

**Ballast Water Management Plan**  
**Section 5 – Ballast Exchange Procedure**

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**5.1 General**

The necessity of pre-planning is to ensure that all safety considerations as addressed in Section 6 and 7 are in compliance with ballast exchange, ballast water treatment or other control options.

The need for ballast water exchange in open water shall be carefully examined and prepared in advance, in a similar manner and with the same degree of thoroughness to the preparation of a cargo plan.

All local and/or national regulations should be taken into consideration as they may specify other requirements such as different water depths and distances from land for carrying out the exchange.

A ship will not be required to deviate from its intended voyage or delay the voyage in order to comply with any particular requirement as stated above. In addition, if the master decides reasonably that an exchange would threaten the safety or stability of the ship, its crew or its passengers because of adverse weather, ship design or stress, equipment failure, or any other extraordinary condition, then, he is not required to comply with above paragraphs.

**Requirements**

The Convention requires that vessels should conduct ballast water exchange:

- a) At least 200 miles from the nearest land and in water at least 200 m in depth; if this is not possible,
- b) As far from the nearest land as possible, and in all cases at least 50 nm from the nearest land and in water at least 200 m in depth or
- c) In sea areas designated by the Port State.

**Methods of Ballast Water Exchange**

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

**5.2 Preparation for Ballast Water Exchange**

The Chief Officer shall prepare the ballast water exchange plan, specially for exchanging ballast water at sea, taking into account all safety concerns and requirement within the BWM. The completed plan shall be presented to Master for his guidance and/or approval.

In preparing the ballast water exchange plan, the ship's approved loading instrument (Loading Computer) should be use to ensure that calculated shear forces and bending moments during every steps of ballast operations are always within the permissible strength limits of the ship.

Ballast water exchange operation shall be recorded in Ballast Water Reporting forms required by the Port State of arrival where the ballast water will be discharge.

Duration of ballast exchange should be computed and planned, that ballast operation shall be completed before the ship is affected by sudden change of weather, or is about to enter into an area where exchanging of ballast at sea is not allowed.

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Forward draft should be greater than minimum forward draft of the loading manual. If this criteria is not fulfilled for some of the sequences during preparation of “Ballast Water Exchange Plan”, the following note must be put on that plan for these sequences:

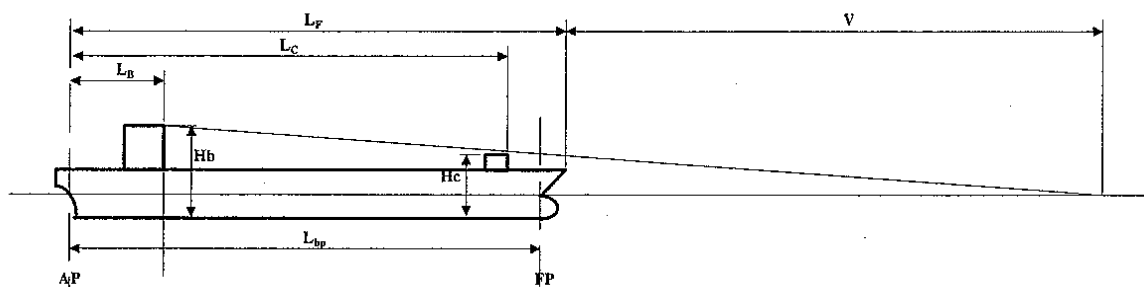
*“Minimum forward draft is lower than minimum value of loading manual. The Master is to be advised that these sequences must be performed in calm conditions of weather. Routes to be chosen to absolutely avoid slamming”.*

Full immersion of the propeller should be ensured. If this criterion is not fulfilled for some sequences, the following note must be put on that plan for these sequences:

*“Propeller immersion is not fulfilled. The master is to be advised that all necessary precautions will have to be taken during these sequences”.*

Bridge Visibility (Blind Forward Sector), as an indication of bridge visibility, the view of the sea surface forward of the bow from the conning position is to be not more than two ship lengths or 664 meters, which ever is the less. As per Panama Canal's Requirements, for ship in Ballast condition, to be not more than 1.5 ship lengths. It is recognized that not all ships can comply with SOLAS 1974, Chapter V Safety of Navigation, Regulation 22 Navigation bridge visibility. In such cases, ships are expected to comply in respect of forward view and blind sectors, as far as is practicable without structural alteration being required.

In the Ballast Water Notification form, when there is increased in the blind sector (Horizontal and/or vertical) vessel is to determine it is safe and if necessary to provide proper look lookout i.e. Stationed at the forecandle.



- LOA : Length Overall (meters)
- LBP : Length Between Perpendiculars (meters)
- D : Depth meters (meters)
- Dr : Draught at Amidship (meters)
- LF : Horizontal distance from A.P. to vessel's forward end (meters)
- LC : Horizontal distance from A.P. to forward and upper end of the foremost point (that effects the visibility) (meters)
- LB : Horizontal distance from A.P. to forward point of Navigation Bridge (mtr)
- Hb : Vertical distance from B.L. to the eyes of the Master in the Bridge (mtr)
- Hc : Vertical distance from B.L. to forward, top side of the foremost point (mtr)
- V : Forward Invisible Distance (meters)
- Trim : Loading Condition Trim (meters)
- LCF : Horizontal distance of Longitudinal Center of Flotation from Amidship(m)

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**Maximum allowable bridge invisible length forward, as per IMO Regulation  
V : 500 meters**

**Maximum allowable bridge invisible length forward, as per Panama Canal  
V : 274.48 meters**

If SOLAS Chapter V, Reg. 22. criteria is not fulfilled for some sequences, the following note must be put on that plan for these sequences:

*The master is to be advised that the visibility from the bridge will be reduced during the sequences and so the master, being aware of this point, will take the necessary action to compensate this problem.*

### 5.3 Sequential Method

The '**Sequential Method**' is a process by which the ballast tank is first emptied (In pair to avoid excessive listing) and then refilled with replacement ballast water to achieve at least a 95 per cent volumetric exchange.

In each tank, all the ballast water shall be discharged until suction of the pump(s) is lost, and eductors should be used, if possible. This is to avoid a possible situation, where organisms are left in the bottom part of the tank, the tank is refilled with new water which may allow re-emergence of organisms.

During entire ballast operation, the vessel should be always in upright position. Tank sounding should be taken and recorded at regular interval.

The sequential method requires careful planning and monitoring by the ship's staff to mitigate risks to the ship in respect of:

- longitudinal strength
- dynamic loads
- excessive trim
- forward slamming
- propeller immersion
- intact stability; and
- bridge visibility

A detailed operational description of the ballast exchange sequence used is given in Section 8 and Appendix III. This section shall be consulted prior, during and after the exchange in addition to the safety considerations in Section 6 and 7. At the same time ship staff should be taking account of the ship's position in relation to the land, navigational hazards, shipping density, current and forecast weather, machinery performance and degree of crew fatigue, before proceeding to the next pair of steps/sequence. If any factors are considered unfavourable the ballast exchange should be suspended or halted.

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#### **5.4 Flow Through Method**

The '**Flow through**' method is a process by which replacement ballast water is pumped into the ballast tank, allowing water to flow through and overflow or other arrangements to achieve at least 95 per cent volumetric exchange of ballast water. Pumping through three times the volume of each ballast water tank usually shall be considered to meet the standard described above. Pumping through less than three times the volume may be accepted provided the ship can demonstrate that at least 95 per cent volumetric exchange is met.

The flow through method 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 and is relatively easy to follow by ships staff. However, the flow through method introduces certain other risks and problems which must be considered before using this procedure. Refer to safety procedures described in Section 6.

The disadvantages are that not all tanks are designed with a head to the top of the overflow. Moreover, some tank configurations can be difficult to flush through effectively, in particular cellular double bottom spaces and peak tanks. There is a danger of over pressurisation of tanks and there can be an accumulation of water on deck, which in sub zero temperature conditions make the method impractical and dangerous for crew. In addition pumps and piping will experience an increase in workload.

The above, in addition to the safety aspects addressed in Section 6 and 7 shall be carefully consulted and followed where applicable.

Where peak tanks are partially filled, the flow through method should be avoided unless any inadvertent exceedance of the design partial filling levels will not result in hull girder bending moments and shear forces exceeding the permissible values.

#### **5.5 Ballast Water Treatment Systems**

A Ballast Water Management System (BWMS) is any system, which processes ballast water such that it meets or exceeds the Ballast Water Performance Standard in Regulation D-2 of the Convention. The BWMS includes Ballast Water Treatment Equipment, all associated Control Equipment, Monitoring Equipment and Sampling Facilities.

Ballast Water Treatment Equipment is an equipment, which mechanically, physically, chemically, or biologically processes, either singularly or in combination, to remove, render harmless, or avoid the uptake or discharge of Harmful Aquatic Organisms and Pathogens within Ballast Water and Sediments. Ballast Water Treatment Equipment may operate at the uptake or discharge of ballast water, during the voyage, or at a combination of these events.

Ballast water management systems, if installed on board, should ensure in addition to compliance with the convention requirements, to be type approved and relevant certificates to be readily available on board.

When such a system is fitted on board it should be operated in accordance with the system design criteria and manufacturers operational and maintenance instructions as contained in the relevant booklet.

When the systems encounter failure and/or malfunctions, these are to be recorded in the ballast record book.

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**5.6 Precautionary Practices**

Minimizing uptake of harmful aquatic organisms, pathogens and sediments.

When taking 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 the areas identified by the port State in connection with advice relating to:

- a) areas with outbreaks, infestations or known populations of harmful organisms and pathogens;
- b) areas with current phytoplankton blooms (algal blooms, such as red tides);
- c) nearby sewage outfalls;
- d) nearby dredging operations;
- e) when a tidal stream is known to be the more turbid; and
- f) areas where tidal flushing is known to be poor
- g) In darkness when bottom-dwelling organisms may rise up in the water column;
- h) in very shallow water; or
- i) Where propellers may stir up sediment.

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.

Minimise departure and arrival ballast quantities but always within the constraints of safe navigation.

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.

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.