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## Revision Record for Ballast Water Management Manual

## SECTION 1

### SHIP PARTICULARS

SHIP'S NAME : BELLATRIX  
SHIP TYPE : Bulk Carrier  
PORT OF REGISTRY : VALLETTA  
OWNER : MINDORO SHIPPING COMPANY LIMITED  
INTERNATIONAL CALL SIGN : A8IL6  
FLAG : Malta  
GROSS TONNAGE : 40,500 T  
IMO NUMBER : 9304071  
DIMENSIONS :  
LENGTH : 225.0 (m)  
BREATH : 32.26 (m)  
SEAGOING BALLAST DRAFT :  
1) HEAVY BALLAST CONDITION  
FORE : 8,33 (m)  
AFT : 8,79 (m)  
2) NORMAL BALLAST CONDITION  
FORE : 4,66 (m)  
AFT : 7,71 (m)  
TOTAL WATER BALLAST CAPACITY : 37,163.7 (m<sup>3</sup>)

TOTAL NOS. OF SEGRATED BALLAST TANKS ON BOARD : 13 TANKS  
LIST OF WATER BALLAST TANKS AND CAPACITY OF EACH TANKS :

FORE PEAK TANK	=	2,154.4 CUBIC MTRS.
NO.1 W.B.T. (P&S)	=	3,705.4 CUBIC MTRS.
NO.2 & 3 W.B.T. (P&S)	=	6,820.8 CUBIC MTRS.
NO.4 W.B.T. (P&S)	=	2,834.3 CUBIC MTRS.
NO.5 & 6 W.B.T. (P&S)	=	5,636.6 CUBIC MTRS.
NO.7 W.B.T. (P)	=	1,456.9 CUBIC MTRS
(S)	=	1,414.2 CUBIC MTRS
AFTER PEAK TANK (C)	=	833.1 CUBIC MTRS.
NO.4 C.H. / W.B.T.	=	12,308.0 CUBIC MTRS.

## SECTION 2

### EXPLANATION OF THE NEED FOR BALLAST WATER MANAGEMENT, AND FOR REPORTING TO PORT STATES

#### Introduction

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 weeks duration. Subsequent discharge of ballast water or sediment into the waters of port states may result in the establishment of colonies of harmful species and pathogens which can seriously upset the existing ecological balance. Although other methods have been identified by which organisms are transferred between geographically separated sea areas, ballast water discharge from ships appears to have been prominent those identified.

The potential for ballast water discharge to cause harm has been recognized not only by the International Maritime Organization (IMO), 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.

#### Requirements

Some states have established controls on the discharge of ships' ballast water that will minimise the potential for colonisation of their rivers and estuaries by non-native species. The preferred option is mid-ocean ballast water exchange prior to arrival. Accordingly, the countries most concerned have promulgated advice to ships for ballast management, together with a request for their cooperation in applying the techniques voluntarily. Standard procedures have been developed that will be accepted by quarantine authorities as achieving the level of acceptability desired by the port state.

#### Conflict with safety

Unless applied carefully some of the measures being urged for ballast management can affect a ship's safety, either by creating forces within the hull that are greater than the design parameters, or by compromising the stability of the ship. It is because of concern about this that the IMO became involved in what would otherwise be a purely quarantine matter. It has been recognized by governments and the shipping industry that individual countries' need should be harmonized with the greater need to ensure the safety of ships, their crews and passengers.

IMO recommends that each ship should be provided with a Ballast Water Management Plan, detailing the way that the ship can comply with any measures demanded by a port state. Once it has been established that the management of ballast is necessary to meet the quarantine requirements of a port state, preparation for it should be treated with the same seriousness as preparation of a cargo plan. All concerned with the operation and safe passage of the ship can thereby be assured that they are both protecting the marine environment and ensuring the safety of the ship and crew.

#### **Summary of records required**

To be able to demonstrate at the arrival port that the correct measures have been completed, it will be necessary to maintain a full and accurate ballast log. A suitable outline for such a log is provided in Section 9. Even if a ship is not trading in an area where ballast water information is required, it may later prove worthwhile to have a history of what water has been carried.

#### **Reporting to port states**

Several countries have become aware of the potential, through discharge of ships' ballast water, for the transfer into their coastal areas of what are found to be harmful aquatic organisms. Governments have recognized that, before devising mandatory controls on ships, it is necessary to know the scale of what has, until very recently, been an unrecorded procedure.

Concerned countries have therefore introduced a requirement which, through often differing in detail, generally calls for ships to report in advance, to the national monitoring authority, how much ballast water will be on board on arrival, where it was taken on board, and whether a ballast management procedure has been followed. In most cases it is mandatory to make the report, even though the actual ballast exchange in mid-ocean (or other management procedure) remains voluntary.

To assist in this regard, wherever possible the plan contains the format of the relevant national reporting forms.

### SECTION 3

#### BALLAST WATER ARRANGEMENTS

#### TANK CAPACITIES

Tank	Cap. in cu. Mtrs	Pumps available
F.P.T.	2154.4	No.1 Ballast Pump
No.1 W.B.T. (P&S)	3705.4	NO.1 & 2 Ballast pumps
No.2 & 3 W.B.T. (P&S)	6820.8	-DO-
No.4 W.B.T. (P&S)	2834.3	-DO-
No.5 & 6 W.B.T. (P&S)	5636.6	-DO-
NO.7 W.B.T.(P) (S)	1456.9 1414.2	-DO-
A.P.T.	833.1	Fire & General Service Pump
NO.4 CARGO HOLD W.B.T.	12308.0	NO.1 & 2 Ballast pumps Fire & General Service Pump

PUMP	RATED CAPACITY
FIRE AND GS PUMP	90/700m <sup>3</sup> /H × 70/25mTH
NO.1 BALLAST PUMP	800m <sup>3</sup> /H × 25mTH
NO.2 BALLAST PUMP	800m <sup>3</sup> /H × 25mTH

## SECTION 4

### SAFETY CONSIDERATIONS

The IMO Resolution includes guidance on safety aspects of ballast water exchange at sea. The safety points outlined below are intended to emphasize that the consequences of an inadvertent error at sea can be more significant than the same error made in port. Ballast water exchange at sea is a comparatively new development, and a sense of familiarity with the mechanics of ballasting should not be allowed to induce complacency in this new procedure.

#### Conditions in which ballast water exchange at sea is not to be undertaken

In case where ballast exchange at sea in deep water was not possible because of force majeure such as harsh weather condition mentioned below, pump failure, loss of power or any other circumstances in which human life or safety of the ship is threatened, this situation shall be recorded as per company's Safety Management Manual and Procedures.

A list of circumstances in which ballast water exchange should not be undertaken.

1. If wind/sea condition is above force 5 of Beaufort scale.
2. If there is heavy swell in any direction, wave height is more than 3m.
3. If near storm, cyclones, typhoons, hurricanes and heavy freezing conditions, etc.,
4. If excessive trim occurs,
5. If Longitudinal stress values exceeded those permitted by classification society.

## SECTION 5

### PROCEDURES FOR MANAGING BALLAST WATER

A ballast handling plan for a ballast voyage should be prepared in advance, in a similar manner to the preparation of a cargo plan for a loaded voyage, and with the same degree of thoroughness. This pre-planning is necessary in order to maintain safety in case compliance with ballast exchange or other ballast water treatment or control options is required.

The safety information in Section 4 should be taken into account when preparing the voyage plan.

This section gives guidance on ballast handling procedures to be followed at sea.

#### INFORMING SHORE MANAGEMENT

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

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

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.

Port States 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.

- 1) Details of their requirements concerning ballast water management.
- 2) Location and terms of use of alternative exchange zones.
- 3) Any other port contingency arrangement.
- 4) 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.

#### **SEDIMENT REMOVAL OR REDUCTION**

- 1) Where practical, cleaning of the ballast tanks to remove sediments should be undertaken.
- 2) Clean the ballast tank in mid-ocean waters or under controlled arrangement in port or dock.
- 3) Disposed sediments in accordance with port state regulation.

#### **RETENTION OF BALLAST ON BOARD**

Retain the ballast water on board the vessel:

- 1) If suitable new 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 means acceptable to the port state.
- 2) If reception facilities for ballast water and/or sediments are provided by a port State, they should, where appropriate, be utilized.

#### **WATER TREATMENT**

The Company and the master is responsible for collecting information on ballast water and sediment treatment. If Marine Section is charge of collecting information through IMO circular and deliver it to Head of Ship Management Department.

## EXCHANGE AT SEA

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.
- 2) The flow-through method, in which ballast tanks are simultaneously filled and discharged by pumping in clean water.

### Sequential Method

The following table describes a safe sequence for the exchange of ballast water using the empty-then-refill procedure, known as the sequential method. The process requires the removal of very large weights from the ship in a dynamic situation, and then their replacement. This is a new procedure, and a sense of familiarity with the mechanics of ballasting in port should not be allowed to induce complacency.

The table indicates the status of the ballast water in every tank at the start of each step, and indicates an assumed weight of fuel and domestic drinking water [aft of the engine room bulkhead], estimate draughts, bending moments and shear forces. The action to be taken and tanks involved in each step are then specified.

It will be noted that the original condition is restored after each pair of steps. A positive decision should be made at that time, taking account of the ship's position, weather forecast, machinery performance and degree of crew fatigue, before proceeding to the next pair of steps. If any factors are considered unfavourable the ballast exchange should be suspended or halted.

Heeling effects due to asymmetrical emptying or filling have been taken into account so that all steps represent upright conditions. Actual operations must be managed so that lists do not develop during pumping.

The steps in the table meet trim and draught requirements of propeller and rudder immersion, to avoid any possibility of slamming while changing ballast, and to maintain the bridge visibility within tolerable limits.

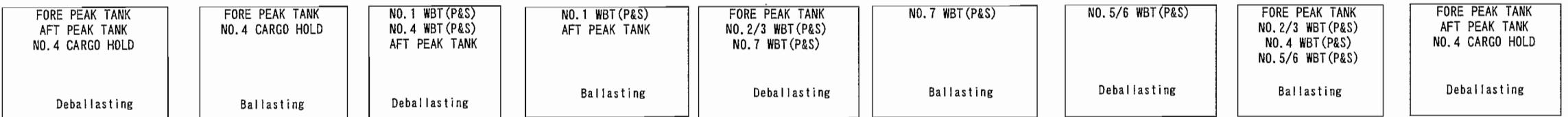
It is as important to avoid under pressure in a tank due to emptying, as it is to avoid overpressure when filling. The consequences of bulkhead damage, or even tank collapse, at sea will be even more significant than in port.

Each step has been checked for conformity with strength and stress limitations. Checks have been made that the minimum intact stability requirements of the ship are met at every stage, and that the allowable limits for bending and twisting moments are not exceeded. Each step is therefore safe for the ship at sea in fair weather. The figure given under bending moments is the percentage of the maximum allowable at the end of each step, before commencing the next step.

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 ships classification society with regard to prevailing sea conditions.
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.

# 1-1. Summary of Ballast and Deballast Sequence at Heavy/Normal Ballast Condition



	SEQUENCE NO. 1 (HEAVY BALLAST COND.) WEIGHT	SEQUENCE NO. 2 (NORMAL BALLAST COND.) WEIGHT	SEQUENCE NO. 3	SEQUENCE NO. 4	SEQUENCE NO. 5	SEQUENCE NO. 6	SEQUENCE NO. 7	SEQUENCE NO. 8	SEQUENCE NO. 9 (HEAVY BALLAST COND.) WEIGHT	SEQUENCE NO. 10 (NORMAL BALLAST COND.) WEIGHT
FORE PEAK TANK	2,208	100	0	0	2,208	100	2,208	100	2,208	100
NO. 1 WBT (P)	1,899	100	1,899	100	0	0	1,899	100	1,899	100
NO. 1 WBT (S)	1,899	100	1,899	100	0	0	1,899	100	1,899	100
NO. 2/3 WBT (P)	3,496	100	3,496	100	3,496	100	3,496	100	0	0
NO. 2/3 WBT (S)	3,496	100	3,496	100	3,496	100	3,496	100	0	0
NO. 4 WBT (P)	1,452	100	1,452	100	0	0	0	0	0	0
NO. 4 WBT (S)	1,453	100	1,453	100	0	0	0	0	1,453	100
NO. 5/6 WBT (P)	2,890	100	2,890	100	2,890	100	2,890	100	0	0
NO. 5/6 WBT (S)	2,888	100	2,888	100	2,888	100	2,888	100	0	0
NO. 7 WBT (P)	1,493	100	1,493	100	1,493	100	1,493	100	1,493	100
NO. 7 WBT (S)	1,450	100	1,450	100	1,450	100	1,450	100	1,450	100
AFT PEAK TANK	854	100	507	59	507	59	0	854	100	854
NO. 4 CARGO HOLD	12,616	100	0	0	12,616	100	12,616	100	12,616	100
TOTAL WEIGHT (TON)	38,094		22,923		37,747		30,537		35,189	
DRAFT F.P. (m)	8.21		4.55		8.37		5.75		7.69	
DRAFT A.P. (m)	8.77		7.67		8.49		8.90		8.37	
DRAFT MEAN (m)	8.49		6.11		8.43		7.33		8.03	
TRIM (m)	0.56		3.12		0.13		3.15		0.68	
GoM (m)	2.94		3.83		3.00		4.47		3.61	
PROP. IMMERSION (%)	76		60		72		78		70	
MAX BEND. MOM. (KN-m)	(SAGG.) -886,665 (60.2%) (FR. 126~ FR. 127)	(HOGG.) 1,118,584 (71.5%) (FR. 98~ FR. 99)	(SAGG.) -985,128 (66.9%) (FR. 126~ FR. 127)	(SAGG.) -1,156,143 (78.5%) (FR. 127~ FR. 128)	(HOGG.) 812,835 (55.7%) (FR. 66~ FR. 67)	(HOGG.) 674,211 (55.5%) (FR. 177~ FR. 178)	(HOGG.) 824,679 (63.1%) (FR. 173~ FR. 174)	(HOGG.) 1,240,087 (79.3%) (FR. 75~ FR. 76)	(SAGG.) -886,665 (60.2%) (FR. 126~ FR. 127)	(HOGG.) 1,118,584 (71.5%) (FR. 98~ FR. 99)
MAX SHEAR FORCE (KN)	(FR. 112) -41,622 (53.3%)	(FR. 31) 18,618 (34.7%)	(FR. 112) -40,819 (52.3%)	(FR. 112) -35,056 (44.9%)	(FR. 112) -30,386 (38.9%)	(FR. 139) 43,021 (53.9%)	(FR. 139) 38,775 (48.6%)	(FR. 112) -40,614 (52.0%)	(FR. 112) -41,622 (53.3%)	(FR. 31) 18,618 (34.7%)
DIFFERENCE WT. OF BALLAST BETWEEN EACH SEQUENCE (MT)		-15,171	14,824	-7,210	4,652	-10,843	2,943	-5,778	16,583	-15,171
DRIVING PUMP		2A + B	2A + B	2A + B	2A + B	2A + B	2A	2A	2A + B	2A + B
NORMAL BALLAST COND. BALLAST/DEBALLAST TIME FOR DIFF. WT OF BALLAST BETWEEN EACH SEQ. (HOUR)			ABT. 6.8	ABT. 3.4	ABT. 2.2	ABT. 5.1	ABT. 2.2	ABT. 4.3	ABT. 7.8	ABT. 7.2
HEAVY BALLAST COND. BALLAST/DEBALLAST TIME FOR DIFF. WT OF BALLAST BETWEEN EACH SEQ. (HOUR)		ABT. 7.2	ABT. 6.8	ABT. 3.4	ABT. 2.2	ABT. 5.1	ABT. 2.2	ABT. 4.3	ABT. 7.8	

※ Note :

- (1) This calculation to be carried out Half bunker condition.
- (2) Pump start/stop operating time, valve switching time and ballast stripping time are not included in the above ballast/deballast time.
- (3) Ballast exchange at sea should only be carried out at calm sea and under favorable weather condition. Severe weather and sea condition may cause structural damage/loss of stability due to :
  - a. free surface effect, especially in No.4 cargo hold, when the hold is partially ballasted.
  - b. slamming on the bow when the fore draft is reduced.
  - c. sloshing, especially in No.4 cargo hold, when the hold is partially ballasted.

A : BALLAST PUMP 800 m3/h      × 25mTH × 2 Sets  
B : FIRE & G.S. PUMP 90/700 m3/h      × 70/25mTH  
C : EUDUCTOR 60 m3/h

ABT. HOURS  
39

ABT. HOURS  
39

### Flow-through Method

The flow-through method, whereby tanks are overfilled by pumping in additional water, has the advantage that it can be used in weather conditions which would be marginal for use of the sequential method, since there is little change to the condition of the ship. However, the flow-through method introduces certain other risks and problems which must be considered before using this procedure.

Refer also to [Section 4],, “Safety Considerations”.

### Safety issues related to the Flow-through Method

The parameters used when the ship is designed always take account of storm conditions and the water on deck which results. Therefore, even at maximum pumping rates, any accumulation of water on deck will be insufficient to affect stability.

Research has established that it is necessary to pump in three times the volume of the tank to achieve a 95% change of water. For the record, pumping in only once the volume of the tank produces a 63% exchange, twice the volume produces 86% exchange, while four times the volume produces a 98% water exchange.

The table below shows the time needed for the required amount of water to be pumped into each ballast tank to achieve the desired percentage change of water, and the pumps to be used.

A step by step procedure follows, listing the order in which tanks are to be processed.

After each step, a positive decision should be made, taking account of the ship's position, weather forecast, machinery performance and degree of crew fatigue, before proceeding to the next step. If any factors are considered unfavourable the ballast exchange should be suspended or halted.

If the flow through method is used, following cautions should be exercised.

- 1) Air pipes are not designed for continuous ballast water overflow.
- 2) Pumping as three times full volumes of the tank capacity as possible could be needed to be effective when filling clean water from the bottom and overflowing from the top.
- 3) Certain watertight and weathertight closures (e.g. manholes) which may be opened at least one or two manhole(s) during ballast exchange, should be re-secured.

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.

(1) BALLAST EXCHNGE PLAN (FLOW-THROUGH METHOD) : Heavy Ballast Condition

Step	Tanks	Capacity(m3) 100%	Pumps	Time for 3 exchange
1	F.P.T.	2154.4	NO.1 Ballast Pump	9.0
2	NO.1 W.B.T. (P&S)	3705.4	NO.1 & 2 Ballast pumps	7.7
3	NO2 & 3W.B.T. (P&S)	6820.8	NO.1 & 2 Ballast pumps	14.2
4	NO.4 W.B.T. (P&S)	2834.3	NO.1 & 2 Ballast pumps	5.9
5	NO.5 & 6W.B.T. (P&S)	5636.6	NO.1 & 2 Ballast pumps	11.7
6	NO.7 W.B.T. (P) (S)	1456.9 1414.2	NO.1 & 2 Ballast pumps	6.0
7	A.P.T.	833.1	Fire & General Service Pump	4.0
8	NO.4 CARGO HOLD	12308.0	NO.1 & 2 Ballast pumps Fire & General Service Pump	17.8

NOTE ; "Time for 3 exchanges " is calculated by the following numerical expression.

$$\text{"Time for 3 exchanges (Hr)"} = (\text{Total Tank Capacities} / \times 0.9(\text{Pump efficiency})) \times 3$$

cautions as follows

For NO.1 ~ NO.7 W.B.T.

Hatches of each ballast tank are to be opened while performing flow-through method to avoid additional pressure in tanks.

For F.P.T. & A.P.T.

Blank flange of Air Pipe Branch Pipe are to be opened while performing flow-through method to avoid additional pressure in tanks.

For NO.4 CARGO HOLD

Vent hatches of NO.4 Cargo hold are to be opened while performing flow-through method to avoid additional pressure in tanks.

(2) BALLAST EXCHNGE PLAN (FLOW-THROUGH METHOD) : Normal Ballast Condition

Step	Tanks	Capacity(m3)	Pumps	Time for 3 exchange
1	F.P.T.	0	NO.1 Ballast Pump	0.0
2	NO.1 W.B.T. (P&S)	3705.4	NO.1 & 2 Ballast pumps	7.7
3	NO2 & 3W.B.T. (P&S)	6820.8	NO.1 & 2 Ballast pumps	14.2
4	NO.4 W.B.T. (P&S)	2834.3	NO.1 & 2 Ballast pumps	5.9
5	NO.5 & 6W.B.T. (P&S)	5636.6	NO.1 & 2 Ballast pumps	11.7
6	NO.7 W.B.T. (P) (S)	1456.9 1414.2	NO.1 & 2 Ballast pumps	6.0
7	A.P.T. (61%)	508.2	Fire & General Service Pump	2.4
8	NO.4 CARGO HOLD	0	NO.1 & 2 Ballast pumps Fire & General Service Pump	0.0

NOTE ; "Time for 3 exchanges " is calculated by the following numerical expression.

$$\text{"Time for 3 exchanges (Hr)"} = (\text{Total Tank Capacities} / \times 0.9(\text{Pump efficiency})) \times 3$$

cautions as follows

For NO.1 ~ NO.7 W.B.T.

Hatches of each ballast tank are to be opened while performing flow-through method to avoid additional pressure in tanks.

For F.P.T. & A.P.T.

Blank flange of Air Pipe Branch Pipe are to be opened while performing flow-through method to avoid additional pressure in tanks.

For NO.4 CARGO HOLD

Vent hatches of NO.4 Cargo hold are to be opened while performing flow-through method to avoid additional pressure in tanks.

Check List for Ballast Water Exchange

**I BALLASTING OPERATION**

For Reference

NO.	DESCRIPTION	YES	NO
1.1	Ballasting plan to be prepared		
1.2	Tanks venting system to be checked for operational		
1.3	Valves to designated tanks to be opened		
1.4	Sea suction valves to be opened for ballasting		
1.5	Ballasting to be commenced by gravity		
1.6	Tanks soundings to be taken and reported to ballast duty officer (Soundings to be taken during the ballasting period)		
1.7	Ballast Water to be checked for contamination		
1.8	Ballast Pumps to be started		
1.9	Drafts to be checked against restrictions		
1.10	Ballasting to be stopped in tank at required level in order to avoid overflow (unless it is necessary all ballast tanks will be stopped off at open sea)		
1.11	Ballast pumps to be stopped		
1.12	All ballast system and tank valves to be closed		
1.13	Ballast intake to be entered into the Ballast Water Reporting Form and Deck Log Book		

**II DEBALLASTING OPERATION**

NO.	DESCRIPTION	YES	NO
2.1	Deballasting plan to be prepared		
2.2	Tanks venting system to be checked for operational		
2.3	Valves to designated tanks to be opened		
2.4	Sea discharging valves to be opened for deballasting		
2.5	Deballasting to be commenced by gravity		
2.6	Tanks soundings to be taken (Soundings to be taken during deballasting period)		
2.7	Overboard outlets to be checked for water contamination		
2.8	Ballast Pumps to be started		
2.9	Drafts to be checked against restrictions		
2.10	Deballasting to be stopped when the tanks are empty		
2.11	Ballast pumps to be stopped		
2.12	All ballast system and tank valves to be closed		
2.13	Deballasting to be entered into the Ballast Water Reporting Form and Deck Log Book		

During Ballasting and Deballasting Operation the following items will be taken into account :

- 1-) To be agreed who will be responsible for the ballasting / deballasting operation as duty officer / engineer, watch relieve must be informed,
- 2-) Ships office (Ballast Control Console) will not be left unattended while the ballast pump(s)/stripping pump(s) are in use,
- 3-) Agreed Communication system must be set up and known by the officers/engineers,
- 4-) Duty engineer must be clearly informed after completion ballasting / deballasting operations,
- 5-) During the hold ballasting / deballasting additional manholes must be opened, together with hatch covers if it is permitted/practicable.

Second Engineer

Chief Officer

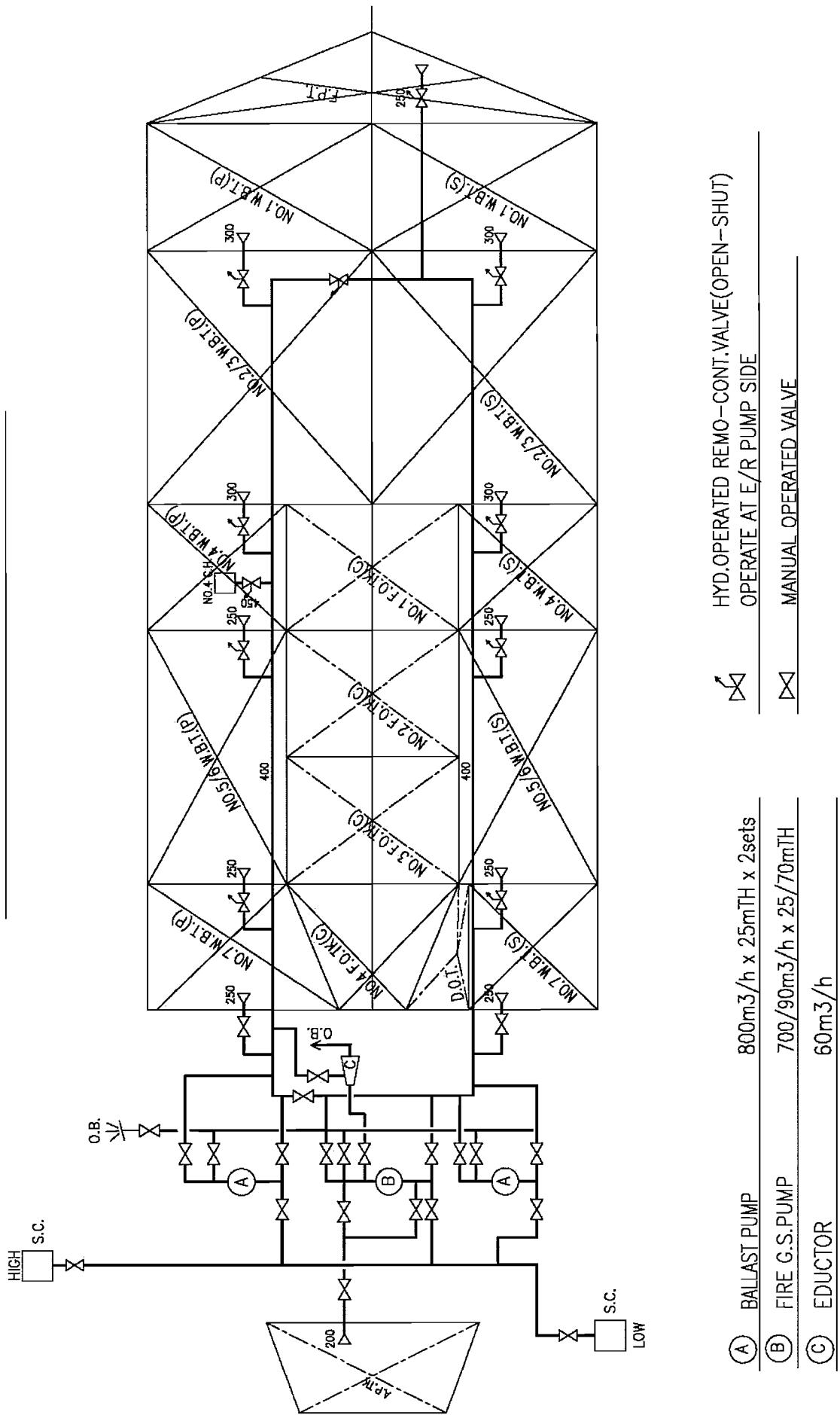
Master

Signature

Signature

Signature

## BALLAST PIPING DIAGRAM



## SECTION 6

### BALLAST WATER SAMPLING POINTS

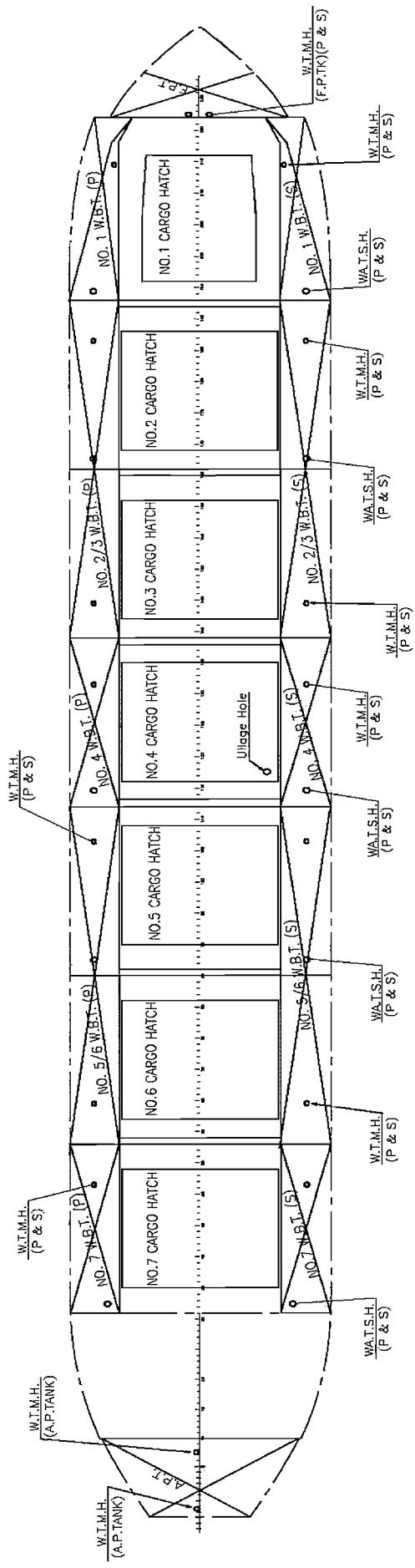
This section is confined to identifying sampling points

There is unlikely to be any need for crewmembers to take samples except at the express request, and under the supervision, of a quarantine officer.

The lists or diagrams below indicate sampling and access points in pipelines and tanks, so that crewmembers can quickly assist quarantine officers who wish to obtain samples.

Quarantine officers must be advised of all safety procedures to be observed when entering enclosed spaces.

#### AA) Ballast Water Sampling Points



## BB) For Sediment Sample Points from Ballast Water Tanks

Fore Peak.....	.....	Manhole Cover	.....	2	Manholes			
NO.1 W.B.T.....	.....	SmallHatches	Manhole Cover	.....	2	Smallhatches and	2	Manholes
NO.2 & 3 W.B.T.....	.....	SmallHatches	Manhole Cover	.....	2	Smallhatches and	4	Manholes
NO.4 W.B.T.....	.....	SmallHatches	Manhole Cover	.....	2	Smallhatches and	2	Manholes
NO.5 & 6 W.B.T.....	.....	SmallHatches	Manhole Cover	.....	2	Smallhatches and	4	Manholes
NO.7 W.B.T.....	.....	SmallHatches	Manhole Cover	.....	2	Smallhatches and	2	Manholes
A.P.T.....	.....	.....	Manhole Cover	.....	2	Manholes		
NO.4 CARGO HOLD.....	.....	.....	Ullage Hole	.....	1	Ullage Hole		

## SECTION 7

### CREW TRAINING AND FAMILIARISATION

- 7.1 The Company should provide training for master and crew as appropriate, including instruction on the application of ballast water and sediment management and treatment procedures, based on the information contained in these plan. Instruction should also be provided on the maintenance of appropriate log and record.
- 7.2 Training for ship's masters and crews as appropriate should include instruction 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.
- 7.3 The Master shall ensure that ships officers and ratings engaged in ballast water exchange at sea should be trained in and familiarized with the following, if not enough, do training.
  - 1) The ships pumping plan, which should ballast pumping arrangement, with positions of associated air and pipelines connecting them to ships 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 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 require safety precaution.
  - 5) The method of on-board ballast water record keeping, reporting and recording of routine soundings.
- 7.4 All records relating to training are maintain on board for 2 years to identify trainee. That is any document relating to the Plan.

## Training Record for Ballast Water Management Manual

It is hereby confirmed that I/We have been informed by the vessel's ECO on the IMO's Resolution A.868(20) Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens. Furthermore I have been informed on the Company's "Ballast Water Management Manual" and relative procedures established on board.

Vessel shall prepare two copies of this record, one copy shall kept on board in training file and one copy shall sent to Company every three months period. The training shall be carried out in the concept of Specific Familiarization (one week period after the embarkation of vessel) in accordance with STCW 95 Convention A-VI/14. In addition to Familiarization trainings, Ballast Water Management Training shall be carried out and reviewed for officers in three months period.

## SECTION 8

### DUTIES OF APPOINTED BALLAST WATER MANAGEMENT OFFICER

Appointed Ballast Water Management Officer  
[CHIEF OFFICER]

Duties of the appointed officer in charge of ballast water management

1. Ensure that the ballast water treatment or exchange follows procedures in the ballast water management plan.
2. [ Inform the owner or operator by an agreed procedure when commencing ballast water exchange, and when it is completed. ]
3. Prepare the ballast water declaration form prior to arrival in port.
4. Be available to assist the port state control or quarantine officers for any sampling that may need to be undertaken.
5. Maintain the ballast water handling log.

## SECTION 9

### BALLAST WATER REPORTING FORM AND HANDLING LOG

#### 1. Format for ballast water reporting form

##### Guidelines for completing the ballast water reporting form

This form was developed by IMO, to serve as a guide for use when reporting to a national authority that requests information in advance. To avoid misunderstandings, some guidance for completing it follow on the page opposite. It should be noted that question 3, "Total number of tanks on board" refers only to the total number of segregated ballast tanks. Care should be taken before using this general form, that the country being approached does not have its own form for use when reporting.

#### 2. Format for ballast water handling log

Record of loading and discharging ballast

Narrative pages for recording unusual events

These two forms have been created as a guide for recording the sort of information often requested by quarantine officers who wish to learn about the source of the ballast water on board.

Even if the ship 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.

# BALLAST WATER REPORTING FORM

(To be provided to the Port State Authority upon request)

## 1. SHIP INFORMATION

Ship's Name:	Type:	IMO Number:
Owner:	Gross Tonnage:	Call Sign:
Flag:	Arrival Date:	Agent:
Last Port and Country:	Arrival Port:	
Next Port and Country:		
Specify Units: M <sup>3</sup> , MT, LT, ST		
Total Ballast Water on Board:		
Total Ballast Water Capacity:		

## 2. BALLAST WATER

3. BALLAST WATER TANKS Ballast Water Management Plan on board? YES NO Management Plan Implemented? YES NO  
 Total number of ballast tanks on board: \_\_\_\_\_ No. of tanks in ballast: \_\_\_\_\_ IF NON IN BALLAST GO TO No.5

STATE OF ARKANSAS  
DEPARTMENT OF HOMELAND SECURITY

Ballast Water Tank Codes : Forepeak  $\equiv$  FB ; Aftpeak  $\equiv$  AP ; Double Bottom  $\equiv$  DB ; Wing  $\equiv$  WT ; topside  $\equiv$  TS ; Cargo Hold  $\equiv$  CH ; Other  $\equiv$  O

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

## IE NON STATE REASON WHY NOT :

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3. IMO BALLAS | WATER GUIDELINES ON BOARD (RESOLUTION A.888(20))  
RESPONSIBLE OFFICER'S NAME AND TITLE (PRINTED) AND SIGNATURE:

**BALLAST WATER HANDLING LOG**  
Record of ballast water management on board

## Record of ballast water management on board

## BALLAST WATER HANDLING LOG

---

Narrative record of events related to ballast water management on board

Ship	Port of Registry	IMO number
<i>Record here events which are relevant to ballast management, and which will be of interest to quarantine officers, such as sediment removal during drydock, or tank flushing at sea. Each entry should be completed with the signature and rank of the officer making the entry.</i>		

## SECTION 10

Guidelines from IMO Resolution A.868(20), and appendices.

**Resolution A.868(20)**  
*Adopted on 27 November 1997*  
(Agenda item 11)

**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 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 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

- Chapter 1 - Introduction
- Chapter 2 - Definitions
- Chapter 3 - Application
- Chapter 4 - Guideline objectives and background
- Chapter 5 - Dissemination of information
- Chapter 6 - Training and education
- Chapter 7 - Procedures for ships and port States
  - 7.1 Procedures for ships
  - 7.2 Procedures for port States
- Chapter 8 - Recording and reporting procedures
  - 8.1 Procedures for ships
  - 8.2 Procedures for port States
- Chapter 9 - Ships' operational practices
  - 9.1 Precautionary practices
    - .1 Minimizing uptake of harmful aquatic organisms, pathogens and sediments
    - .2 Removing ballast sediment on a timely basis
    - .3 Avoiding unnecessary discharge of ballast water
  - 9.2 Ballast water management options
    - .1 Ballast water exchange
    - .2 Non-release or minimal release of ballast water
    - .3 Discharge to reception facilities
    - .4 Emergent and new technologies and treatments

- Chapter 10 - Port State considerations
  - 10.1 Highly disparate conditions between uptake and discharge ports
  - 10.2 Ballast water age
  - 10.3 Presence of target organisms
- Chapter 11 - Enforcement and monitoring by port States
- Chapter 12 - Future considerations in relation to ballast water exchange
  - 12.1 Research needs
  - 12.2 Long-term evaluation of safety aspects in relation to ballast water exchange
- Chapter 13 - Ballast system design
  - Appendix 1 - Ballast water reporting form
  - Appendix 2 - Guidance on safety aspects of ballast water exchange at sea

## 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 purpose 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 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 crews 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 is 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 on board 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 SHIP'S 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 educators 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 programme, 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 measure accordingly. Even if such target species are not present, however, it should be noted that the ship may still be carrying many untargetted 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 on board. 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 analyze 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 checkpoints 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 on board;
- 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.

BALLAST WATER REPORTING FORM

(TO BE PROVIDED TO PORT STATE AUTHORITY UPON REQUEST)

1. VESSEL INFORMATION

Same as P.23

## 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 ballast 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 and any one time;
- .3 admissible weather conditions;
- .4 weather routeing 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 deballasting;
- .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 condition. 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 favourable 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 suctions and pipelines connecting them to ship's ballast pumps and, in the case of use of the flow-through method of ballast water exchange, the openings used for release of water from the top of the tank together with overboard discharge arrangements;
- .2 the method of ensuring that sounding pipes are clear, and that air pipes and their non-return devices are in good order;
- .3 the different times required to undertake the various ballast water exchange operations;
- .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.

## SECTION 11

Technical advice by NIPPON KAIJI KYOKAI for Ballast Water Exchange at sea

July 2002

Hull Department

In addition to SECTION 4 "Safety Considerations" & SECTION 5 "Procedures for Managing Ballast Water", the master has to take care of following matters.

### Sequential Method

The master has to check following matters for each steps with the vessel's approved Loading Manual & Stability Information.

The ballast hold (cargo hold) is always to be empty or fully filled to avoid unacceptable stress on hull structure by sloshing.

- |                              |                             |
|------------------------------|-----------------------------|
| 1. Stability                 | -----always to be satisfied |
| 2. Longitudinal Strength     | -----always to be satisfied |
| 3. Minimum bow draft         | -----see below              |
| 4. Bridge Visibility Forward | -----see below              |
| 5. Propeller Immersion       |                             |

When the vessel can't satisfy the requirement of minimum bow draft, the exchange isn't to be carried out in rough sea to avoid forward bottom slamming.

When the vessel can't satisfy the requirement of navigation bridge visibility, the exchange is to be carried out in an open sea confirming that no other vessel is likely in the visibility.

### Flow-through method

Manholes of each ballast tank are to be opened while performing flow-through method to avoid additional pressure in tanks.

From our study, if the total sectional area of air pipes is more than twice the total sectional area of filling pipes, there is little possibility of additional pressure in tanks.