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Guideline on Procurement and Installation of Ballast Water Management System
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Guideline on Procurement and Installation of Ballast Water Management System

FOREWORD

The International Maritime Organization (IMO) has developed international legislation, the "International Convention for the Control and Management of Ships' Ballast Water and Sediments", to regulate discharges of ballast water and reduce the risk of introducing non-native species from ships' ballast water.

The requirement for ballast water management has arisen from the requirements of regulation D-2 of the Convention. In response to this, a number of technologies have been developed to meet the requirements of the Ballast Water Management Convention and shipboard operation.

The techno-economic considerations to be evaluated before selection of a suitable Ballast Water Management system are many.

Owners therefore face a complex task in choosing and installing the appropriate Ballast Water Management systems particularly when past experience on operation and installation of such systems does not exist.

In view of this, the Guideline has been prepared by Association of Asian Classification Societies (ACS) to summarize the current state of ballast water treatment regulations and available technologies in order to provide useful guideline to ship owners, operators, and builders in their decisions about suitable management options for new constructions as well as existing ships.

Feedback from the industry on the contents of ACS guidelines is welcomed anytime.
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1. Introduction

The ballast water is carried by ships to stabilise them often contains organisms, e.g. small fishes, benthic organisms or plankton, or pathogenic bacteria, which are released into the environment when the ballast water is discharged. With continued growth of shipping traffic, the probability increases that such organisms survive the transport in ballast water. In this way, numerous invasive alien species have already established populations, e.g., in the North and Baltic Seas. In the Baltic Sea, the shipworm (teredo navalis) has damaged coastal defence structures, e.g. groynes made of local types of wood, by boring into the wood and destroying it. The damage caused by such invasive alien organisms is rarely expressed in figures, and its origin mostly is not traced back to the discharge of ballast water.

For quite a long time, this aspect of marine environmental protection lacked adequate international regulations. To address the situation in February 2004, the Ballast Water Convention was adopted during a diplomatic conference at IMO. The Convention entered into force on 8 September 2017 and requires the establishment of a ballast water management system on board ships which will replace the uncontrolled ballast water uptake and discharge operations common based on the timeline (i.e., amendments to regulation B-3) given in MEPC Res. 297(72). Ballast water has to be treated on board before being discharged into the marine environment, to comply with the ballast water performance standard in Regulation D-2 of the Ballast Water Convention.

These notes have been prepared to provide guideline to ship owners and operators who are preparing to install ballast water management systems on their ships. The Guideline provides the current status of the IMO regulations and gives some recommendations that will help owners to prepare their ships and ensure that their ships remain compliant.

2. Ballast Water Management Convention

The Ballast Water Convention has been developed to regulate discharges of ballast water and reduce the risk of introducing non-native species.

2.1 Applicability of the IMO BWM Convention

BWM Convention applies to all vessel types operating in the aquatic environment which are designed to carry ballast water. This includes submersibles, floating craft and platforms including floating storage units (FSUs) and floating production storage and offloading units (FPSOs), although the applicable requirements vary.

2.1.1 Regulation A-4, Exemptions

Regulation A-4 of the Convention stipulates that a Party or Parties, in waters under their jurisdiction, may grant exemptions to any requirements to apply regulation B-3 or C-1, in addition to those exemptions contained elsewhere in this Convention, but only when they are, inter alia, granted based on the guidelines on risk assessment developed by IMO. At MEPC seventieth session, it endorsed that Administrations may grant exemptions in accordance with regulation A-4 of the Convention based on the same risk area (SRA) concept, subject to consultation and agreement between States that may be affected by such exemptions. At MEPC seventy-first session, the 2017 Guidelines for risk assessment under regulation A-4 of the BWM Convention (G7) was adopted by Resolution MEPC.289(71) which introduced the SRA concept.

2.2 Standards for Ballast Water Management under BWM Convention

The Convention includes two regulations that define ballast water management standards; Regulation D-1 addresses the Ballast Water Exchange standard and Regulation D-2 details the Ballast Water Treatment Performance standard.

Ballast water exchange is founded on the principle that organisms and pathogens contained in ballast water taken on board from coastal waters will not survive when discharged into deep oceans or open seas, as these waters have different temperatures, salinity and chemical composition. Similarly the deep ocean waters or open seas, when compared to the coastal waters, contain fewer organisms and pathogens and those that do exist are less likely to adapt to the new coastal or freshwater environment. Therefore the probability of organism and pathogen transfer through ballast water is significantly reduced. Ships performing ballast water exchange are required to do so with an efficiency of at least 95 percent volumetric exchange. Acceptable methods for ballast water exchange are the Sequential Method, the Flow-through Method and the Dilution Method. Noting that ballast water exchange presents significant operational concerns and challenges, and that it may not provide a totally effective solution to reduce the spread of unwanted aquatic organisms and pathogens from ships' ballast water over time, the Convention requires an upgrade to the installation of ballast water management systems in accordance with a specified schedule.

Regulation D-2 defines the performance standard for the ballast water management system. This criterion is in the form of specific limits on aquatic life in the ballast discharge: Ships conducting ballast water management in accordance with this regulation shall discharge:

- Less than 10 viable organism per m^3 > 50μ in minimum dimension, and
- Less than 10 viable organisms per ml < 50μ and >10μ in minimum dimension, and

- Less than the following concentrations of indicator microbes:
  - Toxicogenic Vibrio cholera less than 1 colony forming unit (cfu) per 100 ml, or less than 1 cfu per 1 gram zooplankton samples
  - Escherichia coli less than 250 cfu per 100 ml
  - Intestinal Enterococci less than 100 cfu per 100 ml

The D-2 standard is the metric used to measure the efficacy of the treatment system and it applies to the system as installed on board and used in actual operations. All treatment systems must be type approved by an Administration under a robust protocol which requires that they satisfy this standard in full scale operations. In any port or offshore terminal, an officer authorized by a Party to the Convention may board a vessel to which the Convention applies and test the ballast water discharge for compliance by taking samples.

2.3 Entry into force

The Convention entered into force on 8 September 2017 after Finland ratified the same on 8 September 2016 bringing the number of contracting states to 52, representing 35.1441% of the world merchant shipping fleet. As on 8 September 2017, it has been ratified by 77 states constituting 77.17% of the world's merchant shipping fleet.

It requires ballast water treatment to be used in place of ballast water exchange in a phased manner. This requirement will be phased in according to the timescales shown in the table in Para. 2.5 below, and is based on whether a ship is an existing or a newbuilding.

2.3.1 No penalty for early movers

It was agreed by IMO that owners who have already fitted a BWMS complying with the previous G8 Guidelines (Res. MEPC. 174(58)) should not have to replace the BWMS for the life of the ship or the life of the BWMS, whichever is the sooner. Nor should they be penalized for non-compliance with the D2 standard provided the BWMS has been installed, operated and maintained in accordance with the manufacturer's recommendations. The stakeholders should also pay attention to the information that the phrase "no need to replace", the meaning of the words "prior to application of the revised Guidelines (G8)", the footnote of the "not be penalized" and the word "occasional exceedance of the D-2 standard" need more clarification when implementation of the "roadmap for the implementation of the BWM convention" (Annex 2 to document MEPC 68/WP.8) takes place.

2.3.2 Trial Period

(i) The trial period would be as per the time framework approved by MEPC 72 in accordance with BWM.2/Circ.67.
(ii) During the trial period, Port States would refrain from applying criminal sanctions or detaining the ship based on only sampling.
(iii) The methods considered mature enough for use in the context of port state control are identified in the trial.

2.4 Problem point for the interpretation of BWM Convention

(a) Considering the breakdown of BWMS, is it necessary to consider the installation of BWMS for both main and sub?
Normally, one BWMS will be installed for a vessel (it is defined this BWMS as "main"). On the other hands, there is possibility to have some breakdown for the BWMS, and it is difficult to carry out the ballast water treatment using BWMS. In this case, in order to comply with the D-2 standard, it is necessary to install another BWMS ((it is defined this BWMS as "sub"). The discussion for the installation of BWMS for both main and sub is not held in IMO. Therefore, even if the requirement of BWMS for both main and sub is specified, the requirement will be applied for a long way off, and it is not necessary to consider the requirement under present circumstances.

(b) Whether or not the particular equipment for the sampling of ballast water is required? It is required to carry out ballast water sampling in accordance with G2 and the sampling facility is to comply with the requirement of G2. It may trigger this issue in future.

2.5 Timeline for implementation of D-2 standard

At MEPC 72, amendments to regulation B-3 of the BWM convention have been adopted under Res. 297(72) which gives the timeline for implementation of D-2 standard and the same is detailed in the following table.

Timeline for implementation of D-2 standard (amendments to regulation B-3) (derived from MEPC Res. 297(72) and adopted by IMO MEPC 72)

S.No.	Ship Constructed	Date of IOPP Renewal Survey	Deadline for BWMS implementation
1	Before 8 September 2017	Vessels for which IOPP renewal survey does not apply	By 8 September 2024
		Vessels completed IOPP renewal survey on or after 8 September 2014 but prior to 7 September 2017	By the completion date of first renewal survey associated with the IOPP Certificate on or after 8 September 2017
		Vessels other than the above	By the completion date of the second renewal survey associated with the IOPP Certificate on or after 8 September 2017 or the renewal survey associated with the IOPP Certificate on or after 8 September 2019, whichever comes first
2	On or after 8 September 2017	All vessels	On Delivery

Note: Refer to Regulation A-1.4 and A-1.5 for the definition of "Constructed"

Reference to the MARPOL Annex I, IOPP "renewal" survey as the basis for measurement: Under the BWM Convention, the survey regime is the BWM survey regime which provides a much narrower period (one year) for compliance as that survey regime starts with the initial issuance of the BWM Certificate (thereby establishing the BWM survey regime) on entry into force of the Convention. The revised compliance schedule "spreads out" compliance over a 5-year period (or even more) for existing ships since they already have established IOPP renewal surveys.

3. IMO Guidelines Available

Since the adoption of the Convention, IMO has been working to develop a series of guidelines that further clarify and expand upon the requirements put forward in the Convention. All 14 of the planned guidelines have been completed and are available from IMO. A list of the guidelines supporting the Ballast Water Convention is as follows:

G1 Sediment Reception Facilities
MEPC.152(55)

G2 Ballast Water Sampling
MEPC.173(58)

G3 BWM Equivalent Compliance
MEPC.123(53)

G4 BWM and the Development of BWM Plans
MEPC.127(53)

G5 BW Reception Facilities
MEPC.153(55)

G6 BW Exchange – Operational
MEPC.124(53)

G7 2017 Guidelines for Risk Assessment under Regulation A-4 of the BWM Convention
MEPC. 289(71)

G8 2016 Guidelines for Approval of BW Management Systems
MEPC.279(70), to be revoked by MEPC Res. 300(72) "Code for approval of ballast water management systems" (BWMS Code) on 13 October 2019

G9 Approval of BWM Systems that make use of Active Substances
MEPC.169(57)

G10 Approval and Oversight of Prototype BW Treatment Programs
MEPC.140(54)

G11 BW Exchange Design and Construction Standard
MEPC.149(55)

G12 Design and Construction to Facilitate Sediment Control on Ships
MEPC.209(63)

G13 Additional Measures Regarding BWM Including Emergency Situations
MEPC161(56)

G14 Designation of Areas for BWE
MEPC.151(55)

Note: BW = Ballast Water

BWM = Ballast Water Management

BWE = Ballast Water Exchange

4. Points to be considered in case of New Construction

Building Yards should identify the options for installing ballast water management systems in their new construction specifications – both within the construction programme or through retrofitting. This could involve providing system drawings to show how a selection of different treatment options might be fitted, ensuring that sufficient space has been allocated for retrofitting treatment systems if they are not included in the initial build. Piping connections should also be fitted to ballast systems in preparation for retrofitting of the selected treatment equipment.

5. Points to be considered in case of existing ships

Operators will need to be aware of all modifications necessary to fit treatment systems to existing ships. It will be necessary to obtain schematic arrangements and equipment plans from the system supplier in order to develop a work programme. The work programme may alternatively be provided by the supplier, but the ship operator will still need to provide the ship's ballast water system plans, functional requirements and details of compartmental spaces where the equipment is to be fitted. Steps to be followed in selecting the ballast water management system are detailed in next section.

6. Steps to be followed for selecting a ballast water treatment system

6.1 Type Approval

To install a Ballast Water Management System (BWMS) on board ship, it must be "type approved" by the flag administration or a Recognised Organisation in accordance with the relevant IMO Guidelines. At MEPC 72, Code for Approval of Ballast Water Management Systems (BWMS Code) has been adopted for type approval of BWMS. All BWMS *installed* on or after 28 October 2020 are to be "type approved" as per BWMS code. BWMS approved as per G8 Guidelines (i.e MEPC Res. 174(58)) not later than 28 October 2018, may continue to be *installed* onboard ships before 28 October 2020. It has also been clarified that BWMS approved as per 2016 G8 Guidelines (as per MEPC Res. 279(70)) are deemed to be in accordance with BWMS Code. If the system uses an active substance, this will need to have received final approval from the IMO before type approval can be granted.
Note: "*installed"* means the contractual date of delivery of the BWMS to the ship or, in the absence of such a date, the actual date of delivery of the BWMS to the ship.

6.2 Capacity

All Ballast Water Management Systems have a 'Treatment Rated Capacity' (TRC). This indicates how many cubic meters of ballast water the system can process each hour. System with a TCR high enough to handle ship's ballast capacity and operational pumping rate to be selected.

6.3 Space Requirements

System footprints range from approximately 0.25 m^2 to 145 m^2, depending on their TRC. Some are single units while others can be installed as separate components. Ballast Water management system having separate components may be useful if a single space on board ship is not big enough or if access for bringing a single system on board is difficult.

6.4 Capital and operating costs

Ballast Water Management System installation is a big investment and could cost as much as $2,000,000 depending on the manufacturer. As for operating cost, it depends on the type of system and starts from as little as a few dollars per 1,000 m^3 of treated water. Many system suppliers quote operating costs below $20 per 1,000 m^3.

6.5 Power Requirements

Some systems have very high power requirements – as much as 220 kW per 1,000 m^3 of treated water. Hence it should be checked whether there will be need to run another generator when the system is in operation or even install an additional generator set. Another consideration is whether a spare breaker available in the electrical distribution board to provide power to the Ballast Water Management System. If not, an alternative solution has to be arranged.

6.6 Integration Possibility with existing Ballast Water System

It is advantageous to integrate the alarms and controls for the Management system with those for the ballast pumping system, so that both can be operated from all control panels.

6.7 Type of Process Technology employed

This section of the Advisory Notice provides an explanation of treatment technologies currently being developed, the regulatory approval process certifying vendor-supplied equipment as compliant with the regulation, and a list of

available systems currently on the market as of the date of publication of this document.

6.7.1 Overview of Treatment Technologies

IMO defines ballast water treatment equipment as: "…the 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 organisms or pathogens. Ballast water treatment equipment may operate at the uptake or discharge of ballast water, during the voyage, or at a combination of these events."

6.7.2 Types of Treatment Technologies

The technologies currently available or being developed can generally be grouped under three broad categories based on their primary mechanism for rendering the organism inactive: mechanical, physical and chemical. These groups and the more promising technologies related to each are described briefly in the following text.

6.7.2.1 Mechanical Systems

- **Filtration** – sediment and particles are removed with disk and screen filters during ballast intake. They are often self-cleaning with a back-flushing cycle. The waste stream is directed overboard back to the water source. These filtration systems create pressure drops and a reduced flow rate due to resistance in the filter elements and the self cleaning procedures.

- **Cyclonic separation –** solid particles are separated from the water due to centrifugal forces. Only those particles with a specific gravity greater than that of water can be separated.

- **Electro-mechanical separation –** a flocculent is injected that attaches to organisms and sediment. Magnetic separation and filtration is used to remove the solid particles.

6.7.2.2 Physical Disinfection

- **Ultraviolet light –** UV radiation is used to attack and break down the cell membrane killing the organism outright or destroying its ability to reproduce. The effectiveness depends on the turbidity of the ballast water (i.e. the concentration of sediments) as this could limit the transmission of the UV radiation. UV lights are required to be maintained and power consumption needs to be considered.

- **Cavitation /ultrasounds –** venturi pipes or slit plates are used to generate cavitation bubbles and this high energy bubble creation and collapse results in hydrodynamic forces and ultrasonic oscillations, or high frequency noise, which disrupts the cell walls of organisms & effectively killing them.

- **De-oxygenation –** various methods are used to remove the dissolved oxygen in the ballast water and replace it with inactive gases, such as nitrogen or other inert gas. Removing the oxygen not only kills the aerobic organisms but it can also have benefits for corrosion prevention provided that the oxygen content is maintained at the correct levels. De-oxygenation can require a prolonged period in order to render the organisms and pathogens harmless to the receiving waters.

6.7.2.3 Chemical Treatment

- **Disinfecting biocides –** pre-prepared or packaged disinfectants designed to be dosed into the ballast flow and kill the living organisms by chemical poisoning or oxidation. Typical biocides include chlorine, chloride ions, chlorine dioxide, sodium hypochlorite and ozone. Residual biocides in the ballast water must meet ballast discharge standards which may require neutralization techniques.

- **Electrolytic chlorination –** electrical current is applied directly to the ballast water flow in an electrolytic chamber, generating free chlorine, sodium hypochlorite and hydroxyl radicals, causing electrochemical oxidation through the creation of ozone and hydrogen peroxide. This method is limited in effectiveness to seawater having a certain level of dissolved salt and could also create unwanted residuals. Types of chemical treatments include Active Substances or Preparations.

The definitions given in the BWM Convention are as follows:

- **Active substance –** a substance or organism, including a virus or a fungus that has a general or specific action on or against harmful aquatic organisms and pathogens.

- **Preparation –** any commercial formulation containing one or more active substances including any additives. This term also includes any active substances generated on board for the purpose of ballast water management and any relevant chemicals formed in the ballast water treatment system that make use of active substances to comply with the BWM Convention.

6.7.3 Technical Challenges & System Combinations

The treatment technologies differ in method and rate of application, scalability, holding time (required for kill rates and safe discharge), power requirements, effects on other ship systems or structure (corrosion), inherent safety and costs of operation. In many cases their efficacy varies with the conditions of the ballast water, flow rates, volume of water treated and holding time. There are also issues of whether treatment is done at intake, while being held on board, at discharge, or a combination of the three.

For instance, filtration, separation and UV radiation are done during ballast. UV radiation is also used during deballasting. These systems are sized for the maximum flow rate in the ballast system. Conversely chemical biocides and deoxygenation are usually applied to attain a certain concentration in the water in the ballast tanks.

The efficacies of these systems do not depend so much on the flow rate of the pumps as the time the ballast is allowed to remain in the tanks to achieve the desired kill rate. Short voyages can be a problem for these technologies.

Matching the treatment technology to the ship type, or more accurately the ballast system type, and vessel service is the key to designing a successful ballast water management system.

To overcome the limitations of a particular technology many proposed treatment systems are based on a combination of two or more technologies. Although there are approved chemical disinfection only treatments, these are often combined with some form of pre-treatment to make them more effective for certain vessel or ballast conditions.

The most prevalent system types are ones that combine mechanical separation / filtration with UV radiation or chemical disinfection. The initial mechanical separation/filtration is used to remove the larger organisms in order to increase the effectiveness of the secondary treatments.

6.8 Availability of consumables, spares and service support

It is important to be able to keep Ballast Water Management System operational. If it stops working, there will be contravention of the Convention and ship could face fines or detention. Check that spares, consumables and servicing are readily available in all the areas where ship is trading.

6.9 Effect on Ballast Water Tank structure and coating

Corrosion and coating degeneration are two potential effects that system substances and processes may have on tanks. Hence assurance is required from the system manufacturer that tanks will not be adversely affected.

6.10 Time required for treatment to be effective

This is an important consideration depending on length of voyage and ballasting / de-ballasting rate. For some Ballast Water Treatment plant, 24 hours of storing of ballast water in the ballast tanks after treatment can ensure effective disinfection to the Regulation D-2 and no re-growth of organisms were found in the treated water after 10 days.

Extent of reduction in vessel's ballasting rate following installation of treatment system also needs to be considered i.e. detail of pressure drop and effect on ballast pump suction and delivery performance.

6.11 Health and Safety aspects for Crew

A number of different chemicals or chemical processes are employed in the ballast water management systems available, which are as follows:

- chlorination
- electrochlorination
- ozonation
- chlorine dioxide
- peracetic acid
- hydrogen peroxide
- menadine/vitamin K
- perchloric acid.

Some systems generate chemicals during the treatment process; for others, chemicals are required to be stored on board.

If chemicals are stored on board, the crew will require training on their use and handling. Suitable storage space for chemicals and proper ventilation are of paramount importance. The Safety Data Sheets for chemicals to be stored on board need to be consulted and where necessary the appropriate fire protection and extinction arrangements will need to be installed.

In the case of systems that generate chemicals during the treatment process, the crew will require training on the hazards associated with them.

Advice on the storage and handling of chemicals is contained in the IMO Circular: BWM.2/Circ.20.

6.12 Ease of maintenance, calibration and water sampling

It needs to be ensured from suppliers that maintenance of Ballast Water management plant, calibration of monitoring and measurement equipment and sampling of ballast water is easy.

6.13 Provision of Emergency bypass operation

To ensure the ballast water management system (BWMS) remains operational in the event of the management system failing, suitable by-passes or overrides should be installed to protect the safety of the ship and personnel. The by-pass should activate an alarm, and the by-pass event should be recorded by the control equipment.

6.14 Whether Treatment System is Gas safe?

If ship is a tanker or gas carrier, and the system is going to be installed in a "gas dangerous area" (i.e., in the cargo area), then system must be certified "gas safe".

7. Points to be considered while preparing Procurement specification

In order to select a suitable system, ship operators will need to prepare a Procurement Specification for potential suppliers, which details their technical requirements. This should include the following information:

- The ballast water pump flow rates that the management system will be required to cope with (note: the treatment equipment capacity should be greater than the ship’s ballast rate to allow for an operating margin).
- A copy of the ballast system pipe work diagrams showing the connections, pumping capacities and valves.
- Compartment details for the installation of treatment equipment and storage of consumable materials.
- Power supply availability and routing for control cabling.
- Certification requirements
- Details of the ballast tank coatings

8. Ship operators should expect suppliers to include the following information in their offer

- Confirmation that their system has sufficient capacity to meet the ship's maximum ballast flow rates.
- The system’s power consumption (excluding the ship's fitted ballast pumps) and any other electrical requirements.
- Types of technology employed in the system.
- The chemicals required and their consumption rates.
- Health and safety considerations in terms of working environment, handling and storage of chemicals.
- Protection systems for normal and emergency operation.
- Training requirements for system operation, calibration, monitoring and health and safety.
- The work plan for supply to ship, installation, commissioning and test.
- A statement of the effect that the treated ballast water will have on ballast tank coatings, including copies of relevant studies that support such claims.
- An estimate of the reduction in the vessel's ballasting rate following installation of the treatment system and a description of any mitigation measures. This should include details of pressure drops and the effect that the introduction of the treatment equipment will have on ballast pump suction and delivery performance.

When short listing potential suppliers, in addition to price, operators should consider: installation and commissioning costs; training requirements; estimated operating costs including consumables; maintenance requirements; operating experience; delivery lead times for supply and fitting; and any special docking requirements or ship modifications required for equipment installation.

9. Technical considerations

After technical data has been received from the suppliers, operators should carry out the following engineering checks:

- Ensure that existing auxiliary generators and control systems can cope with the additional power requirements (for some systems it may be necessary to upgrade generators).
- Check that treatment equipment can be easily integrated into existing ballast systems.
- Check the suitability of control requirements, including alarms and protective devices.
- Conduct a review of local versus remote operating systems and ease of integration with existing machinery controls.

- Assess ease of maintenance, calibration and ballast water sampling.
- Assess the need for venting or other measures for compartments where active substances (chemical or otherwise) are stored or at risk of escape.
- Review manufacturers' maintenance requirements to confirm which activities the ship's staff are required to perform, what spares and consumables would need to be carried, and what service requirements, if any, would have to be undertaken by the original equipment manufacturer (OEM).
- Assess how sediments will be managed.
- Ensure ballast tank gauging will not be affected by the ballast water management system.
- Ensure that the ballast water management system arrangements maintain the separation of ballast tanks located within "gas safe" and "gas dangerous" zones. In some cases, separate ballast water systems may be required for each zone. This applies to oil and chemical tankers.

10. Evaluation Checklists Ship & Service Characteristics that Impact BWMS Selection

Owner Supplied Data

1. Ship type and capacity

a. Ship type: high ballast dependent or low ballast dependent

2. Ballast water handling practices

a. On average, how much ballast is loaded or discharged at any given port?

b. What are the time constraints on ballast intake (how fast must it happen)?

c. Maximum required flow rate for intake of ballast?

d. What are the time constraints on ballast discharge (how fast must it happen)?

e. Maximum required flow rate for discharge of ballast?

f. Sediment build up in tanks (little, moderate, significant)

g. Is treatment required for possible NOBOB condition?

h. Minimum time ballast is held in a tank between port of calls?

3. Ballast water characteristics

a. Are there freshwater ports encountered where ballast is taken in?

b. Minimum salinity of brackish water encountered?

c. Turbidity or silt content of port water (low, moderate, heavy)?

4. Vessel service characteristics

a. Any unique service constraints or trading patterns regarding ballast use?

b. Is there trade to special Ballast Water Treatment zones: California, Great Lakes, Australia, etc.?

c. Does active ballast management allow zero ballast discharge in some/all ports?

5. Ballast system characteristics

a. What are the gravity intake/discharge practices?

b. Can internal ballast transfer for trim, heel, bending moment control be easily accomplished?

11. Treatment Technology Factors

Vendor Supplied Data

1. Treatment method

a. Description of technology offered (all stages).

b. For UV system: lamp type, required minimum intensity and water clarity?

c. For chemical based treatment system:

c1: Required minimum dosage rate and minimum holding time ?

c2: Neutralizing agents – how created, stored, dosed?

c3: How long before safe to discharge?

c4: Chemicals generated on board or supplied as preparations?

d. For de-oxygenation:

d1: How much inert gas required?

d2: Minimum holding time?

d3: Type of gas, fuel type and consumption to generate gas?

2. Management system capacity

a. Overall treatment capacity (m3)

b. Overall treatment rate (m3/hour)

3. Management system pressure drops

a. Expected pressure drops added by treatment system to main ballast flow

b. Quantity of ballast redirected for cleaning or sludge discharge

c. Is gravity intake/discharge possible with this system?

4. Equipment size and space requirements

a. Total space required for treatment equipment

b. Size of largest single component

c. Weight of largest single component

d. Space required for maintenance (element removal, etc.)

5. Materials, equipment protection (IP rating) and hazardous spaces

a. IP rating of components

b. EX rating of components

c. Any special risk assessments performed to date for hazardous space installations?

6. Power requirements

a. Average and maximum power requirements and operating voltage

b. Duration of maximum power consumption as function of ballast process

7. Impacts on ballast tank and pipe corrosion

a. Is there published R&D available regarding the impact on tank and pipe corrosion rates?

8. Health and safety (handling, operation, maintenance)

a. Quantity of treatment chemicals needed (per ton of ballast water treated)

b. For active substances: a copy of the MEPC final approval with recommendations.

c. For active substances: Material Safety Data Sheets

12. General Management System Considerations

Vendor Supplied Data

1. Proven efficacy and official approvals

a. Copy of Type Approval Certificate issued by, on behalf of, a Government

b. System limitations or operating guidelines from Type Approval process

2. Vendor qualifications and reputation

a. Annual production capacity of manufacturer?

b. Which components are custom made or incorporate new/novel technology?

c. How many units have been built at the factory to be used for this installation?

d. Client referrals for previously installed systems

3. Maintenance requirements and system reliability

a. How many units of similar capacity have been installed?

b. What is average duration of operating experience per unit?

c. What is standard maintenance protocol?

d. What is expected service life?

4. Simple operation: control and monitoring

a. Type of remote control system included

b. Ease of connection to primary control and monitoring system

5. Life cycle costs

a. Estimated power consumption for normal ballast operations?

b. Fuel consumption expected for inert gas generation?

c. Cost of consumables (chemicals, lamps, filter elements)?

d. Expected frequency of resupply of consumables for planned system size?

e. What major components are most likely to need replacement within 10, 15, 20, 25 years? What is their cost?

13. Challenges for Installation Engineering

Owner Supplied Data

1. Intake/discharge isolation: cross-contamination

a. Can piping installation options provide good contamination protection?

b. Can intake and discharge pumps be isolated and dedicated to that service?

2. Sampling and in-service testing

a. Is there adequate space and facilities for sampling and testing?

3. Maintaining ballasting flexibility

a. Can the treatment system options selected provide full ballast flexibility?

4. Other Relevant Matters required to be considered for installation of BWMS

a. Is there space for all system components and ballast connections?
b. What are the access openings and routes for bringing in new management system components?
c. What are the access needs during system operation and maintenance?
d. Are switchboard modifications required?
e. Are control system modifications required?

14. Technical Information for Ballast Water Management Systems

Important treatment method characteristics for ballast water management systems, which are currently being offered in the market are given below. It should be noted that some ballast water management systems which use chemical biocides or de-oxygenation may require additional treatment prior to the water being discharged into receiving waters.

14.1 Important Treatment Method Characteristics

Treatment Process	Method of Treatment	When Applied	Time for Lethality	Corrosion Potential
Chlorine Generation	Use electrolytic cell to generate chlorine and bromine that act as biocides. Next, sodium sulfate neutralizes the ballast water prior to discharge. As long as free chlorine exists in the tank, biocide will be active so dosage can be adjusted to keep biocide always active.	At uptake and neutralize at discharge	Hours	High dosage levels promote steel corrosion
Chemical Application	Mix proprietary chemicals with the ballast water in metered dosage rates at intake to kill living organisms. Chemicals degrade over time	At uptake via educator	24 hours	High dosage levels promote steel corrosion

	so ballast will be safe to discharge.			
Filtration & Radiation	Filtration of the incoming water, usually with self-cleaning 50 micron filters, in parallel with discharge of filtrate to the waters where intake takes place. Ballast water is exposed to a form of radiation, such as UV energy or other hydroxyl radical generator, to kill smaller organisms and bacteria.	At uptake for filter and UV and at discharge for UV	At treatment	No effect
De-Oxygenation	Mix inert gas generated on board with the ballast water, either by a venturi educator or by bubbling from pipes in the tanks. This removes oxygen from the water and lowers pH, therefore killing the living organisms. This process requires the atmosphere in the ballast tank be maintained in an inert condition.	At uptake for some systems and in tanks for others	4 to 6 days	Relatively less corrosive
Ozone Generation	Ozone is generated on board and acts as a biocide. It is applied during the ballast pumping process by educator either at uptake or discharge. It can be combined with filtration or other methods of treatment.	At uptake for some systems and at discharge for others	Up to 15 hours	Limited effects as ozone has short life. If treated at discharge, no effect.

14.2 New requirements in BWMS Code which would be significant while considering the options of BWMS

a) Salinity and Temperature: During type approval, testing is to be carried out across a full range of salinities (fresh, brackish and marine) and through a temperature range of 0o C to 40o C (2o C to 40o C for fresh water). BWMS unable to demonstrate successful performance across these salinity and/or temperature ranges will be assigned Limiting Operating Conditions on the Type Approval Certificate.

b) System Design Limitations: An important development is the concept of documenting the critical parameters known as System Design Limitations

(SDL). These parameters impact the operation of BWMS (for example: minimum and maximum flow rates, time between ballast uptake and discharge) and design limits (for example: water quality expressed by oxidant demand and ultraviolet transmittance). SDLs are to be identified by the manufacturer, validated during testing and indicated on the Type Approval Certificate.

c) Bypass Arrangements: BWMS bypass or override arrangements, provided to protect the safety of the ship and personnel in the event of an emergency, should activate an alarm and be recorded by the control equipment.

d) Self-Monitoring: BWMS are to be provided with a system that monitors, records and stores sufficient data/parameters to verify correct operation for the past 24 months. Alerts are to be indicate when the system is shutdown or when an operational parameter exceeds the approved specification.

14.3 List of ballast water management systems that make use of Active Substances which received Basic Approval from IMO

Table (1) given at the end of publication may be referred for list of ballast water management systems that make use of Active Substances which received Basic Approval from IMO.
http://www.imo.org/en/OurWork/Environment/BallastWaterManagement/Documents/Table%20of%20BA%20FA%20TA%20updated%20August%202018.pdf

14.4 List of ballast water management systems that make use of Active Substances which received Final Approval from IMO

Table (2) given at the end of publication may be referred for list of ballast water management systems that make use of Active Substances which received Final Approval from IMO.
http://www.imo.org/en/OurWork/Environment/BallastWaterManagement/Documents/Table%20of%20BA%20FA%20TA%20updated%20August%202018.pdf

14.5 List of ballast water management systems which received Type Approval Certification by their respective Administration (resolution MEPC.228(65))

Table (3) given at the end of publication may be referred for list of ballast water management systems which received Type Approval Certification by their respective Administration under resolution MEPC.228(65).

http://www.imo.org/en/OurWork/Environment/BallastWaterManagement/Documents/Table%20of%20BA%20FA%20TA%20updated%20August%202018.pdf

15. Recommendation on Arrangement of Ballast Water Management System Installation

15.1 Requirements related to installation location

The ballast water management system is expected to be installed in the machinery space for installing ballast pump, cargo pump room, ballast pump room, or enclosed compartment installed on the exposed deck. In such a case, the points to be considered and the installation standards are mentioned here.

15.1.1 Machinery space

If the system is to be installed in the machinery space, study must be conducted to consider maintenance space for the system also. If the system uses chemicals, these chemicals must be stored at least in accordance with the requirements specified in G9 and the revised G8. Some systems are imposed on heat source management, ventilation, etc. of the storage containers as an approval condition.

15.1.2 Cargo pump room and ballast pump room

If the system is installed in a cargo pump room or ballast pump room, this pump room may be considered a hazardous area; in such a case, the management system and electric equipment to be installed are required to be explosion-proof type.

15.1.3 Exposed deck

Care should be taken to check the increase in gross tonnage of ships in service when an enclosed compartment is installed on the exposed deck. In tankers, ships carrying dangerous chemicals in bulk, and ships carrying liquefied gases in bulk, the space on the exposed deck may be treated as hazardous area, therefore, explosion-proof management system and electric equipment may need to be provided in such cases.

15.1.4 Special conditions for the system using toxic gas

The system which may generate toxic gas in process of treatment is to comply with the followings.

(a) Detector for toxic gas is to be equipped. When leakage of gas is detected,

gas generator (or BWTS) is to be stopped automatically.

(b) Audible and visual alarm is to be provided to notify the leakage of gas. The alarm signal is to be provided in the suitable space such as BWTS installed space, ship's office, etc.

15.1.5 Special conditions for the system using gas which has a possibility of spreading fire

The system which may generate gas which has a possibility of spreading fire is to be installed in the space apart from the ignition source.

15.2 Recommendation related to piping

Points to be considered and relevant rules for ballast piping, chemical feed pipes, sampling pipes, and piping used in combination with the main fire pump that are related to the ballast water management system, are mentioned here.

15.2.1 General requirements

(a) Design (piping) shall be according to approval conditions for ballast water management system in G9 and the revised G8.
(b) The ballast water management system and related piping and equipment shall be installed such that cleaning, inspection, maintenance and operation can be easily performed.
(c) When fresh water is supplied to the system for maintenance, etc., measures shall be adopted to ensure that sea water does not contaminate the fresh water system.
(d) The material of pipe and pipe fittings used in the chemical feed line shall be resistant to chemicals used in the line.
(e) The material of pipe and pipe fittings shall comply with the requirements of the rules of Classification Society in consideration of design pressure and temperature.
(f) When the fire pump also serves as the ballast pump and it is remotely started, the intake and delivery valves for the fire main pipes of the said pump in the engine room shall also be capable of remote operation. (including the switching valve when the water is passed through a bypass line)

Important consideration to carry out the installation work over a short amount of time

(a) In addition to the engineering validation for drawing preliminary, it is necessary to consider the task of the installation work and the confirmation of feature for BWMS. Considering point for the engineering validation is "selection of BWMS and confirmation of specification", "installation position",

"electric needs and electric system", "piping system", "capacity of ballast pump and generator" and so on.

Effective approach to carry out the installation work over a short amount of time

(a) To keep the working space and carry-in route, opening section for construction is made (opening section is made for shell and/or bulkhead)
(b) Clearly articulate the working procedure
(c) Preparatory work to minimize the on-the-spot work (ex. piping should be worked on ahead to factory.)

Important consideration to install BWMS in container

For example, the following should be considered:

(a) Comply with the strength of structure and damage stability.
(b) In case of any failure compromising the proper operation of the BWMS, audible and visual alarm signals should be given in all stations from which ballast water operations are controlled. (revised G8 Para.4.7)
(c) In case that the chemical are used for BWMS and the chemical tank is installed in container, the chemical which temperature limitation is required should be managed appropriately.
(d) In case that the gas (ex. H_2) are generated in the process of treatment for BWMS, the tightness of container and ventilation system should be consider.

Installation of BWMS in an independent enclosed compartment

(a) If the BWMS is installed in an independent enclosed compartment, what is the structural fire protection category of the said compartment?
(b) This compartment may be treated as "Other machinery space", similar to the ballast pump room.

Installation location of chemical tank

(a) Are there restrictions on the installation location of chemicals tank?
(b) In principle, the limitations imposed for approval described in the revised G8 and G9 are to be adhered to.
(c) Separate safety measures may be demanded by ACS depending on the riskiness of the chemicals.

Installation of neutralization unit

(a) For the way of neutralization of ballast water which is discharged from top side tank of bulk carrier, is it acceptable to install neutralization unit on upper deck?
(b) If the neutralization is carried out in no certainly, the concept of the neutralization method is acceptable for us.

Installation position of backwash line

(a) Whether or not it is acceptable that the installation position of backwash line is downstream of G2 sampling point? If backwash line is installed on upstream of G2 sampling point, there is possibility to sample ballast water which is not treated by BWMS.

(b) Under BWM Convention, it is acceptable to install backwash line on downstream of G2 sampling point.

G2 sampling point

(a) Is it necessary to install G2 sampling point on stripping operation using educators?

(b) In accordance with the outcome of MEPC67, it is not necessary to install G2 sampling point on stripping operation.

TRO sampling

(a) Is it necessary to install TRO sampling on stripping operation using educators?

(b) Due to the mixing of driving water and suction water, ACS considers that it is not necessary to install TRO sampling on stripping operation.

(c) Please note that it is necessary to comply with the requirement of TRO for discharging ballast water. Therefore, the suction water of stripping operation should comply with the requirement of TRO.

Fire pump used as Ballast pump

(a) When a fire pump is also used as a ballast pump, is it possible to install a bypass line so as not to pass through the BWMS?

(b) A bypass line may be provided.

15.2.2 Special requirements for tankers and ship carrying dangerous chemicals in bulk

Ballast water in ballast tank in contact with cargo oil tank in tankers or ships carrying dangerous chemicals in bulk is classified as dangerous ballast water. For this reason, two kinds of ballast water exist in the said ships, namely, safe ballast water and dangerous ballast water, and the requirements below shall be adhered to.

(a) Dangerous ballast pipes such as ballast pipes in ballast tank adjacent to cargo oil tank, shall be connected separately from other pipes, and shall not be led to the engine room.

(b) If the ballast system of the fore peak tank (FPT) is to be led to the ballast system of ballast tank adjacent to other cargo oil tank, the requirements below shall be complied with.
  (i) The FPT is classified as hazardous area Zone 1.
  (ii) The open end of the air pipe in the FPT shall be installed on the exposed deck more than 3 m away from the ignition source. In this respect, area within a sphere with 1.5m radius from the open end is classified as Zone 1 and plus 1.5m surrounding area of Zone 1 is classified as Zone 2.
  (iii) Means shall be provided to measure the concentration of combustible gas in the FPT. In this case, a combination of detection pipe led to a location above the exposed deck and a portable detector may be used. The detection pipe may also be used as the sounding pipe specified in (iv).
  (iv) The sounding pipe of the FPT shall be led to a location above the exposed deck.
  (v) Provision shall be made for direct access to FPT from open deck. However, indirect access to the FPT through enclosed compartment may be allowed provided the following requirements are complied with.
    - If the enclosed compartment is not adjacent to a cargo oil tank, the access to FPT shall be through a gastight manhole provided in the enclosed compartment. In this case, only after confirming that no combustible gas exists in the FPT, and after shutting off electric equipment other than explosion-proof equipment installed in the enclosed compartment, the marking plate indicating that the manhole may be opened, may be affixed to the said manhole.
    - If the enclosed compartment is adjacent to a cargo oil tank, the said compartment shall satisfy relevant requirements for hazardous area, and in addition, shall be adequately ventilated.

(c) The chemical feed line led from the engine room to the pump room may be approved subject to the conditions below.
  - The line is used only for feeding chemicals.
  - Small bore pipes are used.
  - Appropriate measures have been adopted against back flow.
  - Bulkheads between engine room and pump room are not penetrated by the line.

2 sets of BWMS are required for both dangerous ballast and safe ballast. For example, fill fresh water in aft peak tank (safe ballast) and the aft peak tank to be "Permanent Ballast Water". We consider that the aft peak tank fall under the category of "Permanent Ballast Water in sealed tanks" specified in Article 3, 2 (f) of BWM Convention, therefore, BWM Convention is not applied for the aft peak tank.

In case that "Store" is newly set up on upper deck to install BWMS, the way to deal with the Store as "safe area". For example, to comply with following, the store is categorized as safe area.

1. Not to be adjacent to store and cargo tank, cofferdam set up between store and cargo tank.
2. The height of the entrance of store to be more than 2.4 meter from upper deck level and not to set up the opening to dangerous area directly.

Depending on the treatment system, the installation requirements based on the revised G8 and G9, or the requirements of toxic chemical substances or gas, may be required to be studied separately.

(d) Ballast pump in the machinery space may be used for the discharge of ballast water in ballast tank adjacent to the cargo tank, and the ballast water may be discharged overboard through eductor in the cargo pump room. In this case, a non-return valve shall be installed between the ballast pump and the eductor, and spool piece installed on the exposed deck within the cargo space.

(e) Ballast water can be filled from the tank deck position, and if a screw-down non-return valve (stop valve + non-return valve) is installed, the ballast pump in the machinery space may be used to fill ballast water in the ballast tank adjacent to the cargo tank.

15.2.3 Acceptable arrangement of sharing a ballast water management system in tankers or ships carrying dangerous chemicals in bulk

For the purposes of two existing commercially available typical ballast water management systems (pre-treatment type and pre-treatment plus post-treatment type), we believe that it is feasible for both types to share a ballast water management system in hazardous and safe areas on tankers, taking into account of system arrangement and piping separation, specifically as follows:

(1) Arrangement of pre-treatment type system
With pretreatment, ballast water need not be re-treated during discharge and can be discharged directly. For this type of ballast water management systems, ballast tanks in the gas safe area (in general the afterpeak) and ballast tanks in the gas hazardous area may share a ballast water treatment system, provided that system arrangement meets all conditions below:

① The ballast water management system and associated equipment are to be located in the gas-safe area (such as engine room).
② Ballast water in hazardous areas is not to be pumped to engine room, afterpeak or other gas safe areas.

③ Ballast water in safe areas may be pumped to hazardous areas, provided that pipe connection meets all conditions below:

a. Pipes between gas safe areas and gas hazardous areas are to be connected by removable spool piece or liquid seal (at least 1.5 m in depth) at open positions on the exposed deck. The connection of such spool piece / liquid seal is to be in the hazardous area of the exposed deck. Ballast water pipes in hazardous areas are to be led into related compartments (pump room or ballast water tanks) within hazardous areas from main deck. When the system is not in service, the ends of connection pipes between gas safe areas and gas hazardous areas are to be blanked off by blank flanges, and removable spool piece / liquid seal is to be located in the vicinity of connection pipes and securely fixed, and permanent notices showing restricted use of the connection pipes are to be displayed in their vicinity. However, if the liquid seal is used and it is in good condition after inspection, it is no need to use blanked method;
b. Two screw down check valves or an equivalent arrangement is to be provided in series with the spool piece / liquid seal;
c. As an alternative, an automatic double block and bleed valves and a non-return valve could be regarded as the accepted means of appropriated isolation and it can replace the spool piece / liquid seal and two screw down check valves mentioned in above item a & b;
d. Ballast water pipes are not to pass through any bulkhead between hazardous areas and safe areas below main deck.

④ Ballast water pumps in gas safe areas and gas hazardous areas are used for discharge of ballast water from each area respectively;

⑤ The afterpeak is considered as gas safe area.

An example of the acceptable arrangement is shown in Figure 15.2.3 (1).

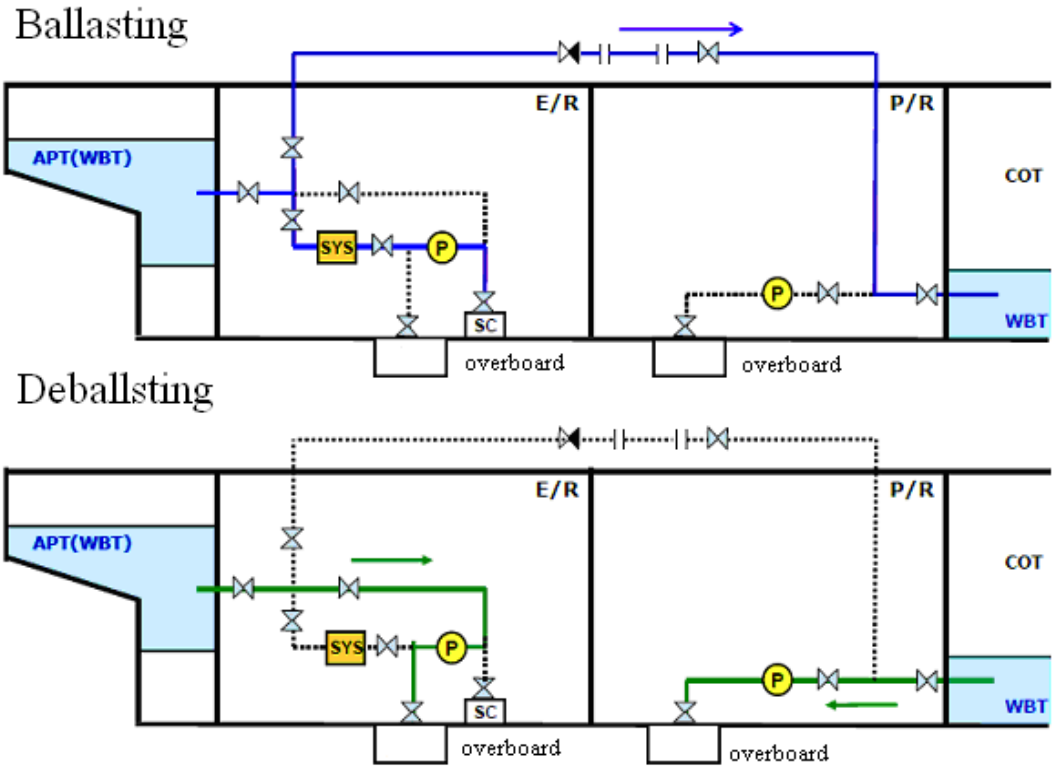


Figure 15.2.3 (1)

Note: Valves at open positions on the exposed deck to be screw down check valves.

(2) Combination arrangement of pre-treatment unit + independent post-treatment unit

For ballast water management systems of pre-treatment + independent post-treatment, ballast tanks in the gas safe area (in general the afterpeak) and ballast tanks in the gas hazardous area may share a treatment system, provided that system arrangement meets all conditions below:

① Pre-treatment installations and associated equipment are to be located in the gas safe area (such as engine room), and post-treatment installations and associated equipment are to be located in the gas hazardous area (such as pump room or main deck).

② Ballast water in hazardous areas is not to be pumped to engine room, afterpeak or other gas safe areas.

③ Ballast water in safe areas may be pumped to hazardous areas, provided that pipe connection meets all conditions below:

a. Pipes between gas safe areas and gas hazardous areas are to be connected by removable spool piece or liquid seal (at least 1.5 m in

depth) at open positions on the exposed deck. The connection of such spool piece/ liquid seal is to be in the hazardous area of the exposed deck. Ballast water pipes in hazardous areas are to be led into related compartments (pump room or ballast water tanks) within hazardous areas from main deck. When the system is not in service, the ends of connection pipes between gas safe areas and gas hazardous areas are to be blanked off by blank flanges, and removable spool piece / liquid seal is to be located in the vicinity of connection pipes and securely fixed, and permanent notices showing restricted use of the connection pipes are to be displayed in their vicinity. However, if the liquid seal is used and it is in good condition after inspection, it is no need to use blanked method;

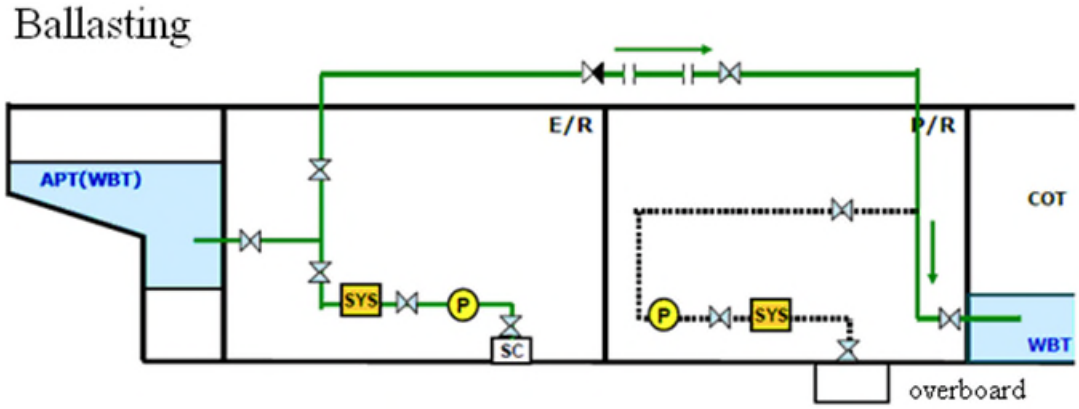
b. Two screw down check valves or an equivalent arrangement is to be provided on the ballast water pipeline in series with the spool piece / liquid seal;
c. As an alternative, an automatic double block and bleed valves and a non-return valve could be regarded as the accepted means of appropriated isolation and it can replace the spool piece / liquid seal and two screw down check valves mentioned in above item a & b;
d. Ballast water pipes are not to pass through any bulkhead between hazardous areas and safe areas below main deck.

④ Ballast pumps and ballast water pre-treatment installations in gas safe areas are used for loading of ballast water in gas safe areas and gas hazardous areas.

⑤ Ballast pumps and ballast water post-treatment installations in gas hazardous areas are to be used for discharge of ballast water from gas safe areas and gas hazardous areas.

⑥ The afterpeak is considered as gas safe area.

An example of the acceptable arrangement is shown in Figure 15.2.3 (2).



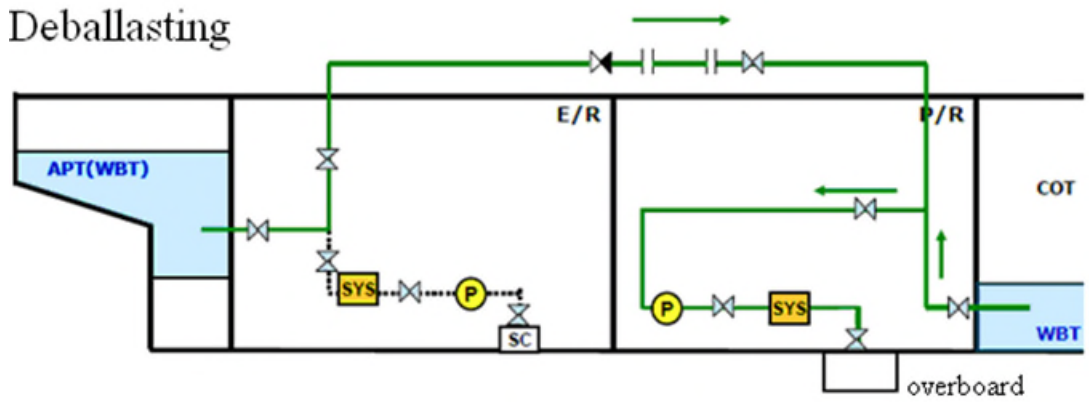


Figure 15.2.3 (2)

Note: Valves at open positions on the exposed deck to be screw down check valves.

15.2.4 Special conditions for using neutralizing agent (only for ships carrying dangerous ballast water)

Treatment systems also exist in which chemicals need to be used for neutralization during discharge. To determine the amount of neutralizing agent, the ballast water is sometimes passed through a measuring system before discharge. If the measuring system cannot be installed in the pump room of tankers or ship carrying dangerous chemicals in bulk, then the requirements for installing it in the engine room are as given below:

(a) The following additional requirements are necessary when dangerous ballast water is to be led to electrically-safe spaces:
- The measuring system shall be enclosed by strong casing with gastight door.
- The standard inside diameter of bulkhead opening shall not exceed 12 mm.
- Pipe material made of corrosion resistant metal shall be used.
- The penetration of pipe shall be welded on both sides.
- The measuring system shall be installed as close to the bulkhead as possible; the measuring pipe shall be as short as possible.
- Stop valves shall be installed in both the suction pipe and return pipe at gas-safe locations near the penetrations of bulkhead. A warning plate shall be installed on the valve with the warning "Keep valve closed when not performing measurements." A water seal shall be installed in the return pipe on the side of the "gas hazardous area". (The sampling water return pipe opens into the cargo area, so the water seal should preferably be installed to prevent back flow to the engine room. If this is difficult, non-return valve and stop valve may be substituted depending on a ship-to-ship basis.)
- Wherever possible, safety valve should be installed on the gas-hazardous

area side in the sampling line.
- If safety valve is installed in the sampling system, hydrostatic test shall be carried out at a pressure greater than that required to open the valve, or at a pressure greater than the operating pressure of cargo pump and ballast pump if no valve is provided.
- No opening shall be provided in the safety space for the sampling line.
- The sampled ballast water shall be returned to a part of the system or to the ballast tank.

15.3 Requirements related to electric equipment

Depending on the installed location of the ballast water management system, the requirements below apply to explosion proof electric equipment, generator capacity, etc., related to the system.

15.3.1 General requirements

The relevant electric equipment shall have a degree of protection (IP grade) suitable for the installed location in accordance with the rules of Classification Society.

15.3.2 Special requirements for tankers, ship carrying dangerous chemicals in bulk, and ship carrying liquefied gases in bulk

When electric equipment of the ballast water management system is to be installed in a hazardous area of a tanker, ship carrying dangerous chemicals in bulk, or a ship carrying liquefied gases in bulk, the equipment shall comply with the rules of Classification Society.

16. Compilation of Local BWM Requirements

I. Compilation of Local BWM Regulations

There are many states and regions stipulate their own special BWM regulations, non- exhaustive list include (but not necessarily be limited to) as follows:

States:
Argentina (including special requirements at Buenos Aires port), Australia(including special requirements by State of Victoria), Brazil, Canada, Chile, Georgia, Israel, South Korea, Lithuania (Port of Klaipeda and Butinge oil terminal), New Zealand, Norway, Panama, Peru, United Kingdom, United States (including special requirements by Arizona,, California, New York, etc.).

Region:
Mediterranean, Gulf area, North East Atlantic and the Baltic Sea, Antarctic.

For more details, please visit the relevant official websites.

II. Guidelines for Port State Control under BWMS Convention

MEPC 67 adopted as resolution MEPC.252 (67) Guidelines for port State control inspection for compliance with the BWMC. The Port State Guidelines involve a four-stage inspection (see below) and recommend that every effort should be made to avoid any undue delays to the ship:
Stage 1 – Initial inspection to focus on documentation and visual checks of the overall condition of the BWM system. This is likely to involve a check of the BWM Certificate and records and a check of the familiarity of the designated officer with the system. If the check triggers any suspicion or doubt, then the PSC may proceed to Stage 2.
Stage 2 – More detailed inspection. A more detailed inspection to check if the BWM system has been operated according to the BWM Plan.
Stage 3– Sampling and indicative analysis. This will be an indicative analysis to see if the D-2 standard is met. However, the criteria for the indicative analysis method will continuously need to be developed.
Stage 4 – Detailed analysis. A representative sample will be tested to ascertain compliance with the D-2 standards.

III. Implications on Asian Shipping Industry

1. The conflict between IMO and US requirements: the ballast water management systems apply in the US are different from those adopted by the IMO through the Ballast Water Management Convention.
2. Present PSC procedures especially the sampling and analysis procedures are tough to comply with.