GUIDELINES FOR SURVEYS FOR THE INTERNATIONAL BALLAST WATER MANAGEMENT CERTIFICATE
 - (BI) 1.1 Initial surveys
 - (BA) 1.2 Annual surveys

(BIn) 1.3 Intermediate surveys

(BR) 1.4 Renewal surveys”

2 Section “GENERAL”

2.1 Insert new subparagraph .7 after existing subparagraph 1.1.6:

“7 International Convention for Control and Management of Ships’ Ballast Water and Sediments”
(Ballast Water Management Convention)

2.2 Insert new subparagraph .5 after existing subparagraph 1.2.4:

“1.2.5 Survey Guidelines under the Convention for Control and Management of Ships’ Ballast Water and Sediments (annex 5)”

2.3 In subparagraph 2.8.1, a new line is added after “BCH Code 85/90, regulation .6.2.1.1”, as follows:

“Ballast Water Management Convention regulation E-1.1.1”.

2.4 In subparagraph 2.8.3, a new line is added after “BCH Code 85/90, regulation .6.2.1.2”, as follows:

“Ballast Water Management Convention regulation E-1.1.2”.

2.5 In subparagraph 2.8.4, a new line is added after “BCH Code 85/90, regulation .6.2.1.3”, as follows:

“Ballast Water Management Convention regulation E-1.1.3”.

2.6 In subparagraph 2.8.5, a new line is added after “BCH Code 85/90, regulation 1.6.2.1.4”, as follows:

“Ballast Water Management Convention regulation E-1.1.4”.

2.7 In subparagraph 3.8, after the existing text “(P) for the Passenger Ship Safety Certificate;” add the following new line:

“(B) for the International Ballast Water Management Certificate;”

2.8 In subparagraph 4.8.1, sixth line, after “and the BCH Code 85/90 regulation 1.6.1.3” add the following text: “, or in the case of the Ballast Water Management Convention the survey shows that the ship’s Ballast Water Management does not conform to the particulars of the Certificate required under regulations E-2 or E-3, or is such that the ship is not fit to proceed to sea without presenting a threat of harm to the environment, human health, property or resources, the surveyor should be guided by regulation E-1.6.”

2.9 In paragraph 5.2:

.1 in the references, third line, replace with a comma (“,”) the word “and” between “regulation 1.5.6.3” and “the BCH Code”; replace the full stop at the end of the sentence with a comma; and add the following text at the end of the line “and the Ballast Water Management Convention regulations E-5.5 and E-5.6.”

.2 in the second paragraph, 13th line from the top, replace with a comma (“,”) the word “and” between “1.5.6.6” and “the BCH Code”; and after “regulations 1.6.6.5 and 1.6.6.6” add the following text: “and the Ballast Water Convention regulation E-5.2.2.”

.3 in the second paragraph, last line, replace with a comma (“,”) the word “and” between “regulation 1.5.6.2.2” and “the BCH Code”; and add the following text at the end of the line: “and the Ballast Water Management Convention regulation E-5.3.”

2.10 In paragraph 5.4 in the references, last line, replace with a comma (“,”) the word “and” between “regulation 1.5.6.6” and “the BCH Code”; and add the following text at the end of the line “and the Ballast Water Management Convention regulation E-5.3.”

2.11 In paragraph 5.5 in the references, last line, replace with a comma (“,”) the word “and” between “regulation 1.5.6.7” and “the BCH Code”; and add the following text at the end of the line “and the Ballast Water Management Convention regulation E-5.7.”

3 Annex 1 “SURVEY GUIDELINES UNDER THE 1974 SOLAS CONVENTION, AS MODIFIED BY THE 1988 PROTOCOL RELATING THERETO”

3.1 The following new subparagraph .8ter is added after existing paragraph 1.2.1.8bis:

“(EA) .8ter checking, when appropriate, the validity of the International Ballast Water Management Certificate;”

3.2 The following new subparagraph .8ter is added after existing paragraph 2.2.1.8bis:

“(CA) .8ter checking, when appropriate, the validity of the International Ballast Water Management Certificate;”

3.3 The following new subparagraph .8ter is added after existing paragraph 4.2.1.8bis:

“(RP) .8ter checking, when appropriate, the validity of the International Ballast Water Management Certificate;”

3.4 The following new subparagraph .5ter is added after existing paragraph 5.2.1.5bis:

“(PR) .5ter checking, when appropriate, the validity of the International Ballast Water Management Certificate;”

4 Annex 2 “SURVEY GUIDELINES UNDER THE 1966 LOAD LINE CONVENTION, AS MODIFIED BY THE 1988 PROTOCOL RELATING THERETO”

4.1 The following new subparagraph .8ter is added after existing paragraph 1.2.1.8bis:

“(LA) .8ter checking, when appropriate, the validity of the International Ballast Water Management Certificate;”

5 Annex 3 “SURVEY GUIDELINES UNDER THE 1973/78 MARPOL CONVENTION”

5.1 The following new subparagraph .8bis is added after existing paragraph 1.2.1.8:

“(OA) .8bis checking, when appropriate, the validity of the International Ballast Water Management Certificate;”

6 Annex 4 “SURVEY GUIDELINES UNDER THE MANDATORY CODES”

6.1 The following new subparagraph .6ter is added after existing paragraph 1.2.1.6bis:

“(DA) .6ter checking, when appropriate, the validity of the International Ballast Water Management Certificate;”

6.2 The following new subparagraph .6ter is added after existing paragraph 2.2.1.6bis:

“(GA) .6ter checking, when appropriate, the validity of the International Ballast Water Management Certificate;”

7 New Annex 5

7.1 Insert new Annex 5, starting with a new page following the last entry of Annex 4 ((GR) 2.4.3.1):

“ANNEX 5

SURVEY GUIDELINES UNDER THE 2004 INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS’ BALLAST WATER AND SEDIMENTS**(B) 1 GUIDELINES FOR SURVEYS FOR THE INTERNATIONAL BALLAST WATER MANAGEMENT CERTIFICATE**

(BI) 1.1 **Initial surveys** – see part “General” section 2.1

(BI) 1.1.1 For the Control and Management of Ships Ballast Water Sediments the examination of plans and designs should consist of:

- (BI) .1 examining the design and construction (regulation B-5);
- (BI) .2 examining the ballast water management plan (regulation B-1);
- (BI) .3 examination of plans for the installation of ballast water management systems (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .4 if applicable, examination of plans for the installation of prototype ballast water treatment technologies (regulation D-4).

(BI) 1.1.2 For Control and Management of Ships Ballast Water Sediments the survey during construction and after installation should consist of:

- (BI) .1 confirming that the Ballast Water Management Plan has been provided (regulation B-1);
- (BI) .2 confirming that the Ballast Water Record Book has been provided (regulation B-2);
- (BI) .3 confirming that certificate(s) for type approval of ballast water management system(s) are available (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .4 confirming that a statement has been provided by the Administration, or from a laboratory authorized by the Administration, confirming that the electrical and electronic components of the ballast water management system(s) have been type-tested in accordance with the specifications for environmental testing contained in Part 3 of the Annex of the Guidelines for Approval of Ballast Water Management Systems (G8) (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .5 confirming that equipment manuals for major components of the ballast water management system(s) have been provided (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .6 confirming that an operations and technical manual for the ballast water management system(s) specific to the ship and approved by the Administration, containing a technical description of the ballast water management system(s), operational and maintenance procedures, and backup procedures in case of equipment malfunction has been provided (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);

- (BI) .7 confirming that installation specifications for the ballast water management system(s) have been provided (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .8 confirming that installation commissioning procedures for the ballast water management system(s) have been provided (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .9 confirming that initial calibration procedures of the ballast water management system(s) have been provided (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .10 confirming that sampling facilities are provided and so arranged in order to collect representative samples of the ship's ballast water from the ballast water management system(s) intake(s) before the ballast discharge points and any other points necessary for sampling (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .11 verifying that the BWMS installation has been carried out in accordance with the technical installation specification (note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .12 verifying that the BWMS is in conformity with the Type Approval Certificate of BWMS issued by the Administration or its representative (note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .13 verifying that the installation of the complete BWMS has been carried out in accordance with the manufacturer's equipment specification (note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .14 verifying that any operational inlets and outlets are located in the positions indicated on the drawings of the pumping and piping arrangements (note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .15 verifying that the workmanship of the installation is satisfactory and, in particular, that any bulkhead penetrations or penetrations of the ballast system piping are to the relevant approved standards (note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .16 verifying that the Control and Monitoring Equipment operates correctly; (note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .17 confirming that if applicable the ballast water management recording device(s) are operable and that there is a sufficient supply of consumables for the recording device(s) on board (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .18 confirming the satisfactory installation and operation of the ballast water management system, including any audible or visual alarms (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to

regulation D-2 is applicable);

- (BI) .19 confirming that, if applicable, sufficient active substances are provided on board (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .20 confirming that, if applicable, dosage instruction for active substances or preparations are available on board (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BI) .21 verifying that, if applicable, the prototype ballast water treatment technology installation has been carried out in accordance with the approved Programme and that the workmanship of the installation is satisfactory (regulation D-4);
- (BI) .22 confirming that, if applicable, a Statement of Compliance for a Prototype Ballast Water Treatment Technology has been provided (regulation D-4);
- (BI) 1.1.3 For the Control and Management of Ships Ballast Water Sediments the completion of initial survey should consist of:
- (BI) .1 after satisfactory survey, the International Ballast Water Management Certificate should be issued.
- (BA) 1.2 **Annual surveys** - see part “General” section 2.5
- (BA) 1.2.1 For the Control and Management of Ships Ballast Water and Sediments the examination of current certificates and other records should consist of:
- (BA) .1 checking the validity, as appropriate, of the Cargo Ship Safety Equipment Certificate, the Cargo Ship Safety Radio Certificate and the Cargo Ship Safety Construction Certificate or the Cargo Ship Safety Certificate or Passenger Ship Safety Certificate;
- (BA) .2 checking the validity of the International Load Line Certificate or International Load Line Exemption Certificate;
- (BA) .3 checking the validity of the International Oil Pollution Prevention Certificate, International Sewage Pollution Prevention Certificate, and International Air Pollution Prevention Certificate;
- (BA) .4 checking the validity of the International Ship Security Certificate;
- (BA) .4bis checking, when appropriate, the validity of the Safety Management Certificate (SMC) and that a copy of the Document of Compliance (DOC) is on board;
- (BA) .5 checking the certificates of class, if the ship is classed with a classification society;
- (BA) .6 checking, when appropriate, the validity of the International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk;
- (BA) .7 checking when appropriate the validity of the International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk;
- (BA) .7bis checking, when appropriate, the validity of the International Sewage Pollution Prevention Certificate;
- (BA) .8 checking that the ship’s complement complies with the Minimum Safe Manning Document (SOLAS 74/88 regulation V/13(b));

- (BA) .9 checking that the master, officers and ratings are certificated as required by the STCW Convention;
 - (BA) .10 checking whether any new equipment has been fitted and, if so, confirm that it has been approved before installation and that any changes are reflected in the certificate;
 - (BA) .11 confirming that the Ballast Water Management Plan is on board (regulation. B-1);
 - (BA) .12 checking whether the appropriate entries have been made in the Ballast Record Book (regulation B-2);
 - (BA) .13 sighting the type test certificate(s) for the ballast water management system(s) (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
 - (BA) .14 sighting the records of the recording device, if fitted (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
 - (BA) .15 sighting, if applicable, the Statement of Compliance for a Prototype Ballast Water Treatment Technology (regulation D-4);
 - (BA) .16 verifying, if applicable, that there is evidence that the Prototype Ballast Water Treatment Technology is continuing to be operated in accordance with the approved programme (regulation D-4).
- (BA) 1.2.2 For the Control and Management of Ships Ballast Water Sediments the annual survey should consist of:
- (BA) .1 examining externally the ballast water treatment system and confirming, as far as practicable its satisfactory operation (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
 - (BA) .2 confirming that, if applicable, active substances in accordance with the manufacturer's recommendations are provided on board (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
 - (BA) .3 confirming that, if applicable, dosage instruction for active substance or preparations are available on board (regulation D-3 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
 - (BA) .4 where applicable examining externally the prototype ballast water treatment technology and confirming, as far as practicable its satisfactory operation (regulation D-4);
- (BA) 1.2.3 For the Control and Management of Ships Ballast Water Sediments the completion of annual survey should consist of:
- (BA) .1 after satisfactory survey, the International Ballast Water Management Certificate should be endorsed;
 - (BA) .2 if a survey shows that the condition of a ship or its equipment is unsatisfactory; see part "General" section 4.8.

- (BIn) **1.3 Intermediate surveys** - see part “General” section 2.4
- (BIn) 1.3.1 For the Control and Management of Ships Ballast Water Sediments the examination of current certificates and other records should consist of:
- (BIn) .1 the provisions of (BA) 1.2.1.
- (BIn) 1.3.2 For the Control and Management of Ships Ballast Water Sediments the intermediate survey should consist of:
- (BIn) .1 the provisions of (BA) 1.2.2;
- (BIn) .2 examining the ballast water management system for obvious defects, deterioration or damage including examining associated pumps, piping and fittings for wear and corrosion (regulations D-3 and D-4 / note, this survey requirement is relevant only when the performance standard according to regulation D-2 is applicable);
- (BIn) 1.3.3 For the Control and Management of Ships Ballast Water Sediments the completion of intermediate survey should consist of:
- (BIn) .1 after satisfactory survey, the International Ballast Water Management Certificate should be endorsed;
- (BIn) .2 if a survey shows that the condition of a ship or its equipment is unsatisfactory, see part “General” section 4.8.
- (BR) **1.4 Renewal surveys** - see part “General” section 2.3
- (BR) 1.4.1 For the Control and Management of Ships Ballast Water Sediments the examination of current certificates and other records should consist of:
- (BR) .1 the provisions of (BA) 1.2.1, except for the validity of the International Ballast Water Management Certificate.
- (BR) 1.4.2 For the Control and Management of Ships Ballast Water Sediments the renewal survey should consist of:
- (BR) .1 the provisions of (BIn) 1.3.2;
- (BR) .2 if applicable, confirming, if necessary by simulated test or equivalent, the satisfactory operation of the ballast water management systems (regulation. D-4).
- (BR) 1.4.3 For the Control and Management of Ships Ballast Water Sediments the completion of renewal survey should consist of:
- (BR) .1 after satisfactory survey, the International Ballast Water Management Certificate should be issued.”

8 Appendix

- 8.1 Insert new line showing the diagrammatic arrangement of surveys and certification for Ballast Water Management Convention in the Appendix:

Appendix

THE HARMONIZED SYSTEM OF SURVEY AND CERTIFICATION
DIAGRAMMATIC ARRANGEMENT

