INTERNATIONAL MARITIME ORGANIZATION

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SUB-COMMITTEE ON POLLUTION PREVENTION AND RESPONSE
10th session
Agenda items 5, 14 and 17

PPR 10/WP.5
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REVIEW OF THE 2011 GUIDELINES FOR THE CONTROL AND MANAGEMENT OF SHIPS' BIOFOULING TO MINIMIZE THE TRANSFER OF INVASIVE AQUATIC SPECIES (RESOLUTION MEPC.207(62))

UNIFIED INTERPRETATION OF PROVISIONS OF IMO ENVIRONMENT-RELATED CONVENTIONS

ANY OTHER BUSINESS

Report of the Working Group on Marine Biosafety

General

1 The Working Group on Marine Biosafety met from 24 to 27 April 2023 and was chaired by Dr. Sarah Bailey (Canada).

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

ARGENTINA
AUSTRALIA
BAHAMAS
BANGLADESH
BELGIUM
BRAZIL
CANADA
CHINA
DENMARK
FINLAND
FRANCE
GERMANY
GREECE
INDIA
INDONESIA
ITALY
JAPAN
LIBERIA
MALAYSIA
MALTA
MARSHALL ISLANDS
NETHERLANDS (KINGDOM OF THE)
NEW ZEALAND
NIGERIA
NORWAY
PANAMA
PHILIPPINES
POLAND
QATAR
REPUBLIC OF KOREA
RUSSIAN FEDERATION
SAUDI ARABIA
SINGAPORE
SOUTH AFRICA
SWEDEN
THAILAND
TÜRKİYE
UNITED ARAB EMIRATES
UNITED KINGDOM
UNITED STATES

by a representative of the following Associate Member of IMO:

HONG KONG, CHINA

by observers from the following intergovernmental organizations:

EUROPEAN COMMISSION (EC)
INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

and observers from the following non-governmental organizations:

INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
BIMCO
INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES (IACS)
CESA
INTERNATIONAL ASSOCIATION OF INDEPENDENT TANKER OWNERS (INTERTANKO)
ADVISORY COMMITTEE ON PROTECTION OF THE SEA (ACOPS)
CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA)
THE INSTITUTE OF MARINE ENGINEERING, SCIENCE AND TECHNOLOGY (IMarEST)
INTERNATIONAL SHIP MANAGERS' ASSOCIATION (INTERMANAGER)
THE ROYAL INSTITUTION OF NAVAL ARCHITECTS (RINA)
INTERNATIONAL TRANSPORT WORKERS' FEDERATION (ITF)
WORLD COATINGS COUNCIL (WCC)
WORLD SHIPPING COUNCIL (WSC)
CLEAN SHIPPING COALITION (CSC)
ACTIVE SHIPBUILDING EXPERTS' FEDERATION (ASEF)
BALLASTWATER EQUIPMENT MANUFACTURERS' ASSOCIATION (BEMA)
GLOBAL TESTNET

Terms of reference

3 The Working Group was instructed, taking into account comments and decisions made in plenary, to:

with regard to agenda item 5:

.1 finalize the text of the draft revised Biofouling Guidelines, using the annex to document PPR 10/5/1 as the basis and taking into account documents PPR 10/5/4, PPR 10/5/5, PPR 10/5/6, PPR 10/5/7, PPR 10/5/9, PPR 10/5/10, PPR 10/5/11, PPR 10/5/13, PPR 10/5/14, PPR 10/5/15 and PPR 10/INF.21;

with regard to agenda item 14:

.2 finalize the draft unified interpretation to the form of the International Ballast Water Management Certificate and regulations B-3.5 and B-3.10 of the BWM Convention, regarding the "date of construction" for a ship which has undergone a major conversion in order to implement the BWM Convention, using the annex to document PPR 10/14/1 as the basis; and

with regard to agenda item 17:

.3 consider the amendments to the *2015 Guidelines for the development of the Inventory of Hazardous Materials* (resolution MEPC.269(68)) proposed in document PPR 10/17/1, and advise the Sub-Committee accordingly; and

.4 submit a written report to plenary by Thursday, 27 April 2022.

Finalization of the revision of the Biofouling Guidelines

4 As instructed by the Sub-Committee, the Group considered the report of the Correspondence Group on Review of the Biofouling Guidelines (PPR 10/5/1) with a view to finalizing the text of the revised Biofouling Guidelines, using the annex to document PPR 10/5/1 as the basis and taking into account documents PPR 10/5/4, PPR 10/5/5, PPR 10/5/6, PPR 10/5/7, PPR 10/5/9, PPR 10/5/10, PPR 10/5/11, PPR 10/5/13, PPR 10/5/14, PPR 10/5/15 and PPR 10/INF.21, as well as the relevant comments and decisions made in plenary.

5 In this regard, the Group recognized that the fundamental decisions made in plenary would inform its detailed work and that it should identify how those decisions would be reflected in the final draft of the revised Guidelines. Furthermore, during its work the Group bore in mind that the aim was to finalize the draft revised Biofouling Guidelines at this session with a view to adoption by MEPC 80. In light of this objective, and noting the large number and broad range of issues and views arising from the Correspondence Group and the submitted documents, as well as the fact that this work related to voluntary guidelines, the Group recognized that it should strive for compromise through a pragmatic approach, to ensure the successful completion of this work in the available time.

6 With the above in mind, the Group proceeded to a thorough review of the draft revised Guidelines, focusing on each chapter and each appendix, taking into account the relevant outcomes of the plenary discussion and the respective comments and proposals contained in the submitted documents. The following paragraphs 7 to 39 provide an overview of the most substantial discussions held and decisions made, noting that some parts of the draft revised Guidelines were finalized without any substantial discussions or changes from the report of the Correspondence Group.

Introduction

7 The main matter for consideration with regard to chapter 1 (Introduction) was the flow chart visualizing the biofouling management life cycle (figure 1). In this connection, the Group recognized that this flow chart should reflect the entire revised Guidelines and should therefore be finalized after all other parts of the Guidelines were agreed. Therefore, the Group considered figure 1 after the finalization of all other parts of the Guidelines and finalized it accordingly, following the consideration of a proposed simplified version of the flow chart.

8 The Group also noted that paragraph 1.9 of the draft revised Guidelines contained a reference to the *Initial IMO Strategy on Reduction of GHG Emissions from Ships* (resolution MEPC.304(72)), which should be replaced at the time of the adoption of the revised Guidelines at MEPC 80 by a reference to the revised Strategy expected also to be adopted at MEPC 80.

Definitions

9 While most of the definitions contained in chapter 2 could be agreed as included in the report of the Correspondence Group or with minor edits, for certain definitions the Group recognized, following extensive discussions not resulting in consensus, that they would be

affected by the finalization of various parts of the Guidelines. This included, inter alia, the existing draft definitions of independent inspection organizations, niche areas, proactive cleaning and waste substances, as well as proposed new definitions for terms including, inter alia, capture, cleaning systems, high-risk areas, hull areas and treatment. Therefore, the Group considered those definitions following the consideration of all other parts of the Guidelines and finalized them accordingly in order to reflect the usage of the respective terms throughout the Guidelines.

10 In this regard, in addition to updates to some existing definitions, following extensive discussion, the Group also agreed to the addition of new definitions on capture and cleaning systems, while on the other hand the definition of independent inspection organizations was deleted. With regard to this term, as well as others for which no definition was introduced, the Group agreed that their usage or related concept and other aspects could instead be clarified at a high level, as may be necessary, in an appropriate place in the Guidelines, and this was implemented accordingly.

Application

11 Following brief discussion regarding chapter 3 (Application), the Group implemented the deletion of the reference to paragraph 10.16 in paragraph 3.4, as a consequence of the decision of plenary that paragraph 10.16 would be deleted, and did not agree with the proposal in document PPR 10/5/6 to include two new paragraphs after paragraph 3.5 relating to limited applicability of the Guidelines to certain specialized ship types.

Objectives

12 Noting that there were proposals to introduce references to the principles in Articles 195 and 196 of UNCLOS in the revised Guidelines, the Group recognized that chapter 4 (Objectives), and in particular paragraph 4.2, of the draft revised Guidelines already contained a reference to Articles 194 and 195. Therefore, the Group agreed that the best option was to add a reference to Article 196 in that paragraph.

Risk assessment and monitoring

13 The Group recalled that plenary had decided that chapter 7 of the draft revised Guidelines would be deleted and instead the text proposed in paragraph 12 of document PPR 10/5/7 would be included with any necessary adjustments made by the Group, while this would not entail losing the entirety of that chapter as some of its content would be moved to other parts of the Guidelines. In this connection, the Group also noted that, as this chapter was deleted, the subsequent chapters would be renumbered accordingly; however, to avoid confusion, in the body of this report all references to chapters and paragraphs correspond to the draft contained in document PPR 10/5/1.

14 In this connection, the Group recognized that it should consider the proposal in document PPR 10/5/7 to move figure 2 of the draft revised Guidelines, containing a flow chart visualizing the biofouling management risk profile and monitoring parameters, to another part of the Guidelines. Following brief discussion, the Group agreed to move this flow chart to appendix 1 and, in particular, under a new section 4 of that appendix. With regard to the context of the flow chart, while some delegations expressed some concerns regarding certain elements, it was noted that it had been moved to an appendix as merely an example and therefore the Group agreed to retain it with minor changes.

15 The Group then proceeded to the finalization of the new text proposed in paragraph 12 of document PPR 10/5/7, noting that this text would eventually be placed where paragraph 9.4 of the draft revised Guidelines was originally located, replacing that paragraph. As the proposed new text contained three paragraphs, the Group reviewed each paragraph, keeping in mind that it should only make relatively minor adjustments as the text had been agreed in plenary.

16 The first paragraph of the new text was finalized with a few edits following brief discussion, while the third paragraph was agreed without any changes. However, the Group had extensive discussions on the second paragraph of the new text, which contained, inter alia, references to inspection frequencies and the factors influencing them, on which there were divergent views as well as concerns regarding whether possible edits in that regard went beyond the instructions of the Sub-Committee. Following consideration of various views and proposals submitted by delegations, the Group was able to reach consensus and finalize this paragraph.

17 The outcomes outlined above informed the review and finalization of appendix 1 to the draft revised Biofouling Guidelines on biofouling risk assessment; this included edits and resolving square brackets, including in table 3, as well as a consideration of figure 2, which had been agreed to be moved to this appendix.

Contingency measures

18 The Group recalled that the Sub-Committee had agreed to include a new chapter 8 on contingency measures as proposed by the Correspondence Group, with adjustments to be made by this Group.

19 In the ensuing discussion, some delegations expressed concerns with regard to overlaps with chapter 9 (Inspection), including possible duplications of inspection regimes and other elements of inspections by ship crews and/or independent organizations. Various proposals were made by several delegations on different parts of this chapter, and following extensive discussions the Group finalized the content of this chapter, including also an adjustment to its title.

Inspections

20 The Group recognized that decisions made in plenary would affect its consideration of provisions for inspections; this included, for example, the deletion of paragraph 9.4 and, to some extent, the agreement to develop separate guidance on matters relating to in-water cleaning. The Group also recalled that the voluntary nature of the guidelines and the objective to finalize the revision at this session would inform its consideration.

21 The Group had extensive discussions on the first few paragraphs of chapter 9, which were difficult to reach consensus on. While noting the benefit of considering the chapter in its totality, as well as recognizing its relatively limited remit in light of the decisions made in plenary, the Group had extensive exchanges of views on various aspects of those paragraphs before proceeding to the consideration of the remainder of the chapter. These included, inter alia, the identification of relevant stakeholders as well as numerous matters relating to the entities involved in inspections, including their competencies and how they would be determined. These discussions resulted in substantial amendments to those paragraphs.

22 Subsequently, the Group proceeded to the further consideration of the new text replacing paragraph 9.4, including various alternative proposals to address diverse elements of the text. The issue that received the most attention was that of intervals for the first and

subsequent inspections, including whether they should be fixed or more flexible as well as how they would be affected by whether performance monitoring was undertaken. Compromise proposals were also made by delegations, as well as a proposal by the Chair aiming to combine elements of the diverse views expressed. Using those proposals as starting points the Group was able to finalize this text in a satisfactory manner.

23 Recognizing that the agreement to delete paragraph 9.4 (and chapter 7) entailed also the removal of table 1 potentially into an appendix, the Group then turned its attention to this proposal. In the ensuing discussion, while the initial proposal was to move this table to appendix 1 along with figure 2 so that it could also be used as an example reference, the majority of delegations were in favour of deleting the table altogether as they felt it was redundant following the introduction of the new text. Therefore, the Group agreed to delete this table.

Fouling ratings and recommended actions

24 Another important decision of plenary affecting the Group's work was the deletion of fouling rating 2 and the retention of one microfouling rating without any distinction between light and heavy microfouling. In this connection, the Group focused on consequential adjustments to table 2 as well as the consideration of various proposals relating to this table that had been submitted in commenting documents. This entailed primarily the consideration of recommended actions for each fouling rating, including proactive or reactive cleaning and the need for capture for microfouling; in this regard, the Group considered the impacts and benefits of each option as well as aspects of effectiveness and safety. The Group also noted that many aspects of this matter were covered in chapter 10 on cleaning and maintenance.

25 Following extensive discussions, the Group finalized table 2 and subsequently turned its attention to the remaining paragraphs of chapter 9. Edits were made to some paragraphs, including reduction and merging of certain paragraphs. This concluded the finalization of chapter 9.

Cleaning and maintenance

26 The Group recognized that decisions made in plenary would affect its consideration of provisions for cleaning and maintenance (chapter 10) too; this included, for example, the deletion of paragraphs 10.16, 10.5 and possibly 10.7.2, and the agreement to develop separate guidance on matters relating to in-water cleaning, which could lead to this chapter focusing only on high-level principles. The Group agreed that the edits made to this chapter should aim to its overall improvement focusing especially on consistency and clarity.

27 Various edits were made to the first few paragraphs of chapter 10, focusing, inter alia, on the concept of capture. In addition, the inclusion of a new paragraph 10.5*bis* proposed in document PPR 10/5/7 was agreed. The Group also considered that elements relating to the communication of information might be best suited under chapter 13 on dissemination of information, and agreed to consider this further as part of its consideration of that chapter.

28 As part of this work, the Group noted that most chapters started with a paragraph identifying the stakeholders to whom each chapter would be relevant. Following brief discussion, the Group agreed to delete those paragraphs from all chapters and keep only the general applicability provisions in chapter 3.

29 Recalling that the Sub-Committee had instructed it to consider the possible deletion of paragraph 10.7.2, following discussion the Group agreed to this deletion. It may be noted that, in connection with this discussion, there were also several proposals relating to the

general environmental considerations of the implementation of the Guidelines, including the introduction of references to Articles 195 and 196 of UNCLOS in this chapter; in this regard, the Group noted that the draft revised Guidelines did contain such a reference in chapter 4 and addressed this matter accordingly (see paragraph 12).

30 In light of the agreement to develop separate guidance on in-water cleaning, there were some proposals to replace the entirety of chapter 10 with very brief high-level text. However, some delegations expressed concerns that this would weaken the Guidelines and the Group agreed to proceed with a detailed consideration of the remainder of the chapter. The Group therefore thoroughly considered the respective sections on proactive and reactive cleaning and made several edits, including deletions or merging of some paragraphs, with a view to making these sections inclusive and realistic.

Other matters

31 Recognizing that no comments had been submitted on chapters 11 to 15, the Group agreed that, unless there were any significant concerns on any part of those chapters, they could be agreed as included in the report of the Correspondence Group. A few comments were made on chapters 11 and 13, including a change to the title of chapter 13 to "Documentation and dissemination of information" and the addition of a new opening paragraph to that chapter. Notwithstanding the lack of relevant commenting documents, as chapters 11 and 12 related to biofouling management plans and record books, the Group further considered those chapters in conjunction with appendices 3 and 4, in accordance with the decisions of plenary, as set out in the next section.

32 The Group also considered some specific aspects that were raised by individual delegations. This included the applicability of the draft revised Guidelines to underwater areas of offshore platforms and similar ship types, for which it may not be intuitive to associate references to 'hulls' and 'niche areas', and to the use of coatings or surfaces that do not have an anti-fouling action, which were agreed to be highlighted in chapter 1, as well as the relation between biofouling and its management with underwater noise, as well as harmful underwater radiated noise arising from in-water cleaning technologies, which was considered to be implicitly covered by the references to the UNCLOS articles in chapter 4.

Biofouling management plans and record books

33 Recognizing that the extensive updates made throughout the draft revised Guidelines would affect the proposed lists of elements recommended to be included in biofouling management plans and record books, as set out in paragraphs 11.3 and 12.4 of the draft revised Guidelines, the Group agreed that a review of those lists should be done prior to the detailed consideration of the forms proposed in document PPR 10/INF.21 as instructed by the Sub-Committee. In this connection, the Group also noted that the inclusion of such forms in the revised Guidelines would replace appendices 3 and 4; thus the Group agreed that there was no need to consider those appendices.

34 The Group first considered the list of elements to be included in biofouling management plans. Following thorough consideration, the Group agreed on numerous updates and edits to several items on the list, including deletion, reordering and/or merging of some items. Subsequently the Group undertook the same exercise for the list of elements to be included in biofouling record books, similarly resulting in various edits as well as deletions and additions of items.

35 Based on the finalized lists, the Group reviewed the forms for the biofouling management plan and record book proposed in document PPR 10/INF.21 in order to reflect therein the decisions of the Group both on the lists and on the text of the revised Biofouling Guidelines. Following discussion, several edits and updates were agreed for the form of the biofouling management plan, whereas there were no comments on the form of the biofouling record book beyond the necessary consequential editorials. The revised forms were introduced into the draft revised Guidelines as appendices 3 and 4, respectively.

Inspection and cleaning reports

36 Following brief discussion, while recognizing that the tables in appendix 2 could be improved and that this could relate to the future work under the amended output 1.21, the Group agreed to retain this appendix with only a few minor edits consequential to updates in the body of the Guidelines. In addition, the title of the appendix was revised to remove specific reference to reactive cleaning.

Best practices for biofouling inspections and cleaning actions

37 Owing to time constraints, the Group was not able to consider appendices 5 and 6, including their missing content. Under the circumstances, the Group agreed to remove these appendices from the finalized draft of the revised Biofouling Guidelines. Noting that the reason for the paucity of relevant information on best practices was that stakeholders were still gaining experience with inspection and cleaning, the Group recommended that the Sub-Committee invite Member States and international organizations to submit relevant information on best practices for biofouling inspections and cleaning actions to the Organization as it may become available in the future. In this connection, some delegations noted that there may be opportunities to provide such information in the context of the GloFouling Partnerships project.

Draft MEPC resolution

38 Finally, the Group prepared the draft MEPC resolution on the adoption of the revised Biofouling Guidelines, using resolution MEPC.207(62) as the basis and introducing adjustments to reflect the adoption of the revised Guidelines. The resulting text of the draft resolution was included in the draft revised Biofouling Guidelines for the consideration of the Sub-Committee.

Finalized draft revised Biofouling Guidelines

39 The Group finalized the draft text of the 2023 guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species and the associated draft MEPC resolution, set out in annex 1, and invited the Sub-Committee to approve it with a view to adoption by MEPC 80, and to request the Secretariat to conduct an editorial review of the text prior to its submission for adoption.

Unified interpretation of appendix I and regulation B-3 of the BWM Convention

40 As instructed by the Sub-Committee, the Group considered the proposed unified interpretation (UI) to the form of the International Ballast Water Management Certificate and regulations B-3.5 and B-3.10 of the BWM Convention, regarding the "date of construction" for a ship which has undergone a major conversion in order to implement the BWM Convention, with a view to finalizing it using the annex to document PPR 10/14/1 as the basis.

41 In this regard, the Group recalled that there was some support in plenary for the second alternative option proposed in document PPR 10/14/1 for paragraph 2.1 of the UI, while there were no particular views expressed with regard to paragraph 1.1 of the UI. Following brief discussion, the Group agreed to paragraph 1.1 of the UI as proposed in document PPR 10/14/1.

42 With regard to paragraph 2.1 of the proposed UI, several delegations, making reference to regulation A-1.4 of the BWM Convention, supported the view that there should be only one date in the International Ballast Water Management Certificate. There was also broad support for the view that in case of a major conversion, the ship should be considered as a new ship in terms of determining the "date of construction" in this context, however, it was not clear how this could be best addressed with the two proposed options. The Group therefore agreed to consider a third alternative proposal for paragraph 2.1 of this UI, which was subsequently supported.

43 In conclusion, the Group prepared the draft unified interpretation to the form of the International Ballast Water Management Certificate and regulations B-3.5 and B-3.10 of the BWM Convention, set out in annex 2, and invited the Sub-Committee to agree to the UI for approval by MEPC 80 and inclusion in BWM.2/Circ.66/Rev.5, consolidating all unified interpretations to provisions of the BWM Convention.

Guidelines for the development of the Inventory of Hazardous Materials

44 As instructed by the Sub-Committee, the Group considered the amendments to the *2015 Guidelines for the development of the Inventory of Hazardous Materials* (resolution MEPC.269(68)) proposed in document PPR 10/17/1, with a view to advising the Sub-Committee accordingly.

45 In this connection, the Group recalled that the Sub-Committee had agreed that all references to the use of cybutryne specifically as a biocide should be deleted, and that the Group should further consider the thresholds for cybutryne and associated references to relevant resolutions.

46 Following brief discussion, the Group agreed that only the threshold corresponding to sampling of dry paint directly from the hull should be included, as the threshold corresponding to wet sampling from a paint container would not be relevant in the context of the Inventory of Hazardous Materials which relates to ship recycling.

Draft MEPC resolution

47 Finally, the Group prepared the draft MEPC resolution on the adoption of the revised Guidelines, using resolution MEPC.269(68) as the basis and introducing adjustments to reflect the adoption of the revised Guidelines. The resulting text of the draft resolution was included in the draft revised Guidelines for the consideration of the Sub-Committee.

Finalized draft revised Guidelines for the development of the Inventory of Hazardous Materials

48 The Group finalized the draft text of the 2023 guidelines for the development of the Inventory of Hazardous Materials devices and the associated draft MEPC resolution, set out in annex 3, and invited the Sub-Committee to approve it with a view to adoption by MEPC 80.

Action requested of the Sub-Committee

49 The Sub-Committee is invited to approve the report in general and in particular to:

.1 invite Member States and international organizations to submit relevant information on best practices for biofouling inspections and cleaning actions to the Organization as it may become available in the future (paragraph 37);

.2 approve the draft 2023 guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species and the associated draft MEPC resolution, set out in annex 1, with a view to their adoption by MEPC 80, and request the Secretariat to conduct an editorial review of the text prior to its submission for adoption (paragraph 39);

.3 agree to the draft unified interpretation to the form of the International Ballast Water Management Certificate and regulations B-3.5 and B-3.10 of the BWM Convention, set out in annex 2, and invite the Committee to approve it for inclusion in BWM.2/Circ.66/Rev.5, consolidating all unified interpretations to provisions of the BWM Convention (paragraph 43); and

.4 approve the draft 2023 guidelines for the development of the Inventory of Hazardous Materials and the associated draft MEPC resolution, set out in annex 3, and invite the Committee to adopt them (paragraph 48).

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ANNEX 1

DRAFT MEPC RESOLUTION

2023 GUIDELINES FOR THE CONTROL AND MANAGEMENT OF SHIPS' BIOFOULING TO MINIMIZE THE TRANSFER OF INVASIVE AQUATIC SPECIES

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38 of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee relating to any matter within the scope of the Organization concerned with the prevention and control of marine pollution from ships,

RECALLING ALSO that Member States of the International Maritime Organization made a clear commitment to minimizing the transfer of invasive aquatic species by shipping in adopting the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004,

RECALLING FURTHER that studies have shown biofouling on ships to be an important means of transferring invasive aquatic species which, if established in new ecosystems, may pose threats to the environment, human health, property and resources,

NOTING the objectives of the Convention on Biological Diversity, 1992, and that the Kunming-Montreal Global Biodiversity Framework includes a target to eliminate, minimize, reduce and/or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species,

NOTING ALSO that the transfer and introduction of aquatic invasive species through ships' biofouling threatens the conservation and sustainable use of biological diversity, and implementing practices to control and manage ships' biofouling can greatly assist in reducing the risk of the transfer of invasive aquatic species,

NOTING FURTHER that this issue, being of worldwide concern, demands a globally consistent approach to the management of biofouling,

RECALLING that, at its sixty-second session, it had adopted the *2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species* (Biofouling Guidelines), developed by the Sub-Committee on Bulk Liquids and Gases,

RECALLING ALSO that, at its seventy-second session, it had agreed to review the Biofouling Guidelines, with a view to amending the Guidelines, if required,

HAVING CONSIDERED, at its eightieth session, the draft revised *Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species*, developed by the Sub-Committee on Pollution Prevention and Response,

1 ADOPTS the *2023 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species*, as set out in the annex to the present resolution;

2 REQUESTS Member States to take urgent action in applying these Guidelines, including the dissemination thereof to the shipping industry and other interested parties, taking these Guidelines into account when adopting measures to minimize the risk of introducing invasive aquatic species via biofouling, and reporting to MEPC on any experience gained in their implementation;

3 AGREES to keep these Guidelines under review in light of the experience gained; and

4 REVOKES resolution MEPC.207(62).

REVISED GUIDELINES FOR THE CONTROL AND MANAGEMENT OF SHIPS' BIOFOULING TO MINIMIZE THE TRANSFER OF INVASIVE AQUATIC SPECIES

TABLE OF CONTENTS

1 INTRODUCTION

1.1 MEPC 62 adopted the 2011 *Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species* (the Guidelines) through resolution MEPC.207(62). The aim of the Guidelines was to provide a globally consistent approach to managing biofouling by providing useful recommendations of general measures to reduce the risk associated with biofouling for all types of ships.

1.2 Member States of the International Maritime Organization (IMO) decided at MEPC 72 to review the Guidelines in order to assess the uptake and effectiveness of the Guidelines and identify any required action.

1.3 Studies have shown that biofouling can be a significant vector for the transfer of invasive aquatic species. Biofouling on ships entering the waters of States may result in the establishment of invasive aquatic species, which may pose threats to human, animal and plant life, economic and cultural activities, and the aquatic environment.

1.4 Invasive aquatic species have been recognized as one of the major threats for the well-being of the oceans by, inter alia, the Convention on Biological Diversity (CBD), several UNEP Regional Seas Conventions, the Asia Pacific Economic Cooperation forum (APEC) and the Secretariat of the Pacific Region Environmental Program (SPREP).

1.5 Prediction of risk for introducing invasive species is complex, hence these Guidelines have the intention to minimize the accumulation of biofouling on ships. Biofouling may include invasive species while a clean hull and niche areas significantly reduce this risk. Studies have shown that the biofouling process begins within the first few hours of a ship's immersion in water. The biofouling pressure on a specific ship is influenced by a range of factors, starting with design and construction of the ship hull and niche areas, followed by operating profile of the ship and maintenance history.

1.6 These Guidelines describe recommended biofouling management practices, as illustrated in figure 1. Attention during initial ship design and construction may provide effective and sustainable means to reduce ship biofouling risks, supplemented by anti-fouling systems (AFS) for all types of ships' submerged or otherwise wetted surface areas, including hull and niche areas. Although these Guidelines focus on ships using AFS, these biofouling management practices are equally recommended for ships using coatings or surfaces that are not used to control or prevent attachment of organisms, as may be applicable.

1.7 The need for inspection and biofouling management may depend on the use of AFS, cleaning regime, and the overall risk of biofouling on the hull and in niche areas. By conducting ship-specific monitoring of risk parameters, identifying potential higher risk for biofouling, an optimized regime for biofouling management can be determined. Cleaning is an important measure to remove biofouling from the hull and niche areas but, when conducted in-water, it poses a risk for releasing invasive aquatic species into the water. Waste substances which are dislodged from the ship during the cleaning operation should therefore be collected. The Guidelines provide guidance for cleaning actions based on a fouling rating number with an overall aim to minimize the risk of transfer of invasive aquatic species. Maintenance and ship recycling should also be conducted with sufficient preventative measures to avoid release of any invasive aquatic species into the water. When conducting biofouling management, potential release of harmful waste substances should also be considered.

1.8 In addition to the Biofouling Guidelines, the following frameworks are relevant for minimizing the transfer of invasive aquatic species:

.1 the *International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004* (BWM Convention), which aims to minimize the transfer of invasive aquatic species through ships' ballast water and sediments; and

.2 the *International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001* (AFS Convention), which addresses anti-fouling systems on ships and focuses on the prevention of adverse impacts from the use of anti-fouling systems and the biocides they may contain.

1.9 Biofouling management practices may also improve a ship's hydrodynamic performance and can be effective at enhancing energy efficiency and reducing air emissions from ships. This concept has been identified by IMO in the 2022 *Guidelines for the development of a ship energy efficiency management* plan *(SEEMP)* (resolution MEPC.346(78)). These Guidelines further support the *Initial IMO Strategy on Reduction of GHG Emissions from Ships* (resolution MEPC.304(72)) [Comment: To be replaced by the revised strategy to be adopted at MEPC 80)].

1.10 A GEF-UNDP-IMO GloFouling Partnerships Project was conducted as part of wider efforts by the International Maritime Organization (IMO), in collaboration with the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF), to protect marine ecosystems from the negative effects of invasive aquatic species. The aim of the GloFouling Partnerships Project was to build capacity in developing countries for implementing the IMO Biofouling Guidelines and other relevant guidelines to minimize the transboundary introduction of invasive aquatic species, with additional benefits in the reduction of greenhouse gas (GHG) emissions from global shipping.

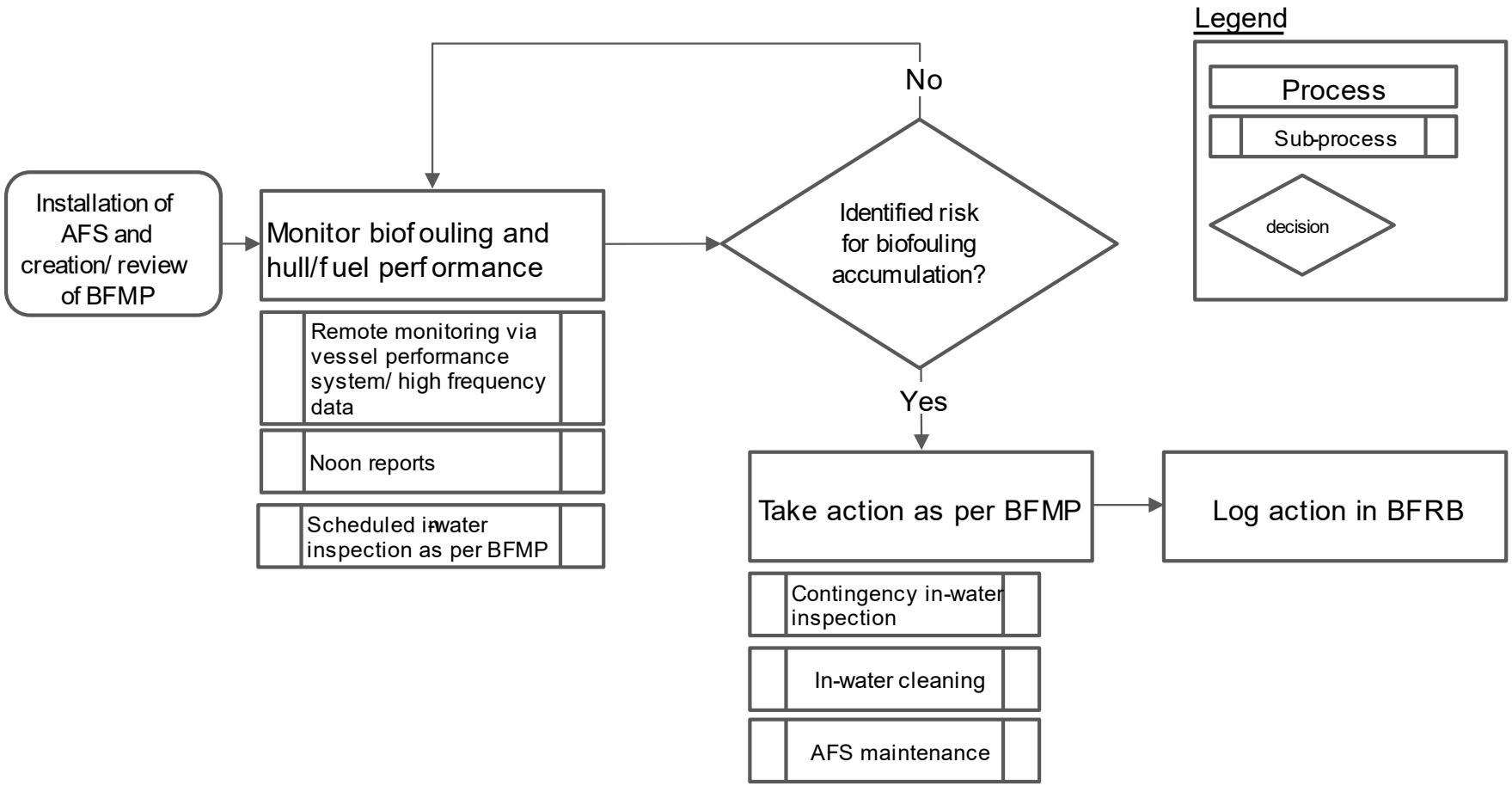

Figure 1: Simplified flow chart visualizing the biofouling management activities of a ship

2 DEFINITIONS

2.1 For the purposes of these Guidelines, the following definitions apply:

Anti-fouling system (AFS) means a coating, paint, surface treatment, surface, or device that is used on a ship to control or prevent attachment of organisms.

Anti-fouling coating (AFC) means a surface coating or paint designed to prevent, repel or facilitate the detachment of biofouling from hull and niche areas that are typically or occasionally submerged.

Biofouling is the accumulation of aquatic organisms such as microorganisms, plants and animals on surfaces and structures immersed in or exposed to the aquatic environment. Biofouling can include pathogens. For microfouling and macrofouling, see definitions below.

Biofouling pressure means the biofouling accumulation rate, which differs regionally and seasonally. High biofouling pressure means the development of dense biofouling within a short period of time.

Capture is the process of containment, collection and removal of biofouling material and waste substances surfaces during cleaning in water or in dry-dock.

Cleaning system is the equipment used for, or the process of removal of biofouling from the ship surface, with or without capture.

Dry-dock cleaning refers to the cleaning of the submerged areas when the ship is out of water.

Fouling rating is the allocation of a number for a defined inspection area of the ship surface based on a visual assessment, including description of biofouling present and percentage of macrofouling coverage.

In-water cleaning is the removal of biofouling from a ship's hull and niche areas while in the water.

Invasive aquatic species are non-native species to a particular ecosystem which may pose threats to human, animal and plant life, economic and cultural activities and the aquatic environment.

Macrofouling is biofouling caused by the attachment and subsequent growth of visible plants and animals on structures and ships exposed to water. Macrofouling is large, distinct multicellular individual or colonial organisms visible to the human eye such as barnacles, tubeworms, mussels, fronds/filaments of algae, bryozoans, sea squirts and other large attached, encrusting or mobile organisms.

Marine growth prevention system (MGPS) is an AFS used for the prevention of biofouling accumulation in niche areas or other surface areas but may also include methods which apply surface treatments.

Member States means States that are Members of the International Maritime Organization.

Microfouling is biofouling caused by bacteria, fungi, microalgae, protozoans and other microscopic organisms, that creates a biofilm also called a slime layer.

Niche areas are a subset of the submerged surface areas on a ship that may be more susceptible to biofouling than the main hull due to structural complexity, different or variable hydrodynamic forces, susceptibility to AFC wear or damage, inadequate or no protection by AFS.

Organization means the International Maritime Organization.

Port State authority means any official or organization authorized by the Government of a port State to verify the compliance and enforcement of standards and regulations relevant to the implementation of national and international shipping control measures.

Proactive cleaning is the periodic removal of microfouling on ships' hulls to prevent or minimize attachment of macrofouling.

Reactive cleaning is a corrective action during which biofouling is removed from a ship's hull and niche areas either in-water with capture or in drydock.

Ship means a vessel of any type whatsoever operating in the aquatic environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft, fixed or floating platforms, floating storage units (FSUs) and floating production storage and off-loading units (FPSOs).

States means coastal, port, flag or Member States, as appropriate.

Waste substances are dissolved and particulate materials that may be released or produced during cleaning or maintenance, and may include biocides, metals, organic substances, removed biofouling, pigments, microplastics or other contaminants that could have a negative impact on the environment.

3 APPLICATION

3.1 The Guidelines are intended to provide useful recommendations for measures to minimize biofouling for all types of ships. The Guidelines are directed to various stakeholders, such as ship designers, shipbuilders, anti-fouling paint manufacturers and suppliers, States, including environmental and regulatory agencies, classification societies, shipowners, ship operators, charterers, shipmasters, port authorities, ship cleaning and maintenance operators, inspection organizations, ship repair, dry-docking and recycling facilities, and any other interested parties.

3.2 Alternative procedures, methods or actions taken to meet the objectives of these Guidelines, which are not described, should be reported to the Organization by Members of the Organization and their representatives and be taken into account in future review of the Guidelines as appropriate.

3.3 A separate guidance document, based on these Guidelines, provides advice relevant to owners and/or operators of recreational craft less than 24 meters in length, using terminology appropriate for that sector (*Guidance for minimizing the transfer of invasive aquatic species as biofouling (hull fouling) for recreational craft*, MEPC.1/Circ.792).

3.4 The Guidelines may not be relevant to ships which operate only in the same waters in which the biofouling was accumulated. Although operation in the same waters leads to no risk of introducing invasive aquatic species, measures to avoid discharge of harmful waste substances during cleaning may still be relevant.

3.5 An inspection regime as defined in paragraphs 8.4 to 8.6 may not be relevant to a ship when idle for a longer period. To maintain the anti-fouling effect of an AFS, inspection and reactive cleaning may be needed before the ship is reactivated to reduce the risk of biofouling.

4 OBJECTIVES

4.1 The objective of these Guidelines is to minimize the transfer of invasive aquatic species through biofouling on ships.

4.2 Procedures, methods and actions taken in line with these Guidelines should safeguard the obligation under the United Nations Convention on the Law of the Sea (UNCLOS) article 194 to prevent, reduce and control pollution of the marine environment. This includes ensuring not to transfer, directly or indirectly, damage or hazards from one area to another, or transform one type of pollution into another (ref. UNCLOS article 195), as well as preventing the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment (ref. UNCLOS article 196).

4.3 The objective of these Guidelines is pursued by providing a globally consistent approach to stakeholders on the control and management of biofouling, which will contribute to minimizing the risk of transferring invasive aquatic species from biofouling on ships. An additional effect of good biofouling management can be a reduction in emissions to air from ships, due to lower fuel demand in operation as a result from a clean hull.

5 DESIGN AND CONSTRUCTION

5.1 Initial ship design and construction offers the most comprehensive, effective and long-lasting means to minimize ship biofouling risks. In the design and construction of a ship, or when a ship is being significantly modified, the following items, not exhaustive, should be taken into consideration:

.1 small niches and sheltered areas should be avoided as far as practical, e.g. flush mounting pipes in sea chests (where not practical, these should be designed so that they may be easily accessed for inspection, cleaning and application of AFS like marine growth prevention systems (MGPS));

.2 rounding and/or bevelling of corners, gratings and protrusions to promote more effective coverage of AFC and hinging of gratings to enable diver access;

.3 providing the capacity to block off the sea chest and other areas, such as moon pools, floodable docks and other free flood spaces, for cleaning and treatment, if applicable and appropriate; and

.4 internal seawater cooling systems should be designed with a minimum number of bends and flanges. The design should be made of appropriate material to minimize biofouling, and be compatible with MGPS, if any. Dead ends, as can be found between different systems like cross-over piping between cooling and general service systems, should be avoided. Stand-by pumps and piping should be fully integrated into the systems to avoid stagnant water.

6 ANTI-FOULING SYSTEM INSTALLATION AND MAINTENANCE

6.1 AFS are effective means to minimize biofouling on ships' submerged surfaces, including the hull and niche areas.

6.2 Restrictions on the use of certain substances in the AFC are regulated by the AFS Convention.

Choosing an AFS

6.3 It is recommended to install AFS in all submerged surfaces on a ship where biofouling may attach. Various AFS are designed for different ship operating profiles, some suitable for hull and some for niche areas and therefore will require different maintenance activities. Thus, it is essential that shipowners, ship operators and ship builders obtain appropriate technical advice. AFS manufacturers are best suited to provide advice to ensure a suitable system is applied, re-applied, installed or renewed. As biofouling may typically be found at higher abundance in niche areas, where flow characteristics change as the ship moves through the water, it is recommended to choose a combination of AFC and MGPS, suitable for different submerged areas. If an appropriate AFS is not applied, biofouling accumulation may increase, and more frequent inspections may be necessary. Some factors to consider when choosing an AFS include the following:

.1 **Ship design and construction:** Where possible and appropriate upon the recommendation of AFS manufacturers, targeted installation of AFS may be employed for different areas of the ship. AFS for the hull may include specific AFC, paint and/or surface treatment. Installation of any proactive cleaning measures should be in accordance with the recommendations from the AFC provider and should not damage the AFC. Different AFS are designed to optimize their performance for specific ship speeds. For niche areas, the selected AFS should be optimized for conditions of the niche area, e.g. an AFC may be recommended for use in combination with effective MGPS to minimize biofouling. AFC should be based on expected wear, abrasion and water flow rates.

.2 **Active ingredients of AFC:** Environmental impact assessment of the selected AFC with respect to the release of harmful substances should be considered. The limitations of an AFC to minimize biofouling should be known and may include operating profile, aquatic environment, ship design and lifecycle of AFC. Decision-makers should be aware of the limitations of each AFC and the recommended in-water cleaning methods in order to minimize potential environmental impacts and damage to the system. Depending on type of AFC, various type of waste substances may be released when cleaning. Some waste substances may easily be captured but others are fine particles or dissolved substances that may be released into the water. Therefore, not all AFC types are designed for frequent cleaning. The AFC manufacturers should provide key information on any biocides used and coating types on publicly available safety and technical datasheets. Frequent cleaning may impact the effectiveness of a specific AFC, and it is therefore recommended that the AFC manufacturers provide relevant guidance. In-water cleaning service providers and manufacturers of cleaning methods/equipment should provide guidance considering compatibility with AFC type.

.3 **Operating profile:** Patterns of use, operating routes, ship activity levels and periods of inactivity may influence the rate of biofouling accumulation and thus the effectiveness of the AFS. Inactivity may cause higher accumulation of biofouling. Biofouling may attach more easily on slow-moving ships.

.4 **Aquatic environment:** Biofouling pressure differs between areas, depending on temperature, salinity and nutrient conditions. Biofouling grows more slowly, but is not prevented, in low temperature waters. Ships operating in ice conditions should consider special AFC. Different organisms grow in different salinity waters and, if a ship operates in all salinity ranges, the anti-fouling system should target a wide range of organisms causing fouling. The benthic (seabed) environment should also be considered. Increasing depth of water and distance from shore may decrease susceptibility for biofouling. Additionally, higher content of nutrients in the water may increase algae blooms and susceptibility for biofouling.

.5 **Cleaning method:** Although cleaning system manufacturers are encouraged to find technological solutions that allow them to clean a wide variety of AFC, not all AFC can be cleaned by every cleaning system. When selecting the AFC, the available cleaning technologies and techniques and their suitability for the specific AFC should be considered. Therefore, AFC manufacturers should provide key information on any biocides used and coating types. The choice of AFC should be compatible with the cleaning technologies available to ensure both minimum biofouling growth as well as reducing the risk of damage to the AFC and the potential release of harmful waste substances to the environment.

.6 **Maintenance:** The lifespan of an AFS should be considered in combination with dry-docking schedules. AFC lifespan and lifetime of MGPS (e.g. anodes) should exceed the period between drydocks.

.7 **Legal requirements:** In addition to the AFS Convention, any national or regional regulatory requirements, if relevant, should be considered in the selection of AFS. This may apply to release of chemicals from MGPS and the AFS.

Installing the AFS

6.4 Installing an AFS in hull and niche areas should be in accordance with manufacturer's guidance.

6.5 Niche areas are particularly susceptible to biofouling growth. Care should be taken in surface preparation and application of any AFC to ensure adequate adhesion and coating thickness. Particular attention should be paid to corners, edges, pipes, holding brackets and bars of gratings. Corners, edges and welded joints should be smooth and coated with adequate coating thickness to optimize system effectiveness. Additionally, for such areas, it is recommended to apply a touch up to ensure film thickness or a higher-grade AFC.

6.6 A non-exhaustive list of recommended measures for installation of an AFS in niche areas are:

.1 **Sea chest:** Internal surfaces and inlet gratings of sea chests should be protected by an AFS that is suitable for the flow conditions of the area over the gratings and through the sea chest.

.2 **Bow and stern thrusters:** Free-flooding spaces which may exist around the thruster tunnel require special attention. The housings/recesses, and retractable fittings such as stabilizers and thruster bodies, should have an AFC of adequate thickness for optimal effectiveness.

.3 **Rudder hinges and stabilizer fin apertures:** Rudders and stabilizer fins should be moved through their full range of motion during the coating process to ensure that all surfaces are correctly coated to the specification of the AFC. Rudders, rudder fittings and the hull areas around them should also be adequately coated to withstand the increased wear rates experienced in these areas.

.4 **Propeller and shaft:** Propellers and immersed propeller shafts are generally not coated, but polished. Fouling release coatings or other suitable coatings may be applied where possible and appropriate to maintain efficiency.

.5 **Stern tube seal assemblies and the internal surfaces of rope guards:** Exposed sections of stern tube seal assemblies and the internal surfaces of rope guards should be carefully painted with AFC appropriate to the degree of water movement over and around these surfaces.

.6 **Cathodic protection anodes:** Biofouling can be minimized in niche areas if anodes are flush-fitted to the hull, a rubber backing pad is inserted between the anode and the hull or the gap is caulked. Caulking the gap will make the seam or joint watertight. If not flush-fitted, the hull surface under the anode and the anode strap should be coated with an AFC suitable for low water flow to prevent biofouling accumulation. If anodes are attached by bolts recessed into the anode surface, the recess should be caulked to remove a potential niche.

.7 **Pitot tubes:** Where retractable pitot tubes are fitted, the housing should be internally coated with an AFC suitable for static conditions.

.8 **Sea inlet pipes and overboard discharges:** Pipe openings and accessible internal areas should be protected by an AFS as far as practicable. Any anti-corrosive or primer coating used should be appropriate for the specific pipe material and area requirements. Care should be taken in surface preparation and coating application to ensure good adhesion and coating thickness.

6.7 Details for performance monitoring of the AFS should be included in the ship-specific biofouling management plan (BFMP) and be based on recommendations from the manufacturer of the AFS. Necessary measures to ensure that the AFS remains effective over the specified docking interval, plus any recommendations on how to return the AFS to optimal performance, should be included.

6.8 Manufacturers of AFS are also encouraged to provide information on appropriate cleaning methods, details of maintenance or upgrade protocols specific for the AFS and details on inspection and repair to ensure the effectiveness of their products. Such details are encouraged to be included in the ship-specific BFMP.

Re-installing, re-applying or repairing the AFS

6.9 Re-installing, re-applying or repairing the AFS should be in accordance with manufacturer's guidance that includes measures for surface preparation to facilitate good adhesion and durability.

6.10 Positions of dry-docking blocks and supports should be varied at each dry-docking, or alternative arrangements made to ensure that areas under blocks are painted with an AFC, at least at alternate dry dockings. Where it is not possible to alternate the position of dry-docking support strips, these areas should be specially considered and managed by other means, e.g. the application of specialized coatings or procedures or measures for such areas based on the past arrangement of dry-docking support strips to shift their position step by step for each docking.

6.11 Re-installing or repairing the MGPS in niche areas should be in accordance with manufacturer's guidance.

6.12 When re-installing, re-applying or repairing AFS in niche areas, the list of recommended items in paragraph 6.6 should be considered. A non-exhaustive list of some additional recommended measures for re-installation or re-application of an AFS in niche areas are:

.1 bow and stern thrusters – the body and area around bow, stern and any other thrusters prone to coating damage should be routinely maintained during dry-dockings;

.2 recesses within rudder hinges and behind stabilizer fins need to be carefully and effectively cleaned and recoated during maintenance dry-dockings; and

.3 gratings located in sea chests may require a major-refurbishment type of surface preparation at each dry-docking to ensure coating durability.

7 CONTINGENCY ACTION PLANS

7.1 A ship-specific contingency action plan based on specific triggers from monitoring of biofouling parameters should be described in the BFMP.

7.2 As presented in figure 1, monitoring of hull/fuel performance during ship operation should identify whether there may be an increased risk of biofouling accumulation. When monitoring identifies possible increase of biofouling accumulation, the ship is at a higher risk level which should lead to contingency actions. A contingency action plan may involve inspection of submerged surfaces in line with chapter 8.

7.3 A contingency action plan may include measures which are ship-specific and relevant for the monitoring parameters. In general, a contingency action plan could include the following aspects:

.1 proactive actions can be implemented to lower the risk of biofouling accumulation if a higher biofouling risk may be predicted due to planned operational changes;

.2 corrective actions to operating profile, maintenance or other repair plans, if the monitoring identifies an early indication of elevated risk; and

.3 inspection may be necessary to determine biofouling accumulation if the monitoring of biofouling parameters identifies an indication of prolonged elevated risk. The inspection should be in line with chapter 8.

7.4 Depending on the relevant biofouling risk parameters, the contingency action plan should trigger a reaction to be conducted in line with BFMP.

7.5 If an inspection is conducted and biofouling is identified, cleaning actions should be conducted as described in table 1.

7.6 Monitoring of risk parameters may also identify and trigger a need for maintenance of MGPS or AFC.

8 INSPECTION

8.1 Inspections should be carried out:

.1 by organizations, crew or personnel competent to undertake inspection following these guidelines and competent to use relevant inspection methods or equipment to determine level of biofouling and the condition of the AFS;

.2 for the purpose of fixed schedule inspections, by inspection organizations or personnel able to provide impartial inspection; and

.3 for the purpose of inspection as part of contingency actions, by organizations, crew or personnel competent for such inspection.

8.2 The fixed schedule of inspections should be carried out in line with the minimum frequencies as described in paragraphs 8.4 to 8.6.

8.3 Inspection frequency or inspection dates (or date ranges) for in-water inspections during the in-service period of the ship should be based on the ship-specific biofouling risk profile, including inspection as a contingency action, and specified in the BFMP. The BFMP should also specify management actions to be taken when biofouling is identified during inspections (e.g. cleaning), including changes to inspection frequency.

8.4 For ships not undertaking performance monitoring, the first inspection date should be within 12 months of application, re-application, installation or renewal of AFS to confirm their effective operation.

8.5 Where monitoring indicates that the AFS is not performing effectively soon after application, re-application, installation or renewal (e.g. increased fuel consumption), an inspection should be carried out to confirm the condition of the AFS and level of biofouling as soon as practical/possible, in accordance with the BFMP and Contingency Action Plan. If adequate performance of the AFS is observed through monitoring, the inspection could be conducted up to 18 months after application, re-application, installation or renewal, noting that such monitoring may not reflect the level of biofouling in all niche areas.

8.6 Subsequent inspections should occur at least every 12 to 18 months and may need to increase to confirm the continued effectiveness of aging or damaged anti-fouling systems. In-water inspections should seek to coincide with existing subsea operations (e.g. underwater inspections in lieu of dry-dock or any other in-water inspections), including any unscheduled subsea operations. If no anti-fouling systems are installed in areas of a ship and no other measures are undertaken such as in-water cleaning or propeller polishing, then inspections should occur more frequently (<12 months) to manage the risk of biofouling accumulation.

8.7 In-water inspections should assess biofouling across the entirety of a ship's hull and niche areas. If high levels of biofouling are identified during an inspection and there are reasons to suspect issues with the AFS effectiveness, actions should be taken to manage the biofouling and subsequent inspections should occur more frequently, for example biannually until dry-docking and re-coating of AFC.

8.8 In-water inspections should determine the level of biofouling of the hull and niche areas and the condition of the AFS. The inspection areas should be sub-divided into appropriate sections as listed in tables 4 and 5 of appendix 2. The fouling rating for each area on the ship should be the highest rating identified in the inspected areas.

8.9 The following should be investigated during the inspection:

.1 rating of the type and approximate extent of biofouling in line with the definitions in Table 1 below;

.2 condition of the AFC on the hull and in niche areas as described in paragraph 8.7 using definitions in Table 4; and

.3 functionality of the MGPS in niche areas.

Extent of biofouling and recommended actions

8.10 During an inspection, niche areas in the ship specific BFMP should be inspected as a priority. All inspected areas should be allocated a fouling rating number in line with the extent of fouling as defined in table 1 below.

Table 1: Rating scale to assess the extent of fouling on inspection area

Rating	Description	Macrofouling cover of area inspected (visual estimate)	Recommended cleaning
0	**No fouling**. Surface entirely clean. No visible biofouling on surfaces.	-	-
1	**Microfouling**. Submerged areas partially or entirely covered in microfouling. Metal and painted surface may be visible beneath the fouling.	-	Proactive cleaning may be recommended as further specified in paragraph 9.4
2	**Light macrofouling**. Presence of microfouling and multiple macrofouling patches. Fouling species cannot be easily wiped off by hand.	1-15% of surface	Cleaning with capture is recommended as further specified in paragraph 9.9. It is recommended to shorten the interval until next inspection. If the AFS is significantly deteriorated, drydocking with maintenance and re-application of AFS is recommended.
3	**Medium macrofouling**. Presence of microfouling and multiple macrofouling patches.	16-40% of surface	
4	**Heavy macrofouling**. Large patches or submerged areas entirely covered in macrofouling.	41-100% of surface	

Condition of the AFS

8.11 The condition of the AFS on the hull and in niche areas should be observed during the inspection and reported. Recommended action and relevant procedures for inspection of the AFS are described in Table 4 and Table 5 .

Inspection report

8.12 An inspection report should be prepared and a copy , should be available on board and listed/linked in the biofouling record book (BFRB). For details on reporting on biofouling levels and AFS condition inspections, see appendix 2, tables 4 to 6.

9 CLEANING AND MAINTENANCE

9.1 Cleaning is an important measure to remove biofouling from the hull and niche areas, but may physically damage the AFC, shorten coating service lifetime and release harmful waste substances and invasive aquatic species into the environment.

9.2 Comprehensive testing of cleaning systems or processes is necessary to understand the cleaning performance, capture efficiency, or any release of harmful waste substances as well as improving knowledge concerning the prevention of release of viable fragments, spores and other parts of biofouling organisms that have the potential to be invasive.

9.3 In-water cleaning is a complex activity to manage appropriately and international standards for the management of in-water cleaning may continue to be developed and published in a standalone document to the Guidelines.

Procedures for proactive cleaning

9.4 Proactive cleaning is the periodic removal of microfouling on ships' hull and niche areas or other submerged surfaces as relevant prior to macrofouling growth and can be conducted with or without capture. Proactive cleaning without capture should:

.1 not be conducted on biofouling with rating ≥2 in line with Table ; and

.2 be performed in an area accepted by the relevant authority for this activity.

9.5 Operators undertaking proactive cleaning should be aware of any local regulations or requirements. Regulations regarding the discharge of biofouling and waste substances into the marine environment and the location of sensitive areas (such as Marine Protected Areas) may be relevant.

9.6 Procedures for proactive cleaning and frequency should be described in the BFMP. All proactive cleaning, and any determination of biofouling level prior to the cleaning, should be entered in the BFRB.

Procedures for reactive cleaning

9.7 Reactive cleaning systems physically remove micro- and macrofouling from the hull and niche areas. There are various reactive cleaning methods available and more under development.

9.8 Reactive cleaning should be conducted based on the inspection results and contingency actions as outlined in Table , though cleaning with capture may be used to manage any rating level.

9.9 The reactive cleaning should:

.1 use a reactive cleaning system that is compatible with the AFC in order to minimize damage of the AFC;

.2 be conducted with the aim to achieve a fouling rating ≤1 for the cleaned area in line with table 1;

.3 strive for effective collection and safe disposal of all biofouling material and waste substances when reactive cleaning is performed in-water or dry dock; and

.4 be performed in an area accepted by the relevant authority for this activity.

9.10 Biofouling management in niche areas should include the following or similar adequate measures:

.1 maintenance of any MGPS installed to ensure they operate effectively to prevent accumulation of biofouling in relevant niche areas;

.2 regular polishing (with capture of debris) of uncoated propellers to maintain operational efficiency and minimize macrofouling accumulation;

.3 appropriate treatment of internal seawater cooling systems and discharge of any treated water in accordance with applicable regulations; and

.4 minimize use of any soap, cleaner or detergent used on surfaces and ensure they are toxic- and phosphate free, biodegradable and non-hazardous to the marine environment.

9.11 Operators undertaking in-water reactive cleaning should be aware of any regulations or requirements. Regulations regarding the discharge of biofouling and waste substances into the marine environment and the location of sensitive areas (such as Marine Protected Areas) may be relevant.

9.12 Captured biological waste and waste substances should be disposed of and treated in a safe and environmentally sound manner, in accordance with local requirements.

9.13 A report on the cleaning should be prepared by the operators undertaking reactive cleaning. The report should have the content as described in appendix 2 and describe the cleaning outcome.

9.14 A copy of the cleaning report or similar outcome in a digital tool should be available on board and the activity entered in the BFRB.

Procedures for recycling facilities

9.15 Ship recycling facilities should adopt measures (consistent with applicable national and local laws and regulations) to ensure that biofouling organisms or waste substances are not released into the local aquatic environment.

9.16 Ship recycling facilities should develop a plan to minimize release of biofouling organisms and/or waste substances. If relevant, it is recommended that hull and niche areas be cleaned prior to recycling to avoid release of viable biofouling organisms or waste substances.

10 BIOFOULING MANAGEMENT PLAN

10.1 It is recommended that every ship has a ship-specific BFMP under the responsibility of ship owners, ship operators and shipmasters. A BFMP may require information from ship designers, shipbuilders, shipowners, AFC and MGPS manufacturers, recognized organizations and suppliers.

10.2 An effective BFMP should contribute to the aim of maintaining a recommended fouling rating ≤ 1, as described in chapter 8.

10.3 The ship-specific BFMP should include, but not necessarily be limited to, the following:

.1 identification of the officer, or the position (e.g. chief engineer), responsible for the BFMP and ensuring that the plan is properly implemented;

.2 details of the AFS installed and where it is installed;

.3 details of the recommended operating conditions which are suitable for the selected AFS to avoid deterioration of AFC, including recommended conditions such as temperature, salinity, speed, etc.;

.4 details of expected AFC efficacy throughout AFC lifetime including the need for inspection or maintenance, if relevant;

.5 description of monitoring on biofouling risk parameters;

.6 regime for cleaning, if any;

.7 details of hull and niche areas where biofouling may accumulate;

.8 schedule for fixed inspections of areas;

.9 procedures for reactive cleaning actions that should be performed if triggered by inspection results;

.10 contingency action plan based on specific triggers from monitoring of biofouling risk parameters;

.11 regime for repairs, maintenance and renewal of AFS, when relevant, in accordance with the manufacturer's instructions;

.12 process for monitoring and maintenance of MGPS as per the manufacturer's instructions to ensure their effectiveness in minimizing biofouling; and

.13 details of the documentation/reports required to document biofouling activities.

Continuous improvements

10.4 Information should be gathered to plan and facilitate efficient and sustainable biofouling management, allowing the evaluation and comparison of the cost-effectiveness of alternative strategies. The optimal solution is case-specific and should be considered in the light of several aspects.

10.5 Monitoring of the hull and the biofouling risk parameters may determine a risk for biofouling to be higher than predicted in the BFMP and therefore trigger more frequent inspections.

10.6 Inspection results may be shared in agreement with stakeholders involved if they are relevant for improvement purposes. To increase the efficiency of biofouling management and inspections, inspection organizations are encouraged to share inspection results with AFS manufacturers.

10.7 The effectiveness of the management actions in place should be reviewed following inspections and cleaning. The BFMP should be updated if the management actions in place are ineffective or deficient. Efficacy of the following items should be evaluated:

.1 ability to minimize biofouling by use of proactive cleaning methods;

.2 biofouling inspections schedule;

.3 ability to minimize biofouling by MGPS;

.4 AFS performance; and

.5 outcome of reactive biofouling management procedures:

.1 efficacy of the biofouling removal (i.e. no areas are missed); and

.2 accessibility for reactive cleaning in niche areas.

10.8 A form of a BFMP is set out in appendix 3 to these Guidelines.

11 BIOFOULING RECORD BOOK

11.1 The overall record keeping of ship-specific biofouling management activities in a BFRB is the responsibility of shipowners, ship operators and/or ship masters. The ship-specific BFRB should include information on biofouling management actions with input from AFS manufacturers and suppliers, ship cleaning and maintenance operators, inspection organizations, ship repair and dry-docking facilities when relevant.

11.2 It is recommended that the BFRB be retained on board for the life of the ship. The book should record details and reports of all inspection and maintenance activities to be undertaken for all hull and niche areas. The BFRB may be maintained physically or electronically, and could be a stand-alone document, or integrated in part, or fully, into the existing ships' operational and procedural manuals and/or planned maintenance system.

11.3 The BFRB should assist the shipowner and operator to evaluate the efficacy of the specific AFS and biofouling management measures on the ship.

11.4 All biofouling management activities should be recorded in a BFRB, including the following:

.1 details of repair and maintenance to the AFS including date, location and areas of the ship affected, including the percentage of the ship that was re-coated with AFC – this is in addition to recordings in the International Anti-fouling System Certificate;

.2 details of repair and maintenance to the MGPS, including date, location and areas of the ship affected;

.3 the initial date, final date, duration in hours/days and location of in-water inspections, including the inspection report;

.4 the initial date, final date, duration in hours/days and location of cleaning (in-water or in dry-dock), including a cleaning report;

.5 details of when the ship has been operating outside its normal operating profile including any details of when the ship was laid-up or inactive for extended periods of time;

.6 details of relevant performance monitoring parameters used to determine inspection intervals;

.7 a copy of the cleaning report including the information set out in appendix 2, if applicable

.8 description of contingency actions taken, including date, time and location.

11.5 A form of a BFRB is set out in appendix 4 to these Guidelines.

12 DOCUMENTATION AND DISSEMINATION OF INFORMATION

12.1 Documentation which is recommended in these guidelines such as relevant plans and reports can be developed, maintained and kept in an electronic format.

12.2 States are encouraged to provide information on the location and the terms of use of proactive cleaning, inspection, reactive cleaning services and facilities to comply with these Guidelines. States requiring inspection or cleaning prior to arrival in their territory should inform the Organization. Member States or other relevant stakeholders are encouraged to communicate the outcome of testing of cleaning systems and applicable test standards to relevant stakeholders via https://bwema.org

12.3 States are also encouraged to provide technical and research information to the Organization, including any studies on the impact and control of invasive aquatic species in ships' biofouling, information on local biofouling pressure, databases on regional biofouling management options, tools for the choice of AFS, and on the efficacy and practicality of in-water cleaning technologies, risk assessment tools and inspection reporting tools.

12.4 State authorities should provide ships with timely, clear and concise information on biofouling management measures and cleaning requirements that are being applied to shipping and ensure these are widely distributed. Shipowners and operators should endeavour to become familiar with all requirements related to biofouling by requesting such information from their port or shipping agents or competent authorities (i.e. State authorities).

12.5 Organizations or shipping agents representing shipowners and operators should be familiar with the requirements of State authorities with respect to biofouling cleaning and management procedures, including information that will be needed to obtain entry clearance. Verification and detailed information concerning State requirements should be obtained by the ship prior to arrival.

12.6 To monitor the effectiveness of these Guidelines as part of the evaluation process, States are encouraged to provide the Organization with records describing reasons why ships could not apply these Guidelines, e.g. design, construction or operation of a ship, particularly from the viewpoint of ships' safety, or lack of information concerning the Guidelines.

13 TRAINING AND EDUCATION

13.1 Training for ships' masters and crew, in-water cleaning or maintenance facility operators and those surveying or inspecting ships as appropriate should include instructions on the application of biofouling cleaning and management procedures, based upon the information contained in these Guidelines. Instruction should also be provided on the following:

.1 maintenance of appropriate records and logs;

.2 impacts of invasive aquatic species from ships' biofouling;

.3 benefits to the ship of managing biofouling and the threats posed by not applying management procedures;

.4 biofouling management measures and associated safety procedures; and

.5 relevant health and safety issues.

13.2 States and industry organizations should ensure that relevant marine training organizations are aware of these Guidelines and include them in their syllabuses as appropriate.

14 OTHER MEASURES

14.1 To the extent practical, States and port authorities should aim to ensure smooth flow of ships going in and out of their ports to avoid ships waiting offshore, so that AFS can operate as effectively as possible.

14.2 States may apply other measures to ships within their jurisdiction for the purpose of providing additional protection for their marine environment, or in emergency situations. When managing emergency situations for biofouling, States may find the guidance document for ballast water emergency situations (BWM.2/Circ.17, as may be amended) also relevant to biofouling management.

14.3 States should consider these Guidelines when developing other measures and/or restrictions for managing ships' biofouling.

14.4 Where other measures are being applied, States should notify the Organization of the specific requirements, with supporting documentation, for dissemination to other States and non-governmental agencies where appropriate.

14.5 The application of other measures by States should not place the safety of the ship and crew at risk.

LIST OF APPENDICES

APPENDIX 0 ABBREVIATIONS

AFS	Anti-fouling system
AFC	Anti-fouling coating
BFMP	Biofouling management plan
BFRB	Biofouling record book
IMO	International Maritime Organization
MGPS	Marine growth prevention system

APPENDIX 1 ASSESSMENT OF BIOFOULING RISK

1 Introduction

The Guidelines recommend taking a proactive approach to biofouling through assessment of biofouling risk profiles for hull and niche areas and by monitoring various risk parameters during operation. An assigned risk profile is dependent on AFS type and protection and should be ship-specific. Definition of risk monitoring parameters and trigger points for actions should also be ship-specific.

Monitoring various risk parameters during operation will lead to a holistic approach to biofouling management in line with a risk-based approach.

2 Identification of risk areas

Typical niche areas and other areas susceptible to biofouling on the hull are indicated in Figure 2, but other niche areas may be relevant.

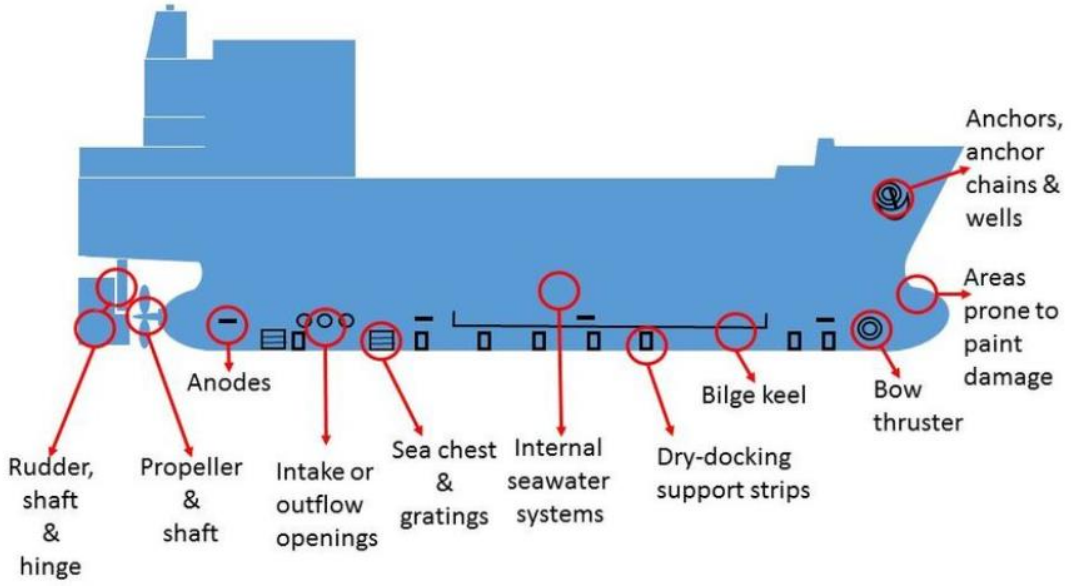

Figure 2: Hull with typical niche areas susceptible to biofouling (source: *Eugene, Conduct of land-based biofouling surveys for domestic vessels)*

3 Relevant parameters to be considered in the risk assessment

A ship-specific assessment should be established based on the possibility for biofouling accumulation. If any ship areas have no AFS installed, there is typically a higher risk of biofouling accumulation. If all ship areas have AFS installed which is compatible with the ships operating profile, the ship has an overall lower risk profile.

Based on the risk profile, an inspection regime should be determined and described in the BFMP. If the assessment determines that an area has a high risk for biofouling accumulation, an inspection regime with short intervals between inspections is recommended. Further, the areas with a low risk profile may follow the inspection regime with longer fixed intervals as specified in chapter 8 of the Guidelines.

The risk profile indicates the possibility of accumulating biofouling and increases as a function of biofouling pressure versus biofouling protection over time. The biofouling risk parameters given in table 2 should be monitored as the risk of biofouling accumulation may increase over time. When higher risk is identified, recommended actions in the form of inspection, reactive cleaning and/or maintenance of AFS should be performed as described in the BFMP. Inspection as a contingency action, if completed by an inspection organization in line with chapter 8, can be treated as a starting point to define the interval for the next inspection.

A hull performance monitoring system can be used to assess the changes in the propulsion power and fuel consumption of the ship. Such changes may indicate a degradation of hull or propeller condition due to biofouling.

The results from the hull performance monitoring may indicate biofouling growth on the hull and propeller; however, growth in niche areas will not necessarily be detected with this monitoring method.

Digital tools may be applied for monitoring of biofouling risk parameters. Monitoring of parameters should be as thorough as practicable.

In Table 2 below, various biofouling risk parameters are presented with a description of possible risk impact.

Table 2: Biofouling risk parameters

	Examples of biofouling risk parameters	Description and evaluation guidance
1	**Deviation from AFS specifications (e.g. speed, salinity, temperature)**	An AFS/AFC can typically work well within a specific range of operating parameters. The relevant parameters and acceptable ranges for each parameter should be described in the manufacturer's specification and included in the BFMP. Specifications typically include operation routes, ship activity level, speed, water salinity and temperature and cleaning requirements. Specifications may vary depending on the technology of the AFS used. Ship operations should be in accordance with the recommendations from the AFC manufacturer. Deviation from the specification of the ship's AFC may increase the deterioration of the AFC or reduce its efficacy and change the biofouling risk. Incidental deviations should be evaluated for potential biofouling impact. Continuous or regular deviations, or deviations not rectified, would lead to an elevated risk profile and more frequent inspection should be part of the contingency plan.
2	**Deviation from AFS maintenance/service regime**	Regular maintenance and service (e.g. calibration or adjustment of treatment dosages for a MGPS) may be necessary actions for proper protection by the AFS. If the maintenance and service time is exceeded, as specified by the manufacturer, the risk profile is elevated. For maintenance of AFC, see item 7. Missing maintenance and/or service should be evaluated as part of the contingency plan for potential biofouling impact.
3	**Deviation from regular proactive cleaning or necessary reactive cleaning**	When proactive cleaning is part of the ship-specific BFMP, deviation from regular use as specified in the BFMP may lead to increased risk of biofouling growth onto relevant areas. The impact should be evaluated as part of the contingency plan for potential biofouling impact until the missing proactive cleaning is back in regular operation. Ships should be aware of possible macrofouling accumulation and, if fouling rating is >1, cleaning with capture is the recommended cleaning action. If reactive cleaning is not conducted when inspection has determined cleaning is necessary, it will increase the risk of spreading organisms to new locations. This risk should be evaluated as part of the contingency plan until the next cleaning event is undertaken.
4	**Extended ship idle time**	Biofouling accumulation starts immediately when a ship is idle, but the rate depends on AFS type and biofouling pressure (temperature, distance to coast). To avoid risk of biofouling, the operating profile should only allow short periods in port or at anchorage or at least not exceed the recommendation by the AFS manufacturer. Acceptable idle time should be specified in the ship's BFMP. Idle time is often defined in charter party contracts and typically ranges between 18 to 30 days. If the idle time is longer than specified in the BFMP, the risk profile changes. If the number of consecutive idle days is still within what is specified as acceptable as per AFS supplier's guarantee and/or idling takes place in an area far from shore (>200 nm and >200 m depth), the risk may still be considered low. If the number of consecutive idle days is beyond what is specified as acceptable as per AFS supplier's guarantee, the risk may be considered very high if the ship is subject to biofouling pressure. For these cases, the contingency plan should include immediate actions before the next voyage.

	Examples of biofouling risk parameters	Description and evaluation guidance
5	**Performance loss as per PMS**	Performance monitoring of fuel consumption may give indication on possible biofouling accumulation on the hull. Performance monitoring is mainly for hull monitoring (not niche areas) and may include the following methods: .1 Sensors and collecting high frequency data. .2 Semi-automatic or manual calculations using data collected from ship's crew (e.g. noon reports). .3 Speed trials and comparing the performance data with previous speed trial reports. Note that PMS is often a lagging indicator and may depend on many factors, therefore additional measures may be necessary before it can be used to determine biofouling accumulation. For some ships, a speed loss between 1% and 3% or increased fuel consumption of 3-9% may indicate light biofouling while a speed loss >3% or fuel consumption increase by >9% may indicate higher biofouling risk (examples taken from ISO19030-2: 2016).
6	**AFS damage**	Failure caused by mechanical damage to the AFS may result in higher risk of biofouling in the areas affected, if not rectified within reasonable time. Failures and damage should be recorded in the BFRB. As part of the contingency action plan, the impact from the damage should be evaluated for potential biofouling accumulation and relevant actions should be implemented until a repair is undertaken.
7	**Downtime/malfunction of MGPS, proactive cleaning or other AFS**	Observed downtime of an MGPS, proactive cleaning or other AFS have a direct impact on risk of biofouling accumulation. The impact on the area impacted will be affected depending on the duration of malfunction. The impact should be evaluated as part of the contingency plan for potential biofouling impact until the missing MGPS/proactive cleaning/other AFS is back in operation. Reduced operation time of proactive cleaning, i.e. longer intervals between cleaning than specified in the BFMP, is defined as downtime and may increase biofouling accumulation particularly in those areas where it is not applied as specified in the BFMP. The impact on the area affected depends on the duration of malfunction and the trading conditions during that time. The evaluation of impact and potential reactions should be part of the contingency plan. If proactive cleaning without capture is irregular, ships should be aware of possible macrofouling accumulation and take actions to avoid spread of macrofouling. If microfouling growth exceeds fouling rating 1, cleaning with capture is recommended.
8	**Exceeding expected lifetime of AFS**	Once an AFS has exceeded its lifetime, as specified by the manufacturer, the biofouling risk profile is elevated. Inspection and cleaning should be performed more often and 1-2 months interval between inspections is recommended. Additionally, the efficacy of the AFS may be reduced as it approaches the end of its lifetime. If macrofouling has been removed in a previous cleaning event, the strong forces needed for removing the fouling can have compromised the lifetime of the AFC. The performance of the AFS, and any necessary change in maintenance or inspection schedule, as given by the AFS manufacturer, should be part of the contingency plan specified in the BFMP.

4 Flow chart visualizing biofouling management:

An example of a flow chart for visualizing biofouling management risk profile and monitoring of parameters is shown in Figure 3

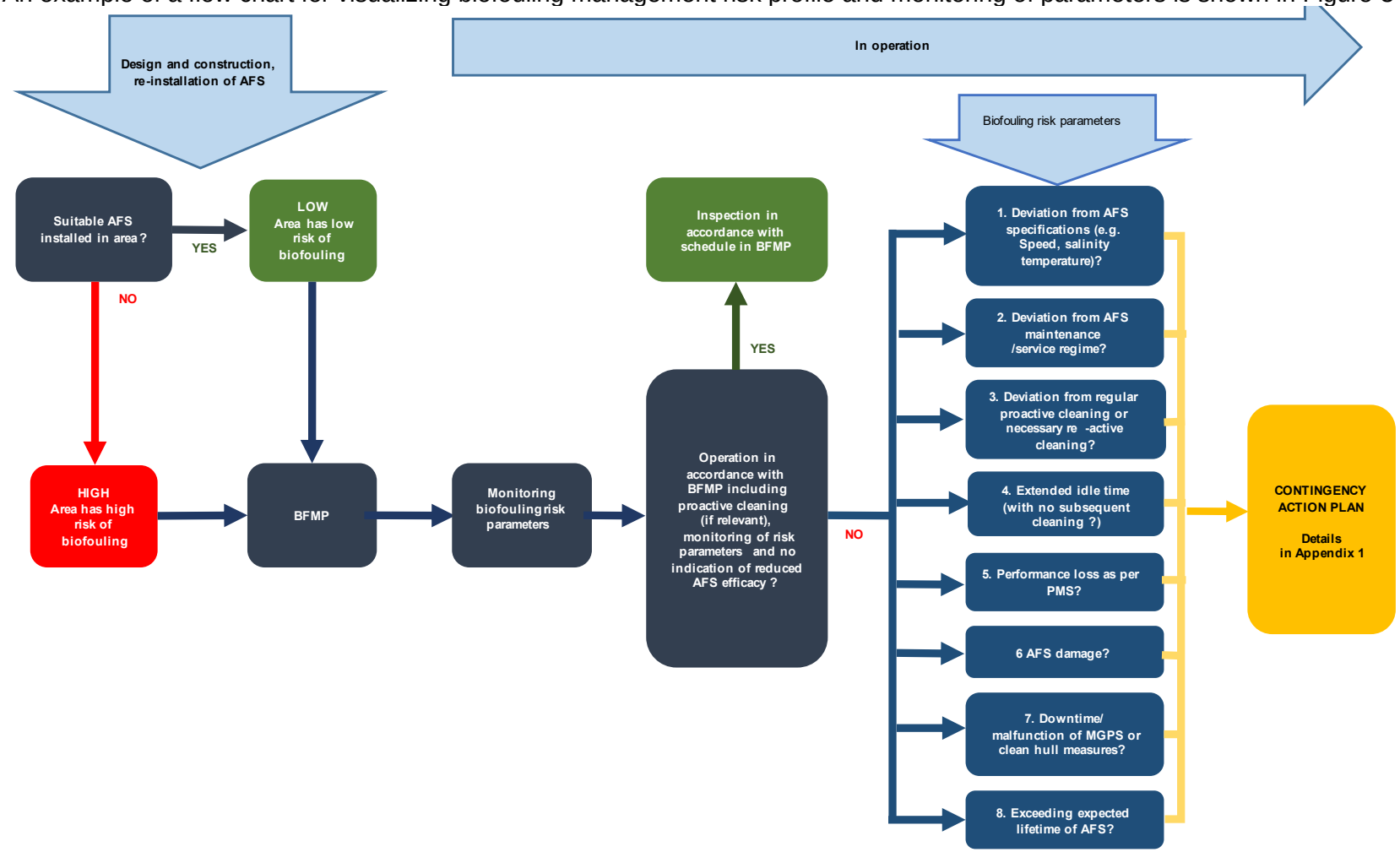

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Figure 3: Flow chart visualizing the biofouling management risk profile and monitoring parameters

APPENDIX 2 INSPECTION AND CLEANING REPORTS

1 Introduction

The Guidelines recommend that a report should be prepared after an inspection and/or cleaning operation. The report should record the details of the biofouling management actions undertaken on the ship. The inspection report should be prepared by the inspection provider. It may also be relevant to prepare a report after an inspection carried out by ship's crew as part of contingency actions.

The cleaning report should be prepared by either the cleaning operators or the inspection provider as part of a combined cleaning and inspection report.

Digital tools may be applied for the reporting and/or assessment of results. The conclusion from the reports should be recorded in the BFRB including reference to the detailed report/assessment.

2 Entries in the report after a biofouling inspection

The following information should be recorded in the inspection report:

- Ship particulars:
  - ship name
  - IMO number
- Date and place of inspection
- Name of inspection/cleaning company
- List of all inspected hull and niche areas
- Inspection equipment used (including list of divers/ROV operators participating in the operation)
- Inspection conditions (i.e. duration, estimated visibility underwater)
- Signature of authorized person of the inspection/cleaning company
- Inspection start and end times
- Results:
  - Type of biofouling as per the rating in Table 1
  - Quantitative assessments of biofouling cover of area inspected (i.e. estimates of percent cover) as per Table 1
- AFC condition
  - The condition of the AFC should be observed during the inspection and reported. The condition is recommended to be categorized in line with Table 4
- MGPS condition
  - The condition of the MGPS should be observed during the inspection and reported. The condition is recommended to be categorized in line with Table 5
- Photos/videos
  - Photos and videos submitted or used in a digital assessment tool as evidence of hull fouling

SAMPLE OF INSPECTION REPORT

Name of ship: .....

IMO number: .....

Date: .....

Location/port: …….

Inspection organization/responsible officer: …….

Inspection conditions: …….

Inspection equipment used: …….

Divers/ROV operators participating: …….

Quantitative assessment of biofouling cover is summarized in Table (in line with the rating in Table 3)

Table 3: Quantitative assessment of biofouling cover

For each transect and niche area surveyed, the mode of the fouling rating (most frequent rating) and the range (lowest and highest rating) should be recorded. An average should not be used. If more than one of the same type of area is assessed, these should be recorded separately and each be given their own fouling rating.

Areas	**Fouling rating** (0-4)			**Macrofouling cover** (%)
	Lowest rating	Highest rating	Most frequent rating	
Hull below the waterline:				
Port vertical side				
1 m wide belt				
1 m wide belt of sub-section X				
1 m wide belt of sub-section X				
Starboard vertical side				
1 m wide belt				
1 m wide belt of sub-section X				
1 m wide belt of sub-section X				
Flat bottom front				
1 m wide belt				
1 m wide belt of sub-section X				
Flat bottom mid				
1 m wide belt				
1 m wide belt of sub-section X				

Flat bottom aft				
1 m wide belt				
1 m wide belt of sub-section X				
Niche areas				
Bow sub-section X				
Bow sub-section X				
Bow thruster				
Bilge keels				
Sea chest gratings				
Location 1				
Location 2				
Stern				
Propeller and its shaft				
Rudder and rudder shaft				
Discharge pipes				
Rope guards				
Sounders/instruments				
Sacrificial anodes				
Internal seawater systems				
…..				
…..				

An area should be assigned a fouling rating equal to the highest rated 1 m^2 identified along the sub-divided areas.

The inspection should be as comprehensive as practicable. The more sub-divided areas that are inspected, the greater the certainty that the biofouling for the area is realistic. It is recommended that the identified niche areas should be in line with the BFMP.

The condition of the AFC and MGPS should be observed during the inspection and reported. The condition is recommended to be categorized in line with Table 4 and Table 5. If the condition of the AFC could only be thoroughly assessed after reactive cleaning, Table 4 should be part of the leaning report.

Table 4: The condition of the AFC

AFC condition								
Areas	**Intact and effective in preventing biofouling**	**Failure of adhesion between a coating and a metallic surface**	**Blistering in coating**	**Cracks in the coatings**	**Cold flow resulting in irregular coating thickness**	**Delamination / peeling / detachment between coatings**	**Polishing off coating during the ship's operation (beyond specifications)**	**Grounding / general damage to coating**
Hull below the waterline:								
Port vertical side								
sub-section X								
Starboard vertical side								
sub-section X								
Flat bottom front								
sub-section X								
Flat bottom mid								
sub-section X								
Flat bottom aft								
sub-section X								
Bow								
Bow thruster								
Bilge keels								
Sea chest gratings								
Location X								
Location X								
Stern								
Propeller and its shaft								
Rudder and rudder shaft								
Discharge pipes								
Rope guards								
Sounders/instruments								
Sacrificial anodes								
…								
…								

Table 5: The condition of the MGPS

Areas examples (typical niche areas)	**Condition of MGPS**		
	Intact and effective in preventing biofouling	Calibration/maintenance required	Non-effective to prevent biofouling
Bow			
Bow thruster			
Bilge keels			
Sea chest gratings			
Location 1			
Location 2			
Stern			
Propeller and its shaft			
Rudder and rudder shaft			
Discharge pipes			
Rope guards			
Sounders/instruments			

Comments: ……..……

Reference to supporting photos/videos for fouling inspection and assessment of AFC/MGPS: ……

Signature of inspection organization or competent ship's crew: ……..……..……

3 Entries in the report after biofouling management (reactive cleaning)

The following information should be recorded in the cleaning report:

- Ship particulars:
  - ship name
  - IMO number
- Date and place of inspection
- Name of cleaning company
- All hull and niche areas cleaned/treated specified and documented in the report, including also areas not cleaned/treated
- Cleaning equipment used for hull
- Cleaning equipment used for niche areas
- Inspection equipment used (including list of divers/ROV operators participating in the operation)
- Conditions during cleaning inspection (i.e. duration, estimated visibility underwater)
- Signature of authorized person of the cleaning company
- Cleaning start and end times
- Results:
  - Type of biofouling after reactive cleaning (as per the rating in Table 1)
  - Quantitative assessments of biofouling cover after cleaning (as per Table 1)
- AFC condition (unless assessed during inspection)
  - The condition of the AFC should be observed during the cleaning activity and reported using the conditions as categorized in Table 4
- Photos/videos
  - Photos and videos submitted or used in a digital assessment tool as evidence of hull cleaning
- Capture
  - Description of capture method
  - Supporting evidence that dislodged material (by mass) has been captured as described in chapter 9

  (Reference to equipment specification and validation test report may be sufficient)
- Treatment[1] and/or disposal of waste material captured during cleaning should be described in the report. Evidence of delivery to waste management facility(ies) should be attached to the cleaning report. The biofouling waste should be disposed of and/or treated in a safe and environmentally sound manner, in accordance with local regulations, and ensure that the main objective of the Guidelines, to minimize the spread of invasive aquatic species, is safeguarded.

[1] Treatment is any process designed to remove or deactivate any biofouling material and particulate or dissolved waste substances captured or produced during any stages of cleaning.

SAMPLE OF A BIOFOULING CLEANING REPORT

Name of ship: .....

IMO number: .....

Date: .....

Location/port: ……..

Cleaning company: …….

In-water conditions: …….

Technologies used for reactive cleaning of hull and niche areas:
……
……

Table 6: Summary of the operations

Areas examples	New fouling rating after performed cleaning		
	Lowest rating	Highest rating	Most frequent rating
Hull below the waterline:			
Port vertical side			
sub-section X			
sub-section X			
sub-section X			
Starboard vertical side			
sub-section X			
sub-section X			
sub-section X			
Flat bottom front			
sub-section X			
sub-section X			
Flat bottom mid			
sub-section X			
sub-section X			
Flat bottom aft			
sub-section X			
sub-section X			
Niche areas			
Bow			
Bow thruster			
Bilge keels			
Sea chest gratings			
Location 1			
Location 2			
Stern			
Propeller and its shaft			
Rudder and rudder shaft			
Discharge pipes			
Rope guards			
Sounders/instruments			
Sacrificial anodes			
Internal seawater systems			
….			
….			

Description of activity and reference to supporting evidence (photos/videos):

Description of capture and reference to supporting evidence:

Description of treatment and/or biofouling waste disposal with supporting evidence (e.g. receipts):

Description of any problems encountered during cleaning including details of any damage to the AFS that may have occurred:

Comments:

Signature of cleaning organization: ……..……...……

APPENDIX 3 BIOFOULING MANAGEMENT PLAN

PROPOSED EXAMPLE FORM OF BIOFOULING MANAGEMENT PLAN

INTRODUCTION

Biofouling on ships can be a significant vector for the transfer of invasive aquatic species. Biofouling management practices may also improve a ship's hydrodynamic performance and can be effective at enhancing energy efficiency, hence reducing air emissions from ships as well as fuel costs.

This Biofouling Management Plan (BFMP) should assist the ship crew in conducting biofouling management and is specific to this ship.

SHIP PARTICULARS

Name of ship	
IMO number	
Date of construction	
Ship type	
Gross tonnage	
Beam or ship's breadth	
Length overall	
Maximum and minimum draughts	

RECORD OF REVISION OF THE BFMP

This plan describes the biofouling management for the period between two scheduled dry-dockings which include application, re-application, installation or renewal of AFS. The plan should be re-evaluated and, if necessary, updated after a dry-docking and/or if any changes are made that have an impact on the anticipated biofouling.

	Date:
Most recent scheduled dry-docking	
The next scheduled dry-docking	

The following revisions have been made:

Date/Timeline	**Developed by**	**Implemented by/Responsible person**	**Updated parts**

INDEX

<A table of contents should be included.>

PURPOSE

The purpose of the BFMP is to outline measures for the control and management of the ship's biofouling to minimize spread of invasive aquatic species.

DESCRIPTION OF OPERATING PROFILE

The ship's operating profile is described below and is the basis for the selection of the ship's anti-fouling systems (AFS) and operational practices.

Typical operating speed	
Typical trading areas	<EXAMPLE> <Domestic, great coasting, North Sea and Baltic trade, European trade, short international voyage, international voyage, overseas voyage or unrestricted voyages>
Typical operating areas, including climate zones in which the ship will operate	<EXAMPLE> <Temperate, semi-temperate, tropical and/or arctic>
Typical salinities of operating areas in which the ship will operate	<EXAMPLE> <Fresh water, brackish water and/or marine water>
AFS installed are suitable for typical operating profile (Y/N)	

DESCRIPTION OF HULL AND NICHE AREAS WHERE BIOFOULING MAY ACCUMULATE

The hull and niche areas where biofouling may accumulate are described below.

Areas on hull	<EXAMPLE> <flat-bottom front flat-bottom- mid flat-bottom- aft bow dome boot top vertical sides – port side vertical sides- starboard side vertical side – aft transom or others>
Niche areas (including quantity where relevant)	<EXAMPLE> <Sea chests bow dome bow thruster tunnel tunnel grates cathodic protection anodes bilge keels anchor chain chain locker stabilizer fins rudder dock block positions A-brackets/stern tube cathodic protection anodes and systems draft internal pipework ballast uptake system inlet gratings sea inlet pipes stern thruster thruster body velocity probes propeller propeller shaft stern tube seal echo sounders rope guards box coolers moon pools free-flood spaces/voids engine cooling system fire-fighting system auxiliary service system or others>

LOCATION OF AREAS WHERE BIOFOULING MAY ACCUMULATE ON THE SHIP

<A diagram of both side and bottom of the ship identifying the location of each area that may accumulate biofouling should be included.>

DESCRIPTION OF APPLIED ANTI-FOULING SYSTEM

The selected AFS that are applied, re-applied, installed or renewed on the ship are described below. When more than one type of anti-fouling coating (AFC) or marine growth prevention system (MGPS) are applied, re-applied, installed or renewed, each AFS should be described individually and in accordance with each manufacturer's instructions.

Prior to a scheduled dry-docking, an evaluation of qualitative observations regarding the ship's biofouling should be made with the purpose of a potential improvement of the AFS selection. Previous reports on the performance of the ship's AFS should be part of the evaluation.

Manufacturer(s) and type(s) of AFC	<EXAMPLE> <Hard coating, self-polishing or fouling release, etc.>
Biocides in AFC	<EXAMPLE> <Copper oxide, zineb, etc.>
Dry film thickness	
Expected lifetime and, if any, expected reduction of efficiency of AFC	
Operating profiles which are suitable for the AFC including temperature, salinity, speed, periods of inactivity	
Recommended regime for repairs, maintenance, and/or renewal to receive the AFC optimal performance	<EXAMPLE> <Regime for repairs> <Regime for maintenance> <Regime for renewal> <N/A>
Cleaning methods recommended for AFC	
Cleaning methods not appropriate for AFC, if any	
IAFS Certificate	

Manufacturer(s), models and type(s) of MGPS	<EXAMPLE> <Anode, ultra-sound, electrode, electrolysis, ultraviolet radiation or other>
Type(s) of harmful discharge from MGPS	<EXAMPLE> <Chlorine, noise or other>

Operating conditions/frequency of use	<EXAMPLE> <dosing frequency temperature, salinity, speed>
Required maintenance and frequency	
Service life of MGPS	

Manufacturer(s), models and type(s) of other AFS	
Type(s) of harmful discharge from other AFS	
Operating conditions/frequency	
Required maintenance and frequency	
Service life and expiration date of AFS	

INSTALLATION OF ANTI-FOULING SYSTEM

The areas on the ship which are protected with the selected AFS are described below. If necessary, the individual AFS could be identified as A and B, respectively. Areas with no protection are also described.

AFS applied	**Areas on ship where AFS is applied**	**Date of application**	**Recommended cleaning technique**
<EXAMPLE> <AFC (A)>	<EXAMPLE> <flat-bottom front, flat-bottom- mid, flat-bottom- aft, bow dome, boot top, vertical sides – port side, vertical sides- starboard side, vertical side – aft, transom, or others>		<EXAMPLE> <soft brush, blades, metal brushes or water jet>
<EXAMPLE> <MGPS (A)>	<EXAMPLE> <Sea chests, internal pipework, ballast uptake system, inlet gratings>		<EXAMPLE> <Steaming>
<EXAMPLE> <Other AFS>			
<EXAMPLE> <No AFS>			

INSPECTION SCHEDULE OF HULL AND NICHE AREAS

An inspection will be carried out by organizations or personnel competent to undertake inspections according to the fixed intervals described below:

Inspection areas	**Initial inspection**	**Subsequent inspections**
<EXAMPLE> <Areas installed with AFS and operating within the profile>	<EXAMPLE> <Inspection within 12months> <When utilising a performance monitoring system that indicates adequate performance of the AFS, an inspection will be conducted within 18 months. If the monitoring indicates that the AFS is not performing effectively, an inspection should be carried out as soon as possible. >	<EXAMPLE> <If rating 0-1 in previous inspection, then inspection every: 12-18 months If rating 2, 3 or 4 in previous inspection, then more frequently inspections>
<EXAMPLE> <Areas with no AFS and no other measures>	<EXAMPLE> <Inspection within 12 months >	<EXAMPLE> <Inspection more frequently >

CLEANING

Reactive cleaning should be performed as a result of any inspection with a fouling rating condition ≥ 2. It should be performed in line with procedures of the ship cleaning operator or the drydocks facilities used, and the cleaning practices should be conducted in accordance with the jurisdiction's policies or regulations of relevant authority. Preferred cleaning methods and procedures that can be used, are described below. The methods and cleaning operator used in each cleaning occasion should be recorded in the BFRB.

Reactive cleaning method(s)	**Areas where cleaning method will be applied**	**Operating condition when cleaning method will be applied**	**Cleaning schedule**
<EXAMPLE> <Water jet and suction with capture according to	<EXAMPLE> <flat-bottom front, flat-bottom- mid, flat-bottom- aft, bow dome, boot	<EXAMPLE> <moored in harbour, drifting in open sea, on anchorage	<EXAMPLE> <When recommended based on monitoring of biofouling parameters and/or

<name of the standard>>	top, vertical sides – port side, vertical sides-starboard side, vertical side – aft, transom, or others>	in coastal waters, on voyage>	in case unforeseen biofouling levels are detected on hull or in niche areas>
<EXAMPLE> <Steaming with capture performed by according to <name of the standard>>	<EXAMPLE> <Sea chests, internal pipework, ballast uptake system, inlet gratings>	<EXAMPLE> <in drydock>	<EXAMPLE> <When recommended based on monitoring of biofouling parameters and/or in case unforeseen biofouling levels are detected in niche areas>
Possible harmful discharge from cleaning with reactive cleaning method			
Manufacturer and model of ship-specific reactive cleaning device if applicable			
Reactive cleaning method suitable for AFC			
Required maintenance and frequency, as applicable			

Reactive cleaning suitable for typical operating profile, i.e. is the ship expected to stay enough time in locations where reactive cleaning can be carried out			
Reactive cleaning device tested according to <name of the standard> (Y/N) if applicable			

Proactive cleaning should take into account recommendations from the AFS manufacturer listed in this BFMP. Description of proactive cleaning activities which are planned on a regular basis, if any, are listed below.

Proactive cleaning method(s)	**Areas where cleaning method will be applied**	**Operating condition when cleaning method will be applied**	**Cleaning schedule**
<EXAMPLE> <ROV with water jet, ROV with soft brush, manual device with soft brush or other>	<EXAMPLE> <flat-bottom front, flat-bottom- mid, flat-bottom- aft, bow dome, boot top, vertical sides – port side, vertical sides- starboard side, vertical side – aft, transom, or others>	<EXAMPLE> <moored in harbour, drifting in open sea, on anchorage in coastal waters, on voyage>	<EXAMPLE> <every <XX> days when operating in temperate waters; every <XX> days when operating in tropical/semi-tropical waters; when recommended based on monitoring of biofouling parameters; and in case of unforeseen biofouling levels defined as rating 1 are detected on hull or in niche areas>
Possible harmful discharge from cleaning with proactive cleaning method		<EXAMPLE> <AFC biocides, biofouling, particles or other>	

Manufacturer and model of ship-specific proactive cleaning device if applicable	
Proactive cleaning method suitable for AFC	
Required maintenance and frequency, as applicable	
Proactive cleaning suitable for typical operating profile, i.e. is the ship expected to stay enough time in locations where proactive cleaning can be carried out	
Description of how to avoid biofouling cleaning and discharge of macrofouling, if possible	
Proactive cleaning device tested according to <name of the standard> (Y/N) if applicable	

MONITORING OF BIOFOULING RISK PARAMETERS AND CONTINGENCY ACTIONS

Relevant digital tools applied for monitoring of biofouling risk parameters and/or digitalized real-data input are <describe the tools and data used for this ship>.

The biofouling risk parameters given below should be monitored when the ship is in operation. When a parameter goes beyond the deviation limit, the risk of biofouling is increased, and the recommended contingency actions should be used as described.

Biofouling risk parameters to monitor	**Evaluation of a deviation including deviation limit of the risk parameter**	**Contingency actions**	**Long-term actions**
<EXAMPLE> <Deviation from speed specifications acceptable for the AFS>	<EXAMPLE> <Incidental deviations should be evaluated for potential biofouling impact. Continuous or regular deviations, or deviations not rectified, should lead to contingency actions>.	<EXAMPLE> <Shorter inspection interval with inspection every 4 months. When recommended by the AFS manufacturer, more frequent proactive cleaning activities could be implemented between inspections.>	<EXAMPLE> <Evaluate the need of a potential improvement of the AFS selection prior the next dry-docking.>

<EXAMPLE> <Deviation from salinity specifications acceptable for the AFS >	<EXAMPLE> <Incidental deviations should be evaluated for potential biofouling impact. Continuous or regular deviations, or deviations not rectified, should lead to contingency actions.>	<EXAMPLE> <Shorter inspection interval with inspection every 4 months. When recommended by the AFS manufacturer, more frequent proactive cleaning activities could be implemented between inspections.>	<EXAMPLE> <Evaluate the need of a potential improvement of the AFS selection prior the next dry-docking.>
<EXAMPLE> <Deviation from temperature range specifications acceptable for the AFS>	<EXAMPLE> <Incidental deviations should be evaluated for potential biofouling impact. Continuous or regular deviations, or deviations not rectified, should lead to contingency actions.>	<EXAMPLE> <Shorter inspection interval with inspection every 4 months. When recommended by the AFS manufacturer, more frequent proactive cleaning activities could be implemented between inspections.>	<EXAMPLE> <Evaluate the need of a potential improvement of the AFS selection prior the next dry-docking.>
<EXAMPLE> <Deviation from the maintenance/service regime of the AFC>	<EXAMPLE> <If the maintenance and service time, specified by the manufacturer, is exceeded, the risk of biofouling is elevated, and contingency actions should be implemented>.	<EXAMPLE> <An inspection should be carried out for the relevant area. Maintenance or repair should be performed at earliest possible opportunity. >	<EXAMPLE> <Regular maintenance and repair (e.g.) may be necessary actions for proper protection by the AFC. Evaluate the need to update maintenance programme.>
<EXAMPLE> <AFC damage>	<EXAMPLE> <Failure caused by mechanical damage to the AFC may result in higher risk of biofouling in the areas affected, if not	<EXAMPLE> <An inspection should be carried out for the relevant area.	

	rectified within reasonable time. The damage should be evaluated for potential biofouling accumulation.>	Repair should be performed at earliest opportunity. More frequent inspections of damaged area should be implemented until a repair is undertaken.>	
<EXAMPLE> <Deviation from the maintenance/service regime of the MGPS>	<EXAMPLE> <If the maintenance and service time, specified by the manufacturer, is exceeded, the risk of biofouling is elevated, and contingency actions should be implemented.>	<EXAMPLE> <An inspection should be carried out for the relevant niche area where MGPS is installed. Maintenance, calibration, or adjustment of treatment dosages for a MGPS should be performed at earliest possible opportunity.>	<EXAMPLE> <Regular maintenance and service (e.g.) may be necessary actions for proper protection by the AFS. Evaluate the need to update maintenance programme>
<EXAMPLE> <Downtime/malfunction of MGPS>	<EXAMPLE> <Observed downtime of an MGPS could have a direct impact on risk of biofouling accumulation. The impact will depend on the duration of malfunction and operating areas (coastal area). >	<EXAMPLE> <More frequent inspections of relevant area should be implemented until the MGPS is back in operation.>	
<EXAMPLE> <Downtime/malfunction of other AFS>	<EXAMPLE> <Reduced operation time of other AFS may increase biofouling accumulation in areas where it is usually applied.>	<EXAMPLE> <More frequent inspections of relevant area should be implemented until the AFS is back in operation.>	

<EXAMPLE> <Exceeding expected lifetime of AFS>	<EXAMPLE> <Once an AFS has exceeded its lifetime, as specified by the manufacturer, the biofouling risk is increased. >	<EXAMPLE> <More frequent inspections should be implemented until the AFS is back in operation.>	<EXAMPLE> <The performance of the AFS, and any necessary change in maintenance or inspection schedule, based on experience, should be included in the next update of this BWMP.>
<EXAMPLE> <Deviation from regular proactive cleaning>	<EXAMPLE> <When proactive cleaning is implemented as part of the AFS, deviation from regular use could lead to increased risk of biofouling growth onto relevant submerged areas.>	<EXAMPLE> <An inspection should be carried out. If it is light microfouling/heavy microfouling (fouling rating 1/2) or more in the relevant area, reactive cleaning with capture should be performed before proactive cleaning is used again. Maintenance or repair should be performed at earliest possible opportunity. More frequent inspections should be implemented until the missing proactive cleaning is in regular use.>	<EXAMPLE> <Regular maintenance and repair (e.g.) may be necessary actions for proper protection by the proactive cleaning. Evaluate the need to update maintenance programme.>
<EXAMPLE> <Deviation from necessary reactive cleaning>	<EXAMPLE> <If reactive cleaning is not conducted as scheduled or after an inspection has determined that reactive cleaning is necessary, it will increase the risk of spreading organisms to new locations.>	<EXAMPLE> <Prior to departure reactive cleaning should be performed, to avoid risk of spreading invasive aquatic species. If no reactive cleaning is performed prior to departure, a reactive cleaning activity should be scheduled at earliest possible opportunity.	<EXAMPLE> <More frequent reactive cleaning may be necessary actions for proper biofouling management. Evaluate the need to update the cleaning schedule.>

		If no reactive cleaning is performed, an acceptance could be required to arrive in the next port. Contact next port for further advice.>	
<EXAMPLE> <Extended ship idle time (berthed, anchored, moored)>	<EXAMPLE> <If the idle time is longer than estimated time in the ship's operating profile, it could lead to an elevated risk of biofouling. If the idle time is beyond the guarantee of the AFS supplier, the risk of biofouling accumulation increases. The risk also depends on biofouling pressure, e.g. temperature and distance to the coastline. If ship is idle in an area far from shore (>200 nm and >200 m depth) and far from other installations, the risk may still be considered low.>	<EXAMPLE> <If the idle time is within the guarantee of the AFS supplier, a short voyage with speed as specified for AFS could be conducted, sea chests could be blanked off or, when recommended by the AFS manufacturer, more frequent proactive cleaning activities could be implemented. If the idle time is beyond the guarantee of the AFS supplier, an inspection should be carried out.>	EXAMPLE> <Evaluate the need of a potential improvement of the AFS selection prior the next dry-docking.>
<EXAMPLE> <Performance loss as per Performance Monitoring System>	<EXAMPLE> <Performance monitoring may detect biofouling growth on hull, but not necessarily in niche area. Performance monitoring of fuel consumption may give indication on possible biofouling	<EXAMPLE> <When the data show a trend in performance loss over time, the time since last cleaning activity in combination with operating profile should be evaluated to determine if an	<EXAMPLE> <Experience from fuel consumption and cleaning activity over time may lead to optimization and changes to the cleaning schedule.>

	accumulation on the hull and may include the following methods: .1 Sensors and collecting high frequency data. .2 Semi-automatic or manual calculations using data collected from ship's crew (e.g. noon reports). .3 Speed trials and comparing the performance data with previous speed trial reports. <Percentage of the speed loss and percentage of increased fuel consumption, that may indicate light biofouling on the ship>.>	inspection should be carried out.>	
<EXAMPLE> <Downtime/malfunction of proactive cleaning >	<EXAMPLE> <When proactive cleaning is implemented as part of the AFS, long periods of downtime could lead to increased risk of biofouling growth.>	<EXAMPLE> <More frequent inspections of relevant area should be implemented until the proactive cleaning is back in operation. Maintenance or repair should be performed at earliest possible.	<EXAMPLE> <Regular maintenance and repair (e.g.) may be necessary actions for proper protection by the proactive cleaning. Evaluate the need to update maintenance programme.>

		If macrofouling accumulation is found or microfouling growth exceeds fouling rating 1, cleaning with capture should be conducted before the proactive cleaning is put into service again.>	

CAPTURE AND DISPOSAL OF WASTE

In-water reactive cleaning companies should arrange for capture of debris during cleaning. The biofouling waste should be disposed of and/or treated in a safe and environmentally sound manner, in accordance with local regulations, to ensure that the main objective of the Guidelines, to minimize the transfer of invasive aquatic species, is safeguarded.

Documenting evidence of collection/delivery of the wastes (a receipt) will be appended to the BFRB.

SAFETY PROCEDURES FOR THE SHIP AND THE CREW

<Details of specific operational or safety restrictions associated with the AFC or MGPS systems that affect the ship and/or the crew.

Details of specific safety procedures to be followed during ship inspections and cleaning operations.>

CREW TRAINING AND FAMILIARIZATION

<Information on the provision of crew training and familiarization on biofouling management.

Detailed description of how inspections are to be carried out by ship crew as part of contingency actions.>

APPENDIX 4

PROPOSED EXAMPLE FORM OF BIOFOULING RECORD BOOK

PART I – Biofouling management activities

Name of ship: .....

IMO number, distinctive numbers or letters:.....

Gross tonnage: .....

Period from:..... to: .....

Note:

Biofouling Record Book Part I should be provided to every ship with a Biofouling Management Plan (BFMP), to record relevant biofouling activities such as inspections, maintenance and cleaning activities. Biofouling Record Book Part II should also be provided to record when the ship has higher risk for biofouling accumulation and related contingency actions.

1 Introduction

The following pages of this section show a comprehensive list of items of biofouling management activities which are, when appropriate, to be recorded in the Biofouling Record Book Part I. Management of biofouling should be in accordance with an approved Biofouling Management Plan (BFMP) and take into account guidelines developed by the Organization. The items have been grouped into operational sections, each of which is denoted by a letter code.

When making entries in the Biofouling Record Book Part I, the date, operational code and item number should be inserted in the appropriate columns and the required particulars should be recorded chronologically in the blank spaces. Each completed operation should be signed for and dated by the officer or officers in charge. The master of the ship should sign each completed page.

The use of an electronic record book to record activities is an alternative method to a hard copy record book. Electronic recording and reporting should be encouraged as it may have many benefits and may allow ships to utilize their technology to reduce administrative burdens and contribute to on board environmental initiatives, e.g. reduction of paper use. In case electronic recording is to be used, resolution MEPC.312(74) may be used for guidance.

The Biofouling Record Book Part I contains many references to observations regarding fouling rating. These observations may be included in separate reports including observations of sub-sections and belonging photos/video. The entries in the Biofouling Record Book Part I may be a summary only including a conclusion to whether the activity is in line with the BFMP.

The Biofouling Record Book Part I should be kept on board the ship in a place where it is readily available for inspection at all reasonable times and for the life of the ship.

Any inspection of Biofouling Record Book Part I should be performed as expeditiously as possible without causing the ship to be unduly delayed.

LIST OF ITEMS TO BE RECORDED

(A) Proactive cleaning

1 Date and location of ship when proactive cleaning occurred.

2 General observations with regard to biofouling prior to cleaning, if any (i.e. extent of microfouling and macrofouling in line with the defined ratings).

3 Records of permits required to undertake in-water proactive cleaning if applicable.

4 Details of hull and niche areas cleaned.

5 General observations with regard to biofouling after the cleaning, if any (i.e. extent of microfouling and macrofouling in line with the defined ratings).

6 Reference to any supporting evidence/reports of the cleaning (e.g. report from supplier, photographs/videos and/or receipts), if any.

7 Method, manufacturer and model of proactive cleaning method used, if not given in BFMP.

8 Reference to test standard for which the method has been tested, if not given in BFMP.

9 Name, position and signature of the person in charge of the activity.

(B) Inspection

1 Date and location of inspection.

2 Methods used for inspection (including inspection tools/devices).

3 Areas inspected of the ship.

4 Observations with regard to biofouling (extent of microfouling and macrofouling in line with the defined fouling rates).

5 Observations with regard to anti-fouling system (AFS) condition.

6 Reference to any supporting evidence/reports of the inspection.

7 Name, position and signature of the person in charge of the activity.

(C) Reactive cleaning

1 Date and location of ship when cleaning occurred.

2 Records of permits required to undertake in-water cleaning if applicable.

3 Description of hull and niche areas cleaned.

4 Methods of reactive cleaning used.

5 Estimation of overall biofouling after cleaning in line with the defined fouling rates.

6 Reference to any supporting evidence/reports of the activity.

7 Receipt or other documenting evidence of collection/delivery of the wastes.

8 Name, position and signature of the person in charge of the activity.

9 Manufacturer and model of cleaning and capture device as well as cleaning company executing the cleaning.

10 Reference to test standard for which the method has been tested, if relevant.

(D) Additional operational procedures and general remarks

Name of ship .....

IMO number, distinctive numbers or letters .....

BIOFOULING MANAGEMENT ACTIVITIES

Date	Code (letter)	Item (number)	Record of activity/signature of officer in charge

Signature of master .....

PART II – Monitoring of biofouling risk parameters

Name of ship: .....

IMO number, distinctive numbers or letters:.....

Gross tonnage: .....

Period from:..... to: .....

Note:

Biofouling Record Book Part II should be provided to every ship with a Biofouling Management Plan, to record when the ship is in higher risk for biofouling accumulation given by monitoring of biofouling risk parameters. Relevant contingency actions should also be recorded.

1 Introduction

The following pages of this section show a comprehensive list of risk parameters to be monitoring and recorded in the Biofouling Record Book Part II whenever the risk is increased according to the BFMP. The items have been grouped into sections, each of which is denoted by a letter code.

When making entries in the Biofouling Record Book Part II, the date, code and item number should be inserted in the appropriate columns and the required particulars should be recorded chronologically in the blank spaces. Each completed operation should be signed for and dated by the officer or officers in charge. The master of the ship should sign each completed page.

The use of an electronic record book to record when the ship is subject to higher risk of biofouling accumulation is an alternative method to a hard copy record book. Electronic recording and reporting should be encouraged as it may have many benefits and may allow ships to utilize technology to monitor the risk parameters as defined in the BFMP. This may reduce administrative burdens and contribute to better surveillance of potential risk. In case electronic recording is to be used whenever the ship has higher risk, resolution MEPC.312(74) may be used for guidance.

The Biofouling Record Book Part II may contain many references to contingency actions. When actions include inspection, maintenance and/or cleaning, these may be recorded in the Biofouling Record Book Part I.

The Biofouling Record Book Part I should be kept on board the ship in a place where it is readily available for inspection at all reasonable times and for the life of the ship

Any inspection of Biofouling Record Book Part II should be performed as expeditiously as possible without causing the ship to be unduly delayed.

(A) When the ship operates outside the expected operating profile specified in the BFMP (e.g. speed, temperature or salinity)

1 Duration and dates when ship is not operating in line with its BFMP.

2 Reason for departure from normal operation.

3 Contingency actions taken to minimize biofouling accumulation (e.g. more frequent inspections) taken in the period when the ship is operating outside the expected operating profile.

4 Time and location (port name or latitude/longitude) when the ship operates again as specified in the BFMP.

(B) Maintenance/service or damage to AFC

1 Date/period and description of any observed reduction of the efficacy, damage or deviation from maintenance/service to anti-fouling coating (AFC) during its lifetime.

2 Date/period and description of any operation beyond expected lifetime.

3 Contingency actions taken to minimize biofouling accumulation (e.g. more frequent inspections).

4 Date/period and location where any AFC maintenance or repair was performed (e.g. in dry-dock).

5 Description of any AFC, including patch repairs, that was applied during maintenance. Detail the type of AFC, the area and locations it was applied to (including the location of dry-dock support blocks if relevant), an estimated percentage cover of re-application of the AFC, the coating thickness achieved and any surface preparation work undertaken (e.g. complete removal of underlying AFC or application of new AFC over the top of existing AFC).

6 Reference to any supporting data for AFC maintenance (e.g. AFC technical file).

7 Name, position and signature of the person in charge of the activity.

(C) Maintenance/service or downtime/malfunction of MGPS

1 Date/period and description of any observed reduction of the efficacy, downtime, malfunction or deviation from maintenance/service of marine growth prevention system (MGPS) during its lifetime.

2 Date/period and description of operation beyond the expected lifetime.

3 Date and location of any instances when the system was not operating in line with the BFMP.

4 Records of maintenance (including regularly monitoring the electrical and mechanical functions of the systems, calibration, or adjustment of treatment dosages).

5 Contingency actions taken to minimize biofouling accumulation (e.g. more frequent inspections).

6 Name, position and signature of the person in charge of the activity

(D) Maintenance/service or downtime/malfunction of other AFS

1 Date/period and description of any observed reduction of the efficacy, downtime, malfunction or deviation from maintenance/service of other AFS during its lifetime.

2 Date/period and description of operation beyond expected lifetime.

3 Date and location of any instances when the system was not operating in line with the Biofouling Management Plan.

4 Records of maintenance.

5 Contingency actions taken to minimize biofouling accumulation (e.g. more frequent inspections.

(E) Deviation from regular use of expected proactive cleaning as specified in the BFMP

1 Date and location where ship did not conduct proactive cleaning as specified.

2 Contingency actions taken to minimize biofouling accumulation (e.g. inspections of biofouling and/or reactive cleaning before return to proactive cleaning activity).

3 Records of maintenance, if any.

4 Date when ship returned to normal activities with proactive cleaning.

(F) Deviation from necessary reactive cleaning as specified in the BFMP

1 Date and location where ship was inspected and reactive cleaning found necessary.

2 Contingency actions taken until reactive cleaning, including scheduling of reactive cleaning activity.

3 Date when ship completed the reactive cleaning and reference to relevant recording in Part I.

(G) When the ship is idle (berthed, anchored, moored) for a longer period

1 Date and location where ship was laid up, including general description of biofouling pressure, e.g. temperature and distance to the coastline.

2 Contingency actions taken to minimize biofouling accumulation (e.g. inspections, sea chests blanked off or short voyages taken prior to and following the period laid up).

3 Precautions taken to minimize biofouling accumulation (e.g. short voyage).

4 Date when ship returned to normal operations.

(H) When the ship has performance loss as per Performance Monitoring System for a period beyond the expected period as specified in the BFMP

1 Date and location where ship started with performance loss beyond the expectations.

2 Inspections or biofouling management actions taken prior to and following the period with performance loss.

3 Contingency actions taken to minimize biofouling accumulation.

4 Date when ship returned to normal performance.

(l) Other deviations

Name of ship .....

IMO number, distinctive number or letters .....

BIOFOULING MANAGEMENT ACTIVITIES

Date	Code (letter)	Item (number)	Record of risk /signature of officer in charge

Signature of master .....

***

ANNEX 2

DRAFT UNIFIED INTERPRETATION TO THE BWM CONVENTION

1 Date to meet the standard in regulation D-2 in accordance with resolution MEPC.297(72).

Regulation B-3
Ballast water management for ships

Regulations B-3.5 and B-3.10 read as follows:

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

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

.1 the first renewal survey, as determined by the Committee*, on or after 8 September 2017 if:

.1 this survey is completed on or after 8 September 2019; or

.2 a renewal survey is completed on or after 8 September 2014 but prior to 8 September 2017; and

.2 the second renewal survey, as determined by the Committee,* on or after 8 September 2017 if the first renewal survey on or after 8 September 2017 is completed prior to 8 September 2019, provided that the conditions of paragraph 10.1.2 are not met."

Interpretation:

1.1 A ship constructed before 8 September 2017, which has undergone a major conversion on or after 8 September 2017, should be deemed as a ship constructed on or after 8 September 2017 and comply with regulation B-3.5. If the major conversion has occurred before the renewal survey specified in regulation B-3.10, the said ship should meet the D-2 standard from the date of completion of the major conversion. If the major conversion has occurred after the renewal survey specified in regulation B-3.10, the said ship should meet the D-2 standard from the date of completion of the renewal survey specified in regulation B-3.10.

2 "Date of construction" for a ship which has undergone a major conversion.

Appendix I
Form of International Ballast Water Management Certificate

The following information regarding "Date of construction" and "Date of major conversion" is to be provided on the certificate:

"Date of construction ....."

Interpretation:

2.1 For the International Ballast Water Management Certificate for a ship that has undergone a major conversion, the date of the commencement of the major conversion should be filled in the item "Date of construction".

***

ANNEX 3

DRAFT MEPC RESOLUTION

2023 GUIDELINES FOR THE DEVELOPMENT OF THE INVENTORY OF HAZARDOUS MATERIALS

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 the Safe and Environmentally Sound Recycling of Ships held in May 2009 adopted the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (the Hong Kong Convention) together with six Conference resolutions,

NOTING that regulations 5.1 and 5.2 of the annex to the Hong Kong Convention require that ships shall have on board an Inventory of Hazardous Materials which shall be prepared and verified taking into account guidelines, including any threshold values and exemptions contained in those guidelines, developed by the Organization,

NOTING ALSO that, at its sixty-second session, it adopted, by resolution MEPC.197(62), the *Guidelines for the development of the Inventory of Hazardous Materials*,

NOTING FURTHER that, at its sixty-eighth session, it adopted, by resolution MEPC.269(68), *the 2015 Guidelines for the development of the Inventory of Hazardous Materials*, which superseded the Guidelines adopted through resolution MEPC.197(62), to improve the guidance on threshold values and exemptions,

RECOGNIZING the need for a consequential revision of the Guidelines associated with amendments to Annex 1 to the *International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001* (AFS Convention) (resolution MEPC.331(76)), which introduced controls on cybutryne and entered into force on 1 January 2023,

HAVING CONSIDERED, at its eightieth session, the recommendation made by the Sub-Committee on Pollution Prevention and Response at its tenth session,

1 ADOPTS the *2023 Guidelines for the development of the Inventory of Hazardous Materials* as set out in the annex to this resolution;

2 INVITES Member Governments to apply the 2023 Guidelines as soon as possible, or latest when the Convention enters into force;

3 AGREES to keep the 2023 Guidelines under review in the light of experience gained with their application;

4 SUPERSEDES the guidelines adopted by resolution MEPC.269(68).

ANNEX

2023 GUIDELINES FOR THE DEVELOPMENT OF THE INVENTORY OF HAZARDOUS MATERIALS

1 INTRODUCTION

1.1 Objectives

These guidelines provide recommendations for developing the Inventory of Hazardous Materials (hereinafter referred to as "the Inventory" or "the IHM") to assist compliance with regulation 5 (Inventory of Hazardous Materials) of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (hereinafter referred to as "the Convention").

1.2 Application

These guidelines have been developed to provide relevant stakeholders (e.g. shipbuilders, equipment suppliers, repairers, shipowners and ship management companies) with the essential requirements for the practical and logical development of the Inventory.

1.3 Objectives

The objectives of the Inventory are to provide ship-specific information on the actual hazardous materials present on board, in order to protect health and safety and to prevent environmental pollution at ship recycling facilities. This information will be used by the ship recycling facilities in order to decide how to manage the types and amounts of materials identified in the Inventory of Hazardous Materials (regulation 9 of the Convention).

2 DEFINITIONS

The terms used in these guidelines have the same meaning as those defined in the Convention, with the following additional definitions which apply to these guidelines only.

2.1 *Exemption* (as referred to in regulation 5 of the Convention) means materials specified in paragraph 3.3 in these guidelines that do not need to be listed on the IHM, even if such materials or items exceed the IHM threshold values.

2.2 *Fixed* means the conditions that equipment or materials are securely fitted with the ship, such as by welding or with bolts, riveted or cemented, and used at their position, including electrical cables and gaskets.

2.3 *Homogeneous material* means a material of uniform composition throughout that cannot be mechanically disjointed into different materials, meaning that the materials cannot, in principle, be separated by mechanical actions such as unscrewing, cutting, crushing, grinding and abrasive processes.

2.4 *Loosely fitted equipment* means equipment or materials present on board the ship by the conditions other than "fixed", such as fire extinguishers, distress flares, and lifebuoys.

2.5 *Product* means machinery, equipment, materials and applied coatings on board a ship.

2.6 *Supplier* means a company which provides products; which may be a manufacturer, trader or agency.

2.7 *Supply chain* means the series of entities involved in the supply and purchase of materials and goods, from raw materials to final product.

2.8 *Threshold value* is defined as the concentration value in homogeneous materials.

3 REQUIREMENTS FOR THE INVENTORY

3.1 Scope of the Inventory

The Inventory consists of:

Part I: Materials contained in ship structure or equipment;

Part II: Operationally generated wastes; and

Part III: Stores.

3.2 Materials to be listed in the Inventory

3.2.1 Appendix 1 of these guidelines (Items to be listed in the Inventory of Hazardous Materials), provides information on the hazardous materials that may be found on board a ship. Materials set out in appendix 1 should be listed in the Inventory. Each item in appendix 1 of these guidelines is classified under tables A, B, C or D, according to its properties:

.1 table A comprises the materials listed in appendix 1 of the Convention;

.2 table B comprises the materials listed in appendix 2 of the Convention;

.3 table C (Potentially hazardous items) comprises items which are potentially hazardous to the environment and human health at ship recycling facilities; and

.4 table D (Regular consumable goods potentially containing hazardous materials) comprises goods which are not integral to a ship and are unlikely to be dismantled or treated at a ship recycling facility.

3.2.2 Tables A and B correspond to part I of the Inventory. Table C corresponds to parts II and III and table D corresponds to part III.

3.2.3 For loosely fitted equipment, there is no need to list this in part I of the Inventory. Such equipment which remains on board when the ship is recycled should be listed in part III.

3.2.4 Those batteries containing lead acid or other hazardous materials that are fixed in place should be listed in part I of the Inventory. Batteries that are loosely fitted, which include consumer batteries and batteries in stores, should be listed in part III of the Inventory.

3.2.5 Similar materials or items that contain hazardous materials that potentially exceed the threshold value can be listed together (not individually) on the IHM with their general location and approximate amount specified there (hereinafter referred to as "bulk listing"). An example of how to list those materials and items is shown in row 3 of table 1 of appendix 3.

3.3 Exemptions – Materials not required to be listed in the Inventory

3.3.1 Materials listed in table B that are inherent in solid metals or metal alloys, such as steels, aluminium, brasses, bronzes, plating and solders, provided they are used in general construction, such as hull, superstructure, pipes or housings for equipment and machinery, are not required to be listed in the Inventory.

3.3.2 Although electrical and electronic equipment is required to be listed in the Inventory, the amount of hazardous materials potentially contained in printed wiring boards (printed circuit boards) installed in the equipment does not need to be reported in the Inventory.

3.4 Standard format of the Inventory of Hazardous Materials

The Inventory should be developed on the basis of the standard format set out in appendix 2 of these guidelines: Standard format of the Inventory of Hazardous Materials. Examples of how to complete the Inventory are provided for guidance purposes only.

3.5 Revision to threshold values

Revised threshold values in tables A and B of appendix 1 should be used for IHMs developed or updated after the adoption of the revised values and need not be applied to existing IHMs and IHMs under development. However, when materials are added to the IHM, such as during maintenance, the revised threshold values should be applied and recorded in the IHM.

4 REQUIREMENTS FOR DEVELOPMENT OF THE INVENTORY

4.1 Development of part I of the Inventory for new ships[1]

4.1.1 Part I of the Inventory for new ships should be developed at the design and construction stage.

4.1.2 *Checking of materials listed in table A*

During the development of the Inventory (part I), the presence of materials listed in table A of appendix 1 should be checked and confirmed; the quantity and location of table A materials should be listed in part I of the Inventory. If such materials are used in compliance with the Convention, they should be listed in part I of the Inventory. Any spare parts containing materials listed in table A are required to be listed in part III of the Inventory.

4.1.3 *Checking of materials listed in table B*

If materials listed in table B of appendix 1 are present in products above the threshold values provided in table B, the quantity and location of the products and the contents of the materials

[1] In ascertaining whether a ship is a "new ship" or an "existing ship" according to the Convention, the term "a similar stage of construction" in regulation 1.4.2 of the annex to the Convention means the stage at which:

.1 construction identifiable with a specific ship begins: and
.2 assembly of that ship has commenced comprising at least 50 tonnes or 1% of the estimated mass of all structural material, whichever is less.

present in them should be listed in part I of the Inventory. Any spare parts containing materials listed in table B are required to be listed in part III of the Inventory.

4.1.4 *Process for checking of materials*

The checking of materials as provided in paragraphs 4.1.2 and 4.1.3 above should be based on the Material Declaration furnished by the suppliers in the shipbuilding supply chain (e.g. equipment suppliers, parts suppliers, material suppliers).

4.2 Development of part I of the Inventory for existing ships

4.2.1 In order to achieve comparable results for existing ships with respect to part I of the Inventory, the following procedure should be followed:

.1 collection of necessary information;

.2 assessment of collected information;

.3 preparation of visual/sampling check plan;

.4 onboard visual check and sampling check; and

.5 preparation of part I of the Inventory and related documentation.

4.2.2 The determination of hazardous materials present on board existing ships should, as far as practicable, be conducted as prescribed for new ships, including the procedures described in sections 6 and 7 of these guidelines. Alternatively, the procedures described in this section may be applied for existing ships, but these procedures should not be used for any new installation resulting from the conversion or repair of existing ships after the initial preparation of the Inventory.

4.2.3 The procedures described in this section should be carried out by the shipowner, who may draw upon expert assistance. Such an expert or expert party should not be the same as the person or organization authorized by the Administration to approve the Inventory).

4.2.4 Reference is made to appendix 4 (Flow diagram for developing part I of the Inventory for existing ships) and appendix 5 (Example of development process for part I of the Inventory for existing ships.

4.2.5 *Collection of necessary information (step 1)*

The shipowner should identify, research, request and procure all reasonably available documentation regarding the ship. Information that will be useful includes maintenance, conversion and repair documents; certificates, manuals, ship's plans, drawings and technical specifications; product information data sheets (such as Material Declarations); and hazardous material inventories or recycling information from sister ships. Potential sources of information could include previous shipowners, the shipbuilder, historical societies, classification society records and ship recycling facilities with experience working with similar ships.

4.2.6 *Assessment of collected information (step 2)*

The information collected in step 1 above should be assessed. The assessment should cover all materials listed in table A of appendix 1; materials listed in table B should be assessed as far as practicable. The results of the assessment should be reflected in the visual/sampling check plan.

4.2.7 *Preparation of visual/sampling check plan (step 3)*

4.2.7.1 To specify the materials listed in appendix 1 of these guidelines, a visual/sampling check plan should be prepared taking into account the collated information and any appropriate expertise. The visual/sampling check plan should be based on the following three lists:

.1 List of equipment, system and/or area for visual check (any equipment, system and/or area specified regarding the presence of the materials listed in appendix 1 by document analysis should be entered in the List of equipment, system and/or area for visual check);

.2 List of equipment, system and/or area for sampling check (any equipment, system and/or area which cannot be specified regarding the presence of the materials listed in appendix 1 by document or visual analysis should be entered in the List of equipment, system and/or area as requiring sampling check. A sampling check is the taking of samples to identify the presence or absence of hazardous material contained in the equipment, systems, and/or areas, by suitable and generally accepted methods such as laboratory analysis); and

.3 List of equipment, system and/or area classed as "potentially containing hazardous material" (any equipment, system and/or area which cannot be specified regarding the presence of the materials listed in appendix 1 by document analysis may be entered in the List of equipment, system and/or area classed as "potentially containing hazardous material" without the sampling check. The prerequisite for this classification is a comprehensible justification such as the impossibility of conducting sampling without compromising the safety of the ship and its operational efficiency).

4.2.7.2 Visual/sampling checkpoints should be all points where:

.1 the presence of materials to be considered for the Inventory part I as listed in appendix 1 is likely;

.2 the documentation is not specific; or

.3 materials of uncertain composition were used.

4.2.8 *Onboard visual/sampling check (step 4)*

4.2.8.1 The onboard visual/sampling check should be carried out in accordance with the visual/sampling check plan. When a sampling check is carried out, samples should be taken and the sample points should be clearly marked on the ship plan and the sample results should be referenced. Materials of the same kind may be sampled in a representative manner. Such materials are to be checked to ensure that they are of the same kind. The sampling check should be carried out drawing upon expert assistance.

4.2.8.2 Any uncertainty regarding the presence of hazardous materials should be clarified by a visual/sampling check. Checkpoints should be documented in the ship's plan and may be supported by photographs.

4.2.8.3 If the equipment, system and/or area of the ship are not accessible for a visual check or sampling check, they should be classified as "potentially containing hazardous material". The prerequisite for such classification should be the same prerequisite as in section 4.2.7. Any equipment, system and/or area classed as "potentially containing Hazardous Material" may be investigated or subjected to a sampling check at the request of the shipowner during a later survey (e.g. during repair, refit or conversion).

4.2.9 *Preparation of part I of the Inventory and related documentation (step 5)*

If any equipment, system and/or area is classed as either "containing hazardous material" or "potentially containing hazardous material", their approximate quantity and location should be listed in part I of the Inventory. These two categories should be indicated separately in the "Remarks" column of the Inventory.

4.2.10 *Testing methods*

4.2.10.1 Samples may be tested by a variety of methods. "Indicative" or "field tests" may be used when:

.1 the likelihood of a hazard is high;

.2 the test is expected to indicate that the hazard exists; and

.3 the sample is being tested by "specific testing" to show that the hazard is present.

4.2.10.2 Indicative or field tests are quick, inexpensive and useful on board the ship or on site, but they cannot be accurately reproduced or repeated, and cannot identify the hazard specifically, and therefore cannot be relied upon except as "indicators".

4.2.10.3 In all other cases, and in order to avoid dispute, "specific testing" should be used. Specific tests are repeatable, reliable and can demonstrate definitively whether a hazard exists or not. They will also provide a known type of the hazard. The methods indicated are found qualitative and quantitative appropriate and only testing methods to the same effect can be used. Specific tests are to be carried out by a suitably accredited laboratory, working to international standards[2] or equivalent, which will provide a written report that can be relied upon by all parties.

4.2.10.4 Specific test methods for appendix 1 materials are provided in appendix 9.

4.2.11 *Diagram of the location of hazardous materials on board a ship*

Preparation of a diagram showing the location of the materials listed in table A is recommended in order to help ship recycling facilities gain a visual understanding of the Inventory.

[2] For example ISO 17025.

4.3 Maintaining and updating part I of the Inventory during operations

4.3.1 Part I of the Inventory should be appropriately maintained and updated, especially after any repair or conversion or sale of a ship.

4.3.2 *Updating of part I of the Inventory in the event of new installation*

If any machinery or equipment is added to, removed or replaced or the hull coating is renewed, part I of the Inventory should be updated according to the requirements for new ships as stipulated in paragraphs 4.1.2 to 4.1.4. Updating is not required if identical parts or coatings are installed or applied.

4.3.3 *Continuity of part I of the Inventory*

Part I of the Inventory should belong to the ship and the continuity and conformity of the information it contains should be confirmed, especially if the flag, owner or operator of the ship changes.

4.4 Development of part II of the Inventory (operationally generated waste)

4.4.1 Once the decision to recycle a ship has been taken, part II of the Inventory should be developed before the final survey, taking into account that a ship destined to be recycled shall conduct operations in the period prior to entering the Ship Recycling Facility in a manner that minimizes the amount of cargo residues, fuel oil and wastes remaining on board (regulation 8.2 of the Convention).

4.4.2 *Operationally generated wastes to be listed in the Inventory*

If the wastes listed in part II of the Inventory provided in table C (Potentially hazardous items) of appendix 1 are intended for delivery with the ship to a ship recycling facility, the quantity of the operationally generated wastes should be estimated and their approximate quantities and locations should be listed in part II of the Inventory.

4.5 Development of part III of the Inventory (stores)

4.5.1 Once the decision to recycle has been taken, part III of the Inventory should be developed before the final survey, taking into account the fact that a ship destined to be recycled shall minimize the wastes remaining on board (regulation 8.2 of the Convention). Each item listed in part III should correspond to the ship's operations during its last voyage.

4.5.2 *Stores to be listed in the Inventory*

If the stores to be listed in part III of the Inventory provided in table C of appendix 1 are to be delivered with the ship to a ship recycling facility, the unit (e.g. capacity of cans and cylinders), quantity and location of the stores should be listed in part III of the Inventory.

4.5.3 *Liquids and gases sealed in ship's machinery and equipment to be listed in the Inventory*

If any liquids and gases listed in table C of appendix 1 are integral in machinery and equipment on board a ship, their approximate quantity and location should be listed in part III of the Inventory. However, small amounts of lubricating oil, anti-seize compounds and grease which are applied to or injected into machinery and equipment to maintain normal performance do not fall within the scope of this provision. For subsequent completion of part III of the Inventory

during the recycling preparation processes, the quantity of liquids and gases listed in table C of appendix 1 required for normal operation, including the related pipe system volumes, should be prepared and documented at the design and construction stage. This information belongs to the ship, and continuity of this information should be maintained if the flag, owner or operator of the ship changes.

4.5.4 *Regular consumable goods to be listed in the Inventory*

Regular consumable goods, as provided in table D of appendix 1 should not be listed in part I or part II but should be listed in part III of the Inventory if they are to be delivered with the ship to a Ship Recycling Facility. A general description including the name of item (e.g. TV set), manufacturer, quantity and location should be entered in part III of the Inventory. The check on materials provided for in paragraphs 4.1.2 and 4.1.3 of these guidelines does not apply to regular consumable goods.

4.6 Description of location of hazardous materials on board

The locations of hazardous materials on board should be described and identified using the name of location (e.g. second floor of engine-room, bridge DK, APT, No.1 cargo tank, frame number) given in the plans (e.g. general arrangement, fire and safety plan, machinery arrangement or tank arrangement).

4.7 Description of approximate quantity of hazardous materials

In order to identify the approximate quantity of hazardous materials, the standard unit used for hazardous materials should be kg, unless other units (e.g. m^3 for materials of liquid or gases, m^2 for materials used in floors or walls) are considered more appropriate. An approximate quantity should be rounded up to at least two significant figures.

5 REQUIREMENTS FOR ASCERTAINING THE CONFORMITY OF THE INVENTORY

5.1 Design and construction stage

The conformity of part I of the Inventory at the design and construction stage should be ascertained by reference to the collected Supplier's Declaration of Conformity described in section 7 and the related Material Declarations collected from suppliers.

5.2 Operational stage

Shipowners should implement the following measures in order to ensure the conformity of part I of the Inventory:

.1 to designate a person as responsible for maintaining and updating the Inventory (the designated person may be employed ashore or on board);

.2 the designated person, in order to implement paragraph 4.3.2, should establish and supervise a system to ensure the necessary updating of the Inventory in the event of new installation;

.3 to maintain the Inventory including dates of changes or new deleted entries and the signature of the designated person; and

.4 to provide related documents as required for the survey or sale of the ship.

6 MATERIAL DECLARATION

6.1 General

Suppliers to the shipbuilding industry should identify and declare whether or not the materials listed in table A or table B are present above the threshold value specified in appendix 1 of these guidelines. However, this provision does not apply to chemicals which do not constitute a part of the finished product.

6.2 Information required in the declaration

6.2.1 At a minimum the following information is required in the Material Declaration:

.1 date of declaration;

.2 Material Declaration identification number;

.3 supplier's name;

.4 product name (common product name or name used by manufacturer);

.5 product number (for identification by manufacturer);

.6 declaration of whether or not the materials listed in table A and table B of appendix 1 of these guidelines are present in the product above the threshold value stipulated in appendix 1 of these guidelines; and

.7 mass of each constituent material listed in table A and/or table B of appendix 1 of these guidelines if present above threshold value.

6.2.2 An example of the Material Declaration is shown in appendix 6.

7 SUPPLIER'S DECLARATION OF CONFORMITY

7.1 Purpose and scope

7.1.1 The purpose of the Supplier's Declaration of Conformity is to provide assurance that the related Material Declaration conforms to section 6.2, and to identify the responsible entity.

7.1.2 The Supplier's Declaration of Conformity remains valid as long as the products are present on board.

7.1.3 The supplier compiling the Supplier's Declaration of Conformity should establish a company policy.[3] The company policy on the management of the chemical substances in products which the supplier manufactures or sells should cover:

.1 Compliance with law:

The regulations and requirements governing the management of chemical substances in products should be clearly described in documents which should be kept and maintained; and

[3] A recognized quality management system may be utilized.

.2 Obtaining of information on chemical substance content:

In procuring raw materials for components and products, suppliers should be selected following an evaluation, and the information on the chemical substances they supply should be obtained.

7.2 Contents and format

7.2.1 The Supplier's Declaration of Conformity should contain the following:

.1 unique identification number;

.2 name and contact address of the issuer;

.3 identification of the subject of the Declaration of Conformity (e.g. name, type, model number, and/or other relevant supplementary information);

.4 statement of conformity;

.5 date and place of issue; and

.6 signature (or equivalent sign of validation), name and function of the authorized person(s) acting on behalf of the issuer.

7.2.2 An example of the Supplier's Declaration of Conformity is shown in appendix 7.

8 LIST OF APPENDICES

Appendix 1: Items to be listed in the Inventory of Hazardous Materials

Appendix 2: Standard format of the Inventory of Hazardous Materials

Appendix 3: Example of the development process for part I of the Inventory for new ships

Appendix 4: Flow diagram for developing part I of the Inventory for existing ships

Appendix 5: Example of the development process for part I of the Inventory for existing ships

Appendix 6: Form of Material Declaration

Appendix 7: Form of Supplier's Declaration of Conformity

Appendix 8: Examples of table A and table B materials of appendix 1 with CAS-numbers

Appendix 9: Specific test methods

Appendix 10: Examples of radioactive sources

APPENDIX 1

ITEMS TO BE LISTED IN THE INVENTORY OF HAZARDOUS MATERIALS

Table A – Materials listed in appendix 1 of the Annex to the Convention

No.	Materials		Inventory			Threshold value
			Part I	Part II	Part III	
A-1	Asbestos		x			0.1%[4]
A-2	Polychlorinated biphenyls (PCBs)		x			50 mg/kg[5]
A-3	Ozone depleting substances	CFCs	x			no threshold value[6]
		Halons	x			
		Other fully halogenated CFCs	x			
		Carbon tetrachloride	x			
		1,1,1-Trichloroethane (Methyl chloroform)	x			
		Hydrochlorofluorocarbons	x			
		Hydrobromofluorocarbons	x			
		Methyl bromide	x			
		Bromochloromethane	x			
A-4	Anti-fouling systems containing organotin compounds as a biocide		x			2,500 mg total tin/kg[7]
	Anti-fouling systems containing cybutryne		x			1,000 mg/kg[8]

[4] In accordance with regulation 4 of the Convention, for all ships, new installation of materials which contain asbestos shall be prohibited. According to the UN recommendation "Globally Harmonized System of Classification and Labelling of Chemicals (GHS)" adopted by the United Nations Economic and Social Council's Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals (UNSCEGHS), the UN's Sub-Committee of Experts, in 2002 (published in 2003), carcinogenic mixtures classified as Category 1A (including asbestos mixtures) under the GHS are required to be labelled as carcinogenic if the ratio is more than 0.1%. However, if 1% is applied, this threshold value should be recorded in the Inventory and, if available, the Material Declaration and can be applied not later than five years after the entry into force of the Convention. The threshold value of 0.1% need not be retroactively applied to those Inventories and Material Declarations.

[5] In accordance with regulation 4 of the Convention, for all ships, new installation of materials which contain PCBs shall be prohibited. The Organization set 50 mg/kg as the threshold value referring to the concentration level at which wastes, substances and articles containing, consisting of or contaminated with PCB are characterized as hazardous under the Basel Convention.

[6] "No threshold value" is in accordance with the Montreal Protocol for reporting ODS. Unintentional trace contaminants should not be listed in the Material Declarations and in the Inventory.

[7] This threshold value is based on the *2022 Guidelines for brief sampling of anti-fouling systems on ships* (resolution MEPC.356(78)).

[8] When samples are directly taken from the hull, average values of cybutryne should not be present above 1,000 mg of cybutryne per kilogram of dry paint.

Table B – Materials listed in appendix 2 of the Annex to the Convention

No.	Materials	Inventory			Threshold value
		Part I	Part II	Part III	
B-1	Cadmium and cadmium compounds	x			100 mg/kg[9]
B-2	Hexavalent chromium and hexavalent chromium compounds	x			1,000 mg/kg[8]
B-3	Lead and lead compounds	x			1,000 mg/kg[8]
B-4	Mercury and mercury compounds	x			1,000 mg/kg[8]
B-5	Polybrominated biphenyl (PBBs)	x			50 mg/kg[10]
B-6	Polybrominated diphenyl ethers (PBDEs)	x			1,000 mg/kg[8]
B-7	Polychlorinated naphthalenes (more than 3 chlorine atoms)	x			50mg/kg[11]
B-8	Radioactive substances	x			no threshold value[12]
B-9	Certain shortchain chlorinated paraffins (Alkanes, C10-C13, chloro)	x			1%[13]

9 The Organization set this as the threshold value referring to the Restriction of Hazardous Substances (RoHS Directive 2011/65/EU, Annex II).

10 The Organization set 50 mg/kg as the threshold value referring to the concentration level at which wastes, substances and articles containing, consisting of or contaminated with PBB are characterized as hazardous under the Basel Convention.

11 The Organization set 50 mg/kg as the threshold value referring to the concentration level at which wastes, substances and articles containing, consisting of or contaminated with PCN are characterized as hazardous under the Basel Convention.

12 All radioactive sources should be included in the Material Declaration and in the Inventory. *Radioactive source* means radioactive material permanently sealed in a capsule or closely bonded and in a solid form that is used as a source of radiation. This includes consumer products and industrial gauges with radioactive materials. Examples are listed in appendix 10.

13 The Organization set 1% as the threshold value referring to the EU legislation that restricts Chlorinated Paraffins from being placed on the market for use as substances or as constituents of other substances or preparations in concentrations higher than 1% (EU Regulation 1907/2006, Annex XVII Entry 42 and Regulation 519/2012).

Table C – Potentially hazardous items

No.	Properties		Goods	Inventory		
				Part I	Part II	Part III
C-1	Liquid	Oiliness	Kerosene			x
C-2			White spirit			x
C-3			Lubricating oil			x
C-4			Hydraulic oil			x
C-5			Anti-seize compounds			x
C-6			Fuel additive			x
C-7			Engine coolant additives			x
C-8			Antifreeze fluids			x
C-9			Boiler and feed water treatment and test re-agents			x
C-10			De-ioniser regenerating chemicals			x
C-11			Evaporator dosing and descaling acids			x
C-12			Paint stabilizers/rust stabilizers			x
C-13			Solvents/thinners			x
C-14			Paints			x
C-15			Chemical refrigerants			x
C-16			Battery electrolyte			x
C-17			Alcohol, methylated spirits			x
C-18	Gas	Explosives/ inflammables	Acetylene			x
C-19			Propane			x
C-20			Butane			x
C-21			Oxygen			x
C-22		Green House Gases	CO_2			x
C-23			Perfluorocarbons (PFCs)			x
C-24			Methane			x
C-25			Hydrofluorocarbon (HFCs)			x
C-27			Nitrous oxide (N_2O)			x
C-28			Sulfur hexafluoride (SF_6)			x
C-29	Liquid	Oiliness	Bunkers: fuel oil			x
C-30			Grease			x
C-31			Waste oil (sludge)		x	
C-32			Bilge and/or waste water generated by the after-treatment systems fitted on machineries		x	
C-33			Oily liquid cargo tank residues		x	
C-34			Ballast water		x	
C-35			Raw sewage		x	
C-36			Treated sewage		x	
C-37			Non-oily liquid cargo residues		x	
C-38	Gas	Explosibility/ inflammability	Fuel gas			x

No.	Properties	Goods	Inventory		
			Part I	Part II	Part III
C-39	Solid	Dry cargo residues		x	
C-40		Medical waste/infectious waste		x	
C-41		Incinerator ash[14]		x	
C-42		Garbage		x	
C-43		Fuel tank residues		x	
C-44		Oily solid cargo tank residues		x	
C-45		Oily or chemical contaminated rags		x	
C-46		Batteries (incl. lead acid batteries)			x
C-47		Pesticides/insecticide sprays			x
C-48		Extinguishers			x
C-49		Chemical cleaner (incl. electrical equipment cleaner, carbon remover)			x
C-50		Detergent/bleacher (could be a liquid)			x
C-51		Miscellaneous medicines			x
C-52		Fire fighting clothing and Personal protective equipment			x
C-53		Dry tank residues		x	
C-54		Cargo residues		x	
C-55		Spare parts which contain materials listed in Table A or Table B			x

Table D – Regular consumable goods potentially containing hazardous materials*[15]*

No.	Properties	Example	Inventory		
			Part I	Part II	Part III
D-1	Electrical and electronic equipment	Computers, refrigerators, printers, scanners, television sets, radio sets, video cameras, video recorders, telephones, consumer batteries, fluorescent lamps, filament bulbs, lamps			x
D-2	Lighting equipment	Fluorescent lamps, filament bulbs, lamps			x
D-3	Non ship-specific furniture, interior and similar equipment	Chairs, sofas, tables, beds, curtains, carpets, garbage bins, bed-linen, pillows, towels, mattresses, storage racks, decoration, bathroom installations, toys, not structurally relevant or integrated artwork			x

[14] Definition of garbage is identical to that in MARPOL Annex V. However, incinerator ash is classified separately because it may include hazardous substances or heavy metals.

[15] This table does not include ship-specific equipment integral to ship operations, which has to be listed in part I of the inventory.

APPENDIX 2

STANDARD FORMAT OF THE INVENTORY OF HAZARDOUS MATERIALS[16]

Part I

Hazardous materials contained in the ship's structure and equipment

I-1 – Paints and coating systems containing materials listed in table A and table B of appendix 1 of these guidelines

No.	Application of paint	Name of paint	Location	Materials (classification in appendix 1)	Approximate quantity		Remarks
1	Anti-drumming compound	Primer, xx Co., xx primer #300	Hull part	Lead	35.00	kg	
2	Anti-fouling	xx Co., xx coat #100	Underwater parts	TBT	120.00	kg	

16 Examples of how to complete the Inventory are provided for guidance purposes only in accordance with paragraph 3.4 of the Guidelines.

I-2 – Equipment and machinery containing materials listed in table A and table B of appendix 1 of these guidelines

No.	Name of equipment and machinery	Location	Materials (classification in appendix 1)	Parts where used	Approximate quantity		Remarks
1	Switch board	Engine control room	Cadmium	Housing coating	0.02	kg	
			Mercury	Heat gauge	<0.01	kg	less than 0.01kg
2	~~Diesel engine, xx Co., xx #150~~	~~Engine room~~	~~LeadCadmium~~	~~BearingStarter for blower~~	~~0.02~~	~~kg~~	
3	Diesel engine, xx Co., xx #200	Engine-room	Lead	Starter for blower	0.01	kg	Revised by XXX on Oct. XX, 2008 (revoking No.2)
4	Diesel generator (x 3)	Engine-room	Lead	Ingredient of copper compounds	0.01	kg	
5	Radioactive level gauge	No. 1 Cargo tank	Radioactive substances	Gauge	5 (1.8E+11)	Ci (Bq)	Radionuclides: ^{60}Co

I-3 - Structure and hull containing materials listed in table A and table B of appendix 1 of these guidelines

No.	Name of structural element	Location	Materials (classification in appendix 1)	Parts where used	Approximate quantity		Remarks
1	Wall panel	Accommodation	Asbestos	Insulation	2,500.00	kg	
2	Wall insulation	Engine control room	Lead	Perforated plate	0.01	kg	cover for insulation material
			Asbestos	Insulation	25.00	kg	under perforated plates
3							

Part II

Operationally generated waste

No.	Location[1]	Name of item (classification in appendix 1) and detail (if any) of the item	Approximate quantity		Remarks
1	Garbage locker	Garbage (food waste)	35.00	kg	
2	Bilge tank	Bilgewater	15.00	m^3	
3	No.1 cargo hold	Dry cargo residues (iron ore)	110.00	kg	
4	No.2 cargo hold	Waste oil (sludge) (crude)	120.00	kg	
5	No.1 ballast tank	Ballast water	2,500.00	m^3	
		Sediments	250.00	kg	

[1] The location of a part II or part III item should be entered in order based on its location, from a lower level to an upper level and from a fore part to an aft part. The location of part I items is recommended to be described similarly, as far as practicable.

Part III
Stores

III-1 - *Stores*

No.	Location[1]	Name of item (classification in appendix 1)	Unit quantity		Figure		Approximate quantity		Remarks[2)]
								m^3	
								kg	
								kg	
									Details are shown in the attached list.
5	Paint stores	Paint, xx Co., #600	20.00	kg	5	pcs	100.00	kg	Cadmium containing.

1 The location of a part II or part III item should be entered in order based on its location, from a lower level to an upper level and from a fore part to an aft part. The location of part I items is recommended to be described similarly, as far as practicable.

2 In column "Remarks" for part III items, if hazardous materials are integrated in products, the approximate amount of the contents should be shown as far as possible.

III-2 – Liquids sealed in ship's machinery and equipment

No.	Type of liquids (classification in appendix 1)	Name of machinery or equipment	Location	Approximate quantity		Remarks
1	Hydraulic oil	Deck crane hydraulic oil system	Upper deck	15.00	m^3	
		Deck machinery hydraulic oil system	Upper deck and bosun store	200.00	m^3	
		Steering gear hydraulic oil system	Steering gear room	0.55	m^3	
2	Lubricating oil	Main engine system	Engine-room	0.45	m^3	
3	Boiler water treatment	Boiler	Engine-room	0.20	m^3	

III-3 – Gases sealed in ship's machinery and equipment

No.	Type of gases (classification in appendix 1)	Name of machinery or equipment	Location	Approximate quantity		Remarks
1	HFC	AC system	AC room	100.00	kg	
2	HFC	Refrigerated provision chamber machine	AC room	50.00	kg	

III-4 – Regular consumable goods potentially containing hazardous materials

No.	Location[17]	Name of item	Quantity	Remarks
1	Accommodation	Refrigerators	1	
2	Accommodation	Personal computers	2	

[17] The location of a part II or part III item should be entered in order based on its location, from a lower level to an upper level and from a fore part to an aft part. The location of part I items is recommended to be described similarly, as far as practicable.

APPENDIX 3

EXAMPLE OF THE DEVELOPMENT PROCESS FOR PART I OF THE INVENTORY FOR NEW SHIPS

1 OBJECTIVE OF THE TYPICAL EXAMPLE

This example has been developed to give guidance and to facilitate understanding of the development process for part I of the Inventory of Hazardous Materials for new ships.

2 DEVELOPMENT FLOW FOR PART I OF THE INVENTORY

Part I of the Inventory should be developed using the following three steps. However, the order of these steps is flexible and can be changed depending on the schedule of shipbuilding:

.1 collection of hazardous materials information;

.2 utilization of hazardous materials information; and

.3 preparation of the Inventory (by filling out standard format).

3 COLLECTION OF HAZARDOUS MATERIALS INFORMATION

3.1 Data collection process for hazardous materials

Materials Declaration (MD) and Supplier's Declaration of Conformity (SDoC) for products from suppliers (tier 1 suppliers) should be requested and collected by the shipbuilding yard. Tier 1 suppliers may request from their suppliers (tier 2 suppliers) the relevant information if they cannot develop the MD based on the information available. Thus the collection of data on hazardous materials may involve the entire shipbuilding supply chain (figure 1).

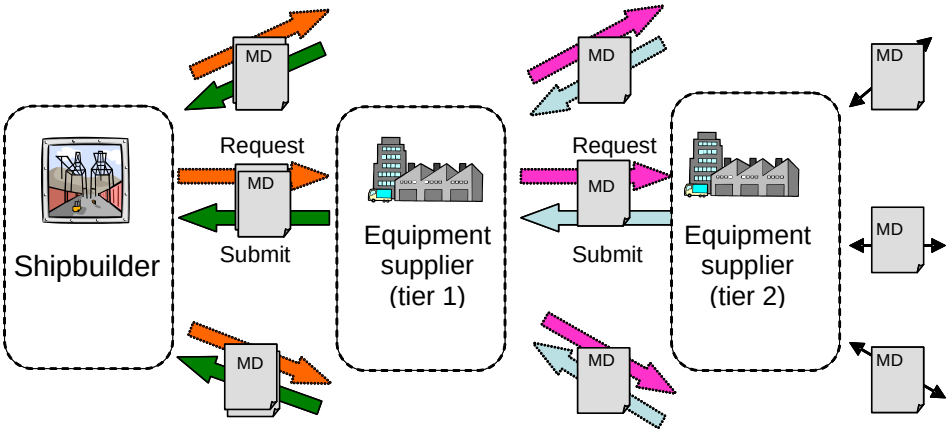


Figure 1 – Process of MD (and SDoC) collection showing involvement of supply chain

3.2 Declaration of hazardous materials

Suppliers should declare whether or not the hazardous materials listed in table A and table B in the MD are present in concentrations above the threshold values specified for each homogeneous material in a product.

3.2.1 *Materials listed in table A*

If one or more materials listed in table A are found to be present in concentrations above the specified threshold value according to the MD, the products which contain these materials shall not be installed on a ship. However, if the materials are used in a product in accordance with an exemption specified by the Convention (e.g. new installations containing hydrochlorofluorocarbons (HCFCs) before 1 January 2020), the product should be listed in the Inventory.

3.2.2 *Materials listed in table B*

If one or more materials listed in table B are found to be present in concentrations above the specified threshold value according to the MD, the products should be listed in the Inventory.

3.3 Example of homogeneous materials

Figure 2 shows an example of four homogeneous materials which constitute a cable. In this case, sheath, intervention, insulator and conductor are all individual homogeneous materials.

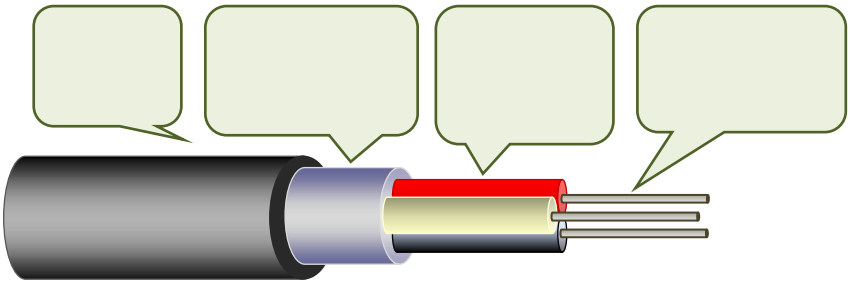


Figure 2 – *Example of homogeneous materials (cable)*

4 UTILIZATION OF HAZARDOUS MATERIALS INFORMATION

Products which contain hazardous materials in concentrations above the specified threshold values should be clearly identified in the MD. The approximate quantity of the hazardous materials should be calculated if the mass data for hazardous materials are declared in the MD using a unit which cannot be directly utilized in the Inventory.

5 PREPARATION OF INVENTORY (BY FILLING OUT STANDARD FORMAT)

The information received for the Inventory, as contained in table A and table B of appendix 1 of these guidelines, ought to be structured and utilized according to the following categorization for part I of the Inventory:

Part I-1 Paints and coating systems;

Part I-2 Equipment and machinery; and

Part I-3 Structure and hull.

5.1 "Name of equipment and machinery" column

5.1.1 *Equipment and machinery*

5.1.1.1 The name of each item of equipment or machinery should be entered in this column. If more than one hazardous material is present in the equipment or machinery, the row relating to that equipment or machinery should be appropriately divided such that all of the hazardous materials contained in the piece of equipment or machinery are entered. If more than one item of equipment or machinery is situated in one location, both name and quantity of the equipment or machinery should be entered in the column. Examples are shown in rows 1 and 2 of table 1.

5.1.1.2 For identical or common items, such as but not limited to bolts, nuts and valves, there is no need to list each item individually (see Bulk Listing in paragraph 3.2 of the guidelines). An example is shown in row 3 of table 1.

Table 1 – Example showing more than one item of equipment or machinery situated in one location

No.	Name of equipment and machinery	Location	Materials (classification in appendix 1)	Parts where used	Approximate quantity		Remarks
1	Main engine	Engine-room	Lead	Piston pin bush	0.75	kg	
			Mercury	Thermometer charge air temperature	0.01	kg	
2	Diesel generator (x 3)	Engine-room	Mercury	Thermometer	0.03	kg	
3	FC valve (x 100)	Througout the ship	Lead and lead compounds		20.5	kg	

5.1.2 *Pipes and cables*

The names of pipes and of systems, including electric cables, which are often situated in more than one compartment of a ship, should be described using the name of the system concerned. A reference to the compartments where these systems are located is not necessary as long as the system is clearly identified and properly named.

5.2 "Approximate quantity" column

The standard unit for approximate quantity of solid hazardous materials should be kg. If the hazardous materials are liquids or gases, the standard unit should be either m^3 or kg. An approximate quantity should be rounded up to at least two significant figures. If the hazardous material is less than 10 g, the description of the quantity should read "<0.01 kg".

Table 2 – Example of a switchboard

No.	Name of equipment and machinery	Location	Materials (classification in appendix 1)	Parts where used	Approximate quantity		Remarks
	Switchboard	Engine control room	Cadmium	Housing coating	0.02	kg	
			Mercury	Heat gauge	<0.01	kg	less than 0.01 kg

5.3 "Location" column

5.3.1 *Example of a location list*

It is recommended to prepare a location list which covers all compartments of a ship based on the ship's plans (e.g. general arrangement, engine-room arrangement, accommodation and tank plan) and on other documentation on board, including certificates or spare parts' lists. The description of the location should be based on a location such as a deck or room to enable easy identification. The name of the location should correspond to the ship's plans so as to ensure consistency between the Inventory and the ship's plans. Examples of names of locations are shown in table 3. For bulk listings, the locations of the items or materials may be generalized. For example, the location may only include the primary classification such as "Throughout the ship" as shown in the table 3 below.

Table 3 – Examples of location names

(A) Primary classification	(B) Secondary classification	(C) Name of location
Throughout the ship		
Hull part	Fore part	Bosun store
		…
	Cargo part	No.1 cargo hold/tank
		No.1 garage deck
		…
	Tank part	Fore peak tank
		No.1 WBT
		No.1 FOT
		…
		Aft Peak Tank
	Aft part	Steering gear room
		Emergency fire pump space
		…
	Superstructure	Accommodation
		Compass deck
		Nav. bridge deck
		…
		Wheel house
		Engine control room
		Cargo control room
		…
	Deck house	Deck house
		…
(A) Primary classification	(B) Secondary classification	(C) Name of location
Machinery part	Engine-room	Engine-room
		Main floor
		2nd floor
		…
		Generator space/room
		Purifier space/room
		Shaft space/room
		Engine casing
		Funnel
		Engine control room
		…
	Pump-room	Pump-room
		…
Exterior part	Superstructure	Superstructure
	Upper deck	Upper deck
	Hull shell	Hull shell
		bottom
		under waterline
		…

5.3.2 *Description of location of pipes and electrical systems*

5.3.2.1 Locations of pipes and systems, including electrical systems and cables situated in more than one compartment of a ship, should be described for each system concerned. If they are situated in a number of compartments, the most practical of the following two options should be used:

.1 listing of all components in the column; or

.2 description of the location of the system using an expression such as those shown under "primary classification" and "secondary classification" in table 3.

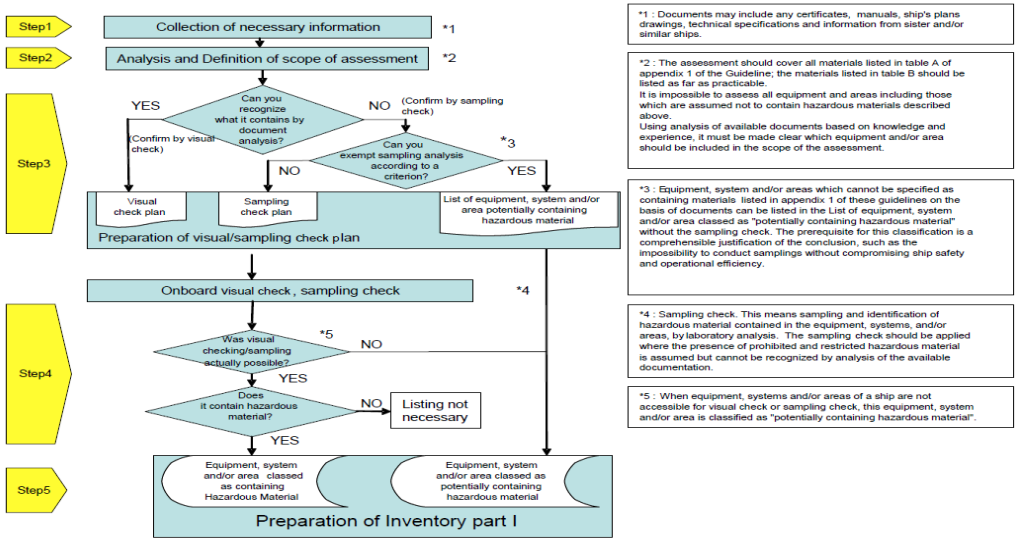
5.3.2.2 A typical description of a pipe system is shown in table 4.

Table 4 – Example of description of a pipe system

No.	Name of equipment and machinery	Location	Materials (classification in appendix 1)	Parts where used	Approximate quantity		Remarks
	Ballast water system	Engine-room, Hold parts					

APPENDIX 4

FLOW DIAGRAM FOR DEVELOPING PART I OF THE INVENTORY FOR EXISTING SHIPS



*1 : Documents may include any certificates, manuals, ship's plans drawings, technical specifications and information from sister and/or similar ships.

*2 : The assessment should cover all materials listed in table A of appendix 1 of the Guideline; the materials listed in table B should be listed as far as practicable.
It is impossible to assess all equipment and areas including those which are assumed not to contain hazardous materials described above.
Using analysis of available documents based on knowledge and experience, it must be made clear which equipment and/or area should be included in the scope of the assessment.

*3 : Equipment, system and/or areas which cannot be specified as containing materials listed in appendix 1 of these guidelines on the basis of documents can be listed in the List of equipment, system and/or area classed as "potentially containing hazardous material" without the sampling check. The prerequisite for this classification is a comprehensible justification of the conclusion, such as the impossibility to conduct samplings without compromising ship safety and operational efficiency.

*4 : Sampling check. This means sampling and identification of hazardous material contained in the equipment, systems, and/or areas, by laboratory analysis. The sampling check should be applied where the presence of prohibited and restricted hazardous material is assumed but cannot be recognized by analysis of the available documentation.

*5 : When equipment, systems and/or areas of a ship are not accessible for visual check or sampling check, this equipment, system and/or area is classified as "potentially containing hazardous material".

APPENDIX 5

EXAMPLE OF THE DEVELOPMENT PROCESS FOR PART I OF THE INVENTORY FOR EXISTING SHIPS

1 INTRODUCTION

1.1 In order to develop part I of the Inventory of Hazardous Materials for existing ships, documents of the individual ship as well as the knowledge and experience of specialist personnel (experts) is required. An example of the development process for part I of the Inventory of Hazardous Materials for existing ships is useful to understand the basic steps as laid out in the guidelines and to ensure a unified application. However, attention should be paid to variations in different types of ships.[18]

1.2 Compilation of part I of the Inventory of Hazardous Material for existing ships involves the following five steps which are described in paragraph 4.2 and appendix 4 of these guidelines.

Step 1: Collection of necessary information;

Step 2: Assessment of collected information;

Step 3: Preparation of visual/sampling check plan;

Step 4: Onboard visual/sampling check; and

Step 5: Preparation of part I of the Inventory and related documentation.

2 STEP 1 – COLLECTION OF NECESSARY INFORMATION

2.1 Sighting of available documents

A practical first step is to collect detailed documents for the ship. The shipowner should try to collate documents normally retained on board the ship or by the shipping company as well as relevant documents that the shipyard, manufacturers, or classification society may have. The following documents should be used when available:

.1 Ship's specification
.2 General Arrangement
.3 Machinery Arrangement
.4 Spare Parts and Tools List
.5 Piping Arrangement
.6 Accommodation Plan
.7 Fire Control Plan
.8 Fire Protection Plan
.9 Insulation Plan (Hull and Machinery)
.10 International Anti-Fouling System Certificate
.11 Related manuals and drawings
.12 Information from other inventories and/or sister or similar ships, machinery, equipment, materials and coatings
.13 Results of previous visual/sampling checks and other analysis

[18] The example of a 28,000 gross tonnage bulk carrier constructed in 1985 is used in this appendix.

2.1.2 If the ship has undergone conversions or major repair work, it is necessary to identify as far as possible the modifications from the initial design and specification of the ship.

2.2 Indicative list

2.2.1 It is impossible to check all equipment, systems, and/or areas on board the ship to determine the presence or absence of hazardous materials. The total number of parts on board may exceed several thousand. In order to take a practical approach, an indicative list should be prepared that identifies the equipment, system, and/or area on board that is presumed to contain hazardous materials. Field interviews with the shipyard and suppliers may be necessary to prepare such lists. A typical example of an indicative list is shown below.

2.2.2 *Materials to be checked and documented*

Hazardous Materials, as identified in appendix 1 of these guidelines, should be listed in part I of the Inventory for existing ships. Appendix 1 of the guidelines contains all the materials concerned. Table A shows those which are required to be listed and table B shows those which should be listed as far as practicable.

2.2.3 *Materials listed in table A*

2.2.3.1 Table A lists the following four materials:

.1 Asbestos
.2 Polychlorinated biphenyls (PCBs)
.3 Ozone depleting substances
.4 Anti-fouling systems containing organotin compounds as a biocide

2.2.3.2 *Asbestos*

Field interviews were conducted with over 200 Japanese shipyards and suppliers regarding the use of asbestos in production. Indicative lists for asbestos developed on the basis of this research are shown below:

Structure and/or equipment	Component
Propeller shafting	Packing with low pressure hydraulic piping flange
	Packing with casing
	Clutch
	Brake lining
	Synthetic stern tubes
Diesel engine	Packing with piping flange
	Lagging material for fuel pipe
	Lagging material for exhaust pipe
	Lagging material turbocharger
Turbine engine	Lagging material for casing
	Packing with flange of piping and valve for steam line, exhaust line and drain line
	Lagging material for piping and valve of steam line, exhaust line and drain line

Structure and/or equipment	**Component**
Structure and/or equipment	Component
Boiler	Insulation in combustion chamber
	Packing for casing door
	Lagging material for exhaust pipe
	Gasket for manhole
	Gasket for hand hole
	Gas shield packing for soot blower and other hole
	Packing with flange of piping and valve for steam line, exhaust line, fuel line and drain line
	Lagging material for piping and valve of steam line, exhaust line, fuel line and drain line
Exhaust gas economizer	Packing for casing door
	Packing with manhole
	Packing with hand hole
	Gas shield packing for soot blower
	Packing with flange of piping and valve for steam line, exhaust line, fuel line and drain line
	Lagging material for piping and valve of steam line, exhaust line, fuel line and drain line
Incinerator	Packing for casing door
	Packing with manhole
	Packing with hand hole
	Lagging material for exhaust pipe
Auxiliary machinery (pump, compressor, oil purifier, crane)	Packing for casing door and valve
	Gland packing
	Brake lining
Heat exchanger	Packing with casing
	Gland packing for valve
	Lagging material and insulation
Valve	Gland packing with valve, sheet packing with piping flange
	Gasket with flange of high pressure and/or high temperature
Pipe, duct	Lagging material and insulation
Tank (fuel tank, hot water, tank, condenser), other equipment (fuel strainer, lubricant oil strainer)	Lagging material and insulation
Electric equipment	Insulation material
Airborne asbestos	Wall, ceiling
Ceiling, floor and wall in accommodation area	Ceiling, floor, wall
Fire door	Packing, construction and insulation of the fire door
Inert gas system	Packing for casing, etc.
Air-conditioning system	Sheet packing, lagging material for piping and flexible joint

Structure and/or equipment	Component
Miscellaneous	Ropes
	Thermal insulating materials
	Fire shields/fire proofing
	Space/duct insulation
	Electrical cable materials
	Brake linings
	Floor tiles/deck underlay
	Steam/water/vent flange gaskets
	Adhesives/mastics/fillers
	Sound damping
	Moulded plastic products
	Sealing putty
	Shaft/valve packing
	Electrical bulkhead penetration packing
	Circuit breaker arc chutes
	Pipe hanger inserts
	Weld shop protectors/burn covers
	Fire-fighting blankets/clothing/equipment
	Concrete ballast

2.2.3.3 *Polychlorinated biphenyl (PCBs)*

Worldwide restriction of PCBs began on 17 May 2004 as a result of the implementation of the Stockholm Convention, which aims to eliminate or restrict the production and use of persistent organic pollutants. In Japan, domestic control began in 1973, with the prohibition of all activities relating to the production, use and import of PCBs. Japanese suppliers can provide accurate information concerning their products. The indicative list of PCBs has been developed as shown below:

Equipment	**Component of equipment**
Transformer	Insulating oil
Condenser	Insulating oil
Fuel heater	Heating medium
Electric cable	Covering, insulating tape
Lubricating oil	
Heat oil	Thermometers, sensors, indicators
Rubber/felt gaskets	
Rubber hose	
Plastic foam insulation	
Thermal insulating materials	
Voltage regulators	
Switches/reclosers/bushings	
Electromagnets	
Adhesives/tapes	
Surface contamination of machinery	
Oil-based paint	
Caulking	
Rubber isolation mounts	
Pipe hangers	

Equipment	Component of equipment
Light ballasts (component within fluorescent light fixtures)	
Plasticizers	
Felt under septum plates on top of hull bottom	

2.2.3.4 *Ozone depleting substances*

The indicative list for ozone depleting substances is shown below. Ozone depleting substances have been controlled according to the Montreal Protocol and MARPOL Convention. Although almost all substances have been banned since 1996, HCFC can still be used until 2020.

Materials	Component of equipment	Period for use of ODS in Japan
CFCs (R11, R12)	Refrigerant for refrigerators	Until 1996
CFCs	Urethane formed material	Until 1996
	Blowing agent for insulation of LNG carriers	Until 1996
Halons	Extinguishing agent	Until 1994
Other fully halogenated CFCs	The possibility of usage in ships is low	Until 1996
Carbon tetrachloride	The possibility of usage in ships is low	Until 1996
1,1,1-Trichloroethane (methyl chloroform)	The possibility of usage in ships is low	Until 1996
HCFC (R22, R141b)	Refrigerant for refrigerating machine	It is possible to use it until 2020
HBFC	The possibility of usage in ships is low	Until 1996
Methyl bromide	The possibility of usage in ships is low	Until 2005

2.2.3.5 *Organotin compounds*

Organotin compounds include tributyl tins (TBT), triphenyl tins (TPT) and tributyl tin oxide (TBTO). Organotin compounds have been used as anti-fouling paint on ships' bottoms and the International Convention on the Control of Harmful Anti-Fouling Systems on Ships (AFS Convention) stipulates that all ships shall not apply or re-apply organotin compounds after 1 January 2003, and that, after 1 January 2008, all ships shall either not bear such compounds on their hulls or shall bear a coating that forms a barrier preventing such compounds from leaching into the sea. The above-mentioned dates may have been extended by permission of the Administration bearing in mind that the AFS Convention entered into force on 17 September 2008.

2.2.3.6 *Cybutryne*

Cybutryne has been used as biocide in anti-fouling system and the International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention, as amended) stipulates that all ships shall not apply or re-apply cybutryne after 1 January 2023, and that ships bearing an anti-fouling system that contains this substance in the external coating layer of their hulls or external parts or surfaces on 1 January 2023 shall either remove the anti-fouling system or apply a coating that forms a barrier to this substance leaching from the underlying non-compliant anti-fouling system at the next scheduled renewal of the anti-fouling system after 1 January 2023, but no later than 60 months following the last application to the ship of an anti-fouling system containing cybutryne.

2.2.4 *Materials listed in table B*

For existing ships it is not obligatory for materials listed in table B to be listed in part I of the Inventory. However, if they can be identified in a practical way, they should be listed in the Inventory, because the information will be used to support ship recycling processes. The Indicative list of materials listed in table B is shown below:

Materials	Component of equipment
Cadmium and cadmium compounds	Plating film, bearing
Hexavalent chromium compounds	Plating film
Mercury and mercury compounds	Fluorescent light, mercury lamp, mercury cell, liquid-level switch, gyro compass, thermometer, measuring tool, manganese cell, pressure sensors, light fittings, electrical switches, fire detectors
Lead and lead compounds	Corrosion resistant primer, solder (almost all electric appliances contain solder), paints, preservative coatings, cable insulation, lead ballast, generators
Polybrominated biphenyls (PBBs)	Non-flammable plastics
Polybrominated diphenyl ethers (PBDE)	Non-flammable plastics
Polychlorinated naphthalenes	Paint, lubricating oil
Radioactive substances	Refer to appendix 10
Certain shortchain chlorinated paraffins	Non-flammable plastics

3 STEP 2 – ASSESSMENT OF COLLECTED INFORMATION

Preparation of a checklist is an efficient method for developing the Inventory for existing ships in order to clarify the results of each step. Based on collected information including the indicative list mentioned in step 1, all equipment, systems, and/or areas on board assumed to contain hazardous materials listed in tables A and B should be included in the checklist. Each listed equipment, system, and/or area on board should be analysed and assessed for its hazardous materials content.

The existence and volume of hazardous materials may be judged and calculated from the Spare parts and tools list and the maker's drawings. The existence of asbestos contained in floors, ceilings and walls may be identified from Fire Protection Plans, while the existence of TBT in coatings can be identified from the International Anti-Fouling System Certificate, Coating scheme and the History of Paint.

Example of weight calculation

No.	Hazardous Materials	Location/equipment/ component	Reference	Calculation
1.1-2	TBT	Flat bottom/paint	History of coatings	
1.2-1	Asbestos	Main engine/ exh. pipe packing	Spare parts and tools list	250 g x 14 sheet = 3.50 kg
1.2-3	HCFC	Ref. provision plant	Maker's drawings	20 kg x 1 cylinder = 20 kg
1.2-4	Lead	Batteries	Maker's drawings	6kg x 16 unit = 96 kg
1.3-1	Asbestos	Engine-room ceiling	Accommodation plan	

When a component or coating is determined to contain hazardous materials, a "Y" should be entered in the column for "Result of document analysis" in the checklist, to denote "Contained". Likewise, when an item is determined not to contain Hazardous Materials, the entry "N" should be made in the column to denote "Not contained". When a determination cannot be made as to the hazardous materials content, the column should be completed with the entry "Unknown".

Checklist (step 2)

Analysis and definition of scope of assessment for "Sample Ship"

No.	Table A/B	Hazardous materials *1	Location	Name of equipment	Component	Quantity			Manufacturer/brand name	Result of documents analysis *2	Procedure of check *3	Result of check *4	Reference/DWG No.
						Unit (kg)	No.	Total (kg)					
[Inventory part I-1.1]													
1	A	TBT	Top side	Painting and coating	A/F Paints			NIL	Paints Co./marine P1000	N			・On Aug., 200X, Sealer Coat applied to all over submerged area before tin-free coating.
2	A	TBT	Flat Bottom				3000m²		Unknown AF	Unknown			
[Inventory part I-1.2]													
1	A	Asbestos	Lower deck	Main engine	Exh. pipe packing	0.25	14		Diesel Co.	Y			M-100
2	A	Asbestos	3rd deck	Aux.boiler	Lagging		12		Unknown lagging	Unknown			M-300
3	A	Asbestos	Engine room	Piping/flange	Packing					PCHM			
4	A	HCFC	2nd deck	Ref. provision plant	Refrigerant(R22)	20.00	1		Reito Co.	Y			Maker's dwg
5	B	Lead	Nav. Br. deck	Batteries		6	16		Denchi Co.	Y			E-300
[Inventory part I-1.3]													
1	A	Asbestos	Upper deck	Back deck ceilings	Engine room ceiling		20m²		Unknown ceiling	Unknown			O-25

Notes

*1 Hazardous materirials: material classification

*2 Result of documents analysis: Y=Contained, N=Not contained, Unknown, PCHM=Potentially containing hazardous material

*3 Procedure of Check:. V=Visual check, S=Sampling check

*4 Result of Check: Y=Contained, N=Not contained, PCHM=Potentially containing hazardous material

4 STEP 3 – PREPARATION OF VISUAL/SAMPLING CHECK PLAN

4.1 Each item classified as "Contained" or "Not contained" in step 2 should be subjected to a visual check on board, and the entry "V" should be made in the "Check procedure" column to denote "Visual check".

4.2 For each item categorized as "unknown", a decision should be made as to whether to apply a sampling check. However, any item categorized as "unknown" may be classed as "potentially containing hazardous material" provided comprehensive justification is given, or if it can be assumed that there will be little or no effect on disassembly as a unit and later ship recycling and disposal operations. For example, in the following checklist, in order to carry out a sampling check for "Packing with aux. boiler" the shipowner needs to disassemble the auxiliary boiler in a repair yard. The costs of this check are significantly higher than the later disposal costs at a ship recycling facility. In this case, therefore, the classification as "potentially containing hazardous material" is justifiable.

Checklist (step 3)

Analysis and definition of scope of assessment for "Sample Ship"

No.	Table A/B	Hazardous materials *1	Location	Name of equipment	Component	Quantity			Manufacturer/brand name	Result of documents analysis *2	Procedure of check *3	Result of check *4	Reference/DWG No.
						Unit (kg)	No.	Total (kg)					
[Inventory part I-1.1]													
1	A	TBT	Top side	Painting & Coating	A/F Paints			NIL	Paints Co./marine P1000	N	V		・On Aug., 200X, Sealer Coat applied to all over submerged area before tin-free coating.
2	A	TBT	Flat bottom				3000m^2		Unknown AF	Unknown	S		
[Inventory Part I-1.2]													
1	A	Asbestos	Lower deck	Main engine	Exh. pipe packing	0.25	14		Diesel Co.	Y	V		M-100
2	A	Asbestos	3rd deck	Aux.boiler	Lagging		12		Unknown lagging	Unknown	S		M-300
3	A	Asbestos	Engine room	Piping/flange	Packing					PCHM	V		
4	A	HCFC	2nd deck	Ref. provision plant	Refrigerant(R22)	20.00	1		Reito Co.	Y	V		Maker's dwg
5	B	Lead	Nav. Br. deck	Batteries		6	16		Denchi Co.	Y	V		E-300
[Inventory Part I-1.3]													
1	A	Asbestos	Upper deck	Back deck ceilings	Engine room ceiling		20m^2		Unknown ceiling	Unknown	S		O-25

Notes

*1 Hazardous materirials: material classification

*2 Result of documents analysis: Y=Contained, N=Not contained, Unknown, PCHM=Potentially containing hazardous material

*3 Procedure of check:. V=Visual check, S=Sampling check

*4 Result of check: Y=Contained, N=Not contained, PCHM=Potentially containing hazardous material

4.3 Before any visual/sampling check on board is conducted, a "visual/sampling check plan" should be prepared. An example of such a plan is shown below.

4.4 To prevent any incidents during the visual/sampling check, a schedule should be established to eliminate interference with other ongoing work on board. To prevent potential exposure to Hazardous Materials during the visual/sampling check, safety precautions should be in place on board. For example, sampling of potential asbestos containing materials could release fibres into the atmosphere. Therefore, appropriate personnel safety and containment procedures should be implemented prior to sampling.

4.5 Items listed in the visual/sampling check should be arranged in sequence so that the onboard check is conducted in a structured manner (e.g. from a lower level to an upper level and from a fore part to an aft part).

Example of visual/sampling check plan

Name of ship	XXXXXXXXXX
IMO Number	XXXXXXXXXX
Gross Tonnage	28,000 GT
L x B x D	xxx.xx × xx.xx × xx.xx m
Date of delivery	dd.mm.1987
Shipowner	XXXXXXXXXX
Contact point (Address, Telephone, Fax, Email)	XXXXXXXXXX Tel: XXXX-XXXX Fax: XXXX-XXXX Email: abcdefg@hijk.co.net
Check schedule	Visual check： dd, mm, 20XX Sampling check：dd, mm, 20XX
Site of check	XX shipyard, No. Dock
In charge of check	XXXX XXXX
Check engineer	XXXX XXXX, YYYY YYYY, ZZZZ ZZZZ
Sampling engineer	Person with specialized knowledge of sampling
Sampling method and anti-scattering measure for asbestos	Wet the sampling location prior to cutting and allow it to harden after cutting to prevent scatter. Notes: Workers performing sampling activities shall wear protective equipment.
Sampling of fragments of paints	Paints suspected to contain TBT should be collected and analysed from load line, directly under bilge keel and flat bottom near amidships.
Laboratory	QQQQ QQQQ
Chemical analysis method	Method by ISO/DIS 22262-1 Bulk materials – Part 1: Sampling and qualitative determination of asbestos in commercial bulk materials and ISO/CD 22262-2 Bulk materials – Part 2: Quantitative determination of asbestos by gravimetric and microscopic methods. ICP Luminous analysis (TBT)
Location of visual/sampling check	Refer to lists for visual/sampling check

Listing for equipment, system and/or area for visual check
See attached "Analysis and definition of scope of investigation for sample ship"

List of equipment, system and/or area for sampling check				
Location	**Equipment, machinery and/or zone**	**Name of parts**	**Materials**	**Result of doc. checking**
Upper Deck	Back deck ceilings	Engine-room ceiling	Asbestos	Unknown
Engine-room	Exhaust gas pipe	Insulation	Asbestos	Unknown
Engine-room	Pipe/flange	Gasket	Asbestos	Unknown
Refer to attached "Analysis and definition of scope of investigation for sample ship" and "Location plan of hazardous materials for sample ship"				

List of equipment, system and/or area classed as PCHM				
Location	**Equipment, machinery and/or zone**	**Name of part**	**Material**	**Result of doc. checking**
Floor	Propeller cap	Gasket	Asbestos	PCHM
Engine-room	Air operated shut-off valve	Gland packing	Asbestos	PCHM
Refer to attached "Analysis and definition of scope of investigation for sample ship" and "Location plan of hazardous materials for sample ship"				

This plan is established in accordance with the guidelines for the development of the Inventory of Hazardous Materials

・Document check・date/place：
dd, mm, 20XX at XX Lines Co. Ltd.

・Preparation date of plan：dd. mm, 20XX

5 STEP 4 – ONBOARD VISUAL/SAMPLING CHECK

5.1 The visual/sampling check should be conducted according to the plan. Check points should be marked in the ship's plan or recorded with photographs.

5.2 A person taking samples should be protected by the appropriate safety equipment relevant to the suspected type of hazardous materials encountered. Appropriate safety precautions should also be in place for passengers, crewmembers and other persons on board, to minimize the potential exposure to hazardous materials. Safety precautions could include the posting of signs or other verbal or written notification for personnel to avoid such areas during sampling. The personnel taking samples should ensure compliance with relevant national regulations.

5.3 The results of visual/sampling checks should be recorded in the checklist. Any equipment, systems and/or areas of the ship that cannot be accessed for checks should be classified as "potentially containing hazardous material". In this case, the entry in the "Result of check" column should be "PCHM".

6 STEP 5 – PREPARATION OF PART I OF THE INVENTORY AND RELATED DOCUMENTATION

6.1 *Development of part I of the Inventory*

The results of the check and the estimated quantity of hazardous materials should be recorded on the checklist. Part I of the Inventory should be developed with reference to the checklist.

6.2 *Development of location diagram of hazardous materials*

With respect to part I of the Inventory, the development of a location diagram of hazardous materials is recommended in order to help the ship recycling facility gain a visual understanding of the Inventory.

Checklist (step 4 and step 5)

Analysis and definition of scope of assessment for "Sample Ship"

No.	Table A/B	Hazardous materials *1	Location	Name of equipment	Component	Quantity			Manufacturer/brand name	Result of documents analysis *2	Procedure of check *3	Result of check *4	Reference/DWG No.
						Unit (kg)	No.	Total (kg)					
[Inventory part I-1.1]													
1	A	TBT	Top side	Painting & Coating	A/F Paints			NIL	Paints Co./marine P1000	N	V	N	・On Aug., 200X, Sealer Coat applied to all over submerged area before tin-free coating.
2	A	TBT	Flat Bottom			0.02	3000m^2	60.00	Unknown AF	Unknown	S	Y	
[Inventory part I-1.2]													
1	A	Asbestos	Lower deck	Main engine	Exh. pipe packing	0.25	14	3.50	Diesel Co.	Y	V	Y	M-100
2	A	Asbestos	3rd deck	Aux. boiler	Lagging		12		Unknown lagging	Unknown	S	N	M-300
3	A	Asbestos	Engine room	Piping/flange	Packing					PCHM	V	PCHM	
4	A	HCFC	2nd deck	Ref. provision plant	Refrigerant(R22)	20.00	1	20.00	Reito Co.	Y	V	Y	Maker's dwg
5	B	Lead	Nav. Br. deck	Batteries		6	16	96.00	Denchi Co.	Y	V	Y	E-300
[Inventory part I-1.3]													
1	A	Asbestos	Upp.deck	Back deck ceilings	Engine room ceiling	0.19	20m^2	3.80	Unknown ceiling	Unknown	S	Y	O-25

Notes

*1 Hazardous materirials: material classification

*2 Result of documents analysis: Y=Contained, N=Not contained, Unknown, PCHM=Potentially containing hazardous material

*3 Procedure of check:. V=Visual check, S=Sampling check

*4 Result of check: Y=Contained, N=Not contained, PCHM=Potentially containing hazardous material

Example of the Inventory for existing ships

Inventory of Hazardous Materials for "Sample Ship"

Particulars of the "Sample Ship"

Distinctive number or letters	XXXXNNN
Port of registry	Port of World
Type of vessel	Bulk carrier
Gross Tonnage	28,000 GT
IMO number	NNNNNNN
Name of shipbuilder	xx Shipbuilding Co. Ltd
Name of shipowner	yy Maritime SA
Date of delivery	MM/DD/1988

This inventory was developed in accordance with the guidelines for the development of the Inventory of Hazardous Materials.

Attachment:

1: Inventory of Hazardous Materials

2: Assessment of collected information

3: Location diagram of Hazardous Materials

Prepared by XYZ (Name & address) (dd/mm/20XX)

Inventory of Hazardous Materials: "Sample Ship"

Part I – *hazardous materials contained in the ship's structure and equipment*

I-1 Paints and coating systems containing materials listed in Table A and Table B of appendix 1 of the guidelines

No.	Application of paint	Name of paint	Location*	Materials (classification in appendix 1)	Approximate quantity		Remarks
1	AF paint	Unknown paints	Flat bottom	TBT	60.00	kg	Confirmed by sampling
2							
3							

I-2 Equipment and machinery containing materials listed in Table A and Table B of appendix 1 of the guidelines

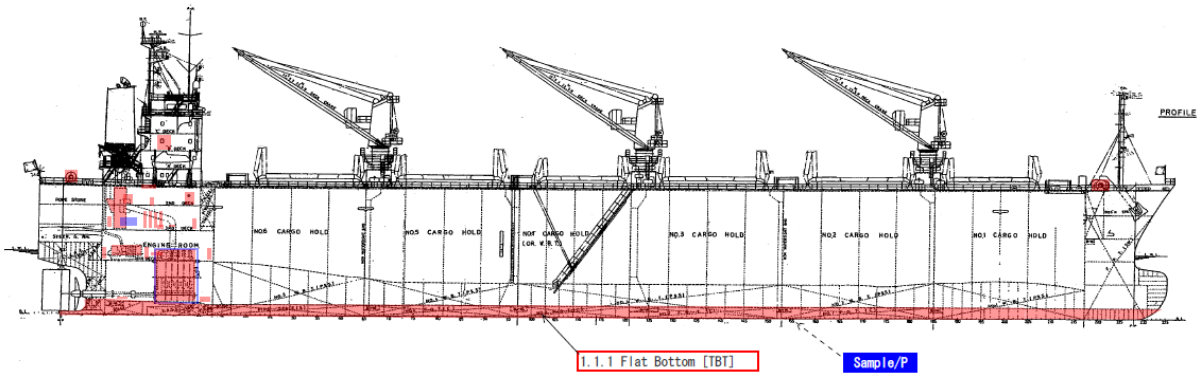
No.	Name of equipment and machinery	Location *1	Materials (classification in appendix 1)	Parts where used	Approximate quantity		Remarks
1	Main engine	Lower floor	Asbestos	Exh. pipe packing	3.50	kg	
2	Aux. boiler	3rd deck	Asbestos	Unknown packing	10.00	kg	PCHM (potentially containing Hazardous Material)
3	Piping/flange	Engine-room	Asbestos	Packing	50.00	kg	PCHM
4	Ref. provision plant	2nd deck	HCFC	Refrigerant (R22)	20.00	kg	
5	Batteries	Navig. Bridge deck	Lead		96.00	kg	

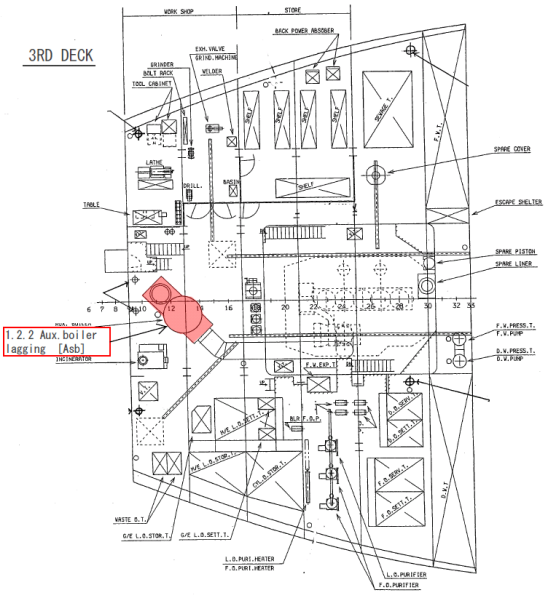
I-3 Structure and hull containing materials listed in Table A and Table B of appendix 1 of the guidelines

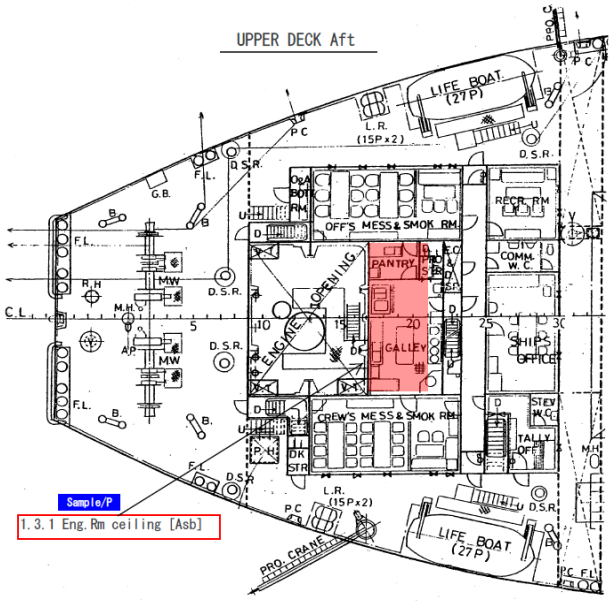
No.	Name of structural element	Location *1	Materials (classification in appendix 1)	Parts where used	Approximate quantity		Remarks
1	Back deck ceiling	Upper deck	Asbestos	Engine-room ceiling (A class)	3.80	kg	Confirmed by sampling
2							
3							

* Each item should be entered in order based on its location, from a lower level to an upper level and from a fore part to an aft part.

Example of location diagram of hazardous materials







APPENDIX 6

FORM OF MATERIAL DECLARATION

<Date of declaration>

Date	

<MD ID number>

MD- ID-No.	

<Other information>

Remark 1	
Remark 2	
Remark 3	

<Supplier (respondent) information>

Company name	
Division name	
Address	
Contact person	
Telephone number	
Fax number	
Email address	
SDoC ID no.	

<Product information>

Product name	Product number	Delivered unit			Product information
		Amount	Unit		

<Materials information>

This materials information shows the amount of hazardous materials contained in 1 (unit: piece, kg, m, m^2, m^3, etc.) of the product.

	Unit
1	

Table	Material name		Threshold value	Present above threshold value	If yes, material mass		If yes, information on where it is used
				Yes / No	Mass	Unit	
Table A (materials listed in appendix 1 of the Convention)	Asbestos	Asbestos	0.1%[19]				
	Polychlorinated biphenyls (PCBs)	Polychlorinated biphenyls (PCBs)	50 mg/kg				
	Ozone depleting substance	Chlorofluorocaobons (CFCs)	no threshold value				
		Halons					
		Other fully halogenated CFCs					
		Carbon tetrachloride					
		1,1,1-Trichloroethane					
		Hydrochlorofluorocaobons					
		Hydrobromofluorocaobons					
		Methyl bromide					
		Bromochloromethane					
	Anti-fouling systems containing organotin compounds as a biocide		2,500 mg total tin/kg				
	Anti-fouling systems		1,000 mg/kg[20]				

19 In accordance with regulation 4 of the Convention, for all ships, new installation of materials which contain asbestos shall be prohibited. According to the UN recommendation "Globally Harmonized System of Classification and Labelling of Chemicals (GHS)" adopted by the United Nations Economic and Social Council's Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals (UNSCEGHS), the UN'S Sub-Committee of Experts, in 2002 (published in 2003), carcinogenic mixtures classified as Category 1A (including asbestos mixtures) under the GHS are required to be labelled as carcinogenic if the ratio is more than 0.1%. However, if 1% is applied, this threshold value should be recorded in the Inventory and, if available, the Material Declaration and can be applied not later than five years after the entry into force of the Convention. The threshold value of 0.1% need not be retroactively applied to those Inventories and Material Declarations.

20 When samples are directly taken from the hull, average values of cybutryne should not be present above 1,000 mg of cybutryne per kilogram of dry paint.

	containing cybutryne						

Table	Material name	Threshold value	Present above threshold value	If yes, material mass		If yes, information on where it is used
			Yes / No	Mass	Unit	
Table B (materials listed in appendix 2 of the Convention)	Cadmium and cadmium compounds	100 mg/kg				
	Hexavalent chromium and hexavalent chromium compounds	1,000 mg/kg				
	Lead and lead compounds	1,000 mg/kg				
	Mercury and mercury compounds	1,000 mg/kg				
	Polybrominated biphenyl (PBBs)	50 mg/kg				
	Polybrominated dephenyl ethers (PBDEs)	1,000 mg/kg				
	Polychloronaphthalenes (Cl >= 3)	50 mg/kg				
	Radioactive substances	no threshold value				
	Certain shortchain chlorinated paraffins	1%				

APPENDIX 7

FORM OF SUPPLIER'S DECLARATION OF CONFORMITY

SUPPLIER'S DECLARATION OF CONFORMITY FOR MATERIAL DECLARATION MANAGEMENT

1 Identification number _____

2 Issuer's name _____

Issuer's address _____

3 Object(s) of the declaration _____

_____

_____

4 The object(s) of the declaration described above is in conformity with the following documents :

	Document No.	Title	Edition/date of issue
5	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

6 Additional information _____

_____

Signed for and on behalf of

_____

_____

(place and date of issue)

7 _____ _____

(name, function) *(signature)*

APPENDIX 8

EXAMPLES OF TABLE A AND TABLE B MATERIALS OF APPENDIX 1 WITH CAS NUMBERS

This list was developed with reference to Joint Industry Guide No.101. This list is not exhaustive; it represents examples of chemicals with known CAS numbers and may require periodical updating.

Table	Material Category	Substances	CAS Numbers
Table A (materials listed in appendix 1 of the Convention)	Asbestos	Asbestos	1332-21-4
		Actinolite	77536-66-4
		Amosite (Grunerite)	12172-73-5
		Anthophyllite	77536-67-5
		Chrysotile	12001-29-5
		Crocidolite	12001-28-4
		Tremolite	77536-68-6
	Polychlorinated biphenyls (PCBs)	Polychlorinated biphenyls	1336-36-3
		Aroclor	12767-79-2
		Chlorodiphenyl (Aroclor 1260)	11096-82-5
		Kanechlor 500	27323-18-8
		Aroclor 1254	11097-69-1
	Ozone depleting substances/ isomers (they may contain isomers that are not listed here)	Trichlorofluoromethane (CFC11)	75-69-4
		Dichlorodifluoromethane (CFC12)	75-71-8
		Chlorotrifluoromethane (CFC 13)	75-72-9
		Pentachlorofluoroethane (CFC 111)	354-56-3
		Tetrachlorodifluoroethane (CFC 112)	76-12-0
		Trichlorotrifluoroethane (CFC 113)	354-58-5
		1,1,2 Trichloro-1,2,2 trifluoroethane	76-13-1
		Dichlorotetrafluoroethane (CFC 114)	76-14-2
		Monochloropentafluoroethane (CFC 115)	76-15-3
		Heptachlorofluoropropane (CFC 211)	422-78-6
			135401-87-5
		Hexachlorodifluoropropane (CFC 212)	3182-26-1
		Pentachlorotrifluoropropane (CFC 213)	2354-06-5
			134237-31-3
		Tetrachlorotetrafluoropropane (CFC 214) 1,1,1,3-Tetrachlorotetrafluoropropane	29255-31-0 2268-46-4
		Trichloropentafluoropropane (CFC 215) 1,1,1-Trichloropentafluoropropane 1,2,3-Trichloropentafluoropropane	1599-41-3 4259-43-2 76-17-5
		Dichlorohexafluoropropane (CFC 216)	661-97-2
		Monochloroheptafluoropropane (CFC 217)	422-86-6
		Bromochlorodifluoromethane (Halon 1211)	353-59-3
		Bromotrifluoromethane (Halon 1301)	75-63-8
		Dibromotetrafluoroethane (Halon 2402)	124-73-2
		Carbon tetrachloride (Tetrachloromethane)	56-23-5
		1,1,1, - Trichloroethane (methyl chloroform) and its isomers except 1,1,2-trichloroethane	71-55-6
		Bromomethane (Methyl bromide)	74-83-9
		Bromodifluoromethane and isomers (HBFC's)	1511-62-2
		Dichlorofluoromethane (HCFC 21)	75-43-4
		Chlorodifluoromethane (HCFC 22)	75-45-6
		Chlorofluoromethane (HCFC 31)	593-70-4

Table	Material Category	Substances	CAS Numbers
		Tetrachlorofluoroethane (121) HCFC	134237-32-4
		1,1,1,2-tetrachloro-2-fluoroethane (HCFC 121a)	354-11-0
		1,1,2,2-tetracloro-1-fluoroethane	354-14-3
		Trichlorodifluoroethane (HCFC 122)	41834-16-6
		1,2,2-trichloro-1,1-difluoroethane	354-21-2
		Dichlorotrifluoroethane(HCFC 123)	34077-87-7
		Dichloro-1,1,2-trifluoroethane	90454-18-5
		2,2-dichloro-1,1,1-trifluroethane	306-83-2
		1,2-dichloro-1,1,2-trifluroethane (HCFC-123a)	354-23-4
		1,1-dichloro-1,2,2-trifluroethane (HCFC-123b)	812-04-4
		2,2-dichloro-1,1,2-trifluroethane (HCFC-123b)	812-04-4
		Chlorotetrafluoroethane (HCFC 124)	63938-10-3
		2-chloro-1,1,1,2-tetrafluoroethane	2837-89-0
		1-chloro-1,1,2,2-tetrafluoroethane (HCFC 124a)	354-25-6
		Trichlorofluoroethane (HCFC 131)	27154-33-2; (134237-34-6)
		1-Fluoro-1,2,2-trichloroethane	359-28-4
		1,1,1-trichloro-2-fluoroethane (HCFC131b)	811-95-0
		Dichlorodifluoroethane (HCFC 132)	25915-78-0
		1,2-dichloro-1,1-difluoroethane (HCFC 132b)	1649-08-7
		1,1-dichloro-1,2-difluoroethane (HFCF 132c)	1842-05-3
		1,1-dichloro-2,2-difluoroethane	471-43-2
		1,2-dichloro-1,2-difluoroethane	431-06-1
		Chlorotrifluoroethane (HCFC 133)	1330-45-6
		1-chloro-1,2,2-trifluoroethane	1330-45-6
		2-chloro-1,1,1-trifluoroethane (HCFC-133a)	75-88-7
		Dichlorofluoroethane(HCFC 141)	1717-00-6; (25167-88-8)
		1,1-dichloro-1-fluoroethane (HCFC-141b)	1717-00-6
		1,2-dichloro-1-fluoroethane	430-57-9
		Chlorodifluoroethane (HCFC 142)	25497-29-4
		1-chloro-1,1-difluoroethane (HCFC142b)	75-68-3
		1-chloro-1,2-difluoroethane (HCFC142a)	25497-29-4
		Hexachlorofluoropropane (HCFC 221)	134237-35-7
		Pentachlorodifluoropropane (HCFC 222)	134237-36-8
		Tetrachlorotrifluropropane (HCFC 223)	134237-37-9
		Trichlorotetrafluoropropane (HCFC 224)	134237-38-0
		Dichloropentafluoropropane, (Ethyne, fluoro-) (HCFC 225)	127564-92-5; (2713-09-9)
		2,2-Dichloro-1,1,1,3,3-pentafluoropropane(HCFC 225aa)	128903-21-9
		2,3-Dichloro-1,1,1,2,3-pentafluoropropane (HCFC 225ba)	422-48-0
		1,2-Dichloro-1,1,2,3,3-pentafluoropropane (HCFC 225bb)	422-44-6
		3,3-Dichloro-1,1,1,2,2-pentafluoropropane (HCFC 225ca)	422-56-0
		1,3-Dichloro-1,1,2,2,3-pentafluoropropane (HCFC 225cb)	507-55-1
		1,1-Dichloro-1,2,2,3,3-pentafluoropropane(HCFC 225cc)	13474-88-9
		1,2-Dichloro-1,1,3,3,3-pentafluoropropane (HCFC 225da)	431-86-7
		1,3-Dichloro-1,1,2,3,3-pentafluoropropane (HCFC 225ea)	136013-79-1
		1,1-Dichloro-1,2,3,3,3-pentafluoropropane(HCFC 225eb)	111512-56-2
		Chlorohexafluoropropane (HCFC 226)	134308-72-8
		Pentachlorofluoropropane (HCFC 231)	134190-48-0
		Tetrachlorodifluoropropane (HCFC 232)	134237-39-1
		Trichlorotrifluoropropane (HCFC 233)	134237-40-4
		1,1,1-Trichloro-3,3,3-trifluoropropane	7125-83-9
		Dichlorotetrafluoropropane (HCFC 234)	127564-83-4
		Chloropentafluoropropane (HCFC 235)	134237-41-5
		1-Chloro-1,1,3,3,3-pentafluoropropane	460-92-4
		Tetrachlorofluoropropane (HCFC 241)	134190-49-1
		Trichlorodifluoropropane (HCFC 242)	134237-42-6
		Dichlorotrifluoropropane (HCFC 243)	134237-43-7
		1,1-dichloro-1,2,2-trifluoropropane	7125-99-7
		2,3-dichloro-1,1,1-trifluoropropane	338-75-0
		3,3-Dichloro-1,1,1-trifluoropropane	460-69-5

Table	Material Category	Substances	CAS Numbers
		Chlorotetrafluoropropane (HCFC 244)	134190-50-4
		3-chloro-1,1,2,2-tetrafluoropropane	679-85-6
		Trichlorofluoropropane (HCFC 251)	134190-51-5
		1,1,3-trichloro-1-fluoropropane	818-99-5
		Dichlorodifluoropropane (HCFC 252)	134190-52-6
		Chlorotrifluoropropane (HCFC 253)	134237-44-8
		3-chloro-1,1,1-trifluoropropane (HCFC 253fb)	460-35-5
		Dichlorofluoropropane (HCFC 261)	134237-45-9
		1,1-dichloro-1-fluoropropane	7799-56-6
		Chlorodifluoropropane (HCFC 262)	134190-53-7
		2-chloro-1,3-difluoropropane	102738-79-4
		Chlorofluoropropane (HCFC 271)	134190-54-8
		2-chloro-2-fluoropropane	420-44-0
	Organotin compounds (tributyl tin, triphenyl tin, tributyl tin oxide)	Bis(tri-n-butyltin) oxide	56-35-9
		Triphenyltin N,N'-dimethyldithiocarbamate	1803-12-9
		Triphenyltin fluoride	379-52-2
		Triphenyltin acetate	900-95-8
		Triphenyltin chloride	639-58-7
		Triphenyltin hydroxide	76-87-9
		Triphenyltin fatty acid salts (C=9-11)	47672-31-1
		Triphenyltin chloroacetate	7094-94-2
		Tributyltin methacrylate	2155-70-6
		Bis(tributyltin) fumarate	6454-35-9
		Tributyltin fluoride	1983-10-4
		Bis(tributyltin) 2,3-dibromosuccinate	31732-71-5
		Tributyltin acetate	56-36-0
		Tributyltin laurate	3090-36-6
		Bis(tributyltin) phthalate	4782-29-0
		Copolymer of alkyl acrylate, methyl methacrylate and tributyltin methacrylate(alkyl; C=8)	-
		Tributyltin sulfamate	6517-25-5
		Bis(tributyltin) maleate	14275-57-1
		Tributyltin chloride	1461-22-9
		Mixture of tributyltin cyclopentanecarboxylate and its analogs (Tributyltin naphthenate)	-
		Mixture of tributyltin 1,2,3,4,4a, 4b, 5,6,10,10adecahydro-7-isopropyl-1, 4a-dimethyl-1-phenanthlenecarboxylate and its analogs (Tributyltin rosin salt)	-
		Other tributyl tins & triphenyl tins	-
	Anti-fouling systems containing cybutryne	Cybutryne	28159-98-0
Table B (Materials listed in appendix 2 of the Convention)	Cadmium/ cadmium compounds	Cadmium	7440-43-9
		Cadmium oxide	1306-19-0
		Cadmium sulfide	1306-23-6
		Cadmium chloride	10108-64-2
		Cadmium sulfate	10124-36-4
		Other cadmium compounds	-
	Chromium VI compounds	Chromium (VI) oxide	1333-82-0
		Barium chromate	10294-40-3
		Calcium chromate	13765-19-0
		Chromium trioxide	1333-82-0
		Lead (II) chromate	7758-97-6
		Sodium chromate	7775-11-3
		Sodium dichromate	10588-01-9
		Strontium chromate	7789-06-2
		Potassium dichromate	7778-50-9
		Potassium chromate	7789-00-6

Table	Material Category	Substances	CAS Numbers
		Zinc chromate	13530-65-9
		Other hexavalent chromium compounds	-
	Lead/lead compounds	Lead	7439-92-1
		Lead (II) sulfate	7446-14-2
		Lead (II) carbonate	598-63-0
		Lead hydrocarbonate	1319-46-6
		Lead acetate	301-04-2
		Lead (II) acetate, trihydrate	6080-56-4
		Lead phosphate	7446-27-7
		Lead selenide	12069-00-0
		Lead (IV) oxide	1309-60-0
		Lead (II,IV) oxide	1314-41-6
		Lead (II) sulfide	1314-87-0
		Lead (II) oxide	1317-36-8
		Lead (II) carbonate basic	1319-46-6
		Lead hydroxidcarbonate	1344-36-1
		Lead (II) phosphate	7446-27-7
		Lead (II) chromate	7758-97-6
		Lead (II) titanate	12060-00-3
		Lead sulfate, sulphuric acid, lead salt	15739-80-7
		Lead sulphate, tribasic	12202-17-4
		Lead stearate	1072-35-1
		Other lead compounds	-
	Mercury/ mercury compounds	Mercury	7439-97-6
		Mercuric chloride	33631-63-9
		Mercury (II) chloride	7487-94-7
		Mercuric sulfate	7783-35-9
		Mercuric nitrate	10045-94-0
		Mercuric (II) oxide	21908-53-2
		Mercuric sulfide	1344-48-5
		Other mercury compounds	-
	Polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs)	Bromobiphenyl and its ethers	2052-07-5 (2-Bromobiphenyl)
			2113-57-7 (3-Bromobiphenyl
			92-66-0 (4-Bromobiphenyl)
			101-55-3 (ether)
		Decabromobiphenyl and its ethers	13654-09-6
			1163-19-5 (ether)
		Dibromobiphenyl and its ethers	92-86-4
			2050-47-7 (ether)
		Heptabromobiphenylether	68928-80-3
		Hexabromobiphenyl and its ethers	59080-40-9
			36355-01-8 (hexabromo-1,1'-biphenyl)
			67774-32-7 (Firemaster FF-1)
			36483-60-0 (ether)
		Nonabromobiphenylether	63936-56-1
		Octabromobiphenyl and its ethers	61288-13-9
			32536-52-0 (ether)
		Pentabromobidphenyl ether (note: commercially available PeBDPO is a complex reaction mixture containing a variety of brominated diphenyloxides.	32534-81-9 (CAS number used for commercial grades of PeBDPO)
		Polybrominated biphenyls	59536-65-1
		Tetrabromobiphenyl and its ethers	40088-45-7
			40088-47-9 (ether)
		Tribromobiphenyl ether	49690-94-0
	Polychlorinated naphthalenes	Polychlorinated naphthalenes	70776-03-3
		Other polychlorinated naphthalenes	-
		Uranium	-

Table	Material Category	Substances	CAS Numbers
	Radioactive substances	Plutonium	-
		Radon	-
		Americium	-
		Thorium	-
		Cesium	7440-46-2
		Strontium	7440-24-6
		Other radioactive substances	-
	Certain shortchain chlorinated paraffins (with carbon length of 10-13 atoms)	Chlorinated paraffins (C10-13)	85535-84-8
		Other short chain chlorinated paraffins	-

APPENDIX 9

SPECIFIC TEST METHODS

1 Asbestos

Types to test for: Actinolite CAS 77536-66-4 Amosite (Grunerite) CAS 12172-73-5 Anthophyllite CAS 77536-67-5 Chrysotile CAS 12001-29-5 Crocidolite CAS 12001-28-4 Asbestos Tremolite CAS 77536-68-6.

Specific testing techniques: Polarized Light Microscopy (PLM), electron microscope techniques and/or X-Ray Diffraction (XRD) as applicable.

Specific reporting information: The presence/no presence of asbestos, indicate the concentration range, and state the type when necessary.

Notes: .1 The suggested three kinds of testing techniques are most commonly used methods when analysing asbestos and each of them has its limitation. Laboratories should choose the most suitable methods to determine, and in most cases, two or more techniques should be utilized together.

.2 The quantification of asbestos is difficult at this stage, although the XRD technique is applicable. Only a few laboratories conduct the quantification rather than the qualification, especially when a precise number is required. Considering the demand from the operators and ship recycling parties, the precise concentration is not strictly required. Thereby, the concentration range is recommended to report, and the recommended range division according to standard VDI 3866 is as follows:

- Asbestos not detected
- Traces of asbestos detected
- Asbestos content approx. 1% to 15% by mass
- Asbestos content approx. 15% to 40% by mass
- Asbestos content greater than 40% by mass

Results that specified more precisely must be provided with a reasoned statement on the uncertainty.

.3 As to the asbestos types, to distinguish all six different types is time consuming and in some cases not feasible by current techniques; while on the practical side, the treatment of different types of asbestos is the same. Therefore, it is suggested to report the type when necessary.

2 Polychlorinated biphenyls (PCBs)

Note: There are 209 different congeners (forms) of PCB of it is impracticable to test for all. Various organizations have developed lists of PCBs to test for as indicators. In this instance two alternative approaches are recommended. Method 1 identifies the seven congeners used by the International Council for the Exploration of the Sea (ICES). Method 2 identifies 19 congeners and seven types of aroclor (PCB mixtures commonly found in solid shipboard materials containing PCBs). Laboratories should be familiar with the requirements and consequences for each of these lists.

Types to test for: Method 1: ICES7 congeners (28, 52, 101, 118, 138, 153, 180). Method 2: 19 congeners and seven types of aroclor, using the US EPA 8082a test.

Specific testing technique: GC-MS (congener specific) or GC-ECD or GC-ELCD for applicable mixtures such as aroclors. Note: standard samples must be used for each type.

Sample Preparation: It is important to properly prepare PCB samples prior to testing. For solid materials (cables, rubber, paint, etc.), it is especially critical to select the proper extraction procedure in order to release PCBs since they are chemically bound within the product.

Specific reporting information: PCB congener, ppm per congener in sample, and for Method 2, ppm per aroclor in sample should also be reported.

Notes:

.1 Certain field or indicator tests are suitable for detecting PCBs in liquids or surfaces. However, there are currently no such tests that can accurately identify PCBs in solid shipboard materials. It is also noted that many of these tests rely on the identification of free chlorine ions and are thus highly susceptible to chlorine contamination and false readings in a marine environment where all surfaces are highly contaminated with chlorine ions from the sea water and atmosphere.

.2 Several congeners are tested for as "indicator" congeners. They are used because their presence often indicates the likelihood of other congeners in greater quantities (many PCBs are mixes, many mixes use a limited number of PCBs in small quantities, therefore the presence of these small quantities indicates the potential for a mix containing far higher quantities of other PCBs).

.3 Many reports refer to "total PCB", which is often a scaled figure to represent likely total PCBs based on the sample and the common ratios of PCB mixes. Where this is done the exact scaling technique must be stated, and is for information only and does not form part of the specific technique.

3 Ozone depleting substances

Types to test for: as per appendix 8 of these guidelines all the listed CFCs, Halons, HCFCs and other listed substance as required by Montreal Protocol.

Specific testing technique: Gas Chromatography-Mass Spectrometry (GC-MS), coupled Electron Capture Detectors (GC-ECD) and Electrolytic Conductivity Detectors (GC-ELCD).

Specific reporting information: Type and concentration of ODS.

4 Anti-fouling systems containing organotin compounds as a biocide and/or cybutryne

4.1 Anti-fouling systems containing organotin compounds as a biocide

Types to test for: Anti-fouling compounds and systems regulated under annex I to the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001 (AFS Convention, as amended), including: tributyl tins (TBT), triphenyl tins (TPT) and tributyl tin oxide (TBTO).

Specific testing technique: As per resolution MEPC.356(78) (*2022 Guidelines for Brief Sampling of Anti-Fouling Systems on Ships*), adopted on 10 June 2022, using ICPOES, ICP, AAS, XRF, GC-MS as applicable.

Specific reporting information: Type and concentration of organotin compound.

Note: For "field" or "indicative" testing it may be acceptable to simply identify presence of tin, due to the expected good documentation on anti-fouling systems.

4.2 Anti-fouling systems containing cybutryne

Types to test for: Anti-fouling systems containing cybutryne regulated under Annex 1 to the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001 (AFS Convention, as amended).

Specific testing technique: As per resolution MEPC.356(78) (2022 Guidelines for brief sampling of anti-fouling systems on ships), adopted on 10 June 2022, using GC-MS.

Specific reporting information: Concentration of cybutryne.

4.3 Simplified approach to detect organotin compounds or cybutryne

Types to test for: Anti-fouling systems containing organotin compounds as biocides and/or cybutryne regulated under Annex 1 to the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001 (AFS Convention, as amended).

Specific testing technique: As per resolution MEPC.356(78) (2022 Guidelines for brief sampling of anti-fouling systems on ships), adopted on 10 June 2022, using GC-MS.

Specific reporting information: Concentration of organotin compound and/or cybutryne.

APPENDIX 10

EXAMPLES OF RADIOACTIVE SOURCES

The following list contains examples of radioactive sources that should be included in the Inventory, regardless of the number, the amount of radioactivity or the type of radionuclide.

Examples of consumer products with radioactive materials

Ionization chamber smoke detectors (typical radionuclides ^{241}Am; ^{226}Ra)
Instruments/signs containing gaseous tritium light sources (^{3}H)
Instruments/signs containing radioactive painting (typical radionuclide ^{226}Ra)
High intensity discharge lamps (typical radionuclides ^{85}Kr; ^{232}Th)
Radioactive lighting rods (typical radionuclides ^{241}Am; ^{226}Ra)

Examples of industrial gauges with radioactive materials

Radioactive level gauges
Radioactive dredger gauges[21]
Radioactive conveyor gauges[21]
Radioactive spinning pipe gauges[21]

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21 Typical radionuclides: ^{241}Am; ^{241}Am/Be; ^{252}Cf; ^{244}Cm; ^{60}Co; ^{137}Cs; ^{153}Gd; ^{192}Ir; ^{147}Pm; ^{238}Pu; ^{239}Pu/Be; ^{226}Ra; ^{75}S; ^{90}Sr (^{90}Y); ^{170}Tm; ^{169}Yb