

**RESOLUTION MEPC.149(55)**  
**Adopted on 13 October 2006**

**GUIDELINES FOR BALLAST WATER EXCHANGE DESIGN AND  
CONSTRUCTION STANDARDS (G11)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that Regulation D-1 of the Ballast Water Management Convention stipulates that ships performing ballast water exchange shall do so with an efficiency of at least 95 per cent volumetric exchange of ballast water and that MEPC 51 identified the need for additional guidance on design and construction standards for ships conducting ballast water exchange,

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

HAVING CONSIDERED, at its fifty-fifth session, the draft Guidelines for ballast water exchange design and construction standards (G11) developed by the Ballast Water Working Group, and the recommendation made by the Sub-Committee on Bulk Liquids and Gases at its tenth session,

1. ADOPTS the Guidelines for ballast water exchange design and construction standards (G11);
2. INVITES Governments to apply the Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep the Guidelines under review.

## ANNEX

### **GUIDELINES FOR BALLAST WATER EXCHANGE DESIGN AND CONSTRUCTION STANDARDS (G11)**

#### **1 INTRODUCTION**

##### **Purpose**

1.1 These Guidelines outline recommendations for the design and construction of ships to assist compliance with Regulation D-1 (*Ballast Water Exchange Standard*) of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Convention).

1.2 These Guidelines have been developed to give guidance to shipbuilders, ship designers, owners and operators of ships in designing safe, environmentally acceptable, technically achievable, practicable, and cost effective ballast water exchange as required in Regulation D-1.

1.3 These Guidelines should be applied without compromising the ship's safety and operational efficiency and taking into account the design of ship types, which may have special safety considerations for example container ships and bulk carriers.

#### **2 DEFINITIONS**

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

- .1 "Ballast Water Tank" – means any tank, hold or space used for the carriage of ballast water as defined in Article 1 of the Convention.
- .2 "Sequential Method" – means a process by which a ballast tank intended for the carriage of ballast water is first emptied and then re-filled with replacement ballast water to achieve at least a 95 per cent volumetric exchange.
- .3 "Flow-through Method" – means a process by which the replacement ballast water is pumped into a ballast tank intended for the carriage of ballast water, allowing water to flow through overflow or other arrangements.
- .4 "Dilution Method" – means a process by which replacement ballast water is filled through the top of the ballast tank intended for the carriage of ballast water with simultaneous discharge from the bottom at the same flow rate and maintaining a constant level in the tank throughout the ballast exchange system.

### **3 BALLAST WATER EXCHANGE – DESIGN AND CONSTRUCTION CONSIDERATIONS**

#### **General considerations**

3.1 When designing and constructing a ship that will operate with ballast water exchange the following considerations should be taken into account:

- .1 maximizing the efficiency of ballast water exchange;
- .2 increasing the range of sea conditions under which ballast water exchange may be conducted safely;
- .3 shortening the time to complete ballast water exchange (thereby increasing the types of voyages under which ballast water exchange can be undertaken safely); and
- .4 minimizing the accumulation of sediments (refer to Guidelines on design and construction to facilitate sediment control on ships (G12)).

#### **Consideration at the design phase of new ships**

3.2 When designing new ships the following aspects related to ballast water management equipment should be considered:

- .1 ballast water management and the processes chosen to achieve it, should be considered as a component of the ship's design;
- .2 design and installation of the ballast water pumping and piping system should ensure that ease of operation and maintenance is maximized;
- .3 ballast tank design should facilitate all aspects of ballast water management;
- .4 installation of monitoring and/or recording equipment for all ballast water operations and treatment processes. If any records are automatically recorded by the equipment they should be in a format that can easily be retained and be made readily available to appropriate authorities;
- .5 remote data management;
- .6 the design of the ballast water exchange system should be such that it facilitates future compliance of the standards set in Regulation D-2 of the Convention, minimizing the need to install new equipment/retrofitting and to carry out dry-docking and/or hot work. It should reduce, as far as possible, the costs of any adaptation for this purpose. Special consideration should be given to the feasibility of combining ballast water exchange methods with ballast water treatment technologies, aiming at meeting, in the future, the standards of Regulation D-2. Adequate spaces for new complementary equipment and pipelines, which may be necessary to meet future standards D-2, should also be considered and planned.

3.3 Where designing new ships ballast water systems designs should take special account of the need for sampling the ballast water by port State control or other authorized organizations. The arrangements should be such that samples as required by the Guidelines for ballast water sampling (G2) can be taken. The sampling arrangements should enhance the quality and ease of sampling of ballast water or sediments, without the need to enter potentially dangerous spaces or partially filled ballast tanks.

3.4 Where ballast water exchange at sea is the chosen method, when designing new ships the following aspects should be considered:

- .1 design of ship structures to enable ballast water exchange to be conducted at various sea states/swell conditions and provide to the ship information on the maximum sea state that ballast water exchange can be conducted;
- .2 minimize the burden on ships crew (e.g. minimize the number of operational steps, the number of partially loaded tanks and the time taken);
- .3 minimize the risk of tank over/under pressurization;
- .4 minimize the flow of ballast water on deck;
- .5 maintaining bridge visibility standards (SOLAS V/22), propeller immersion and minimum draft forward at any stage of a designed ballast water exchange operation;
- .6 the consequences of ballast water exchange at sea, including stability, hull girder strength, shear forces, torsional stresses, resonance, sloshing, slamming and propeller immersion.

3.5 The ballast water exchange methods currently in use are the sequential, flow-through (tank overflow) and dilution methods:

- .1 where the sequential method is to be used, particular attention should be given to the ballast tank layout, total ballast capacity, individual tank configuration and hull girder strength. If the plan requires simultaneously emptying and refilling closely matched diagonal tanks then consequential torsional stresses should be considered. Still water bending moments, shear forces and stability should remain at or within safe limits;
- .2 where the flow through method is to be used adequate provision should be made to avoid the risk of over pressurization of ballast tanks or ballast piping. The installation of additional air pipes, access hatches (as an alternative to deck manholes), internal overflow pipes (to avoid flowing over the deck) and interconnecting ballast trunks between tanks where applicable and possible may be considered. Water on decks and/or direct contact poses a safety and occupational health hazard to personnel. The design should, where possible, be such that it avoids water overflowing directly on to decks to avoid the direct contact by personnel with the ballast water;

- .3 where the dilution method is to be used adequate provision should be made for appropriate piping arrangements to facilitate the ballast water pumping into the previously ballasted tanks through the top of the ballast tank and, simultaneously, discharging the ballast water through the bottom of the tank at the same flow rate while maintaining a constant ballast water level in the tank throughout the exchange operation. Adequate provision should also be made to avoid the risk of over pressurization of ballast tanks or ballast piping. The hydrodynamic performance of the ballast tank is crucial to ensure full water exchange and sediment scouring.

#### **4 DESIGN CONSIDERATIONS TO ENHANCE MANAGEMENT, CONTROL AND OPERATIONAL STRATEGIES**

##### **Sea chests**

4.1 The following should be considered:

- .1 sea chest design should be such that sediment accumulation is minimized; and
- .2 provision of a high sea chest.

##### **Ballast tanks**

4.2 The design of ballast tanks should also take account of the Guidelines on design and construction to facilitate sediment control on ships (G12).

##### **Ship-to-shore ballast transfer arrangements**

4.3 If consideration is given to providing ship-to-shore connections to transfer ballast to shore-based ballast water reception facilities, the arrangements should be compatible with a recognized standard such as those in the Oil Companies International Marine Forum (OCIMF) "Recommendations for Oil Tankers Manifolds and Associated Equipment". It is recognized that this standard was originally produced for oil transfer connections, however the general principles in this standard can be applied to connections for ballast transfer in particular the sections related to flanges and connection methods.

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