



**GUIDE FOR**

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# **BALLAST WATER EXCHANGE**

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**American Bureau of Shipping  
Incorporated by Act of Legislature of  
the State of New York 1862**

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## **Updates**

### **October 2010 consolidation includes:**

- July 2010 version plus Notice No. 1

## Foreword

The inadvertent transfer of harmful aquatic organisms and pathogens in a vessel's ballast water has been determined to have caused a significant adverse impact to many of the world's coastal regions. The international maritime community, under the auspices of the International Maritime Organization (IMO) has developed several documents, including the "International Convention for the Control and Management of Ship's Ballast Water and Sediment, 2004," (Ballast Water Management Convention), which are aimed at preventing the introduction of unwanted aquatic organisms and pathogens through the discharge of ballast water and sediments.

The Ballast Water Management Convention will apply to vessels registered in a country which is party to the Convention and to those vessels registered in other countries when operating in the waters of a country which is party to the Convention.

One of the strategies incorporated into the Ballast Water Management Convention is Ballast Water Exchange (BWE). Ballast water exchange is the process of exchanging coastal water, which may be fresh water, salt water or brackish water, for mid-ocean water. During the exchange process, biologically laden water taken on in the last port of call is flushed out of the ballast tanks with open ocean water, typically 200 nautical miles from the nearest land. Scientists, specifically Marine Biologists, have determined that marine organisms and pathogens are, in general, less numerous in the open ocean and, due to changes in the water's chemistry, temperature and salinity would be less likely to survive once they are discharged into the near shore receiving waters.

While the vast majority of vessels are capable of conducting ballast water exchange, and the procedures do not typically require any special structural modifications to most of the vessels in operation, it does present challenges for designers, builders, owners and operators. These challenges include over-pressurization or under-pressurization of tanks, longitudinal strength and transverse stability concerns, as well as maneuverability issues.

To assist the marine industry, ABS issued the "Advisory Notes on Ballast Water Exchange Procedures" in October 1999. This Advisory described the implications associated with ballast water management and ballast water exchange using fourteen typical vessels as examples. While the findings contained in the Advisory focused on existing vessels, many of the conclusions could also be applied to assist in the development of new buildings. However, it is to be noted that the details provided in the Advisory are vessel-specific and that the information contained therein was to be viewed as typical, and provide representative values that might be obtained for any single vessel and are highly dependent on the vessel's design and structure, which may vary greatly from one vessel to another.

This *Guide for Ballast Water Exchange* is provided for the use of designers, builders, owners, and operators of vessels classed with ABS and specifies the requirements for obtaining the optional classification notation Ballast Water Exchange (**BWE**). The **BWE** notation identifies a level of compliance with the applicable regulations contained in the IMO "International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004", as well as those IMO Guidelines referenced in the Convention addressing ballast water exchange.

While the Convention has not yet entered into force, many port States, such as Brazil, Canada and the United States have established national regulations mandating the exchange of ballast water, together with evidence to support that the exchange has taken place (ballast water records).

This Guide is to be used in conjunction with other Rules published by ABS and IMO guidelines.

Users of this Guide acknowledge and agree that ABS is not responsible for a vessel's operation pertaining to ballast water exchange and shall bear no liability for such operations. This Guide references relevant international regulations and guidelines that are considered to be applicable. While it is the intent of the Guide to be consistent with these relevant regulations and guidelines, it is the ultimate responsibility of the users of this guide to refer to the most recent text of those regulation and guidelines.

ABS appreciates the receipt of comments and suggestions, as well as technical and application questions for the improvement of this Guide. Users are also advised to check with ABS to verify that this version of the Guide is current. For this purpose, enquiries can be submitted electronically to either [rsd@eagle.org](mailto:rsd@eagle.org) or to the Rules & Guides Section of [eagle.org](http://eagle.org).

The effective date of this Guide is the first day of the month of publication



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## CHAPTER 1 Introduction

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## CHAPTER 1 Introduction

### SECTION 1 General

#### 1 Application

The requirements in this Guide apply to vessels that are designed, equipped and intended to conduct ballast water exchange at sea in accordance with the “International Convention for the Control and Management of Ships’ Ballast Water and Sediments, 2004”, the associated IMO Guidelines and national regulations addressing ballast water exchange. At the request of the owner, those vessels intended to conduct ballast water exchange which comply fully with the requirements of this Guide and the applicable Rules and have been constructed under survey by ABS Surveyors may be assigned the **BWE** classification notation as specified in Chapter 1, Section 4 of this Guide.

Within this Guide, ABS refers to relevant international regulations and guidelines that are considered to be applicable. While it is the intent of this Guide to be consistent with the regulations and guidelines, it is recommended that the users of this Guide refer to the most recent text of those regulations and guidelines.

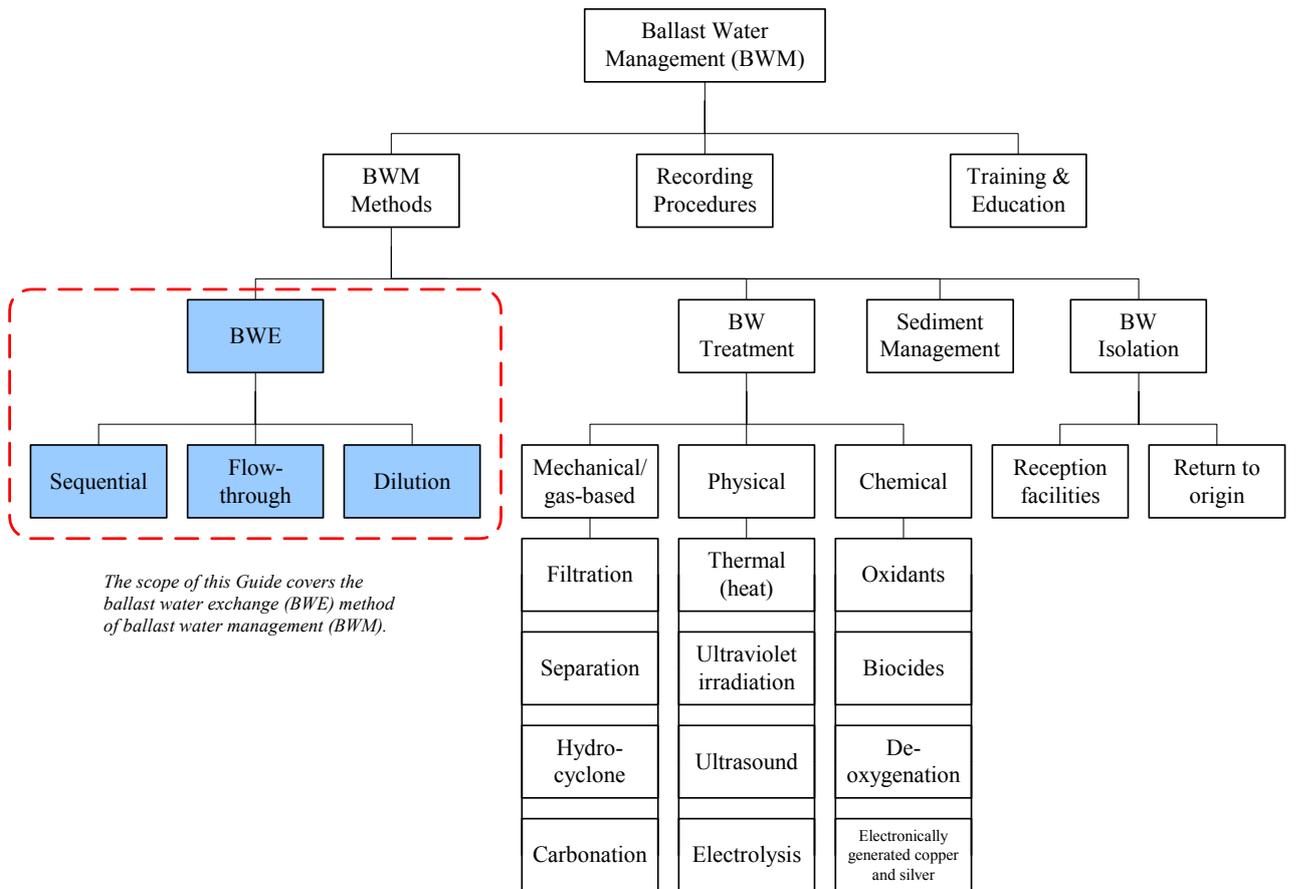
#### 3 Objective/Scope

The objective of this Guide is to provide supplementary requirements regarding ballast water exchange at sea that generally are not addressed by other ABS Rules or Guides. Ballast water exchange at sea presents numerous challenges related to the operation of vessels, specifically vessel structure, stability and machinery systems. Owners/operators that have elected to conduct ballast water exchange at sea as a means to control and manage ballast water pending the implementation of the IMO regulations mandating the installation of an approved ballast water management system, may experience increased structural and mechanical equipment failures unless the vessel’s design, construction and operation have considered the potential hazards associated with ballast water exchange at sea.

It is recognized that vessels conducting ballast water exchange may have unique operating characteristics for which the requirements in this Guide may not be applicable. For such cases, ABS is prepared to consider alternative arrangements, provided that substantiating information and/or a risk analysis is submitted for review.

As indicated in 1-1/Figure 1, BWE is one of the accepted ballast water management methodologies provided for within the Convention which is available for selection by the owner.

**FIGURE 1**  
**Scope of this Guide**





## CHAPTER 1 Introduction

### SECTION 2 Definitions

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

*Ballast Water* is the water with its suspended matter taken onboard a vessel to control trim, list, draft, stability or stresses of the vessel.

*Ballast Water Exchange (BWE)* is a process involving the replacement of water in a ballast tank using either the sequential, flow-through, dilution or other exchange methodologies recommended or required by IMO.

*Ballast Water Exchange Plan* is the procedures and advice to safely and efficiently exchange ballast water in accordance with applicable structural and stability requirements.

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

*Ballast Water Management (BWM)* means mechanical, physical, chemical, and biological processes, either singularly or in combination, to remove, render harmless or avoid the uptake or discharge of harmful aquatic organisms and pathogens within ballast water and sediments.

*Ballast Water Management Plan* is the plan for the handling or treating of ballast water onboard a vessel to minimize the transfer of harmful organisms or pathogens in the vessel's ballast water and sediment.

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

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

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

*Rules* are the ABS Rules for Building and Classing Steel Vessels (*Steel Vessel Rules*) or the ABS Rules for Building and Classing Steel Vessels Under 90 meters (295 feet) in Length (*Under 90m Rules*), as appropriate.

*Sediments* are the matter settled out of ballast water within a vessel.

*Ship* is a vessel of any type whatsoever operating in the aquatic environment and includes submersibles, floating craft, floating platforms, Floating Storage Units (FSUs), and Floating Production Storage and Offloading Units (FPSOs).

*Treatment* is a process or mechanical, physical, chemical or biological method to kill, remove or render infertile harmful or potentially harmful organisms within ballast water.



## CHAPTER 1 Introduction

### SECTION 3 Basis of Notation

This Guide contains the provisions for ballast water exchange systems and for the optional classification notation **BWE** for vessels classed with ABS. This Guide is intended for use in conjunction with the appropriate Rules found in the *ABS Rules for Building and Classing Steel Vessels* or *ABS Rules for Building and Classing Steel Vessels Under 90 meters (295 feet) in Length*, as appropriate. Ballast water exchange systems designed and installed in accordance with this Guide will also comply with the International Maritime Organization (IMO) Regulations and Guidelines listed below:

- The International Convention for the Control and Management of Ship's Ballast Water and Sediments, 2004.
- IMO Resolution MEPC.124 (53), "Guidelines for Ballast Water Exchange (G6)", adopted on July 22, 2005.
- IMO Resolution MEPC.127 (53), "Guidelines for Ballast Water Management and Development of Ballast Water Management Plans (G4)", adopted on July 22, 2005.
- IMO Resolution MEPC.149 (55), "Guidelines for Ballast Water Exchange Design and Construction Standards (G11)" adopted on 13 October 2006.
- IMO Resolution MEPC.150 (55), Guidelines on Design and Construction to Facilitate Sediment Control on Ships (G12)", adopted on 13 October 2006



## CHAPTER 1 Introduction

### SECTION 4 Classification Symbol and Notation

#### 1 Systems Built under Survey

Where requested by the owner, vessels designed, constructed, and surveyed in accordance with this Guide, may be assigned the notation **BWE**.

#### 3 Systems Not Built under Survey

Vessels which have not been constructed under survey in accordance with the requirements of this Guide may obtain the optional **BWE** notation, provided the vessel's arrangements have been determined to comply with the design and construction criteria contained in this Guide. The operation of the ballast water exchange system is to be demonstrated to ABS, or documentation confirming the successful performance of ballast water exchange for a period of one year is to be submitted to ABS.



## CHAPTER 1 Introduction

### SECTION 5 Classification Procedures

#### 1 Engineering Review

Vessels having the **BWE** notation are required to be provided with certain design features. These design features are addressed in Chapter 2 of this Guide.

Prior to the issuance of the **BWE** notation, the following plans or documentation are to be submitted electronically by the manufacturer, designer or shipbuilder to ABS. However, hard copies will also be accepted.

- i) Arrangement showing the location and capacity of the ballast tanks and pumps
- ii) Booklet providing the standard construction details for the ballast piping system, including vents and overflows, valve arrangement and controls, and the means for determining the level in the ballast tanks
- iii) The location of ballast water and sediment sampling openings
- iv) Ballast Water Management Plan
- v) Calculations demonstrating the adequacy of the vents and overflows to prevent over- or under-pressurization of the ballast tanks
- vi) Loading Manual and Trim & Stability Booklet

The ballast water record book is to be developed and retained onboard the vessel.

#### 3 Initial Survey

The ballast water exchange system, alarms, shutdowns and control equipment are to be tested under working conditions to the satisfaction of the attending Surveyor. Vessels complying with the requirements in Chapter 2 and confirmed by survey are eligible to receive the **BWE** notation.

#### 5 Surveys After Construction

An Annual Survey is to be conducted to retain the **BWE** notation status. At each Annual Survey, the ballast water exchange system is to be examined. The survey is to include the following, as applicable:

- i) A general, external examination of the controls and piping systems (including pipes, valves, pipe supports, etc.)
- ii) *Operation and Maintenance Records:* The Surveyor is to review the ballast water exchange records and the ballast water exchange plan to confirm that activities, including sampling of the ballast water, associated with the exchange of ballast water have been properly recorded and that the exchange plan is current.
- iii) *Alarm and Safety Devices:* The Surveyor is to verify the operation of applicable alarms and safety devices, using simulated conditions where necessary.

In conjunction with the Special Periodical Survey, the ballast water exchange system is to be examined and placed in satisfactory condition to retain the **BWE** notation. The mechanical and electrical components are to be examined, including but not limited to valves, seals, pumps, control panels, vents, air pipes and monitoring sensors. When possible, the operation of the ballast water exchange system is to be demonstrated to the satisfaction of the attending Surveyor. At the discretion of the Surveyor, the vessel's entire ballast water exchange system (including ballast tanks, pumps, valves and controls) is to be examined as part of the Special Periodical Survey.

## **7 Governmental Regulations**

Several national administrations have in place additional requirements pertaining to the management of ballast water for vessels operating in their territorial waters. These requirements may address additional vessel features, equipment, reporting, and record keeping that are not included in this Guide. Owners/operators are encouraged to remain current with these national administration requirements.



## CHAPTER 2 Ballast Water Exchange Requirements

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## CHAPTER 2 Ballast Water Exchange Requirements

### SECTION 1 Ballast Water Exchange Standard and Requirements

#### 1 Ballast Water Exchange Standard

Owners/operators that have elected to operate with BWE as the method of BWM are to meet the following requirements:

- i)* Vessels performing ballast water exchange must achieve a 95% volumetric exchange of ballast water.
- ii)* In order to achieve 95% volumetric exchange, vessels utilizing the flow-through or dilution methods, as defined in 2-2/1, must pump through three times the volume of each ballast water tank.
- iii)* If a vessel utilizing the flow-through or dilution method is able to complete at least 95% volumetric exchange in pumping less than three times the volume, documentation consisting of detailed studies confirming this capability is to be submitted for review and is to be attached as an annex of the BWM plan.

#### 3 Where Ballast Water Exchange is to be Conducted

Exchange of ballast water in deep ocean areas or open seas offers a means of limiting the probability that coastal aquatic species will be transferred in vessels' ballast water. A vessel conducting ballast water exchange to meet the BWE standard is to:

- i)* Conduct ballast water exchange at least 200 nautical miles from the nearest land and in water of at least 200 meters in depth.
- ii)* If a vessel cannot conduct ballast water exchange in accordance with 2-1/3i), the exchange is to be conducted as far from the nearest land as possible, but at least 50 nautical miles from the nearest land and in water depth of at least 200 meters.

The location, volume and depth of the water where the exchange is conducted is to be recorded in the Ballast Water Record Book. (See Chapter 3, Section 18 and Appendix 2 of this Guide.)

A port State, in consultation with adjacent or other States, may designate areas where ballast water exchange may be conducted if there are locations of operation where the distance from nearest land and water depth do not meet the requirements of 2-1/3i) or 2-1/3ii). Owners and operators are encouraged to consult with the port State authorities to confirm the presence and location of such designated areas.

In extraordinary conditions, such as adverse weather or equipment failure, the Master may make the decision not to perform ballast water exchange if he/she reasonably determines that in doing so the vessel's stability or safety of the vessel its crew or passengers may be threatened.

If a vessel is not able to perform ballast water exchange in accordance with the requirements of Chapter 2, Section 1, a notation with explanation for the variance is to be made in the Ballast Water Record Book.

## 5 Ballast Water Management Implementation Schedule

The implementation schedule for vessels to meet the ballast water management requirements is provided in Regulation B-3 of the Convention and is summarized in 2-1/Table 1, where D-1 and D-2 refer to Regulations D-1 and D-2 of the Convention, respectively.

**TABLE 1**  
**Summary of Convention B-3 Compliance Schedule**

Ballast Cpty (m3)	Build Date	® First Intermediate or Renewal Survey, whichever occurs first, after the anniversary date of delivery in the respective year									
		2009	2010	2011	2012	2013	2014	2015	2016	2017	
<1500	< 2009	D1 or D2									D2 ®
	in 2009	D1; D2 by "2nd Annual but not beyond 31 Dec 11" or EIF, whichever is later (Note)									
	>2009	D2 (at delivery or EIF, whichever is later)									
≥1500 or ≤5000	< 2009	D1 or D2						D2 ®			
	in 2009	D1; D2 by "2nd Annual but not beyond 31 Dec 11" or EIF, whichever is later (Note)									
	>2009	D2 (at delivery or EIF, whichever is later)									
>5000	< 2012	D1 or D2									D2 ®
	≥ 2012	N/A			D2 (at delivery or EIF, whichever is later)						

Note: Advice is to be sought from Signatory States with respect to the delayed D2 enforcement date recommended by A.1005(25).

## CHAPTER 2 Ballast Water Exchange Requirements

### SECTION 2 Ballast Water Exchange Methods

#### 1 General

Three methods of ballast water exchange have been evaluated and determined to be acceptable to IMO; viz the sequential method, the flow-through method and the dilution method. A description of these methods is as follows:

- i) *Sequential method* – A process by which a ballast tank intended for the carriage of water ballast is first emptied and then refilled with replacement ballast water to achieve at least a 95% volumetric exchange.
- ii) *Flow-through method* – A process by which replacement ballast water is pumped into a ballast tank intended for the carriage of water ballast, allowing water to flow through overflow or other arrangements. At least three times the tank volume is to be pumped through the tank.
- iii) *Dilution method* – A process by which replacement ballast water is filled through the top of the ballast tank intended for the carriage of water ballast with simultaneous discharge from the bottom at the same flow rate and maintaining a constant level in the tank throughout the ballast exchange operation. At least three times the tank volume is to be pumped through the tank.

The flow-through method and the dilution method are often referred to as “pump-through” methods.

Each ballast water exchange method has particular associated aspects that are to be considered when selecting the method(s) to be used on a specific type of vessel, as discussed in the following Subsections. The degree to which a vessel is suited to the sequential method, the flow-through method, or the dilution method is dependent on its design and age.

Any other method of ballast water exchange will be subject to special consideration by ABS.

After the ballast water exchange methods for a vessel have been determined, and the ballast water exchange system requirements have been met, the pertinent sequencing or pump-through operational information is to be documented, together with safety considerations, in the Ballast Water Management Plan as outlined in Chapter 3 of this Guide. The Ballast Water Management Plan is also to include a summary of selected exchange method(s), similar to 2-2/Table 1 below.

**TABLE 1**  
**Log of Ballast Water Exchange Method(s)**

<i>BWE No.</i>	<i>BWE Method</i>	<i>Description of Conditions</i>	<i>Date</i>	<i>Approved By</i>

The vessel’s loading conditions for the selected ballast water exchange method or methods are to be developed and calculations submitted to show that the loading conditions satisfy the applicable requirements for ballast capacity, trim, stability, longitudinal strength, and local strength. These conditions are to be submitted for approval and then placed in the vessel’s Loading Manual or Trim and Stability Booklet. The vessel operators are to use the approved ballast water exchange loading conditions from the Loading Manual or Trim and Stability Booklet when performing ballast water exchange operations.

### 3 Sequential Method

The sequential method entails completely emptying ballast tanks of the coastal waters and refilling with open-ocean water. Emptying of certain tanks may lead to significantly reduced stability, higher vessel structural stresses, high sloshing pressures and/or reduced forward drafts which may then increase the probability of bow slamming.

Margins are to be provided for stability and strength for all seagoing conditions, as specified in the vessel's approved trim and stability booklet and the loading manual. The loading conditions for the selected ballast water exchange method or methods are to be taken from the approved loading manual or trim and stability booklet. The following items are to be evaluated when the sequential method is selected for ballast water exchange.

#### 3.1 Stability

##### 3.1.1 Intact Stability

The intact stability requirements contained in 3-3-1/3.1, "Intact Stability", of the *Steel Vessel Rules* or 3-3-1/3.1 of the *Under 90m Rules*, as applicable are to be satisfied. These requirements are to be met at every stage of the ballast water exchange under all loading conditions. The results of the intact stability calculations demonstrating compliance with the intact stability requirements during ballast water exchange are to be included in the stability booklet and submitted for review and approval.

When calculating stability, the free surfaces in all tanks are to be set to maximum.

##### 3.1.2 Damage Stability

The damage stability requirements contained in 3-3-1/3.3, "Subdivision and Damage Stability", of the *Steel Vessel Rules* or 3-3-1/3.3 of the *Under 90m Rules*, as applicable are to be satisfied. Compliance with limiting GM/KG curves, which may be based partly on applicable damage stability criteria, is to be maintained at all times.

#### 3.3 Longitudinal Strength

##### 3.3.1

The longitudinal strength for each stage is to be within the allowable seagoing limits, as prescribed in the *Steel Vessel Rules* or the *Under 90m Rules*, as applicable. This is to be demonstrated by printouts for each stage as developed by the ABS-approved loading program or by the approved Loading Manual.

##### 3.3.2

At any longitudinal location, a typical output of longitudinal strength includes the following:

- Calculated still-water bending moment (SWBM) and still-water shear force (SWSF)
- Maximum and minimum values of SWBM and SWSF
- Calculated still-water torsional moment (SWTM), where applicable
- Maximum permissible value of SWTM, where applicable
- Calculated SWBM and SWSF in flooding conditions, where applicable
- Maximum permissible values of SWBM and SWSF in flooded conditions, where applicable

##### 3.3.3

Under each loading condition, the calculation of longitudinal strength is to be conducted for each stage of ballast water exchange.

#### 3.3.4

If, in any stage, the seagoing limits are not met and cannot be met due to the vessel's/tank configuration (this must be demonstrated by the designer), special consideration may be given to the implementation of operational procedures such as weather condition limitations or enhanced watch keeping procedures.

### 3.5 Sloshing

#### 3.5.1

In general, sloshing is unavoidable for a vessel using the sequential method. However, it can be controlled to within acceptable limits by restricting the sea state in which the ballast water exchange operations are conducted. Where necessary, an approach is to be proposed, subject to the approval of the Flag Administration, to establish a maximum sea state or significant wave height for partial filling of ballast tanks where sloshing occurs. Documentation for the ballast water exchange is to include where applicable:

- An assessment of the potential for liquid resonance in the tank as a function of the ballast water filling height. For low filling levels (less than 25%), the resonance in general is not a concern. However, confirmation is required. For filling levels greater than 50%, resonance can be an issue that may require a sea state limitation during ballast water exchange sequences.
- For those vessels having a **SH** or **CSR** notation or where the tank is less than  $0.01L$  and  $0.056B$ , sloshing is not a concern. However confirmation is required.
- A ballast water sequence stop (i.e., temporary "hold" or permanent completion of a ballast water exchange operation stage) will not be permitted in the filling range associated with resonance, or if physically checking for resonance during actual operations.
- A check of the impact pressure at partial filling.

#### 3.5.2

The maximum sea state or the significant wave height is to be limited such that the impact pressure is less than or equal to the pressure permitted by the *Steel Vessel Rules*.

The sloshing check may be exempted under the following locations/conditions where extensive internal structure is provided:

- Double side or double bottom tanks for all vessels.
- Topside tanks for bulk carriers in the heavy ballast conditions.
- A forepeak tank fitted with a centerline wash bulkhead or a centerline ring structure or horizontal ring structures.
- Wing ballast tanks of single hull oil tankers fitted with transverse ring web structures.

#### 3.5.3

For ballast holds of bulk carriers, sloshing must be considered where there is resonance due to partial filling. For this reason, partial filling of ballast holds of bulk carriers is to be avoided.

#### 3.5.4

Partial filling of ballast tanks of single hull tankers is to be avoided, especially in light ballast conditions, unless the tanks are designed for unrestricted filling levels for the ballast condition under consideration.

#### 3.5.5

In cases when the sloshing action is to be considered, the sloshing calculations are to be submitted. The Ballast Water Management Plan is to identify the stages of the exchange where sloshing may be of particular concern and a footnote assigned to the relevant stages for justification of their elimination. The footnote may read as follows:

*“Exchange of ballast in tanks .... may impose significant structural loads generated by sloshing action when the level of the water in the tank is between ...% and ...%. Accordingly, the procedure is to be carried out only in favorable sea and swell conditions such that the risk of structural damage is minimized.”*

### 3.7 Wave-induced Hull Vibrations

Ballast water exchange is to be carried out so as to prevent wave-induced hull vibrations in both favorable and swell conditions.

### 3.9 Over- and Under-pressurization of Tanks and Holds

Venting calculations are to be conducted to determine the maximum pressure in each tank and hold during the filling phase and the minimum pressure during the de-ballasting considering the maximum pumping rates of the ballast pump. The results of these calculations are to confirm that the tanks and holds will not be subjected to pressure or vacuum in excess of that for which the tank or hold has been designed.

These sets of calculations are to be submitted for review by ABS.

### 3.11 Free Surface Effects

When using the sequential method, the free surface moments of all tanks are to be set to the maximum for stability and strength calculations.

### 3.13 Forward and Aft Drafts

#### 3.13.1 Forward Draft

In all sequences of ballast water exchange, the forward draft of the vessel is to be greater than the prescribed minimum forward draft as shown in the Trim and Stability Booklet. If, for a transitory period or in a specific sequence, the minimum forward draft can not be satisfied, the Ballast Water Management Plan is to identify the stages of the exchange process that do not meet the criteria for minimum forward draft, and a footnote documenting this is to be assigned to the relevant stages. The following is an example of such a footnote:

*“Exchange of ballast in tanks .... is to be carried out in favorable sea conditions such that the risk of forward slamming is minimized (Beaufort Force less than or equal to 7).”*

#### 3.13.2 Aft Draft

Full propeller immersion is assumed as the minimum requirement for the aft draft.

### 3.15 Propeller Immersion

The aft draft of the vessel in each sequence of ballast exchange shall be adequate to fully immerse the propeller. If, for a transitory period or in a specific sequence, 100% propeller immersion can not be satisfied, the sequence is to be identified in the Ballast Water Management Plan with a footnote documenting this limitation. The following is an example of such a footnote:

*“At this stage of the ballast water exchange operations, the full immersion of the propeller is not possible. This may be considered satisfactory provided the ballast water exchange operations are undertaken in fair weather and sea conditions – such that the Master will be satisfied with the control of the vessel’s maneuverability, and that there is sufficient ballast capacity available at all stages of the voyage to enable propeller immersion in a reasonably short period of time should weather and sea conditions begin to worsen.”*

### 3.17 Bridge Visibility

#### 3.17.1

For vessels built on or after 1 July 1998, the requirements of 3-6-1/1.1.1(a) and (c), 3-6-1/1.1.2(a) and 3-6-1/1.1.3 of the *Steel Vessel Rules* or 3-6-1/1.1.1 (a) and (c) and 3-6-1/1.1.2(a) and 3-6-1/1.1.3 of the *Under 90m Rules*, as applicable are to be met during the stages of ballast water exchange.

#### 3.17.2

For vessels built prior to 1 July 1998, the requirement of IMO MSC/Circ. 403 and SOLAS Regulation V/22.2, is to be met.

*Note:* For vessels built before 1998, this visibility limit was not mandatory and is not to be invoked simply because ballast water exchange is being implemented.

#### 3.17.3

In all sequences of ballast water exchange, the bridge visibility required for the vessel is to be satisfied. If, in a specific sequence or during a transitory period, the bridge visibility requirements can not be satisfied, the Master is to determine that it is safe to conduct the ballast water exchange taking into consideration the increased blind sectors or reduced horizontal fields of vision resulting from these sequences or period. The vessel's Ballast Water Management Plan is to include a footnote to alert the vessel's Master. The following is an example of such a footnote:

*“The Master is to be aware of the fact that the forward bridge visibility is impaired in sequences ..... and accordingly additional measures (such as an enhanced navigational watch will be maintained, including where necessary an additional lookout forward with adequate communications with the navigation bridge) to provide for navigational safety have been established.”*

The commencement and termination of the enhanced navigational safety measures taken during ballast water exchange operations are to be recorded in the vessel's record of navigational activities.

### 3.19 Data, Tables and Forms to be Included

For the sequential method, the following information is to be provided to assist the evaluation of safety considerations entailed in 2-2/3.1 through 2-2/3.17:

- Initial vessel condition data listed in the trim and stability booklet
- Summary of the stage-by-stage ballast water exchange sequences (see 2-2/Table 2 below)
- The printout results of stability criteria calculation at each stage
- The printout results of longitudinal strength calculation at each stage
- Specific instructions entailed in 2-2/3.1 through 2-2/3.19.

The following table is an example of the summary of the ballast water exchange sequences at every stage under a certain loading condition listing the status of each tank and items to be checked for comparison. Such summary table is to be required for each loading condition under consideration, and is to be provided with the Ballast Water Management Plan outlined in Chapter 3 of this Guide.



## 5 Flow-through Method

The flow-through method involves pumping replacement ballast water into the bottom of a full ballast tank, forcing existing ballast water out through an overflow or other arrangement. Ballast water equal to approximately three times the tank capacity must be pumped through the tank to achieve 95% effectiveness in eliminating aquatic organisms.

The flow-through method does not typically alter stability, hull girder stress and vessel attitude. It therefore eliminates concerns of exceeding shear force and bending moment limits and concerns related to shallow forward and aft drafts and extreme trims. As with all methods, the Ballast Water Reporting Form provided in Appendix 1 is to be completed and transmitted to the next port where ballast water is discharged.

In those instances where the flow-through method alters stability, hull girder stress or vessel attitude, a ballast water summary sequence table is to be submitted demonstrating that adequate strength and stability has been maintained.

As the flow-through method is not suitable for all tanks, in addition to the design requirements of Chapter 2, Section 3 of this Guide, the following items are to be evaluated on those vessels utilizing the flow-through method:

- i) Safe pumping procedures are to be provided for ballasting and de-ballasting operations that take into account additional vessel structural stresses that may be involved with conducting ballast water exchange.
- ii) The size of the fixture designated for the overflow is to be verified such that over-pressurization of a ballast tank or pumping equipment, which may lead to structural damage, is prevented. Under-pressurization created by a large drop in pressure due to rapid change in the volume of the contents of the tank is also to be avoided by verifying air vent pipes are open and properly sized prior to discharge. Hydraulic calculations verifying the proper sizing of the fixtures are to be submitted for review.

Calculations confirming that the capacity of the ballast water tank and the ballast piping are capable of providing ballast water exchange by the flow-through method without the risk of being subject to a pressure greater than design are to be submitted for review.

Ballast water carried in double bottom tanks is to be exchanged by the sequential method, unless calculations confirming that pump pressure generated in raising the necessary head of water does not cause excessive internal pressure leading to damage to the vessel.

- iii) Charts and/or tables are to be provided to show the pumping rates, volumes, and time required to exchange ballast water in each tank. In addition, the charts and/or tables are to identify the openings used for release of water from the tank, together with overboard discharge arrangements.
- iv) Arrangements for the examination by the vessel's crew of sounding pipes, vent pipes and non-return devices involved in ballast water exchange are to be provided. Cautionary procedures to be taken regarding the use of air pipes that are not designed for continuous ballast water flow, and weathertight closures (e.g., manholes) which are to be re-secured after flow-through ballast water exchange, are to be provided within the Ballast Water Management Plan and on the charts and/or tables required in item *iii*) above.

The Ballast Water Management Plan is to contain a note similar to the following example:

*“Tank lids or other openings to be used during the flow-through operation are to be specified. Opening of tank lids or manholes, even in fair weather and sea conditions, can compromise deck watertight integrity. The authority as well as the responsibility for this action rests with the Master, and prudent seamanship is to be used. A procedure is to be followed for confirming they are closed after work is completed.”*

- v) The circumstances and conditions under which ballast water exchange is not to be undertaken due to adverse weather, design limitations, equipment failures, loss of power or other extraordinary circumstances that could threaten human life or safety of the vessel are to be detailed.
- vi) A flow-through method that has water flowing on the deck is not recommended. The use of collecting pipes, internal overflow pipes or interconnecting pipe/trunk arrangements between tanks is to be used to avoid water flowing on the deck.

- vii) The cautionary procedures related to flooding of deck areas and icing during cold weather conditions are to be identified (for example, the flow-through method is not to be performed in low temperature weather conditions that would result in icing).
- Where the effect of icing on deck has not been taken into consideration, the Ballast Water Management Plan is to indicate, *“The flow-through method is not to be performed in weather conditions that would result in icing.”*
- viii) For the flow-through method, it is recommended that the inlet and outlet piping connections be located as remotely from each other as practicable. Aft and fore peak tanks are to be provided with additional pipe work to improve the mixing conditions, unless documentation can be provided to demonstrate adequate mixing. The total cross sectional area of the ballast water discharge pipes on the upper deck is not to be less than two times that of the cross sectional area of the filling/suction pipe. To optimize the ballast water exchange, the ballast water discharge pipes serving the same tank are to be of a different diameter. The discharge pipe located closer to the filling/suction pipe is to have a smaller diameter than the other discharge pipe located further away from the filling/suction pipe. For illustration purposes and as an example, where the filling suction pipe has a diameter of 250 mm, the discharge pipes may be of 200 mm and 300 mm diameter, respectively.
- ix) Where topside and lower hopper side tanks are not interconnected, the scantlings of the hopper and double bottom tanks are normally derived using the head to the top of the tank or two-thirds the distance to the top of the overflow, whichever is the greater. Traditionally, ballast tanks are filled until ballast water overflows. The water pressure at the tank bottom drops immediately due to entrapped air, which reduces the water level in a small diameter overflow pipe. However, the flow-through method will result in a constant high pressure during the long periods required to complete the exchange. Therefore, for flow-through ballast water exchange where topside and hopper side tanks are not interconnected, the scantlings of the tank boundary structure are to be verified using a tank head equivalent to the full distance to the top of the overflow plus the generated back pressure at the maximum flow rate.
- x) The installation of additional air pipes, access hatches (as an alternative to deck manholes), internal overflow pipes (to avoid overflowing on the deck), or interconnecting pipe/trunk arrangements between tanks, where applicable and possible, may be considered.

## 7 Dilution Method

In the dilution method, replacement ballast water is filled through the top of the ballast tank and simultaneously discharged from the bottom at the same flow rate while maintaining a constant level in the tank throughout the ballast exchange operation. As with the flow-through method, ballast equal to approximately three times the tank capacity must be pumped through the tank to achieve 95% effectiveness in eliminating aquatic organisms.

The dilution method has the advantages of the flow-through method with regard to maintaining the stability and strength and other similar benefits. By discharging water from the bottom of the ballast tanks, sediments are more easily removed. This method avoids the use of air vent pipes and the removal of manhole covers to discharge water over the deck.

In addition to the design requirements of Chapter 2, Section 3 of this Guide, the following safety precautions are to be taken and noted in the Ballast Water Management Plan if the dilution method is chosen:

- i) Arrangements are to be made to automatically maintain the ballast water level in the tanks at a constant level.
- ii) High and low water level alarms are to be provided where maintaining a constant level in a tank or hold is essential to the operational efficiency of the vessel during the ballast water exchange.
- iii) The arrangements are to include the provision of a manual emergency stop for any operating ballast pump in case of valve malfunction or incorrect control actions.

As with all methods, the Ballast Water Reporting Form provided in Appendix 1 is to be completed and transmitted to the next port where ballast water is discharged.

## CHAPTER 2 Ballast Water Exchange Requirements

### SECTION 3 Ballast Water Exchange System Design and Construction

#### 1 General

The requirements of ballast water exchange system design and construction are provided for compliance with Regulation D-1 of the Convention. These requirements are to be applied in conjunction with 4-6-4/7 of the *Steel Vessel Rules* or Section 4-4-3 of the *Under 90m Rules*, as applicable and with the requirements related to the specific ballast water exchange methods addressed in Chapter 2, Section 2 of this Guide.

#### 3 Ballast Piping

Where the flow-through method or dilution method is to be used, the design of water ballast discharge arrangements is to be made to avoid over-pressurization. When the tank or hold is overflowing at the maximum pump capacity available, the tank, ballast piping, or ballast hold is not to be subjected to a pressure greater than that for which it has been designed.

The design of water ballast discharge piping is to be made to avoid the overflowing of ballast water directly onto decks.

#### 5 Ballast Pump (20 October 2010)

- i) At least two independent power-driven ballast pumps are to be provided, one of which may be driven by the propulsion unit. The ballast pumps are to be certified in accordance with 4-6-1/7.3 of the *Steel Vessel Rules* or 4-4-2/1 of the *Under 90m Rules*, as applicable. Additional pump redundancy may be required for those vessels utilizing the dilution method.
- ii) Where the sequential method is adopted, the capacity of **the ballast water system** is to be capable of providing ballast water exchange of the greatest dedicated ballast water tank or group of **ballast water** tanks that are undergoing simultaneous exchange (whichever is the greater volume), as per the approved Ballast Water Management Plan.
- iii) Ballast water exchange of cargo holds used for the carriage of water ballast may require an extended period of time over that specified in 2-3/5ii) and is normally to be completed within twenty-four hours.
- iv) The ballast pumps are to be included in the power balance calculations for normal seagoing conditions. (See 4-8-1/5.1.5 of the *Steel Vessel Rules* or 4-6-2/1.7 of the *Under 90m Rules*, as applicable.)

## 7 Ballast Valve Arrangements

- i) The piping serving every ballast tank or hold intended for carrying ballast water is to be provided with isolating valves for ballasting and/or deballasting purposes.
- ii) The isolating valves controlling the movement of ballast water are to be arranged so that they remain closed at all times except when ballasting, deballasting, or ballast exchange operations are being carried out.
- iii) For vessels operating in low temperature environments, the side ballast discharge valves placed above the assigned lightest load line are to be provided with adequate heating arrangements. (Refer to the *ABS Guide for Vessels Operating in Low Temperature Environments*.)
- iv) On oil tankers, segregated ballast and clean ballast may be allowed to be discharged below the waterline during ballast water exchange, provided that the surface of the ballast water has been examined either visually or by other means immediately before the discharge to verify that no oil contamination has taken place.

## 9 Sea Chests and Shiplside Openings Intended for Ballast Water Exchange

- i) The relative positions of ballast water intakes and discharge openings are to avoid as far as practical the contamination of replacement ballast water with the water being discharged.

## 11 System Arrangements

- i) The design of the ballast water system is to allow for ballast water exchange operations with the minimum number of stages.
- ii) The internal arrangements of ballast tanks and ballast water piping inlet and outlet arrangements are to allow for complete ballast water exchange and clearing of any sediments. (Refer to IMO Res. MEPC.150(55) "Guidelines on Design and Construction to Facilitate Sediment Control on Ships (G12)".)
- iii) The design of sea suction line strainers is to permit cleaning of strainers without interrupting ballast water exchange procedures.

## 13 Control Features

- i) Ballast pumps and all associated valves are to be provided with a means of remote operation from a central ballast control station during the ballast water exchange process.
- ii) Each ballast pump operated during ballast water exchange is to be provided with a means of local control.
- iii) A manually operated independent means of control of all valves required for ballast water exchange is to be provided for emergency operation in the event of main control system failure. Where the valves are located inside tanks or other closed spaces that are not readily accessible, this means of control may be achieved using valve actuating rods.
- iv) The central ballast control station is to include the following:
  - A valve position indicating system
  - A tank level indicating system which indicates the filling level of ballast tanks
  - A draft and trim indicating system
  - A means of communication between the central ballast control station and local control stations for the ballast pumps and valves
  - Equipment for monitoring and/or recording all ballast water operation processes

These systems are to function independently of one another or have sufficient redundancy so that a failure in one system does not jeopardize the operation of any other system.

- v) The ballast pump and ballast valve control systems are to be arranged such that the loss of any one component will not cause loss of operation of the other pumps or valves.
- vi) Where a dilution method is used, the control of ballast pump(s) is to be such that the ballast water level may be maintained within predetermined levels (i.e., maximum allowable level and minimum allowable level) with due consideration to the hull longitudinal strength.

When the water level reaches outside the predetermined levels, an alarm is to be sent at the ballast water control station and other normally manned location(s).

## 15 Ballast Tanks

For vessels operating in low temperature environments and where there is a risk of freezing water ballast, ballast tanks are to be provided with a means to prevent the water inside the tanks from freezing. (Refer to the *ABS Guide for Vessels Operating in Low Temperature Environments*.)

## 17 Sampling

- i) The design of the ballast water system is to take into account the need for sampling ballast water and sediments by port State or other authorized organizations.
- ii) The area immediately below any tank opening is to be kept free of obstructions that could impede the use of sampling equipment or free access. (Providing safe access to the tanks by the fitting of tank hatches as an alternative to manholes is to be recommended.)
- iii) The sampling arrangements are to provide ease of sampling of ballast water and sediments without the need to enter potentially dangerous spaces or partially filled ballast tanks.
- iv) In tank samples are to be taken via sounding or air pipes or manholes using pumps, sampling bottles or other water containers. Samples may also be taken from the ballast water discharge line.
- v) Sediment samples are to be taken through manhole covers or access hatches.



## CHAPTER 3 Ballast Water Management Plan

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## CHAPTER 3 Ballast Water Management Plan

### SECTION 1 General Information

#### 1 General

The vessel is to maintain a Ballast Water Management Plan onboard for use by the vessel's Master and crew and port State authorities. This plan is to include:

- i)* Vessel particulars
- ii)* Ballast tank arrangements
- iii)* Safety considerations
- iv)* A detailed description of the actions required by the crew to implement ballast water exchange method(s)
- v)* Detailed procedures for the disposal of sediments (at sea and ashore)
- vi)* Other operational considerations including communications with and reporting to coastal and port State authorities, and the designation of the officer onboard who is responsible for proper implementation of the Ballast Water Management Plan

In addition, the Ballast Water Management Plan is to provide a listing and the details of any exemptions issued by the Administration in accordance with Regulation A-4 of the Convention, and where appropriate, a list of any Additional Measures issued by a Party to the Convention that are relevant to the vessel's trade. Detailed descriptions of any actions required by the vessel's crew to comply with the additional measures are also to be included in the Management Plan.

#### 3 Maintenance of the Ballast Water Management Plan

The Ballast Water Management Plan is to be reviewed periodically by the Owner, Operator or Master to maintain its currency. Any changes to the provisions of the Ballast Water Management Plan are to be submitted for review and approval by ABS.

The Ballast Water Management Plan is to be readily available for inspection upon request by authorities such as port State authorities.

#### 5 Development of the Ballast Water Management Plan

The following Sections of this Guide, which have been based on IMO Resolution MEPC.127(53) "Guidelines for Ballast Water Management and Development of Ballast Water Management Plans (G4)" have been provided to assist in the development of a vessel-specific Ballast Water Management Plan in those instances where ballast water exchange is intended.



CHAPTER **3** **Ballast Water Management Plan**

SECTION **2** **Cover Page**

Vessel Name: ABC

IMO No: 12345

Owner/Operator:

Issued Date:

Approved Date:

To Meet the requirements of the  
International Convention for the Control and Management of ships' Ballast Water and Sediments, 2004,  
adopted by the International Maritime Organization on 13<sup>th</sup> February 2004

and

Part "B" of IMO Resolution MEPC.127(53) "Guidelines for Ballast Water Management and Development  
of Ballast Water Management Plans (G4)" adopted on 22 July 2005

## CHAPTER 3 Ballast Water Management Plan

### SECTION 3 Preamble

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

#### 1 General

A preamble is essentially introductory text which is intended to provide all interested parties of the purpose of the plan or relevant document. The text below is a sample preamble which ABS has determined to be acceptable.

#### 3 Preamble

This Ballast Water Management Plan has been developed to provide guidance to the Master and the crew of the M/V \_\_\_\_\_ in the operation of the vessel's ballast water exchange system. This plan has been prepared to be practical and easy to use to assist in the development of structured and logical actions required in association with ballast water exchange operations.

The following items have been included in this plan:

- i) Detailed safety procedures for the vessel and the crew associated with ballast water exchange procedures
- ii) A detailed description of the actions to be taken to implement the ballast water exchange procedures
- iii) Detailed procedures for the disposal of sediments at sea and to shore
- iv) Procedures for coordinating the discharge of exchanged ballast water with the port State authorities
- v) The designation of a Ballast Water Management Officer, who is responsible for the implementation of the Ballast Water Management Plan
- vi) The reporting/recording requirements provided for in the Ballast Water Management Convention.

In addition, advice regarding the uptake of ballast water, step-by-step procedures, sequences for ballast water exchange, and any operational restrictions have been included in the plan.



## CHAPTER 3 Ballast Water Management Plan

### SECTION 4 Introduction

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

#### 1 General

The text below is an example of an “Introductory” paragraph for inclusion into the Ballast Water Plan or Manual. This proposed text is based on the Appendix to IMO Resolution MEPC.127(53) “Guidelines for Ballast Water Management and Development of Ballast Water Management Plans (G4)”.

#### 3 Introductory Text

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

The purpose of the Plan/Manual is to meet the requirements for the control and management of ship’s ballast water and sediments in accordance with the Guidelines for Ballast Water Management and the Development of Ballast Water Management Plans as contained in Resolution MEPC.127(53) and this Guide. The Plan/Manual provides standard operational guidance for the planning and management of vessel’s ballast water and sediments via ballast water exchange, and the procedures to be followed.

This Plan/Manual has been approved by ABS for classification purposes (where the **BWE** notation has been assigned) and statutory certification (where ABS is acting as a Recognized Organization (R.O.)). No alteration or revision has been made to any part of this manual without the approval of ABS.

The Owners/operators and/or the Master have reviewed this manual on a regular basis and can confirm that the information contained herein is accurate and current.

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



**CHAPTER 3 Ballast Water Management Plan**

**SECTION 5 Vessel Particulars**

*At least the following details should be included:*

Vessel name	
Vessel type	
Port of registry	
Flag	
Gross Tonnage (gt)	
Deadweight (DWT)	
IMO number (in accordance with resolution A.600(15) IMO Vessel Identification Number)	
Length overall	
Length between perpendiculars	
Beam	
International call sign	
Summer draft	
Deepest ballast drafts (normal and heavy weather)	
Total ballast capacity of the vessel in cubic meters and other units	
Total number of ballast tanks and holds	
Number of ballast tanks	
Number of holds	
Classification society	
Ballast Water Exchange Method(s)	
Identification (Rank) of the Appointed Ballast Water Management Officer(s)	

This plan is to be kept available for inspection upon request by an authorized authority.

Approved by \_\_\_\_\_ on Date \_\_\_\_\_



CHAPTER **3** **Ballast Water Management Plan**

SECTION **6** **Crew Review Record/Revision History**

**1** **General**

The owners/operators and vessel’s crew on a routine basis are to review the contents of the Ballast Water Management Plan. This review is to confirm that the information provided within the Plan is current and contains the information necessary to conduct a ballast water exchange in accordance with the Ballast Water Management Convention and this Guide. A record of the reviews and revisions to the plan updates has been recorded below.

The text below represents a means to document that the vessel’s crew has conducted a review of the Ballast Water Management Plan and the revisions to the plan have been documented.

**3** **Crew Review/Revision History**

This section of the Ballast Water Management Plan documents a review by the vessel’s crew and provides a means to track the revision history of the plan as a means to confirm that the plan remains current.

**Crew Review**

Name	Position/Rank	Date of Review	Signature

**Revision History**

Current Version	Created by (Position/Rank)	Date of Revision	Revision Description
Previous Versions			



CHAPTER **3 Ballast Water Management Plan**

SECTION **7 Table of Contents**

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

**1 General**

A Table of Contents is to be provided to assist in the implementation of the Ballast Water Management Plan. The Table of Contents is to be simple and provide the user with a quick reference to the various sections of the Plan.

**3 Table of Contents**

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## CHAPTER **3** **Ballast Water Management Plan**

### SECTION **8** **Introduction – Intent and Purpose of Ballast Water Management and Management Plan**

*This section of the Ballast Water Management Plan is to contain a brief introduction for the vessel's crew, explaining the need for ballast water management and for record keeping.*

#### **1** **General**

The intent of this section of the Ballast Water Management Plan is to provide the crew with a basic understanding on why ballast water is carried onboard vessels, the reason why it is necessary to conduct ballast water management and the significance of record keeping. The explanations should be brief and informative.

#### **3** **Carriage of Ballast Water**

Ballast water is carried onboard vessels to maintain acceptable load and trim conditions during a specific voyage or a segment of a voyage. The amount and distribution of ballast water provides for:

- i) A reduction in hull stresses (longitudinal strength)
- ii) Transverse stability
- iii) Sufficient vessel draft, including propeller and rudder immersion (enhanced efficiency and maneuverability)
- iv) Compensation for the consumption of fuel and other consumables.

The amount and distribution is determined by the vessel's Master and is based on specific operational and environmental conditions. The vessel's Master and the designated Ballast Water Management Officer are the responsible authorities for the implementation of the Ballast Water Management Plan.

#### **5** **Purpose of Ballast Water Management**

While the carriage of ballast water is an essential component in the operation of vessels, it has been determined by competent authorities that ballast water is a significant pathway for the transfer of harmful aquatic organisms and/or pathogens. The introduction of these harmful aquatic organisms (including but not limited to Zebra Mussels, Golden Mussel, North American Comb Jellyfish, North Pacific Seastar, and the Cladoceran Water Flea) and/or pathogens (cholera) has caused significant damage to many of the world's coastal regions. The international community, under the International Maritime Organization has developed and adopted the "International Convention for the Control and Management of Ship's Ballast Water and Sediments, 2004. This Convention is aimed at preventing the introduction of unwanted aquatic organisms and pathogens through the discharge of ballast water and sediments.

The responsible authorities, composed of scientists, ship owners/operators and builders as well as flag States, have determined that ballast water exchange provides an effective means, on a temporary basis pending the development of ballast water treatment systems, to prevent the inadvertent transfer of these harmful aquatic organisms and pathogens.

Ballast water exchange is the process of exchanging the biologically rich coastal waters with mid-ocean sea water. It has been scientifically proven that those marine organisms and/or pathogens taken on in coastal waters are less likely to survive when discharged into the open ocean due to changes in the water's chemistry, temperature and salinity. Similarly, those marine organisms taken onboard in the open ocean are less likely to survive once they are discharged into coastal waters.

## **7 Record Keeping**

Each operation concerning ballast water exchange is to be fully recorded without delay in the ballast water record book. These records are considered to be critical to the success of the ballast water management program and serve to provide documentation that the ballast water exchange has been properly conducted and the exchange has been completed.

Authorized port State officers may inspect the ballast water record book onboard the vessel as a means to determine the level of exchange completed. These officials may elect to make a copy of the entries in the record book and require the vessel's Master to certify that the copy is a true copy. Any copy so certified may be admissible in any judicial proceedings as evidence of the facts stated in the entry.

## **9 Ballast Water Management Plan**

This Ballast Water Management Plan has been developed to provide guidance to the vessel's crew in the effective operation of the ballast water exchange system. The implementation of this plan enables the vessel to prepare for the actions required when conducting a ballast water exchange at sea. Effective planning leads to these actions being taken in a structured, logical and safe manner.

## CHAPTER 3 Ballast Water Management Plan

### SECTION 9 Ballast Water System Drawings and Data

*Plan or drawings of the ballast system are to be included in this section of the Ballast Water Management Plan.*

#### 1 General

Plans, drawings, and documentation are to be provided in this section of the Ballast Water Management Plan to facilitate the implementation of the Plan. The number of plans, drawings, or documents provided is to be limited to those determined to be necessary by the Plan's developer and is to be reviewed and revised as necessary by the vessel's crew in order to avoid the inclusion of extraneous information.

#### 3 Drawings and Data

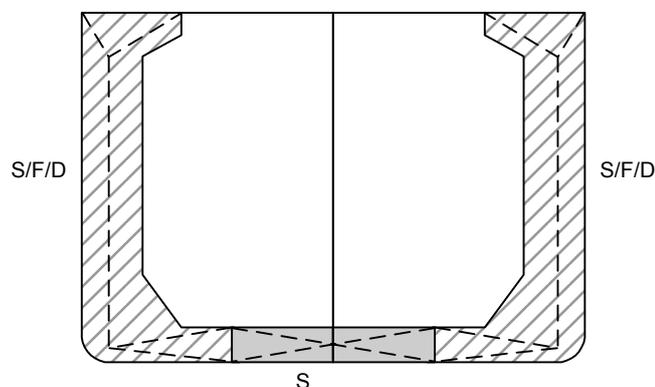
A description of the ballast water system including but not limited to the following drawings and data is to be included in this section of the Ballast Water Management Plan:

- i) Ballast Tank Arrangements (Section, Profile, and Plan Views)
- ii) Ballast Water Capacity Plan
- iii) Ballast Water Piping Plan (including air pipes, discharge/overflows and sounding/gauging locations)
- iv) Ballast pump capacities
- v) The ballast water exchange system used onboard, with references to detailed operational and maintenance manuals held onboard
- vi) Location of tank sampling points

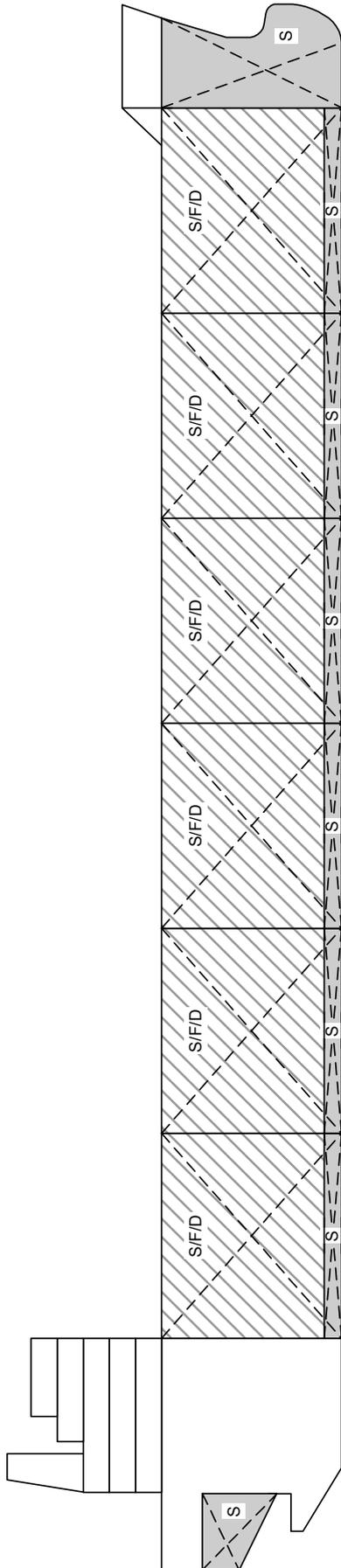
##### 3.1 Ballast Tank Arrangements

Ballast tank arrangements are to be provided, as shown in 3-9/Figures 1 through 3. Schematics should include section, plan, and profile views of the vessel.

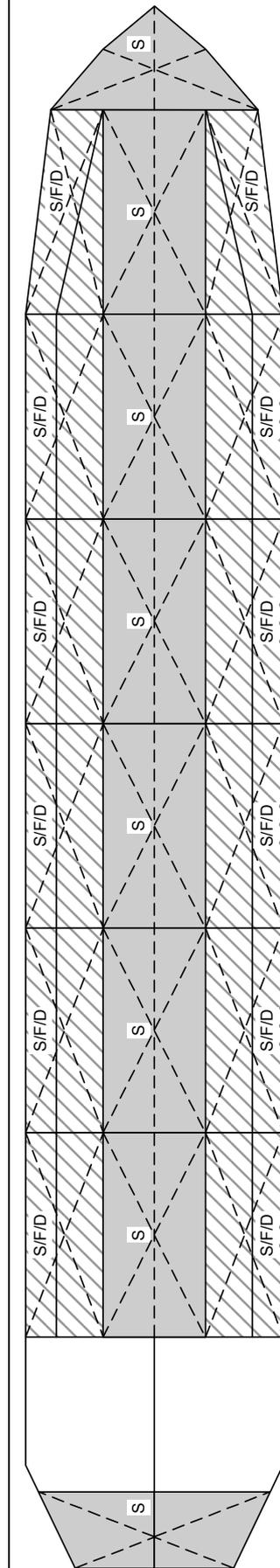
**FIGURE 1  
Section View**



**FIGURE 2**  
Profile View



**FIGURE 3**  
Plan View



### 3.3 Ballast Water Capacity Plan

A tabular format of all ballast water tanks is to be provided, including the tank identifier, location and capacity of the tank, the pumps that serve the tank, and the designated BWE method that has been selected for the tank.

**TABLE 1**  
**Sample Ballast Water Capacity Plan**

<i>Tank Number</i>	<i>Location/Frame Numbers</i>	<i>Capacity (m<sup>3</sup>)</i>	<i>Available Pumps</i>	<i>Designated Exchange Method (s)</i>

### 3.5 Pumping and Piping Arrangements

Tabular and/or schematic drawings are to be provided with ballast water system piping information. 3-9/Tables 2 and 3 below provide sample data to be included, as applicable.

**TABLE 2**  
**Sample Pump Data**

<i>Pump Name</i>	<i>Rated Capacity (m<sup>3</sup>)</i>	<i>Type</i>	<i>Location</i>

**TABLE 3**  
**Sample Overflow and Filling Line Data**

<i>Tank Name</i>	<i>No. of overflow lines per tank (air vents or overflow lines per tank)</i>	<i>Overflow line nominal diameter (mm)</i>	<i>Overflow lines total cross sectional area (mm<sup>2</sup>)</i>	<i>Filling line nominal diameter (mm<sup>2</sup>)</i>	<i>Filling line total cross sectional area (mm<sup>2</sup>)</i>	<i>Ratio of overflow filling line total cross sectional area (mm<sup>2</sup>)</i>



## CHAPTER 3 Ballast Water Management Plan

### SECTION 10 Ballast Water Sampling Points

*A list or diagrams specifying the location of the sampling and access points to the pipelines and ballast water tank.*

#### 1 General

The availability of sampling points is considered to be an essential component of the Ballast Water Management system. These sampling points are to be provided so as to enable the port State officers or other interested parties to confirm that a ballast water exchange has been conducted prior to the discharge of ballast water.

Currently, ballast water salinity is the most common means available to determine if a ballast water exchange has taken place. The concept behind using salinity as an indicator of ballast water exchange is that the salinity of mid ocean seawater differs when compared to coastal waters. However, this is not always a good indicator since some coastal waters have a similar salinity when compared to mid-ocean waters.

For ballast water exchange, samples are normally taken through vents, manholes, hatches, and sounding tubes. Care must be exercised to confirm that the ballast water records have been properly maintained to avoid the possibility of discrepancies in the samples (for example, if any ballast water has been transferred into the tank since the exchange occurred, this is to be noted in the ballast water record).

#### 3 Sampling Points

Articles 6 and 9 of the Ballast Water Management Convention provide for compliance monitoring by officers duly authorized by a Party to the Convention for the purposes of scientific research and determining if the vessel is in compliance with the Convention.

*A list of diagrams specifying the location of the sampling and access points to the pipelines and ballast water tanks, to enable the crew to provide assistance to the authorized officers is provided in Appendix \_\_\_\_ to this plan.* In-tank samples may be taken via sounding or air pipes and manholes by using pumps, sampling bottles or other water containers.

It is unlikely that a crew member will be required to take samples unless at the expressed request and under the direct supervision of an authorized port State inspection officer.

The vessel's Master and crew are to advise the authorized officers of the safety procedures to be observed when entering enclosed spaces.

The Master should contact the appropriate port State authorities to obtain as much notice as is possible regarding the intention of the authorized officers to take samples in order to assist in the planning and to provide for the required resources.

The Master should provide all reasonable assistance to the authorized authorities in support of the sampling.

## CHAPTER 3 Ballast Water Management Plan

### SECTION 11 Operational Guidance

*A detailed description of the operation of the Ballast Water Exchange System is to be provided.*

#### 1 General

This section of the Ballast Water Management Plan should provide the user with a detailed description of the operation of the ballast water exchange system. The text below provides a listing of those items which are considered necessary for inclusion in this section of the Plan. The contents of the Plan are to be clear and easy to understand to support the exchange sequences.

#### 3 Exchange Guidance

The exchange of ballast water at sea requires careful and deliberate planning since these operations have the potential to be more hazardous than ballast water operations conducted in port.

It is the responsibility of the vessel's Master and the Ballast Water Management Officer to develop detailed procedures and processes in support of the ballast water exchange. All parties are to be conversant with the safety aspects of ballast water exchange and in particular with the method(s) of exchange to be used onboard their vessel. The vessel's Master and crew engaged in ballast water exchange at sea should be trained in and familiar with the following, as appropriate:

- i) The approved vessel loading conditions to be used during ballast water exchange
- ii) The vessel's ballast pumping and piping arrangements, positions of associated air and sounding pipes, positions of all compartment and tank suction and pipelines connecting them to the vessel's ballast pumps and, in the case of use of the flow-through method of ballast water exchange, the openings used for release of water from the top of the tank together with overboard discharge arrangements
- iii) The method of confirming that the sounding pipes are clear and that air pipes and non-return devices are in good order
- iv) The different times required to undertake the various ballast water exchange operations including the time required to complete individual tanks
- v) The method (s) to be used for ballast water exchange at sea
- vi) The need to continually monitor ballast water exchange operations

Throughout the exchange process, the Master is to consider if it is acceptable to continue the process, taking into consideration the following:

- i) The vessel's position (traffic density)
- ii) Forecast weather and sea conditions
- iii) Vessel stability and loading conditions
- iv) Condition and performance of the vessel's machinery

The list below identifies a representative listing of those items that should be considered for inclusion in this section of the Ballast Water Management Plan. This list is only a representative listing provided as guidance and is not inclusive:

- i) The location where ballast water exchange is to occur is to be identified (refer to 2-1/3, “Where Ballast Water Exchange is to be Conducted”)
- ii) A detailed location and description of the watertight and weathertight closures (e.g., manholes, opening of vents and air pipes) which may have been opened during ballast exchange that must be re-secured
- iii) Descriptions of the procedures required to conduct ballast water exchange taking into consideration the requirements contained in Chapter 2, Section 2
- iv) Maximum pumping rates to prevent the over-pressurization of the ballast tanks are to be identified
- v) Ballast water transfer within the vessel in order to comply with the loading conditions addressed in Chapter 2
- vi) Allowable weather conditions and sea states
- vii) Weather routing in areas seasonably affected by cyclones, typhoons, hurricanes or heavy icing conditions
- viii) Documented records of ballasting and de-ballasting
- ix) Contingency procedures for situations which may affect ballast water exchange at sea, including deteriorating weather conditions, pump failure and loss of power
- x) Time to complete the ballast water exchange or an appropriate sequence thereof. Ballast water exchange is to commence only if there is sufficient time to safely complete the exchange in the distance and minimum water depth criteria required by the ballast water exchange standard. The exchange is to be completed for as many tanks as possible
- xi) A description of how the ballast water operation will be continually monitored. Monitoring includes pump operation, tank levels, line and pump pressures, stability, stresses, etc.
- xii) A list of circumstances under which ballast water exchange is not to be undertaken. These circumstances may result from critical situations of an exceptional nature or *force majeure* due to weather conditions, equipment failures or defects, or any other circumstances in which human life or vessel’s safety is threatened, or at the discretion of the Master. If ballast water exchange is not undertaken, the details of the circumstances are to be documented in the Ballast Water Record Book (see Chapter 3, Section 18)
- xiii) Ballast water exchange at sea is to be avoided in freezing weather conditions. However, when it is deemed absolutely necessary, particular attention is to be paid to the hazards associated with the freezing of overboard discharge arrangements, air pipes and ballast system valves, together with their means of control and the accumulation of ice on deck.
- xiv) A listing of personnel safety concerns, including precautions which may be required when personnel are required to work on deck at night, in heavy weather, when ballast water overflows the deck and in freezing conditions. These concerns may be related to risk to personnel of falling and injury due to the slippery wet surface of the deck plate where water is overflowing on the deck, and to the direct contact with the ballast water, in terms of occupational health and safety.

## 5 General Ballast Water Management Precautionary Practices

### 5.1 Avoiding Unnecessary Discharge of Ballast Water

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

A note is to be provided explaining that exchanged ballast water which is mixed with non exchanged water is no longer considered to be properly exchanged.

### 5.3 Minimizing the Uptake of Harmful Aquatic Organisms, Pathogens, and Sediments

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

- In areas identified by the port States
- In darkness when organisms may rise up the water column
- In very shallow water
- Where the propellers may stir up sediment; or
- Where dredging is or recently has been carried out.

## CHAPTER 3 Ballast Water Management Plan

### SECTION 12 Safety Procedures for the Vessel and Crew

*Details of the vessel specific safety aspects of the ballast water exchange systems used.*

#### 1 General

The exchange of ballast water at sea presents challenges to the vessel's Master and crew. The development of this section of the Ballast Water Management Plan is to detail the safety procedures which may be required to address those challenges expected to be encountered during the exchange sequences. The precautions and action required by the crew, upon completion of the exchange sequences, are to be carefully considered and documented.

#### 3 Exchange at Sea

The exchange of ballast water at sea has the potential to be more hazardous than ballast water operations conducted in port. Safety procedures aimed at addressing the potential for increases in hull stresses, loss of transverse stability, bottom slamming, adverse affects on the vessel's maneuverability, over- and under-pressurization of ballast tanks, and the effects of sloshing loads on tanks represent only a few of those issues that warrant a heightened awareness from the crew which are to be included in this section of the Ballast Water Management Plan.

Where applicable, the proposed footnotes found in Chapter 2, Section 2 are recommended for insertion in this section of the Ballast Water Management Plan.

Precautions, including keeping the hull girder stresses and bending moments within the permissible limits contained within the approved loading manual and confirming that the vessel maintains adequate intact stability, as contained in the approved trim and stability booklet, are to be adhered to throughout the exchange sequence.

Detailed instructions and procedures for crew safety, including but not limited to, proper lighting being provided when the crew is working on deck, procedures for opening sampling points and guidance regarding water on deck (where the flow-through method is used), are to be addressed.

A listing of those safety considerations pertaining to the specific ballast water exchange method(s) selected is to be included in this section of the management plan. For example, where the sequential method of ballast water exchange is to be utilized, this list should address the following:

- i) Maintaining adequate intact stability
- ii) Means to prevent the longitudinal stress and, where applicable, torsional stress level exceeding the permitted values with regard to the prevailing sea conditions
- iii) Measures to be taken to prevent significant structural loads resulting from sloshing action of partially filled tanks, especially where the partially filled tanks are adjacent to empty tanks.
- iv) Maintaining forward and aft drafts and trim to provide for adequate bridge visibility, propeller immersion and minimum forward draft.

A similar list addressing the flow-through and dilution methods should be developed for inclusion into this section of the Ballast Water Management Plan.



## CHAPTER 3 Ballast Water Management Plan

### SECTION 13 Operational or Safety Restrictions

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

#### 1 General

The implementation of the Ballast Water Management Plan is largely dependent on the proper planning and execution of the task contained therein. Thus pre-planning and training are essential to provide an effective exchange of the vessel's ballast.

The detailed safety procedures discussed in Chapter 3, Sections 11 and 12 should be adopted during the development of the voyage plan.

Ballast exchange procedures, regardless of the method selected, are complex and may require a prolonged period, sometimes lasting days, to complete. Detailed training for all crew members that may participate in the exchange of ballast water should be conducted so that the crew can safely perform the duties that are expected of them and respond to an emergency should it occur.

When conducting ballast water exchange, the vessel's Master, Ballast Water Management Officer and crew are to maintain a diligent watch in order to respond to power failures, ballast pump or pipe failures, or structural failures. Should any of these events occur, they are to be reported immediately to the company's safety office in accordance with established procedures.

Company procedures related to the entry into tanks are also to be included in this section

## CHAPTER 3 Ballast Water Management Plan

### SECTION 14 Description of the Method(s) Used Onboard for Ballast Water Management and Sediment Control

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

#### 1 General

This section of the Ballast Water Management Plan is to clearly identify the method or methods of ballast water exchange utilized onboard the vessel. A detailed spreadsheet or listing of the operational procedures required to be conducted to support the exchange is to be included.

#### 3 Method(s) Used

There are three methods of ballast water exchange which have been determined by the IMO to be acceptable to reduce the spread of harmful aquatic organisms and pathogens via vessel's ballast water.

These three methods are:

- i)* Sequential method
- ii)* Flow-through method
- iii)* Dilution method

##### 3.1 Sequential Method

The sequential method is a process by which a ballast tank intended for the carriage of ballast water is first emptied and then re-filled with replacement ballast water to achieve at least a 95% volumetric exchange.

Where the sequential method is utilized, each tank is to be discharged until the suction on the ballast pump is lost. To assist in sediment control, it is recommended that a small percentage of seawater (approximately 5% of the tank's volume) be pumped into the tank for flushing purposes and then removed prior to refilling the tank to complete the exchange.

The intent of this additional flushing of the tank is to assist in the removal of sediments that may accumulate at the bottom of the tank. Scientists have proven that aquatic organisms and pathogens when entrapped in the sediments may re-emerge and develop when the tank is refilled with mid ocean water.

##### 3.3 Flow-through Method

The flow-through method is a process wherein the replacement ballast water is pumped in at the bottom of the ballasted tank, allowing for the water to flow through an overflow or other arrangements to achieve at least a 95% volumetric exchange of ballast water. Pumping through three times the volume of each ballast water tank is considered to meet the 95% volumetric exchange. In some cases, pumping through less than three times the volume of the ballast tank may be acceptable, provided the vessel can demonstrate that at least 95% volumetric exchange has been met.

### 3.5 Dilution Method

The dilution method is a process by which replacement ballast water is filled through the top of the ballast tank intended for the carriage of ballast water with the simultaneous discharge from the bottom at the same flow rate and maintaining a constant level in the tank throughout the ballast exchange sequence. Pumping through three times the volume of each ballast water tank is considered to meet the 95% volumetric exchange. In some cases, pumping through less than three times the volume of the ballast tank may be acceptable, provided the vessel can demonstrate that at least 95% volumetric exchange has been met.

## 5 Ballast Water Exchange Operation Spreadsheet

A spreadsheet or computer-based means to document the exchange sequences for the ballast water exchange method(s) selected is to be developed and incorporated into this section of the Ballast Water Management Plan. This spreadsheet or computer-based means is to be simple, easy to understand and implement, and is to detail the various steps required to complete the exchange. (For example, Step 1: Tank(s) 1 and 4 are to be pumped out using ballast pump number #. Percentage of tank volume exchanged, etc.). Each ballast water tank (including fore and aft peaks) is to be identified by tank designation and the volume in each tank is to be measured and recorded.

In addition, the forward and aft drafts, trim, bending moments, shear force, propeller immersion, and time required for each sequence or step is to be recorded. Any additional notes regarding the ballast water exchange operations, for example sea states or bridge visibility, are to be annotated.



## CHAPTER 3 Ballast Water Management Plan

### SECTION 15 Procedures for the Disposal of Sediments

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

#### 1 General

In addition to being added weight, the carriage of sediments provides a suitable environment for the aquatic organisms and pathogens to survive for extended periods of time after the water they were originally in has been discharged. The re-introduction of ballast water may enable the organisms and or pathogens to redevelop and subsequently, upon discharge into another port or area, cause injury or damage to the local environment. This section of the Ballast Water Management Plan is intended to provide instructions or procedures to the crew for the disposal of sediments both at sea, via the use of features incorporated into the vessel's design or while in a port or shipyard to shore based facilities.

#### 3 Sediment Management

Regulation B-5 of the Ballast Water Management Convention requires that vessels should, without compromising safety or operational efficiency, be designed and constructed with a view to minimize the uptake and undesirable entrapment of sediments, facilitate the removal of sediments, and provide safe access to allow for sediment removal and sampling.

As discussed in 3-11/5.3, practical steps are to be taken during ballast water uptake to avoid the accumulation of sediments. However, it is recognized that sediments will be taken onboard and will settle on tank surfaces. The amount of sediment accumulation is directly related to the vessel's trading pattern, ballast tank design and configuration, the frequency in which ballast is taken onboard, the frequency of removal and the availability of reception facilities. Where sediment has accumulated, consideration should be given to flushing the tank bottoms and other surfaces in suitable locations, such as more than 200 miles from the nearest land in waters having a depth of more than 200 meters, or in areas designated for ballast water exchange by the port or coastal State.

The volume of sediment in the ballast tanks should be monitored on a regular basis and removed on a timely basis as found necessary.

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

It is to be recognized that flushing with sea water or conducting ballast water exchange in the open sea may only serve to suspend sediment or remove only a limited amount of the sediment. Therefore, the scheduling of in-tank cleaning of the ballast tanks should be incorporated in the vessel's maintenance schedule.



## CHAPTER 3 Ballast Water Management Plan

### SECTION 16 Methods of Communication

*Details of the procedures for coordinating the discharge of ballast in waters of a coastal State.*

#### 1 General

Effective communication between the vessel and the port State and local authorities regarding the discharge of ballast water is a significant component in the management of ballast water.

This section of the Ballast Water Management Plan should contain the information necessary to support this communication.

#### 3 Communications Directory

As the requirements for the submission of ballast water reports vary greatly between parties to the Convention, it is recommended that the Ballast Water Management Plan contain a directory of those authorities that the vessel may be required to contact for any given voyage. This directory should contain the name of the appropriate authority, telephone number, email address and street address. It is recommended that the vessel's Master or the Ballast Water Management Officer contact the port State authorities well in advance of the vessel's arrival to obtain any specific instructions relative to the reporting and discharge of ballast waters.

Appendix 2 of this Guide contains a "generic" ballast water reporting form based on MEPC 52/2 Annex 2. This form is intended to provide assistance to the Master and the designated Ballast Water Management Officer when communicating with the port State.

In addition to reporting the vessel's intended ballast water operations (amount of ballast to be discharged, location of exchange, etc.), the Master or Ballast Water Management Officer should obtain any special instructions from the port State, notify the port State authorities of any special circumstances relative to the exchange of ballast water and advise the Authorities of any exemptions granted to the vessel under regulation A-4 of the Ballast Water Management Convention.

## CHAPTER 3 Ballast Water Management Plan

### SECTION 17 Duties of Designated Ballast Water Management Officer and Vessel's Master

*Outline of the duties of the designated officer and vessel's Master.*

#### 1 General

The responsibility for the execution and record keeping associated with the management of ballast water is to be assigned to a responsible member of the vessel's crew. This section of the template provides guidance on those duties associated with ballast water exchange to be performed by the Ballast Water Management Officer and the vessel's Master. Vessel-specific listings of responsibilities are to be carefully identified and included in this section of the Ballast Water Management Plan.

#### 3 Officer in Charge of Ballast Water Exchange

Duties of the appointed officer (designated or rank officer) in charge of ballast water exchange may include:

- i) Following the applicable Ballast Water Management Plan or developing a new Ballast Water Management Plan on the basis of the vessel's safety criteria, equipment availability and weather forecast
- ii) The responsibility for the proper implementation of the Ballast Water Management Plan including the availability of personnel and equipment
- iii) Informing shore management, the owner or operator of the commencement/interruption/completion of ballast water exchange
- iv) Maintaining the Ballast Water Exchange Record Book (See Chapter 3, Section 18)
- v) Preparing the appropriate national or port Ballast Water Reporting Form prior to arrival at destination
- vi) Assisting the port State control or quarantine officers with any sampling that may need to be performed
- vii) Providing crew familiarization and training in ballast water exchange requirements and applicable shipboard systems and procedures.
- viii) Other duties specified by the vessel's owners/operators

The Ballast Water Management Officer must periodically keep the Master advised on the progress of the plan. If there is any doubt, or if the management plan does not keep to the schedule, the Master is to be advised accordingly. Additionally, the appointed Ballast Water Management Officer is to inform the Chief Officer when commencing/stopping ballast operations at each stage.

## 5 Vessel's Master

Duties of Vessel's Master may include:

- i) Confirmation that the Ballast Water Management Plan is clearly understood by the appointed Ballast Water Management Officer and by any other responsible officer that may be involved, and that all operations strictly conform to the safety parameters
- ii) The Master shall consider the Precautionary Advice to Masters When Undertaking Ballast Water Exchange Operations (MSC/Circ.1145). Where transitory deviations of bridge visibility (SOLAS V/22), propeller immersion, and minimum draft forward during ballast water exchange are acceptable, the Master is to be notified by a note placed in the Ballast Water Management Plan.
- iii) The Master assesses:
  - The duration and time of any such deviation
  - The effect(s) on vessel's navigation/maneuvering performance
  - The time to complete the ballast water exchange operation
- iv) A decision to proceed with such a ballast water exchange operation is to be taken only:
  - When the vessel will be in open water
  - With low traffic density
  - When an enhanced navigation watch will be maintained
  - When the maneuverability of the vessel will not be impaired
  - In suitable weather and sea state conditions
- v) Coordinate communications with coastal and port State authorities through established procedures. Such communications may include, but are not limited to, submission of ballast water reporting forms, coordinating inspections of the ballast water logs and sampling of ballast water, local restrictions or instructions related to the discharge of ballast water, designated areas for the discharge of ballast water in the event that the vessel was unable to discharge the ballast water due to weather or mechanical failures.



## CHAPTER 3 Ballast Water Management Plan

### SECTION 18 Ballast Water Record Book and Reporting Forms

*Details of the record keeping requirements of the Convention.*

#### 1 General

The maintenance of records detailing specific information pertaining to the exchange of ballast water is to be viewed as an important component of the Ballast Water Management Plan. The Ballast Water Exchange Record Book will be reviewed by the port State authorities during port State inspections when assessing the ballast water samples discussed earlier in this Guide. Detailed instructions for the maintenance and retention of these records onboard the vessel are to be provided within this section.

Many port States require the submission of ballast water reporting forms as a means to analyze and evaluate their national ballast water management program. This section of the Ballast Water Management Plan should also contain instructions regarding the completion and retention of these ballast water reporting forms.

#### 3 Record Book and Reporting Forms

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

The Ballast Water Record Book shall be kept readily available for inspection at all reasonable times and, in the case of an unmanned vessel under tow, it may be kept on the towing vessel. An example of the information to be recorded in the Ballast Water Record Book can be found in Appendix 2.

Each operation concerning ballast water shall be fully recorded without delay in the Ballast Water Record Book. Each entry shall be signed by the officer in charge of the operation concerned and each completed page shall be signed by the Master. The entries in the Ballast Water Record Book shall be in the working language of the vessel. If that language is not English, French, or Spanish, the entries shall contain a translation into one of those languages.

Coastal or port State officers may inspect the Ballast Water Record Book onboard any vessel while that vessel is in a port or offshore terminal of that State. These officials may elect to make a copy of the Ballast Water Record Book and require the Master to certify that the copy is a true copy. Any such certified copy shall become admissible in any judicial proceeding as evidence of the facts stated in the entry.

In the Ballast Water Management Plan, the following forms are to be provided for recording and documentation. It is recommended that blank forms be pre-formatted with permanent information such as the Vessel's Name, IMO No., Call Sign, Gross Tonnage, Owner, total ballast capacity, total number and list of tanks onboard, etc. This will help to avoid any inadvertent mistakes and the clarity of presentation will be welcome to quarantine officers.

- i) *Ballast Water Record Book.* The Ballast Water Record Book includes the record of loading and discharging ballast and narrative pages for recording unusual events. This record is to be maintained in order to provide port State officers with historical information they may require concerning the source of the ballast water onboard the vessel.

Even if a vessel is not currently trading in an area where ballast water information is required to be reported, it may later prove worthwhile to have a history of what water has been carried.

- ii) *Ballast Water Reporting Form.* The Ballast Water Reporting Form is to be used when reporting ballast water exchange to national or local authorities that request such information in advance. Guidance for completing the form is included in the pages following the form. Before this general form is completed, the appointed Ballast Water Management Officer is to verify that the appropriate form required by the country or port of call is used.

## CHAPTER 3 Ballast Water Management Plan

### SECTION 19 Crew Training and Familiarization

*Information on the provisions of crew training and familiarization.*

#### 1 General

To assist in the implementation of the Ballast Water Management Plan, the vessel's crew must be trained and familiar with the tasks expected of them. This training together with an understanding as to the reasons why ballast water exchange is necessary will promote the effective and efficient conduct of the Ballast Water Management Plan.

#### 3 Crew Training and Familiarization

Training and familiarization of the vessel's crew is essential in the management of ballast water and sediments. Specifically, this training should include instructions on the requirements of the Ballast Water Management Convention, the implementation of the Ballast Water Management Plan, ballast water exchange procedures, sediment management procedures, the Ballast Water Record Book, and reporting functions. This training should be particularly sensitive to those matters concerned with the safety of the vessel and the crew.

The vessel's Master and crew engaged in the exchange of ballast water at sea are to be trained in and familiar with the following, as appropriate:

- i) The vessel's ballast pumping and piping arrangements, positions of associated air and sounding pipes, positions of compartment and tank suction and pipelines connecting them to the vessel's ballast pumps and, when using the flow-through method, the openings used for release of water from the top of the tank, together with overboard discharge arrangements
- ii) The method of confirming that sounding pipes are clear and that air pipes and their non-return devices are in good working order
- iii) The different times required to undertake the various ballast water exchange operations, including the time to complete individual tanks
- iv) The location of and access to sampling points
- v) The method(s) in use for ballast water exchange at sea with particular reference to safety considerations including the precautions for entering tanks and the removal of sediments (including procedures for the safe handling, packaging and storage of sediments)
- vi) The need to continually monitor ballast water exchange operations
- vii) The method used onboard for ballast record keeping, reporting and sounding of the ballast tanks

Training records are to be maintained with the Ballast Water Management Plan.



## CHAPTER **3** **Ballast Water Management Plan**

### SECTION **20** **Supporting Documentation**

#### **1** **Documentation**

The following documents are recommended to be appended to the Ballast Water Management Plan:

- i)* IMO Resolution A. 868 (20), Guidelines for Control and Management of Ship's Ballast Water to Minimize the Transfer of Harmful Aquatic Organism and Pathogens.
- ii)* The International Convention for the Control and Management of Ship's Ballast Water and Sediments, February 2004.
- iii)* IMO Resolution MEPC.127(53) Guidelines for Ballast Water Management and Development of Ballast Water Management Plans (G4).
- iv)* Latest national or local quarantine requirements for ballast water management



## APPENDIX 1 **Ballast Water Reporting Form**

### **1 General**

The attached Ballast Water Reporting Form was developed based on Annex 2 to MEPC 52/2. Owners/operators are strongly encouraged to communicate with coastal and port States to obtain a copy of any reporting forms and/or instructions which may be unique to that State. For example, those vessels which intend to enter into US Waters should obtain the US Ballast Water Reporting Forms from the NBIC (National Ballast Information Clearinghouse) via the NBIC website at <http://invasions.si.edu/NBIC/bwform.html>. The completed form is to be submitted directly to NBIC in accordance with the instructions provided on the website.

**Ballast Water Reporting Form (based on MEPC 52/2, ANNEX 2)**

**1. VESSEL INFORMATION**

Vessel Name:	Type:	IMO Number:	Specify Units: m <sup>3</sup> , MT, LT, ST
Owner:	GT:	Call Sign:	Total Ballast Water Onboard:
Flag:	Arrival Date:	Agent:	
Last Port and Country:	Arrival Port:		Total Ballast Water Capacity:
Next Port and Country:			

**2. BALLAST WATER**

**3. BALLAST WATER TANKS**

BALLAST WATER MANAGEMENT PLAN ONBOARD? YES \_\_\_ NO \_\_\_ HAS THIS BEEN IMPLEMENTED? YES \_\_\_ NO \_\_\_  
 TOTAL NO. OF TANKS ONBOARD \_\_\_ NO. OF TANKS IN BALLAST \_\_\_ IF NONE IN BALLAST GO TO NO. 5  
 NO. OF TANKS EXCHANGED \_\_\_ NO. OF TANKS NOT EXCHANGED \_\_\_

**4. BALLAST WATER HISTORY:**

RECORD ALL TANKS THAT WILL BE DEBALLASTED IN PORT STATE OF ARRIVAL; IF NONE GO TO NO. 5.

Tanks/Holds (list multiple sources/tanks separately)	Ballast Water Source				BW EXCHANGE: circle one: Empty/Refill or Flow Through				Ballast Water Discharge				
	DATE/ TIME ddmmyy/ hhmmss	PORT or LAT./ LONG.	VOL. (units)	TEMP (units)	DATE/ TIME ddmmyy/ hhmmss	ENDPOINT LAT./ LONG.	VOL. (units)	% Exch.	SEA HGT. (m)	DATE/ TIME ddmmyy/ hhmmss	PORT or LAT./ LONG.	VOLUME (units)	SALINITY (units)

Ballast Water Tank Codes: Forepeak = FP, Aft Peak = AP, Double Bottom = DB, Wing Tank = WT, Center Tank = CT, Topside Tank = TS, Cargo Hold = CH, O = Other

**Ballast Water Reporting Form (continued)**

IF EXCHANGES WERE NOT CONDUCTED, STATE OTHER CONTROL ACTION(S) TAKEN:

IF NONE, STATE REASON WHY NOT:

**5. IMO BALLAST WATER GUIDELINES AND THE INTERNATIONAL CONVENTION) ONBOARD? YES \_\_\_\_\_ NO \_\_\_\_\_**

RESPONSIBLE OFFICER:

NAME \_\_\_\_\_ (PRINTED)

TITLE \_\_\_\_\_ (PRINTED)

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

**Guidance for Completing the Ballast Water Reporting Form**

<p>Please fill out in English and make every effort to PRINT clearly</p> <p><b>Section 1: Vessel information</b></p> <p><b>Vessel name:</b> Print the name of the vessel.</p> <p><b>Owner:</b> The registered owner(s) or operator(s) of the vessel.</p> <p><b>Flag:</b> Country under which the ship normally operates. Write the full name Do not use abbreviations.</p> <p><b>Last port and country:</b> Last port and country at which the vessel called before arrival in the current port. Write the country and port names in full. Do not use abbreviations.</p> <p><b>Next port and country:</b> Next port and country at which the vessel will call, upon departure from the current port. Write the country and port names in full. Do not use abbreviations.</p> <p><b>Type:</b> List specific vessel type, write out or use the following abbreviations: bulk (bc); ro-ro (rr); container (cs); tanker (ts); passenger (pa); oil/bulk ore (ob); general cargo (gc). Write in any additional vessel types.</p> <p><b>GT:</b> Gross tonnage.</p> <p><b>Arrival date:</b> Arrival date to current port. Use European date format (DDMMYY).</p> <p><b>IMO number:</b> Identification number of the vessel used by the International Maritime Organization.</p> <p><b>Call sign:</b> Official call sign.</p> <p><b>Agent:</b> Agent used for this voyage.</p> <p><b>Arrival port:</b> This is the current port. Write the name in full. Do not use an abbreviation.</p> <p><b>Section 2: Ballast water</b> (<i>Note:</i> Segregated ballast water = clean, non-oily ballast)</p> <p><b>Total ballast water onboard:</b> Total segregated ballast water upon arrival to current port, with units.</p> <p><b>Total ballast water capacity:</b> Total volume of all ballast tanks or holds, with units.</p> <p><b>Section 3: Ballast water tanks</b></p> <p>Count all tanks and holds separately (e.g., port and starboard tanks should be counted separately).</p> <p><b>Total no. of tanks onboard:</b> Count all tanks and holds that can carry segregated ballast water.</p>	<p><b>Ballast water management plan:</b> Do you have a ballast water management plan specific to your vessel onboard? Check Yes or No.</p> <p><b>Use of Management plan:</b> Do you follow the above management plan? Check Yes or No.</p> <p><b>No. of tanks in ballast:</b> Number of segregated ballast water tanks and holds with ballast at the onset of the voyage to the current port. If you have no ballast water onboard, go to section 5.</p> <p><b>No. of tanks exchanged:</b> This refers only to tanks and holds with ballast at the onset of the voyage to the current port.</p> <p><b>No. of tanks not exchanged:</b> This refers only to tanks and holds with ballast at the onset of the voyage to the current port.</p> <p><b>Section 4: Ballast water history</b></p> <p><b>Ballast water source:</b> List all tanks and holds that you have discharged or plan to discharge in this port (carefully write out, or use codes listed below the table). Follow each tank across the page listing all source(s), exchange events, and/or discharge events separately. If the ballast water history is identical (i.e., the same source, exchange and discharge dates and locations), like tanks can be combined (example: wing tank 1 with wing tank 2 both water from Belgium, exchanged Oct. 3rd, mid ocean – can be combined. See first line of the table in the sample form). Use an additional page if necessary. Include ship name, date and IMO number at the top of each page.</p> <p><b>Date/Time:</b> Date and time of ballast water uptake. Use European format (DDMMYY) and (HHMMSS).</p> <p><b>Port or latitude/longitude:</b> Location of ballast water uptake. If carried out in port, write the port name in full.</p> <p><b>Volume:</b> Volume of ballast water uptake, with units.</p> <p><b>Temperature:</b> Water temperature at time of ballast water uptake, in degrees Centigrade (Celsius).</p> <p><b>Ballast water exchange:</b> Indicate exchange method: Circle empty/refill or flow through.</p> <p><b>Date/Time:</b> Date and time of ballast water exchange. Use European format (DDMMYY) and (HHMMSS).</p>	<p><b>Endpoint or latitude/longitude:</b> Location of ballast water exchange. If it occurred over an extended distance, list the end point latitude and longitude.</p> <p><b>Volume:</b> Volume of ballast water exchanged, with units.</p> <p><b>Percentage exchanged:</b> Percentage of ballast water exchanged. Calculate this by dividing the number of units of water exchanged by the original volume of ballast water in the tank. If necessary, estimate based on pump rate. (<i>Note:</i> For effective flow-through exchange this value should be at least 300%).</p> <p><b>Sea height (m):</b> Document the sea height in meters at the time of the ballast exchange (<i>Note:</i> this is the combined height of the wind seas and swell, measured from crest to trough).</p> <p><b>Ballast water discharge:</b></p> <p><b>Date/Time:</b> Date and time of ballast water discharge. Use European format (DDMMYY) and (HHMMSS).</p> <p><b>Port or latitude/longitude:</b> Location of ballast water discharge. If discharged in a port, write the name of the port in full.</p> <p><b>Volume:</b> Volume of ballast water discharged, with units.</p> <p><b>Salinity:</b> Document salinity of ballast water at the time of discharge, with units, [i.e., specific gravity (sg) or parts per thousand (ppt)].</p> <p><b>If exchanges were not conducted, state other control action (s) taken:</b> If exchanges were not made on all tanks and holds to be discharged, what other actions were taken? (i.e., transfer of water to a land-based holding facility or other approved treatment).</p> <p><b>If none, state reason why not:</b> List specific reasons why ballast exchange was not done. This applies to all tanks and holds being discharged.</p> <p><b>Section 5: IMO Ballast water</b></p> <p><b>IMO Ballast Water Convention and IMO Guidelines onboard.</b> Is a copy of the IMO Convention and Guidelines on board? Check Yes or No.</p> <p><b>Responsible officer's name and title (printed) and signature:</b> e.g., Master, chief officer or chief engineer must PRINT their name and title and sign the form.</p>
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## APPENDIX 2 **Ballast Water Record**

### **1 General**

The attached Ballast Water Record was developed based on Appendix II of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 and is provided for the assistance of owners/operators.

**Ballast Water Record Book**

Name of Ship \_\_\_\_\_  
 IMO Number \_\_\_\_\_  
 Gross Tonnage \_\_\_\_\_  
 Flag \_\_\_\_\_  
 Total Ballast Water Capacity (in cubic meters) \_\_\_\_\_  
 Is this vessel provided with Ballast Water Management Plan   yes   no  
 Was the approved Ballast Water Management Plan implemented prior to discharge   yes   no

Diagram of the vessel indicating the ballast tanks:

**Introduction**

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

**Ballast Water and Ballast Water Management**

“Ballast Water” means water with its suspended matter taken on onboard a ship to control trim, list, draft, stability or stresses of a ship. Management of Ballast Water shall be in accordance with an approved Ballast Water Management Plan and take into account Guidelines developed by the IMO.





## APPENDIX 3 **International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004**

BWM/CONF/36  
16 February 200

Note: The following contexts obtained from the GEF/UNDP/IMO Global Ballast Water Management Programme (<http://globallast.imo.org>) are a summary of the International Convention for the Control and Management of Ships Ballast Water & Sediments, 2004. The full text of the Convention is available to purchase from IMO ([www.imo.org](http://www.imo.org)).

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

The **International Convention for the Control and Management of Ships Ballast Water & Sediments** was adopted by consensus at a Diplomatic Conference at IMO in London on Friday 13 February 2004.

The Conference was attended by representatives of 74 States, one Associate Member of IMO; and observers from two intergovernmental organizations and 18 non-governmental international organizations.

#### **Summary of Convention requirements**

The International Convention for the Control and Management of Ships' Ballast Water and Sediments is divided into Articles; and an Annex which includes technical standards and requirements in the Regulations for the control and management of ships' ballast water and sediments.

The main features of the Convention are outlined below.

#### **Entry into force**

The Convention will enter into force 12 months after ratification by 30 States, representing 35 percent of world merchant shipping tonnage (Article 18 *Entry into force*).

#### **General Obligations**

Under Article 2 *General Obligations* Parties undertake to give full and complete effect to the provisions of the Convention and the Annex in order to prevent, minimize and ultimately eliminate the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments.

#### **Reception facilities**

Parties are given the right to take, individually or jointly with other Parties, more stringent measures with respect to the prevention, reduction or elimination of the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments, consistent with international law. Parties should ensure that ballast water management practices do not cause greater harm than they prevent to their environment, human health, property or resources, or those of other States.

Under Article 5 *Sediment Reception Facilities* Parties undertake to ensure that ports and terminals where cleaning or repair of ballast tanks occurs, have adequate reception facilities for the reception of sediments.

#### **Research and monitoring**

Article 6 *Scientific and Technical Research and Monitoring* calls for Parties individually or jointly to promote and facilitate scientific and technical research on ballast water management; and monitor the effects of ballast water management in waters under their jurisdiction.

### Survey, certification and inspection

Ships are required to be surveyed and certified (Article 7 *Survey and certification*) and may be inspected by port State control officers (Article 9 *Inspection of Ships*) who can verify that the ship has a valid certificate; inspect the Ballast Water Record Book; and/or sample the ballast water. If there are concerns, then a detailed inspection may be carried out and “the Party carrying out the inspection shall take such steps as will ensure that the ship shall not discharge Ballast Water until it can do so without presenting a threat of harm to the environment, human health, property or resources.”

All possible efforts shall be made to avoid a ship being unduly detained or delayed (Article 12 *Undue Delay to Ships*).

### Technical assistance

Under Article 13 *Technical Assistance, Co-operation and Regional Co-operation*, Parties undertake, directly or through the Organization and other international bodies, as appropriate, in respect of the control and management of ships' ballast water and sediments, to provide support for those Parties which request technical assistance to train personnel; to ensure the availability of relevant technology, equipment and facilities; to initiate joint research and development programmes; and to undertake other action aimed at the effective implementation of this Convention and of guidance developed by the Organization related thereto.

### Annex – Section A General Provisions

This includes definitions, application and exemptions. Under Regulation A-2 General Applicability: “Except where expressly provided otherwise, the discharge of Ballast Water shall only be conducted through Ballast Water Management, in accordance with the provisions of this Annex.”

### Annex – Section B Management and Control Requirements for Ships

Ships are required to have on board and implement a Ballast Water Management Plan approved by the Administration (Regulation B-1). The Ballast Water Management Plan is specific to each ship and includes a detailed description of the actions to be taken to implement the Ballast Water Management requirements and supplemental Ballast Water Management practices.

Ships must have a Ballast Water Record Book (Regulation B-2) to record when ballast water is taken on board; circulated or treated for Ballast Water Management purposes; and discharged into the sea. It should also record when Ballast Water is discharged to a reception facility and accidental or other exceptional discharges of Ballast Water

The specific requirements for ballast water management are contained in regulation B-3 *Ballast Water Management for Ships*:

- Ships constructed before 2009 with a ballast water capacity of between 1500 and 5000 cubic metres must conduct ballast water management that at least meets the ballast water exchange standards or the ballast water performance standards until 2014, after which time it shall at least meet the ballast water performance standard.
- Ships constructed before 2009 with a ballast water capacity of less than 1500 or greater than 5000 cubic metres must conduct ballast water management that at least meets the ballast water exchange standards or the ballast water performance standards until 2016, after which time it shall at least meet the ballast water performance standard.
- Ships constructed in or after 2009 with a ballast water capacity of less than 5000 cubic metres must conduct ballast water management that at least meets the ballast water performance standard.
- Ships constructed in or after 2009 but before 2012, with a ballast water capacity of 5000 cubic metres or more shall conduct ballast water management that at least meets the ballast water performance standard.
- Ships constructed in or after 2012, with a ballast water capacity of 5000 cubic metres or more shall conduct ballast water management that at least meets the ballast water performance standard.

Other methods of ballast water management may also be accepted as alternatives to the ballast water exchange standard and ballast water performance standard, provided that such methods ensure at least the same level of protection to the environment, human health, property or resources, and are approved in principle by IMO's Marine Environment Protection Committee (MEPC).

Under Regulation B-4 *Ballast Water Exchange*, all ships using ballast water exchange should:

- Whenever possible, conduct ballast water exchange at least 200 nautical miles from the nearest land and in water at least 200 metres in depth, taking into account Guidelines developed by IMO;
- In cases where the ship is unable to conduct ballast water exchange as above, this should be as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 metres in depth.

When these requirements cannot be met areas may be designated where ships can conduct ballast water exchange. All ships shall remove and dispose of sediments from spaces designated to carry ballast water in accordance with the provisions of the ships' ballast water management plan (Regulation B-4).

#### **Annex - Section C Additional measures**

A Party, individually or jointly with other Parties, may impose on ships additional measures to prevent, reduce, or eliminate the transfer of Harmful Aquatic Organisms and Pathogens through ships' Ballast Water and Sediments.

In these cases, the Party or Parties should consult with adjoining or nearby States that may be affected by such standards or requirements and should communicate their intention to establish additional measure(s) to the Organization at least 6 months, except in emergency or epidemic situations, prior to the projected date of implementation of the measure(s). When appropriate, Parties will have to obtain the approval of IMO.

#### **Annex – Section D Standards for Ballast Water Management**

There is a ballast water exchange standard and a ballast water performance standard. Ballast water exchange could be used to meet the performance standard:

Regulation D-1 *Ballast Water Exchange Standard* - Ships performing Ballast Water exchange shall do so with an efficiency of 95 per cent volumetric exchange of Ballast Water. For ships exchanging ballast water by the pumping-through method, pumping through three times the volume of each ballast water tank shall be considered to meet the standard described. Pumping through less than three times the volume may be accepted provided the ship can demonstrate that at least 95 percent volumetric exchange is met.

Regulation D-2 *Ballast Water Performance Standard* - Ships conducting ballast water management shall discharge less than 10 viable organisms per cubic metre greater than or equal to 50 micrometers in minimum dimension and less than 10 viable organisms per milliliter less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometers in minimum dimension; and discharge of the indicator microbes shall not exceed the specified concentrations.

The indicator microbes, as a human health standard, include, but are not be limited to:

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

Ballast Water Management systems must be approved by the Administration in accordance with IMO Guidelines (Regulation D-3 *Approval requirements for Ballast Water Management systems*). These include systems which make use of chemicals or biocides; make use of organisms or biological mechanisms; or which alter the chemical or physical characteristics of the Ballast Water.

#### **Prototype technologies**

Regulation D-4 covers *Prototype Ballast Water Treatment Technologies*. It allows for ships participating in a programme approved by the Administration to test and evaluate promising Ballast Water treatment technologies to have a leeway of five years before having to comply with the requirements.

### Review of standards

Under Regulation D-5 *Review of Standards by the Organization*, IMO is required to review the Ballast Water Performance Standard, taking into account a number of criteria including safety considerations; environmental acceptability, i.e., not causing more or greater environmental impacts than it solves; practicability, i.e., compatibility with ship design and operations; cost effectiveness; and biological effectiveness in terms of removing, or otherwise rendering inactive harmful aquatic organisms and pathogens in ballast water. The review should include a determination of whether appropriate technologies are available to achieve the standard, an assessment of the above mentioned criteria, and an assessment of the socio-economic effect(s) specifically in relation to the developmental needs of developing countries, particularly small island developing States.

### Annex – Section E Survey and Certification Requirements for Ballast Water Management

Gives requirements for initial renewal, annual, intermediate and renewal surveys and certification requirements. Appendices give form of Ballast Water Management Certificate and Form of Ballast Water Record Book.

### Resolutions adopted by the Conference

The Conference also adopted four resolutions:

- Conference resolution 1: Future work by the Organization pertaining to the International Convention for the Control and Management of Ships' Ballast Water and Sediments
- Conference resolution 2: The use of decision-making tools when reviewing the standards pursuant to Regulation D-5
- Conference resolution 3: Promotion of technical co-operation and assistance
- Conference resolution 4: Review of the Annex to the International Convention for the Control and Management of Ships' Ballast Water and Sediments

## APPENDIX 4 **IMO Resolution A.868 (20)**

### **IMO RESOLUTION A.868 (20)** **adopted on 27 November 1997**

#### **GUIDELINES FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER TO MINIMIZE THE TRANSFER OF HARMFUL AQUATIC ORGANISMS AND PATHOGENS**

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning prevention and control of marine pollution from ships,

RECALLING ALSO resolution A.774(18) by which it recognized that the uncontrolled discharge of ballast water and sediment from ships has led to the transfer of harmful aquatic organisms and pathogens, causing injury to public health and damage to property and the environment, and accordingly adopted Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges, and further that the Marine Environment Protection Committee (MEPC) and the Maritime Safety Committee (MSC) shall keep the ballast water issue and the application of the Guidelines under review with a view to further developing the Guidelines as a basis for a new Annex to MARPOL 73/78,

RECALLING FURTHER that the 1992 United Nations Conference on Environment and Development (UNCED), in its Agenda 21 requests IMO to consider the adoption of appropriate rules on ballast water discharge to prevent the spread of non-indigenous organisms, and further proclaims in its Declaration on Environment and Development that States shall widely apply the precautionary approach according to their capabilities,

BEARING IN MIND that MEPC/Circ.288 recognized that the existing Guidelines do not provide a complete solution towards the total prevention of the introduction of harmful aquatic organisms and pathogens, but urged that focus should be directed on measures aimed at minimizing the risks, emphasizing further that in applying the existing Guidelines, the ship's safety was of paramount importance,

NOTING the objectives of the Convention on Biological Diversity, 1992, and that the transfer and introduction of alien aquatic species with ballast water threatens the conservation and sustainable use of biological diversity,

NOTING FURTHER the status of work carried out by MEPC as requested by resolution A.774(18) concerning the development of legally binding provisions on ballast water management together with guidelines for their effective implementation, as well as the Guidance on Safety Aspects of Ballast Water Exchange at Sea prepared by the Sub-Committee on Ship Design and Equipment, and distributed as MEPC/Circ.329 and MSC/Circ.806, both of 30 June 1997,

RECOGNIZING that several States have taken unilateral action by adopting legally binding provisions for local, regional or national application with a view to minimizing the risks of introducing harmful aquatic organisms and pathogens through ships entering their ports, and also that this issue, being of worldwide concern, demands action based on globally applicable regulation together with guidelines for their effective implementation and uniform interpretation,

HAVING CONSIDERED the recommendation of the MEPC at its fortieth session on this issue,

1. ADOPTS the Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens set out in the Annex to the present resolution;
2. REQUESTS Governments to take urgent action in applying these Guidelines, including the dissemination thereof to the shipping industry, to use them as a basis for any measures they adopt with a view to minimizing the risks of introducing harmful aquatic organisms and pathogens, and to report to the MEPC on any experience gained in their implementation;
3. REQUESTS ALSO the MEPC to work towards completion of legally binding provisions on ballast water management in the form of a new Annex to MARPOL 73/78, together with guidelines for their uniform and effective implementation with a view to their consideration and adoption in the year 2000;
4. REQUESTS FURTHER the MSC to include in its work plan the evaluation of information received from interested parties, particularly that relevant to 12.2 of the Guidelines adopted herewith, with a view to determining the hazards and potential consequences for various existing ship types and operations. The MSC is also requested to consider any other relevant issues concerning ballast water management as well as design objectives for new ships, with a view to minimizing to the extent possible risks of introducing harmful aquatic organisms and pathogens with ships' ballast water and sediments;
5. REVOKES resolution A.774(18).

## ANNEX

**GUIDELINES FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER TO  
MINIMIZE THE TRANSFER OF HARMFUL AQUATIC ORGANISMS AND PATHOGENS****Contents**

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## 1 INTRODUCTION

1.1 Studies carried out in several countries have shown that many species of bacteria, plants, and animals can survive in a viable form in the ballast water and sediment carried in ships, even after journeys of several months' duration. Subsequent discharge of ballast water or sediment into the waters of port States may result in the establishment of harmful aquatic organisms and pathogens which may pose threats to indigenous human, animal and plant life, and the marine environment. Although other media have been identified as being responsible for transferring organisms between geographically separated water bodies, ballast water discharge from ships appears to have been among the most prominent.

1.2 The potential for ballast water discharge to cause harm has been recognized not only by the International Maritime Organization but also by the World Health Organization, which is concerned about the role of ballast water as a medium for the spreading of epidemic disease bacteria.

1.3 These Guidelines are not to be regarded as a certain solution to the problem. Rather, each part of them should be viewed as a tool which, if correctly applied, will help to minimize the risks associated with ballast water discharge. As scientific and technological advances are made, the Guidelines will be refined to enable the risk to be more adequately addressed. In the interim, port States, flag States and other parties that can assist in mitigating this problem should exercise due care and diligence in an effort to conform to the maximum extent possible with the Guidelines.

1.4 The selection of appropriate methods of risk minimization will depend upon several factors, including the type or types of organisms being targeted, the level of risk involved, its environmental acceptability, the economic and ecological costs involved and the safety of ships.

## 2 DEFINITIONS

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

*Administration* means the Government of the State under whose authority the ship is operating.

*Convention* means MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships, 1973, and the Protocol of 1978 related thereto).

*Member States* means States that are Members of the International Maritime Organization. Organization means the International Maritime Organization (IMO).

*Port State authority* means any official or organization authorized by the Government of a port State to administer guidelines or enforce standards and regulations relevant to the implementation of national and international shipping control measures.

*Treatment* means a process or mechanical, physical, chemical or biological method to kill, remove or render infertile, harmful or potentially harmful organisms within ballast water.

## 3 APPLICATION

The Guidelines are directed to Member States and can apply to all ships; however, a port State authority shall determine the extent to which they do apply.

## 4 GUIDELINE OBJECTIVES AND BACKGROUND

4.1 The objectives of these Guidelines, developed under technical and scientific guidance, are intended to assist Governments and appropriate authorities, ship masters, operators and owners, and port authorities, as well as other interested parties, in minimizing the risk of introducing harmful aquatic organisms and pathogens from ships' ballast water and associated sediments while protecting ships' safety.

4.2 The Guidelines allow port States to exempt ships within the area under their jurisdiction from part or all of the relevant provisions. Notwithstanding, any administration wishing to apply restrictions to ballast water operations should still follow these Guidelines, when developing legislation or procedures.

4.3 In order that the Guidelines may be implemented in a standard and uniform manner, all Member State Governments, ship operators, other appropriate authorities and interested parties are requested to apply these Guidelines.

## 5 DISSEMINATION OF INFORMATION

5.1 Administrations are encouraged to maintain and exchange information relevant to these Guidelines through the Organization. Accordingly, administrations are encouraged to provide the Organization with the following:

- .1 Information on severe outbreaks or infestations of harmful aquatic organisms which may pose a risk;
- .2 Copies of current domestic laws and regulations;
- .3 Technical and research information;
- .4 Education materials (such as audio and video tapes) and printed materials; and
- .5 Location and terms of use of alternative exchange zones, contingency strategies, availability of shore reception facilities, fees, etc.

5.2 Member States, applying ballast water and sediment discharge procedures, should notify the Organization of specific requirements and provide to the Organization, for the information of other Member States and non-governmental organizations, copies of any regulations, standards, exemptions or guidelines being applied. Verification and detailed information concerning port State requirements should be obtained by the ship prior to arrival.

5.3 Port State authorities should provide the widest possible distribution of information on ballast water and sediment management and treatment requirements that are being applied to shipping. Failure to do so may lead to unnecessary delays for ships seeking entry to port States.

5.4 Shipping organizations and ships' managers should be familiar with the requirements of port State authorities with respect to ballast water and sediment management and treatment procedures, including information that will be needed to obtain entry clearance.

5.5 Member States are invited to provide the Organization with details of any research and development studies that they carry out with respect to the impact and control of harmful aquatic organisms and pathogens in ships' ballast water and sediment.

5.6 Member States should provide to the Organization details of records describing reasons why existing requirements could not be complied with, e.g. force majeure, heavy weather, failure of equipment, or lack of information concerning port State requirements.

## 6 TRAINING AND EDUCATION

6.1 Training for ships' masters and crew as appropriate should include instructions on the application of ballast water and sediment management and treatment procedures, based upon the information contained in these Guidelines. Instruction should also be provided on the maintenance of appropriate records and logs. Governments should ensure that their marine training organizations include this in the contents of their syllabus.

6.2 The application of processes and procedures concerning ballast water management are currently at the core of the solution to minimize the introduction of harmful aquatic organisms and pathogens.

6.3 Governments are encouraged to include knowledge of duties regarding the control of pollution of the sea by harmful aquatic organisms and pathogens in their training requirements for certificates.

## 7 PROCEDURES FOR SHIPS AND PORT STATES

### 7.1 Procedures for ships

7.1.1 Every ship that carries ballast water should be provided with a ballast water management plan to assist in the minimization of transfer of harmful aquatic organisms and pathogens. The intent of the plan should be to provide safe and effective procedures for ballast water management.

7.1.2 The ballast water management plan should be specific to each ship.

7.1.3 The ballast water management plan should be included in the ship's operational documentation. Such a plan should address, inter alia:

- relevant parts of these Guidelines;
- approval documentation relevant to treatment equipment;
- an indication of records required; and
- the location of possible sampling points.

## **7.2 Procedures for port States**

7.2.1 Reception and treatment facilities should be made available for the environmentally safe disposal of ballast tank sediments.

7.2.2 Discharge of ship's ballast water into port reception and/or treatment facilities may provide an acceptable means of control. Port State authorities wishing to utilize this strategy should ensure that the facilities are adequate.

## **8 RECORDING AND REPORTING PROCEDURES**

### **8.1 Procedures for ships**

8.1.1 Where a port State authority requires that specific ballast water procedures and/or treatment option(s) be undertaken, and due to weather, sea conditions or operational impracticability such action cannot be taken, the master should report this fact to the port State authority as soon as possible and, where appropriate, prior to entering seas under its jurisdiction.

8.1.2 To facilitate the administration of ballast water management and treatment procedures onboard each ship, a responsible officer should be appointed to maintain appropriate records and to ensure that ballast water management and/or treatment procedures are followed and recorded.

8.1.3 When taking on or discharging ballast water, as a minimum, the dates, geographical locations, ship's tank(s) and cargo holds, ballast water temperature and salinity as well as the amount of ballast water loaded or discharged should be recorded. A suitable format is shown in appendix 1. The record should be made available to the port State authority.

8.1.4 The location and suitable access points for sampling ballast or sediment should be described in the ship's ballast water management plan. This will allow crew members to provide maximum assistance when officers of the port State authority require a sample of the ballast water or sediment.

### **8.2 Procedures for port States**

8.2.1 Consistent with 5.2 above, port States should provide ships with the following information:

- details of their requirements concerning ballast water management;
- location and terms of use of alternative exchange zones;
- any other port contingency arrangements; and
- the availability, location, capacities of and applicable fees relevant to reception facilities that are being provided for the environmentally safe disposal of ballast water and associated sediment.

8.2.2 To assist ships in applying the precautionary practices described in 9.1.1 below, port States should inform local agents and/or the ship of areas and situations where the uptake of ballast water should be minimized, such as:

- areas with outbreaks, infestations or known populations of harmful organisms and pathogens;
- areas with current phytoplankton blooms (algal blooms, such as red tides); nearby sewage outfalls;
- nearby dredging operations;
- when a tidal stream is known to be the more turbid; and
- areas where tidal flushing is known to be poor.

## **9 SHIPS' OPERATIONAL PROCEDURES**

### **9.1 Precautionary practices**

#### **9.1.1 Minimizing uptake of harmful aquatic organisms, pathogens and sediments**

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

- areas identified by the port State in connection with advice relating to 8.2.2 above;
- in darkness when bottom-dwelling organisms may rise up in the water column; in very shallow water; or
- where propellers may stir up sediment.

#### **9.1.2 Removing ballast sediment on a timely basis**

Where practicable, routine cleaning of the ballast tank to remove sediments should be carried out in mid-ocean or under controlled arrangements in port or dry dock, in accordance with the provisions of the ship's ballast water management plan.

#### **9.1.3 Avoiding unnecessary discharge of ballast water**

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

### **9.2 Ballast water management options**

#### **9.2.1 Ballast water exchange**

Near-coastal (including port and estuarine) organisms released in mid-ocean, and oceanic organisms released in coastal waters, do not generally survive.

When exchanging ballast at sea, guidance on safety aspects of ballast water exchange as set out in appendix 2 should be taken into account. Furthermore, the following practices are recommended:

- where practicable, ships should conduct ballast exchange in deep water, in open ocean and as far as possible from shore. Where this is not possible, requirements developed within regional agreements may be in operation, particularly in areas within 200 nautical miles from shore. Consistent with 9.1.2 above, all of the ballast water should be discharged until suction is lost, and stripping pumps or eductors should be used if possible;
- where the flow-through method is employed in open ocean by pumping ballast water into the tank or hold and allowing the water to overflow, at least three times the tank volume should be pumped through the tank;
- where neither form of open ocean exchange is practicable, ballast exchange may be accepted by the port State in designated areas; and
- other ballast exchange options approved by the port State.

#### **9.2.2 Non-release or minimal release of ballast water**

In cases where ballast exchange or other treatment options are not possible, ballast water may be retained in tanks or holds. Should this not be possible, the ship should only discharge the minimum essential amount of ballast water in accordance with port States' contingency strategies.

#### **9.2.3 Discharge to reception facilities**

If reception facilities for ballast water and/or sediments are provided by a port State, they should, where appropriate, be utilized.

### 9.2.4 Emergent and new technologies and treatments

9.2.4.1 If suitable new and emergent treatments and technologies prove viable, these may substitute for, or be used in conjunction with, current options. Such treatments could include thermal methods, filtration, disinfection including ultraviolet light, and other such means acceptable to the port State.

9.2.4.2 Results concerning the application and effectiveness of new ballast water management technologies and associated control equipment should be notified to the Organization with a view to evaluation and incorporation, as appropriate, into these Guidelines.

## 10 PORT STATE CONSIDERATIONS

The following is provided for the guidance of port State authorities in the implementation of their ballast water management program, and to assess risks in relation to the ballast water containing harmful aquatic organisms and pathogens.

### 10.1 Highly disparate conditions between uptake and discharge ports

Significantly different conditions may exist between port(s) of origin and the port in which ballast water is discharged. Examples include freshwater ballast being released into highly saline ports. There may be organisms capable of surviving such extreme transfers; however, there is a lower probability of species establishment under such transport events.

### 10.2 Ballast water age

The length of time during which ballast water is within an enclosed ballast tank may also be a factor in determining the number of surviving organisms, because of the absence of light, decreasing nutrients and oxygen, changes of salinity and other factors. However, the maximum length of survival of organisms in ballast water varies, and in many cases is not known. Water of an age of 100 days should be considered the minimum for applying this consideration. Ballast water and sediments may contain dinoflagellate cysts and other organisms capable of surviving for a much longer length of time.

### 10.3 Presence of target organisms

10.3.1 Under certain circumstances it may be possible to determine if one or more target species are present in the water of a specific port and have been ballasted in a ship. In these circumstances, the receiving port State authority may invoke management measures accordingly. Even if such target species are not present, however, it should be noted that the ship may still be carrying many untargeted species which, if released in new waters, could be potentially harmful.

10.3.2 Port States are encouraged to carry out biological baseline surveys in their ports and to disseminate the results of their investigations.

## 11 ENFORCEMENT AND MONITORING BY PORT STATES

11.1 Consistent with the precautionary approach to environmental protection, these Guidelines can apply to all ships unless specifically exempted by a port State authority within its jurisdiction. In accordance with 5.2 above, port State authorities should inform the Organization on how the Guidelines are being applied.

11.2 Member States have the right to manage ballast water by national legislation. However, any ballast discharge restrictions should be notified to the Organization.

11.3 In all cases, a port State authority should consider the overall effect of ballast water and sediment discharge procedures on the safety of ships and those onboard. Guidelines will be ineffective if compliance is dependent upon the acceptance of operational measures that put a ship or its crew at risk. Port States should not require any action of the master which imperils the lives of seafarers or the safety of the ship.

11.4 It is essential that ballast water and sediment management procedures be effective as well as environmentally safe, practicable, designed to minimize costs and delays to the ship, and based upon these Guidelines whenever possible.

11.5 Any instructions or requirements of a ship should be provided in a timely manner and be clear and concise.

11.6 Port States should on request provide a visiting ship with any requested information relative to ballast water management and its potential effects with respect to harmful aquatic organisms and pathogens.

11.7 Any enforcement or monitoring activities should be undertaken in a fair, uniform and nationally consistent manner at all ports within the port State. Where there are compelling reasons whereby nationally consistent procedures cannot be followed, then deviations should be reported to the Organization.

11.8 Compliance monitoring should be undertaken by port State authorities by, for example, taking and analyzing ballast water and sediment samples to test for the continued survival of harmful aquatic organisms and pathogens.

11.9 Where ballast water or sediment sampling for compliance or effectiveness monitoring is being undertaken, port State authorities should minimize delays to ships when taking such samples.

11.10 When sampling for research or compliance monitoring, the port State authority should give as much notice as possible to the ship that sampling will occur, to assist in planning staffing and operational resources.

11.11 The master has a general obligation to provide reasonable assistance for the above monitoring which may include provision of officers or crew, provision of the ship's plans, records pertaining to ballast arrangements and details concerning the location of sampling points.

11.12 Sampling methods for research and monitoring is the responsibility of the individual port State. The Organization welcomes information on new or innovative methods of sampling and/or analysis, and any relevant information should be provided to it.

11.13 Port State authorities should indicate to the master or responsible officer the purpose for which a sample is taken (i.e., monitoring, research or enforcement). Results of analyses of samples should be made available to ship's operators on request.

11.14 Port State authorities may sample or require samples to analyse ballast water and sediment, before permitting a ship to proceed to discharge its ballast water in environmentally sensitive locations. In the event that harmful aquatic organisms or pathogens are found to be present in the samples, a port State's contingency strategy may be applied.

## **12 FUTURE CONSIDERATIONS IN RELATION TO BALLAST WATER EXCHANGE**

### **12.1 Research Needs**

Operational measures such as ballast water exchange may be appropriate in the short term; however, there is a clear need for further research. These Guidelines should be revised and adjusted in the light of results concerning new ballast water management options.

### **12.2 Long-term evaluation of safety aspects in relation to ballast water exchange**

Recognizing the need to evaluate the hazards and potential consequences for various types of ships and operations, interested parties should carry out detailed studies and provide information relevant to:

- experience gained from carrying out ballast water exchange at sea, including any samples/model procedures;
- operational precautions and procedures implemented to avoid potential hazards and consequences that may arise during the ballast water exchange at sea;
- an evaluation of the safety margins between the actual metacentric height and stresses versus the allowable seagoing limits specified in the approved trim and stability booklet and loading manual, relevant to different types of ships and loading conditions;
- any hazards which may arise due to human element issues relative to the responsible execution of ballast water exchange at sea in a manner which may not be fully prudent;
- operational procedures carried out prior to initiating the ballast water exchange at sea and check points during the exchange;
- the extent of training and management necessary to ensure that the process of ballast water exchange at sea is effectively monitored and controlled onboard;

- plan of action to incorporate any unique procedures should an emergency occur which may affect the exchange of ballast water at sea; and
- the decision-making process, taking into account relevant safety matters, including ship's position, weather conditions, machinery performance, ballast system inspection and maintenance, crew safety and availability.

### **13 BALLAST SYSTEM DESIGN**

Builders, owners and classification societies should take these Guidelines into consideration when designing new ships or modifying existing ships.



## APPENDIX 2

### GUIDANCE ON SAFETY ASPECTS OF BALLAST WATER EXCHANGE AT SEA

#### 1 Introduction

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

1.2 Ballast water exchange at sea procedures contained in relevant management plans should be individually assessed for their effectiveness from the environmental protection point of view as well as from the point of view of their acceptability in terms of structural strength and stability.

1.3 In the absence of a more scientifically based means of control, exchange of ballast water in deep ocean areas or open seas currently offers a means of limiting the probability that fresh water or coastal aquatic species will be transferred in ballast water. Two methods of carrying out ballast water exchange at sea have been identified:

- .1 the sequential method, in which ballast tanks are pumped out and refilled with clean water; and/or
- .2 the flow-through method, in which ballast tanks are simultaneously filled and discharged by pumping in clean water.

#### 2 Safety precautions

2.1 Ships engaged in ballast water exchange at sea should be provided with procedures which account for the following, as applicable:

- .1 avoidance of over and under-pressurization of ballast tanks;
- .2 free surface effects on stability and sloshing loads in tanks that may be slack at any one time;
- .3 admissible weather conditions;
- .4 weather routing in areas seasonably affected by cyclones, typhoons, hurricanes, or heavy icing conditions;
- .5 maintenance of adequate intact stability in accordance with an approved trim and stability booklet;
- .6 permissible seagoing strength limits of shear forces and bending moments in accordance with an approved loading manual;
- .7 torsional forces, where relevant;
- .8 minimum/maximum forward and aft draughts;
- .9 wave-induced hull vibration;
- .10 documented records of ballasting and/or de-ballasting;
- .11 contingency procedures for situations which may affect the ballast water exchange at sea, including deteriorating weather conditions, pump failure, loss of power, etc.;
- .12 time to complete the ballast water exchange or an appropriate sequence thereof, taking into account that the ballast water may represent 50 % of the total cargo capacity for some ships; and
- .13 monitoring and controlling the amount of ballast water.

- 2.2 If the flow through method is used, caution should be exercised, since:
- .1 air pipes are not designed for continuous ballast water overflow;
  - .2 current research indicates that pumping of at least three full volumes of the tank capacity could be needed to be effective when filling clean water from the bottom and overflowing from the top; and
  - .3 certain watertight and weathertight closures (e.g. manholes) which may be opened during ballast exchange, should be re-secured.
- 2.3 Ballast water exchange at sea should be avoided in freezing weather conditions. However, when it is deemed absolutely necessary, particular attention should be paid to the hazards associated with the freezing of overboard discharge arrangements, air pipes, ballast system valves together with their means of control, and the accretion of ice on deck.
- 2.4 Some ships may need the fitting of a loading instrument to perform calculations of shear forces and bending moments induced by ballast water exchange at sea and to compare with the permissible strength limits.
- 2.5 An evaluation should be made of the safety margins for stability and strength contained in allowable seagoing conditions specified in the approved trim and stability booklet and the loading manual, relevant to individual types of ships and loading conditions. In this regard particular account should be taken of the following requirements:
- .1 stability to be maintained at all times to values not less than those recommended by the Organization (or required by the Administration);
  - .2 longitudinal stress values not to exceed those permitted by the ship's classification society with regard to prevailing sea conditions; and
  - .3 exchange of ballast in tanks or holds where significant structural loads may be generated by sloshing action in the partially filled tank or hold to be carried out in favorable sea and swell conditions so that the risk of structural damage is minimized.
- 2.6 The ballast water management plan should include a list of circumstances in which ballast water exchange should not be undertaken. These circumstances may result from critical situations of an exceptional nature, force majeure due to stress of weather, or any other circumstances in which human life or safety of the ship is threatened.

### 3 Crew training and familiarization

- 3.1 The ballast water management plan should include the nomination of key shipboard control personnel undertaking ballast water exchange at sea.
- 3.2 Ships' officers and ratings engaged in ballast water exchange at sea should be trained in and familiarized with the following:
- .1 the ship's pumping plan, which should show ballast pumping arrangements, with positions of associated air and sounding pipes, positions of all compartment and tank suction and pipelines connecting them to ship's ballast pumps and, in the case of use of the flow through method of ballast water exchange, the openings used for release of water from the top of the tank together with overboard discharge arrangements;
  - .2 the method of ensuring that sounding pipes are clear, and that air pipes and their non-return devices are in good order;
  - .3 the different times required to undertake the various ballast water exchange operations;
  - .4 the methods in use for ballast water exchange at sea if applicable with particular reference to required safety precautions; and
  - .5 the method of on-board ballast water record keeping, reporting and recording of routine soundings.

[The end of Resolution A. 868(20)]