Guide for Ballast Water Management System

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GENERAL CONDITIONS

Definitions:

"*Administration*" means the Government of the State whose flag the Ship is entitled to fly or under whose authority the Ship is authorised to operate in the specific case.

"IACS" means the International Association of Classification Societies.

"*Interested Party*" means the party, other than the Society, having an interest in or responsibility for the Ship, product, plant or system subject to classification or certification (such as the owner of the Ship and his representatives, the ship builder, the engine builder or the supplier of parts to be tested) who requests the Services or on whose behalf the Services are requested.

"*Owner*" means the registered owner, the ship owner, the manager or any other party with the responsibility, legally or contractually, to keep the ship seaworthy or in service, having particular regard to the provisions relating to the maintenance of class laid down in Part A, Chapter 2 of the Rules for the Classification of Ships or in the corresponding rules indicated in the specific Rules.

"Rules" in these General Conditions means the documents below issued by the Society:

(i) Rules for the Classification of Ships or other special units;
(ii) Complementary Rules containing the requirements for product, plant, system and other certification or containing the requirements for the assignment of additional class notations;
(iii) Rules for the application of statutory rules, containing the rules to perform the duties delegated by Administrations;
(iv) Guides to carry out particular activities connected with Services;
(v) Any other technical document, as for example rule variations or interpretations.

"*Services*" means the activities described in Article 1 below, rendered by the Society upon request made by or on behalf of the Interested Party.

"Ship" means ships, boats, craft and other special units, as for example offshore structures, floating units and underwater craft.

"*Society*" or *"TASNEEF"* means Tasneef and/or all the companies in the Tasneef Group which provide the Services.

"*Surveyor*" means technical staff acting on behalf of the Society in performing the Services.

Article 1

1.1. The purpose of the Society is, among others, the classification and certification of ships and the certification of their parts and components. In particular, the Society:
(i) sets forth and develops Rules;
(ii) publishes the Register of Ships;
(iii) issues certificates, statements and reports based on its survey activities.

1.2. The Society also takes part in the implementation of national and international rules and standards as delegated by various G overnments.

1.3. The Society carries out technical assistance activities on request and provides special services outside the scope of classification, which are regulated by these general conditions, unless expressly excluded in the particular contract.

Article 2

2.1. The Rules developed by the Society reflect the level of its technical knowledge at the time they are published. Therefore, the Society, although committed also through its research and development services to continuous updating of the Rules, does not guarantee the Rules meet state-of-the-art science and technology at the time of publication or that they meet the Society's or others' subsequent technical developments.

2.2. The Interested Party is required to know the Rules on the basis of which the Services are provided. With particular reference to Classification Services, special attention is to be given to the Rules concerning class suspension, withdrawal and reinstatemen t. In case of doubt or inaccuracy, the Interested Party is to promptly contact the Society for clarification.
The Rules for Classification of Ships are published on the Society's website: www.tasneef.ae.

2.3. The Society exercises due care and skill:
(i) in the selection of its Surveyors
(ii) in the performance of its Services, taking into account the level of its technical knowledge at the time the Services are performed.

2.4. Surveys conducted by the Society include, but are not limited to, visual inspection and non-destructive testing. Unless otherwise required, surveys are conducted through sampling techniques and do not consist of comprehensive verification or monitoring of the Ship or of the items subject to certification. The surveys and checks made by the Society on board ship do not necessarily require the constant and continuous presence of the Surveyor. The Society may also commission laboratory testing, underwater inspection and other checks carried out by and under the responsibility of qualified service suppliers. Survey practices and procedures are selected by the Society based on its experience and knowledge and according to generally accepted technical standards in the sector.

Article 3

3.1. The class assigned to a Ship, like the reports, statements, certificates or any other document or information issued by the Society, reflects the opinion of the Society concerning compliance, at the time the Service is provided, of the Ship or product subject to certification, with the applicable Rules (given the intended use and within the relevant time frame).
The Society is under no obligation to make statements or provide information about elements or facts which are not part of th e specific scope of the Service requested by the Interested Party or on its behalf.

3.2. No report, statement, notation on a plan, review, Certificate of Classification, document or information issued or given as p art of the Services provided by the Society shall have any legal effect or implication other than a representation that, on the basis of the checks made by the Society, the Ship, structure, materials, equipment, machinery or any other item covered by such document or information meet the Rules. Any such document is issued solely for the use of the Society, its committees and clients or other duly authorised bodies and for no other purpose. Therefore, the Society cannot be held liable for any act made or document issued by other parties on the basis of the statements or information given by the Society. The validity, application, meaning and interpretation of a Certificate of Classification, or any other document or information issued by the Society in connection with its Services, is governed by the Rules of the Society, which is the sole subject entitled to make such interpretation. Any disagreement on technical matters between the Interested Party and the Surveyor in the carrying out of his functions shall be raised in writing as soon as possible with the Society, which will settle any divergence of opinion or dispute.

3.3. The classification of a Ship, or the issuance of a certificate or other document connected with classification or certificati on and in general with the performance of Services by the Society shall have the validity conferred upon it by the Rules of the Society at the time of the assignment of class or issuance of the certificate; in no case shall it amount to a statement or warranty of seaw orthiness,

structural integrity, quality or fitness for a particular purpose or service of any Ship, structur e, material, equipment or machinery inspected or tested by the Society.

3.4. Any document issued by the Society in relation to its activities reflects the condition of the Ship or the subject of certifi cation or other activity at the time of the check.

3.5. The Rules, surveys and activities performed by the Society, reports, certificates and other documents issued by the Society are in no way intended to replace the duties and responsibilities of other parties such as Governments, designers, ship builders, manufacturers, repairers, suppliers, contractors or sub-contractors, Owners, operators, charterers, underwriters, sellers or intended buyers of a Ship or other product or system surveyed.

These documents and activities do not relieve such parties from any fulfilment, warranty, responsibility, duty or obligation (also of a contractual nature) expressed or implied or in any case incumbent on them, nor do they confer on such parties any right, claim or cause of action against the Society. With particular regard to the duties of the ship Owner, the Services undertaken by the Society do not relieve the Owner of his duty to ensure proper maintenance of the Ship and ensure seaworthiness at all times. Likewise, t he Rules, surveys performed, reports, certificates and other documents issued by the Society are intended neither to guarantee the buyers of the Ship, its components or any other surveyed or certified item, nor to relieve the seller of the duties arising out of the law or the contract, regarding the quality, commercial value or characteristics of the item which is the subject of transaction.

In no case, therefore, shall the Society assume the obligations incumbent upon the above-mentioned parties, even when it is consulted in connection with matters not covered by its Rules or other documents.

In consideration of the above, the Interested Party undertakes to relieve and hold harmless the Society from any third party claim, as well as from any liability in relation to the latter concerning the Services rendered.

Insofar as they are not expressly provided for in these General Conditions, the duties and responsibilities of the Owner and Interested Parties with respect to the services rendered by the Society are described in the Rules applicable to the specific Service rendered.

Article 4

4.1. Any request for the Society's Services shall be submitted in writing and signed by or on behalf of the Interested Party. Such a request will be considered irrevocable as soon as received by the Society and shall entail acceptance by the applicant of all relevant requirements of the Rules, including these General Conditions. Upon acceptance of the written request by the Society, a contract between the Society and the Interested Party is entered into, which is regulated by the present General Conditions.

4.2. In consideration of the Services rendered by the Society, the Interested Party and the person requesting the service shall be jointly liable for the payment of the relevant fees, even if the service is not concluded for any cause not pertaining to the Society. In the latter case, the Society shall not be held liable for non-fulfilment or partial fulfilment of the Services requested. In the event of late payment, interest at the legal current rate increased by 1.5% may be demanded.

4.3. The contract for the classification of a Ship or for other Services may be terminated and any certificates revoked at the request of one of the parties, subject to at least 30 days' notice to be given in writing. Failure to pay, even in part, the fees due for Services carried out by the Society will entitle the Society to immediately terminate the contract and suspend the Services.

For every termination of the contract, the fees for the activities performed until the time of the termination shall be owed to the Society as well as the expenses incurred in view of activities already programmed; this is without prejudice to the right to compensation due to the Society as a consequence of the termination.

With particular reference to Ship classification and certification, unless decided otherwise by the Society, termination of the contract implies that the assignment of class to a Ship is withheld or, if already assigned, that it is suspended or withdrawn; any st atutory certificates issued by the Society will be withdrawn in those cases where provided for by agreements between the Society and the flag State.

Article 5

5.1. In providing the Services, as well as other correlated information or advice, the Society, its Surveyors, servants or agents operate with due diligence for the proper execution of the activity. However, considering the nature of the activities performed (see art. 2.4), it is not possible to guarantee absolute accuracy, correctness and completeness of any information or advice supplied. Express and implied warranties are specifically disclaimed.

Therefore, except as provided for in paragraph 5.2 below, and also in the case of activities carried out by delegation of Governments, neither the Society nor any of its Surveyors will be liable for any loss, damage or expense of whatever nature sustained by any person, in tort or in contract, derived from carrying out the Services.

5.2. Notwithstanding the provisions in paragraph 5.1 above, should any user of the Society's Services prove that he has suffered a loss or damage due to any negligent act or omission of the Society, its Surveyors, servants or agents, then the Society will pay compensation to such person for his proved loss, up to, but not exceeding, five times the amount of the fees charged for the specific services, information or opinions from which the loss or damage derives or, if no fee has been charged, a maximum of AED5,000 (Arab Emirates Dirhams Five Thousand only). Where the fees charged are related to a number of Services, the amount of the fees will be apportioned for the purpose of the calculation of the maximum compensation, by reference to the estimated time involved in the performance of the Service from which the damage or loss derives. Any liability for indirect or consequential loss, damage or expense is specifically excluded. In any case, irrespective of the amount of the fees charged, the maximum damages payable by the Society will not be more than AED5,000,000 (Arab Emirates Dirhams Five Millions only). Payment of compensation under this paragraph will not entail any admission of responsibility and/or liability by the Society and will be made without prejudice to the disclaimer clause contained in paragraph 5.1 above.

5.3. Any claim for loss or damage of whatever nature by virtue of the provisions set forth herein shall be made to the Society in writing, within the shorter of the following periods: (i) THREE (3) MONTHS from the date on which the Services were performed, or (ii) THREE (3) MONTHS from the date on which the damage was discovered. Failure to comply with the above deadline will constitute an absolute bar to the pursuit of such a claim against the Society.

Article 6

6.1. These General Conditions shall be governed by and construed in accordance with United Arab Emirates (UAE) law, and any dispute arising from or in connection with the Rules or with the Services of the Society, including any issues concerning responsibility, liability or limitations of liability of the Society, shall be determined in accordance with UAE law. The courts of the Dubai International Financial Centre (DIFC) shall have exclusive jurisdiction in relation to any claim or dispute which may arise out of or in connection with the Rules or with the Services of the Society.

6.2. However,

(i) In cases where neither the claim nor any counterclaim exceeds the sum of AED300,000 (Arab Emirates Dirhams Three Hundred Thousand) the dispute shall be referred to the jurisdiction of the DIFC Small Claims Tribunal; and

(ii) for disputes concerning non-payment of the fees and/or expenses due to the Society for services, the Society shall have the

right to submit any claim to the jurisdiction of the Courts of the place where the registered or operating office of the Interested Party or of the applicant who requested the Service is located.

In the case of actions taken against the Society by a third party before a public Court, the Society shall also have the right to summon the Interested Party or the subject who requested the Service before that Court, in order to be relieved and held harmless according to art. 3.5 above.

Article 7

7.1. All plans, specifications, documents and information provided by, issued by, or made known to the Society, in connection with the performance of its Services, will be treated as confidential and will not be made available to any other party other than the Owner without authorisation of the Interested Party, except as provided for or required by any applicable international, European or domestic legislation, Charter or other IACS resolutions, or order from a competent authority. Information about the status and validity of class and statutory certificates, including transfers, changes, suspensions, withdrawals of class, recommendations/conditions of class, operating conditions or restrictions issued against classed ships and other related information, as may be required, may be published on the website or released by other means, without the prior consent of the Interested Party.

Information about the status and validity of other certificates and statements may also be published on the website or released by other means, without the prior consent of the Interested Party.

7.2. Notwithstanding the general duty of confidentiality owed by the Society to its clients in clause 7.1 above, the Society's clients hereby accept that the Society may participate in the IACS Early Warning System which requires each Classification Society to provide other involved Classification Societies with relevant technical information on serious hull structural and engineering systems failures, as defined in the IACS Early Warning System (but not including any drawings relating to the ship which may be the specific property of another party), to enable such useful information to be shared and used to facilitate the proper working of the IACS Early Warning System. The Society will provide its clients with written details of such information sent to the involved Classification Societies.

7.3. In the event of transfer of class, addition of a second class or withdrawal from a double/dual class, the Interested Party undertakes to provide or to permit the Society to provide the other Classification Society with all building plans and drawings, certificates, documents and information relevant to the classed unit, including its history file, as the other Classification Society may require for the purpose of classification in compliance with the applicable legislation and relative IACS Procedure. It is the Owner's duty to ensure that, whenever required, the consent of the builder is obtained with regard to the provision of plans and drawings to the new Society, either by way of appropriate stipulation in the building contract or by other agreement.

In the event that the ownership of the ship, product or system subject to certification is transferred to a new subject, the latter shall have the right to access all pertinent drawings, specifications, documents or information issued by the Society or which has come to the knowledge of the Society while carrying out its Services, even if related to a period prior to transfer of ownership.

Article 8

8.1. Should any part of these General Conditions be declared invalid, this will not affect the validity of the remaining provisions.

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CHAPTER:

1 GENERAL

1.1Introduction

The objective of this Guide is to provide a comprehensive set of normative and technical criteria to regulate the management of ballast water from ships, with the aim to minimize the risk of introducing non-native species through the discharge of ballast water and sediments into other coastal regions, as required by the "International Convention for the Control and Management of Ship's Ballast Water and Sediments, 2004".

The Guide includes also practical and operative indications for the selection of the appropriate Ballast Treatment System and for ensuring compliance with the various aspects of the Convention.

In order to ensure a complete understanding of the matter, some background information are also provided.

1.2The problem

Since the introduction of steel ships around 120 years ago, water has been used as ballast to stabilize ships at sea. Ballast water is pumped-in to maintain safe operating conditions throughout a voyage. This practice reduces stress on the hull, provides transverse stability, improves propulsion and manoeuvrability, and compensates for weight lost due to fuel and water consumption.

While ballast water is essential for safe and efficient modern shipping operations, it may pose serious ecological, economic and health problems due to the multitude of marine species carried in ships' ballast water. These include bacteria, microbes, small invertebrates, eggs, cysts and larvae of various species. The transferred species may survive to establish a reproductive population in the host environment, becoming invasive, out-competing native species and multiplying into pest proportions.

Scientists first recognized the signs of an alien species introduction after a mass occurrence of the Asian phytoplankton algae Odontella (Biddulphia sinensis) in the North Sea in 1903. But it was not until the 1970s that the scientific community began reviewing the problem in detail. In the late 1980s, Canada and Australia were among countries experiencing particular problems with invasive species, and they brought their concerns to the attention of IMO's Marine Environment Protection Committee (MEPC).

The problem of invasive species in ships' ballast water is largely due to the expanded trade and traffic volume over the last few decades and since the volumes of seaborne trade continue to increase the problem may not yet have reached its peak. The effects in many areas of the world have been devastating. Quantitative data show the rate of bio-invasions is continuing to increase at an alarming rate and new areas are being invaded all the time.

The spread of invasive species is now recognized as one of the greatest threats to the ecological and the economic well-being of the planet. These species are causing enormous damage to biodiversity and the valuable natural riches of the earth upon which we depend. Direct and indirect health effects are becoming increasingly serious and the damage to environment is often irreversible.

Some examples of aquatic bio-invasions causing major impact can be found in the following picture. It should be noted, however, that there are hundreds of other serious invasions which have been or are in the process of being recorded around the world.

Figure 1: Examples of aquatic bio-invasions

1.3The response

Preventing the transfer of invasive species and coordinating a timely and effective response to invasions requires cooperation and collaboration among governments, economic sectors, non-governmental organizations.

IMO has been at the front of the international effort by taking the lead in addressing the transfer of aquatic invasive species (AIS) through shipping. In 1991 the MEPC adopted Guidelines for preventing the introduction of unwanted organisms and pathogens from ships' ballast water and sediment discharges (MEPC resolution 50(31); while the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992, recognized the issue as a major international concern.

In November 1993, the IMO Assembly adopted resolution A.774(18) based on the 1991 Guidelines requesting the MEPC and the MSC to keep the Guidelines under review with a view to developing internationally applicable, legally-binding provisions. While continuing its work towards the development of an international treaty, the Organization adopted, in November 1997, resolution A.868(20) - Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens - inviting its Member States to use these new guidelines when addressing the issue of IAS.

After more than 14 years of complex negotiations between IMO Member States, the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) was adopted by consensus at a Diplomatic Conference held at IMO Headquarters in London on 13 February 2004.

Figure 2: Cover of the International Convention for the Control and Management of Ships' Ballast Water and Sediments

The Convention will require all ships to implement a Ballast Water and Sediments Management Plan. All ships will have to carry a Ballast Water Record Book and will be required to carry out ballast water management procedures to a given standard. Parties to the Convention are given the option to take additional measures which are subject to criteria set out in the Convention and to IMO guidelines.

Several articles and regulations of the BWM Convention refer to guidelines to be developed by the Organization and Conference resolution 1 invites IMO to develop these guidelines as a matter of urgency and adopt them as soon as practicable and, in any case, before the entry into force of the Convention, with a view to facilitate global and uniform implementation of the instrument.

The MEPC, at its fifty-first session in April 2004, approved a programme for the development of guidelines and procedures for uniform implementation of the BWM Convention, listed in Conference resolution 1 including additional guidance required but not listed in the resolution. The programme was further expanded at the fifty-third session of the MEPC in July 2005 to develop and adopt 14 sets of Guidelines.

The Convention will enter into force 12 months after ratification by 40 States, representing 35 per cent of world merchant shipping tonnage.

Following the ratification of Finland on 8th September 2016, the above mentioned conditions were met and the Convention entered into force on 8th September 2017.

2
REGULATORY BACKGROUND

2.1 International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004

2.1.1 The Convention

The BWM Convention will apply to ships flying the flag of a Party except:

- ships not designed or constructed to carry ballast water
- ships operating exclusively in waters under the jurisdiction of a Party, unless the party determines that the discharge of ballast water from such ships would impair or damage their environment
- warships, naval auxiliary or other ships owned or operated by a Party
- ships with permanent ballast water not subject to discharge.

Exemptions from the management of ballast water may be granted to ships on voyages between specified ports or operated exclusively between specified ports or locations when ballast water is not mixed other than between these ports or locations. These exemptions shall be effective for a period not exceeding five years, subject to intermediate review. Moreover, BWM.2/Circ.32, dated 8 August 2011, specifies that provisions of the Convention are not applicable to the water in the hopper area of hopper dredgers.

By the entry into force date of the Convention all ships to which the Convention applies will be required to:

- carry on board a “Ballast Water Management Plan” approved by the Administration, detailing safety procedures and actions to be taken to implement the ballast water management requirements
- carry on board a “Ballast Water Record Book” for the recording of each operation concerning ballast water management
- manage their ballast waters on every voyage by performing ballast water exchange or by treating it, according to the
- Convention’s requirements and implementation scheme; and
- carry on board an “International Ballast Water Management Certificate” (for ships of 400 gross tonnage and above excluding floating platforms, FSUs and FPSOs) with a five year validity and subject to annual, intermediate and renewal surveys.

Port State Controls will be authorized to inspect ships verifying:

- validity of the certificate
- presence on board of documents required by the Convention
- compliance with the requirements of the Convention of the ballast water carried on board, performing samples. For the management of ballast water, two main standards are defined by the Convention:
  a) D1: ballast water exchange with an efficiency of 95% volumetric exchange (for ships exchanging ballast water by the pumping through method, pumping through three times the volume of each ballast tank shall be considered equivalent)
  b) D2: allowable limits on viable organisms in ballast water to be discharged, defined as maximum number and size per cubic meter (less than 10 viable organisms per cubic meter greater than or equal to 50 micrometers in minimum dimension and less than 10 viable organisms per milliliter less than 50 micrometers in minimum dimension and greater than or equal to 10 micrometers in minimum dimension). Ballast water management, in compliance with the D-2 standard, will be performed by type approved systems.

The application of the two above-mentioned standards will be required as follows:

a) existing ships, constructed before 2009:
   1) with a ballast water capacity between 1,500 and 5,000 cubic meters, inclusive, that at least meet the standard D1 shall conduct ballast water exchange from the date of entry into force of the Convention until 2014, after which they shall conduct ballast water management meeting at least the D-2 standard
   2) with a ballast water capacity of less than 1,500 cubic meters and more than 5,000 cubic meters that at least meet the standard D1, shall conduct ballast water exchange from the date of entry into force of the Convention until 2016, after which they shall conduct ballast water management meeting at least the D-2 standard.
b) new ships, constructed in or after 2009:
   1) with a ballast water capacity of less than 5,000 cubic meters, shall conduct ballast water management meeting at least the D-2 standard; however, recognizing that a limited number of technologies will probably be available in January 2009 to meet the first implementation date of the D2 standard, Resolution A.1005(25) dated 29 November 2007 recommended that a ship constructed in 2009 and with a ballast water capacity of less than 5000 cubic meters be not required to comply with D-2 standard until its second annual survey, but no later than 31 December 2011.
   2) with a ballast water capacity of 5,000 cubic meters or more:

i. if constructed in or after 2009 but before 2012 shall conduct ballast water exchange until 2016, after which they shall conduct ballast water management meeting at least the D-2 standard

ii. if constructed in or after 2012 shall conduct ballast water management meeting at least the D-2 standard.

Existing ships shall comply with the above-mentioned requirements not later than the first intermediate or renewal survey, whichever occurs earlier, after the anniversary date of delivery of the ship in the year of compliance with the applicable standard.

The expression "anniversary date of delivery of the ship" refers to year 2014 and 2016 indicated in a)1), a)2) and b)2)i). Consequently, ships with a ballast water capacity between 1500 m^3 and 5000 m^3, inclusive, are required to comply with the D-2 standard not later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date of delivery of the ship in 2014; and ships with a ballast water capacity of less than 1500 m^3 or greater than 5000 m^3 are required to comply with D-2 standard not later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date of delivery date of delivery of the ship in 2016 (BWM.2/Circ.29/Rev.1 dated 26 September 2011).

In the following Tab 1, that summarizes the above-mentioned requirements, BWC is to be read as the ballast water capacity of the ship, measured in cubic meters.

Table 1: Implementation table of the BWM Convention's requirements

Minimum requirements of the BWM Convention when it will enter into force

Ship Keel laying	Ship Ballast Water Capacity (BWC)	2009	2010	2011	2012	2013	2014	2015	2016	2017
Before 1/1/2009	1500≤BWC≤5000						(*)			
	BWC < 1500; BWC > 5000								(*)	
In 2009	BWC < 5000			(**)						
	BWC ≥ 5000								(*)	
In 2010 and 2011	BWC < 5000	X								
	BWC ≥ 5000	X							(*)	
On or after 1/1/2012	Any BWC	X	X	X						

Legend

Ballast Water Exchange (D-1)

Ballast Water Treatment (D-2)

(*) Not later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date of delivery of the ship in the year of compliance with the standard applicable to the ship (2014 or 2016).

(**) Ships constructed in 2009 and with a BWC of less than 5000 m^3 are not required to comply with Ballast Water Treatment until their second annual survey, but not later than 31 December 2011.

Ballast water exchange shall be conducted, whenever possible, at least 200 miles from the nearest land and in water at least 200 meters in depth. If the ship is not able to conduct ballast water exchange under these conditions, it should be conducted at 50 miles from the nearest land and in water at least 200 meters in depth. A ship shall not be required to deviate from its intended voyage, or delay the voyage, in order to comply with these requirements.

In particular sea areas, where the distance from the nearest land or the depth does not meet these parameters, the port State may designate sea areas where a ship may conduct ballast water exchange.

A ship shall not be required to conduct ballast water exchange if the master reasonably decides that such exchange may threaten the safety of the ship. In such cases, reasons shall be entered in the ballast water record book.

Ships involved in research programs approved by an Administration, to test and evaluate ballast water treatment technologies (D-2 standard), will not be requested to apply that standard until five years from the date on which the ship would otherwise be required to comply.

To date the following guidelines, guidance and procedures, referred to in the BWM Convention, are available:

- G1 "Guidelines for sediment reception facilities", adopted by Resolution MEPC.152(55) on 13 October 2006
- G2 "Guidelines for ballast water sampling", adopted by Resolution MEPC.173(58) on 10 October 2008
- G3 "Guidelines for ballast water management equivalent compliance", adopted by Resolution MEPC.123(53) on 22 July 2005
- G4 "Guidelines for ballast water management and development of ballast water management plans",

adopted by Resolution MEPC.127(53) on 22 July 2005

- G5 "Guidelines for ballast water reception facilities", adopted by Resolution MEPC.153(55) on 13 October 2006
- G6 "Guidelines for ballast water exchange", adopted by Resolution MEPC.124(53) on 22 July 2005
- G7 "Guidelines for risk assessment under Regulation A-4 of the BWM Convention", adopted by Resolution MEPC.162(56) on 13 July 2007
- G8 "Guidelines for approval of ballast water management systems", adopted by Resolution MEPC.125(53) on 22 July 2005;
- G9 "Procedure for approval of ballast water management systems that make use of active substances", adopted by Resolution MEPC.169(57) on 4 April 2008
- G10 "Guidelines for approval and oversight of prototype ballast water treatment technology programmes", adopted by Resolution MEPC.140(54) on 24 March 2006
- G11 "Guidelines for ballast water exchange design and construction standards", adopted by Resolution MEPC.149(55) on 13 October 2006
- G12 "2012 Guidelines on design and construction to facilitate sediment control on ships", adopted by Resolution MEPC.209(63) on 2 March 2012;
- G13 "Guidelines for additional measures regarding ballast water management including emergency situations", adopted by Resolution MEPC.161(56) on 13 July 2007
- G14 "Guidelines on designated areas for ballast water exchange", adopted by Resolution MEPC.151(55) on 13 October 2006
- "Guidance on scaling of ballast water management systems", disseminated by BWM.2/Circ.33, dated 8 August 2011;
- "Procedures for approving other methods of ballast water management", adopted by Resolution MEPC.206(62) on 15 July 2011
- "2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species", adopted by Resolution MEPC.207(62) on 15 July 2011.

2.1.2 Revised implementation scheme of the IMO Ballast Water Management Convention (IMO Resolution A.1088(28))

To ensure practical and clear implementation of the Convention once it enters into force, IMO agreed to modify the D-2 standard compliance schedule for ships constructed (keel laid) before the entry into force date of the Convention. The revised implementation scheme is summarized in the table below (IMO Resolution A.1088(28):

In addition, IMO clarified that the "first renewal survey" after which ships shall comply with the D-2 standard, is the one associated with the International Oil Pollution Prevention (IOPP) Certificate.

Following the ratification of Finland and the identification of the entry into force date of the Convention (8th September 2016), the above implementation table may be read as follows:

- existing ships will be required to install onboard an approved ballast water treatment system by the first IOPP renewal survey after the 8th of September 2017, whilst
- new ships (constructed on or after the entry into force date) will have to be compliant on delivery, where "constructed" means "keel laid".

In the period between the entry into force date and the first IOPP renewal survey, existing ships will be required to perform the ballast water exchange according to the Convention's requirements.

Table 2: Revised implementation scheme of the BWM introduced by A.1088(28)

Regulation	Date of Ship Construction (C)	Ballast Water Capacity (m^3) (B)	Mandatory D-2 Compliance (treatment) *First renewal survey after the following:*
B-3.1.1	C<2009	1500≤B≤5000	Anniversary Date of Delivery in 2014, or entry into force date, if that occurs later
B-3.1.2		B<1500 or B>5000	Anniversary Date of Delivery in 2016, or entry into force date, if that occurs later
B-3.4	2009≤C<2012	B≥5000	
B-3.3	C≥2009 C< entry into force date	B<5000	entry into force date of the Convention
B-3.5	C≥2012 C< entry into force date	B≥5000	

2.1.3 Final implementation scheme of the IMO Ballast Water Management Convention

The Marine Environment Protection Committee, at its 71st session (MEPC 71), approved draft amendments to the International Ballast Water Management Convention (BWM), revising the implementation scheme for existing ships (Regulation B-3) given in Resolution A.1088(28).

The schedule set forth in regulation B-3, upon entry into force of the Convention, relative to the enforcement of the standard in regulation D-2 in accordance with the a.m. amendments foresees that existing ships (i.e. constructed before 8 September 2017) are to install on board a ballast water management system (BWMS):

1. at the first IOPP renewal survey following the date of entry into force of the Convention if:
   - this survey is completed on or after 8 September 2019; or
   - a renewal survey is completed on or after 8 September 2014 but prior to 8 September 2017;

Table 3: Revised implementation scheme of the BWM introduced by A.1088(28)

Last IOPP renewal survey carried out on						**Next scheduled IOPP renewal surveys**						
						Period of postponement		**Due date for D-2 Compliance**				
	Up to 8-9-2013	Up to 8-9-2014	Up to 8-9-2015	Up to 8-9-2016	Up to 8-9-2017	Up to 8-9-2018	Up to 8-9-2019	Up to 8-9-2020	Up to 8-9-2021	Up to 8-9-2022	Up to 8-9-2023	Up to 8-9-2024
Ship's status 1	IOPP renewal					1st IOPP renew					2nd IOPP renew	
Ship's status 2		IOPP renewal					1st IOPP renew					2nd IOPP renew
Ship's status 3			IOPP renewal					1st IOPP renew				
Ship's status 4				IOPP renewal					1st IOPP renew			
Ship's status 5					IOPP renewal					1st IOPP renew		
Note: in case a ship with ship's status n° 3, 4 or 5 wish to anticipate the renewal survey of IOPP in the "period of postponement" they are not eligible to comply at the 2nd IOPP renewal survey as they already carried out the IOPP renewal in the period 8/7/2014 – 8/7/2017 (dark green area)												

2. at the second IOPP renewal survey following the entry into force date of the convention, if the first renewal survey is completed on or after 8 September 2017 but prior to 8 September 2019 and a IOPP renewal survey has not been completed between 8 September 2014 and 8 September 2017. This last clause has been included to avoid ships anticipating the IOPP renewal survey between the 8 September 2017 and 8 September 2019.
3. at the date decided by the Administration, but not later than 8 September 2024, if the ships are not required to hold the IOPP Certificate.

Ships constructed on or after 8 September 2017 are to conduct ballast water management that at least meets the standards described in regulation D-2.

The implementation scheme for compliance with regulation D-2 is summarized in Tab 4.

2.1.4 Issuance of BWM certificates prior to the entry into force date of the Convention

The Marine Environment Protection Committee, at its 63rd session (February-March 2012), noted that the Convention allows no phase-in period for ships constructed prior to the entry into force of the Convention. This would result in all ships of 400 gross tonnage and above to have on board an approved Ballast Water Management Plan and be surveyed and certified immediately on the entry into force of the Convention.

To address this impracticality the Committee, at its 64th session, approved circular BWM.2/Circ.40 allowing Contracting Governments to the BWM Convention to issue International Ballast Water Management Certificates prior to entry into force of the Convention. In this case it is to be annotated in the Certificate that the validity begins from the entry into-force date of the Convention.

In addition to the above the Administration or any Organization recognized by it (RO) has to issue a statement to the shipowner indicating when the BWM Plan was received. Starting from this date, the ship will be allowed to trade for three months with an unapproved BWM Plan on board.
This provision will be useful for BWM Plan submitted to the relevant Administration/RO in the period close the entry into force date of the Convention. Notwithstanding the above, it is recommended to prepare and to submit to Tasneef the BWM Plan as soon as possible, in order to avoid any possible problem due to the submission of a great number of plans in the very close period to the entry into force of the Convention.

2.1.5 Validity of ballast water management plans previously approved according to resolution A.868(20)

BWM.2/Circ.40 also address the matter of Ballast Water Management Plans approved in accordance with old resolution A.868(20) (November 1997). According to the above circular, whilst the Guidelines adopted by MEPC.127(53) in 2005 and referenced in the BWM Convention have effectively superseded the Guidelines adopted by resolution A.868(20), for practical reasons the Ballast Water Management Plans approved in accordance with resolution A.868(20) will remain valid until the ship is required to install a ballast water treatment system (compliance with D-2 Standard).

2.1.6 Ballast water quality

Regulation D-2 of the Ballast Water Convention sets the standard that ballast water treatment systems must meet (Tab 4). Treatment systems must be tested and approved in accordance with the relevant IMO Guidelines.

Table 4: IMO 'D2' standards for discharged ballast water

Organism category	Regulation
Plankton, > 50 µm in minimum dimension	< 10 cells / m^3
Plankton, 10 - 50 µm	< 10 cells / ml
Toxigogenic Vibrio Cholera (O1 and O139)	< 1 cfu * / 100 ml or less than 1cfu/g (wet weight)
Escherichia coli	< 250 cfu * / 100 ml
Intestinal enterococci	< 100 cfu * / 100 ml

2.1.7 The approval processes

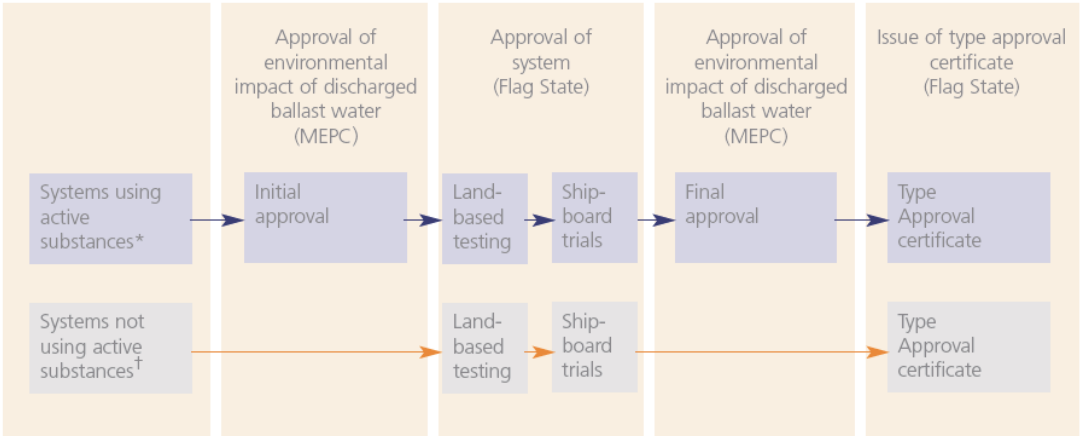
Regulation D-3 of the BWM Convention requires that ballast water management systems used to comply with the Convention must be approved by the Administration taking into account the Guidelines for approval of ballast water management systems (G8).

Approval consists of both shore-based testing of a production model, to confirm that the D-2 discharge standards are met; and shipboard testing, to confirm that the system works in service. Timescales are likely to be between six weeks and six months for the shore-based testing and six months for the ship-based testing.
In addition to the above mentioned requirement, Regulation D-3 also requires ballast water management systems which make use of active substances to be approved by IMO in accordance with the 'Procedure for approval of ballast water management systems that make use of Active Substances (G9)'. Procedure (G9) consists of a two-tier process – Basic and Final Approval - to ensure that the ballast water management system does not pose unreasonable risk to the environment, human health, property or resources.
A technical group of experts has been established under the auspices of GESAMP to review the proposals submitted for approval of ballast water management systems that make use of Active Substances. The GESAMP Ballast Water Working Group (GESAMP-BWWG) reports to the Organization on whether such a proposal presents unreasonable risks in accordance with the criteria specified in the Procedure for approval of ballast water management systems that make use of Active Substances.
Flag Administrations will issue a Type Approval certificate in accordance with the aforementioned G8 guidelines once G9 approval has been granted by MEPC. If the process uses no active substances, the Flag Administration will issue a Type Approval certificate without the need for G9 approval.
A summary of the approval pathway for ballast water treatment systems can be found in the following Fig 3.

2.1.8 Available ballast water treatment systems

At the time of writing, the complete list of systems making use of active substances which received type approval is given by BWM.2/Circ.34/Rev.3 (31 October 2014) together with systems which received basic and final approval."

Figure 3: Summary of the approval pathway for ballast water treatment systems



* Includes chemical disinfectants, e.g. chlorine, ClO_2, ozone

† Includes techniques not employing chemicals, e.g. deoxygenation, ultrasound

3 TREATMENT PROCESS

3.1Overview

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."

The technologies used for treating ballast water are generally derived from municipal and other industrial applications. However, their use is constrained by key factors such as space, cost and efficacy (with respect of the IMO discharged ballast water standards).

There are two generic types of process technology used in ballast water treatment:

- Solid-liquid separation and
- Disinfection.

The following paragraphs provide a brief overview of their characteristics.

3.1.1 Solid-liquid separation

Solid-liquid separation is simply the separation of suspended solid material, including the larger suspended micro-organisms, from the ballast water, either by sedimentation (allowing the solids to settle out by virtue of their own weight) or by surface filtration (removal by straining, i.e. by virtue of the pores in the filtering material being smaller than the size of the particle or organism).

All solid-liquid separation processes produce a waste stream containing the suspended solids. This waste stream comprises the backwash water from filtering operations or the underflow from hydrocyclone separation. These waste streams require appropriate management and during ballasting they can be safely discharged at the point where they were taken up.

On deballasting, the solid-liquid separation operation is generally bypassed.

3.1.2 Disinfection/Sterilization

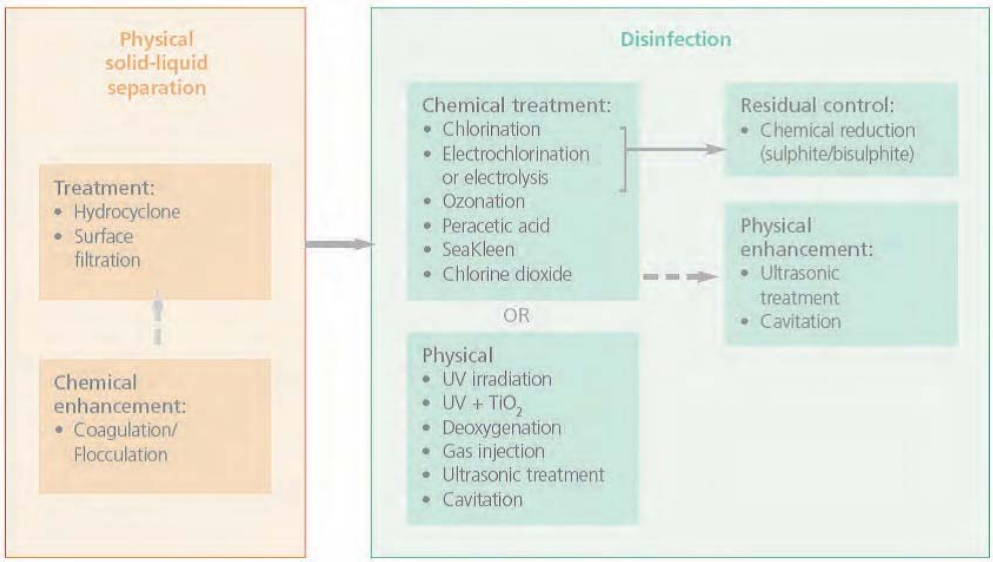
Disinfection removes and/or inactivates microorganisms using one or more of the following methods: Chemical inactivation of the micro-organisms through either:

- oxidising biocides - general disinfectants which act by destroying organic structures, such as cell membranes, or nucleic
- acids
- non-oxidising biocides - these interfere with reproductive, neural, or metabolic functions of the organisms Physico-chemical inactivation of the micro-organisms through processes such as UV light, heat or cavitation Asphyxiation of the micro - organisms through deoxygenation.

All of these disinfection methods have been applied to ballast water treatment, with different products employing different unit processes. Most commercial systems comprise two or more stages of treatment with a solid-liquid separation stage being followed by disinfection (Fig 4), though some disinfection technologies are used in isolation.

One ballast water treatment technology also employs chemical enhancement (i.e., coagulation / flocculation) upstream of solid- liquid separation; another uses titanium dioxide (TiO2) to intensify ultraviolet irradiation.

Figure 4: Summary of treatment options



3.2Processes

The range of system processes employed for ballast water treatment is shown in the following Tab 5.

Table 5: Description of treatment options

Process	Description
Solid-liquid separation	
Filtration	Discs or fixed screens with automatic backwashing
Hydrocyclone	High velocity centrifugal rotation of water to separate particles
Coagulation	Optional pre-treatment prior to separation to aggregate particles and increase their size
Chemical disinfection (oxidising biocides)	
Chlorination	Oxidising biocide that, diluted in water, destroys cell walls of micro-organisms
Electrochlorination	Creates oxidizing solution by employing direct current into water (electrolytic reaction)
Ozonation	Ozone gas is bubbled into the water which decomposes and reacts with other chemicals to kill micro-organisms
Chlorine dioxide	As chlorination
Peracetic acid and hydrogen peroxide	As chlorination
Chemical disinfection (non-oxidising biocides)	
Metadione / Vitamin K	Metadione is toxic to invertebrates
Physical disinfection Ultraviolet (UV) irradiation	Amalgam lamps surrounded by quartz sleeves produce UV light, which denatures the DNA of the micro-organisms and prevents it from reproducing
Deoxygenation	Reduces pressure of oxygen in space above the water with inert gas injection or by means of a vacuum to asphyxiate the micro-organisms
Cavitation	Induced by ultrasonic energy or gas injection. Disrupts the cell wall of organisms
Heat	Heat treatment of ballast water

Systems which employ active substances will treat on uptake only (with the exception of neutralisation prior to discharge) whereas other mechanical methods tend to treat on both uptake and discharge.

Figures 5, 6 and 7 illustrate the basis of the functionality of the ballast system with the treatment module. Figure 8 reports an example of the installation of BWT system in a typical ballast system.

Figure 5: Ballast system functionality scheme with water treatment during ballasting operation

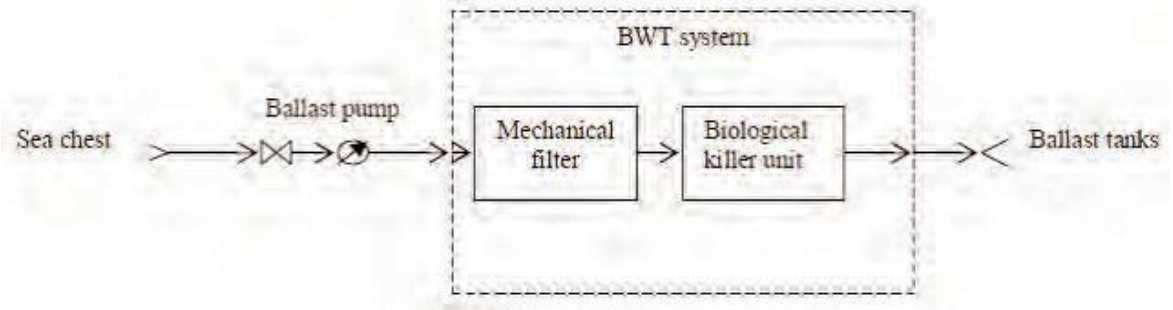


Figure 6: Ballast system functionality scheme with water treatment (single passage) during deballasting operation

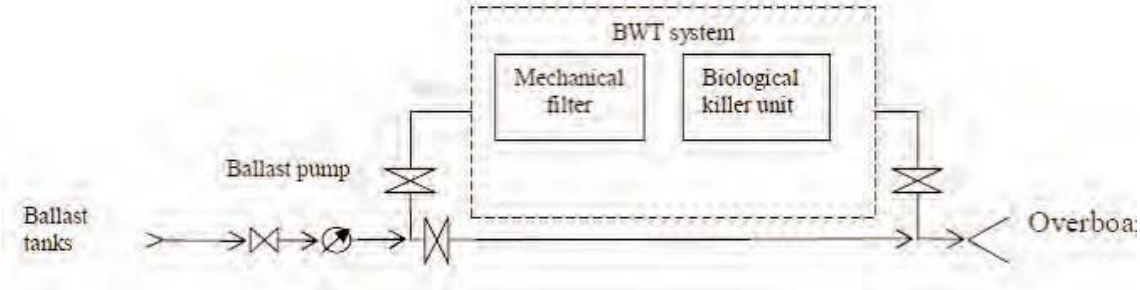


Figure 7: Ballast system functionality scheme with water treatment (double passage) during deballasting operation

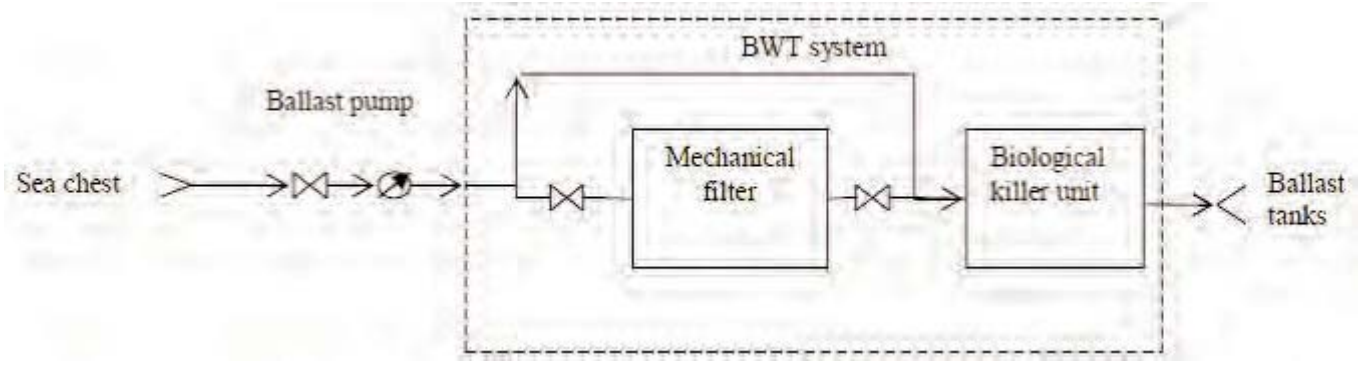
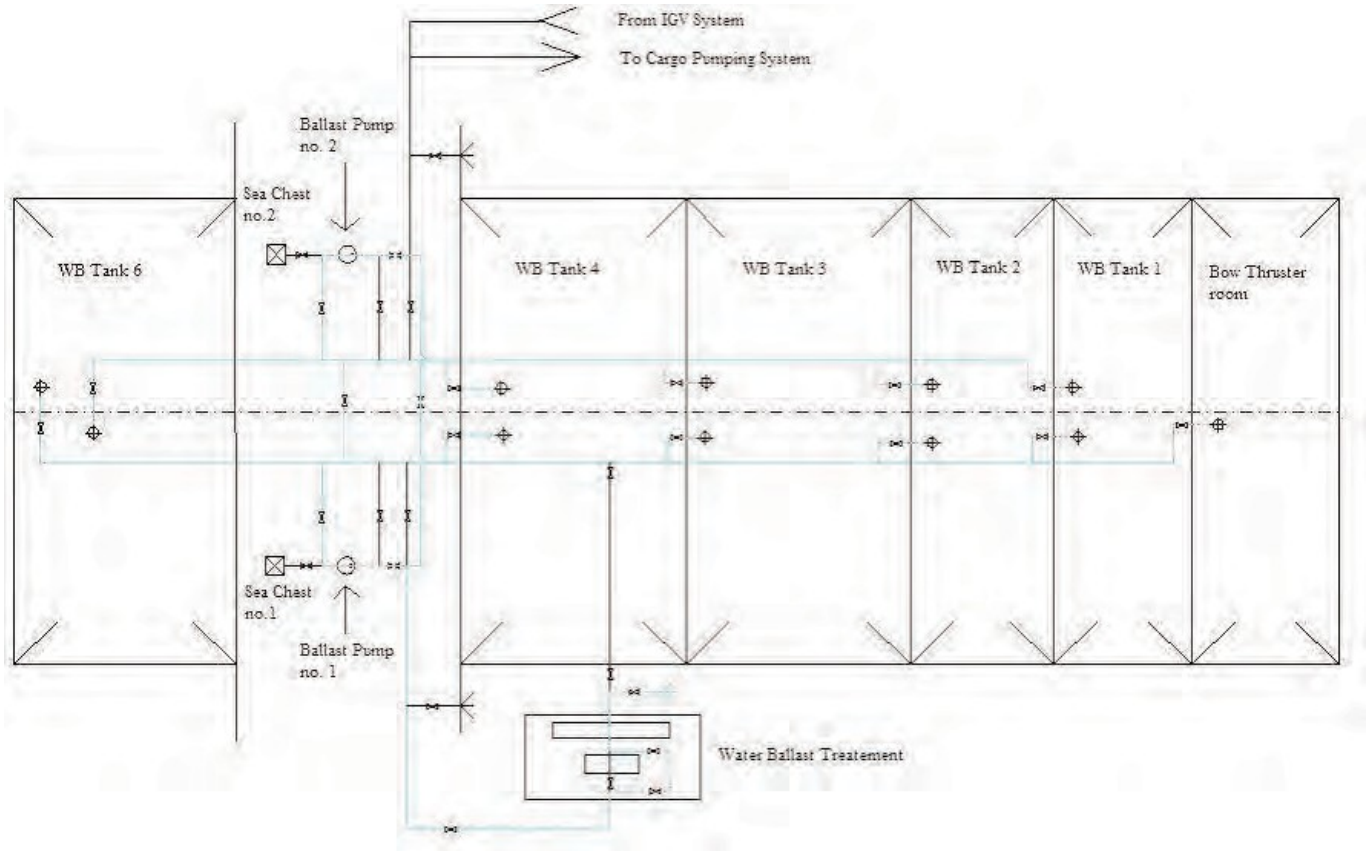


Figure 8: Scheme of ballast system with water treatment (double passage system)



The installation of the BWT system mainly concerns modification of the design of the ballast system and its components. In particular:

- an increase of power of ballast pumps should be considered to overcome the pressure drop lost in the BWT system the system may be redesigned and the scantling of the lines/valves could change for the higher design pressure of part of the system
- Stripping system should be modified: this is not necessary for “single passage” systems.

4 COMPLIANCE WITH THE CONVENTION

4.1General

The following Tab 6 summarizes the requirements for compliance with the Ballast Water Convention:

Table 6: Requirements for compliance with the Ballast Water Convention

Requirement	Description
Type Approval certification for treatment systems	Ships will be required to install and use a ballast water treatment system that is approved by a flag Administration or a recognised organisation, and have a certificate indicating compliance with IMO resolution MEPC.174(58).
Approved Ballast Water Management Plan (BWMP)	Each ship will need to develop a Ballast Water Management Plan and have it approved by the flag administration or a recognised organisation. The plan should be developed in accordance with IMO resolution MEPC.127(53). The plans submitted for approval should include piping, electrical and control systems. In case the ship has on board a ballast water management plan previously approved according to resolution A.868(20), please refer to para 2.1.3.
Ballast Water Record Book	Each ship will need to have on board a Ballast Water Record Book containing the information required by the Convention, and in the required format (please refer to Appendix II of BWM/CONF/36). The Record Book may be in paper format or an electronic format approved by the administration.
Classification requirements for existing ships	To maintain a ship in class the operator needs to submit plans and information about the ballast water treatment system and its installation to the ship's classification society. After these have been reviewed and approved, a class surveyor will survey the installation to confirm that it is in accordance with the approved plans.
Certification and survey requirements	After the Convention has entered into force, every ship over 400 gt will be required to undergo an initial survey and be issued with an International Ballast Water Management Certificate (IBWMC) (please refer also to para 2.1.2 "Issuance of BWM certificates prior to the entry into force date of the Convention"). The IBWMC will be valid for five years subject to annual and intermediate surveys. After five years, a renewal survey will be held and on successful completion of this survey, the IBWC will be reissued. The initial survey survey shall verify that the Ballast Water Management plan required by regulation B-1, the Ballast Water record book and any associated structure, equipment, systems, fitting, arrangements and material or processes comply fully with the requirements of this Convention The annual intermediate and renewal surveys will confirm that: - there have been no changes to the ballast water management arrangement since the last survey - an approved BWMP is on board - the ballast water record book has been maintained and has up to date entries - the treatment system (if applicable) is in good condition and has been operated and maintained in accordance with the manufacturer's instructions - there are sufficient consumables and spares on board as recommended by the manufacturer.

5 Tasneef Authorizations

The following Table 7 summarizes, for each Flag having Tasneef classed ships, the activities that Tasneef is authorized to perform on behalf of the Flag.

The first columns after the one of the flag ("Accession" column) indicates if that flag has ratified or not the BWM Convention.

Table 7: Activities that Tasneef is authorized to perform on behalf of the Flag

Status of ratification updated on 12.09.2017	Ratification of Ballast Water Conv. 2004: 1=ratified 0=not ratified	Tasneef BWM AUTHORIZATION In accordance with ITS II-A-1	Authorization for Type Approval of Ballast Water Management System	Authorization for the approval of Ballast Water Management Plan	De-harmonization of IOPP allowed No Prot. 88= HSSC system not apply A=upon Flag authorization
BAHRAIN	0	-			-
JORDAN	1	F	F	F	-
LEBANON	1	P	-	-	-
MOROCCO	1	F	F	F	-
OMAN	0	-			-
UNITED ARAB EMIRATES	1	F	F	F	-

6 BALLAST WATER TREATMENT SYSTEM PROCUREMENT

6.1 Steps to selecting a treatment system

6.1.1 Initial key aspects

The following initial key aspects should be taken into account in the process of selecting an effective ballast water treatment system:

a) Ship type and characteristics
b) Trading pattern
c) Ballast capacity and flow rate requirements.

6.1.2 Technical and operational considerations

After having identified the key aspects listed in item [5.1.1], it is important to consider some important technical and operational parameters:

a) Time required for treatment to be effective
   Non-oxidizing biocides include numerous chemicals that act by interfering with a necessary life function such as metabolism or reproduction. Because of the time needed for deactivation, non-oxidizing biocides may not be the best option for shorter voyages. On the other side oxidizing biocides (chlorine, bromine, and iodine) act by destroying cell membranes which leads to cell death and are able to treat ballast water in a short time.
b) Ballast and treatment pumping rates
   All BWTS have a 'total capacity rate' (TCR). This indicates how many cubic meters of ballast water the system can process each hour. It is needed to choose a system with a TCR high enough to handle ship's ballast capacity and operational pumping rate. As general principle a treatment equipment capacity greater than the ship's ballast rate is suggested, in order to allow for an operating margin.
c) Health and safety
   Whatever BWTS it's going to be installed, training will be required on operating and maintaining the system, and health and safety aspects such as chemical handling. Training requirements will need to be included in the ballast water management plan required by the Convention.
d) In-service requirements
   It is important to be able to keep the BWTS operational. If it stops working, the ship will be in contravention of the Convention and could face fines or detention. It is important to check that spares, consumables and servicing are readily available in all the areas where the ship is trading.
e) Explosion proof equipment (for oil tankers, for example)
   If the ship is a tanker, and the system is going to be installed in a 'gas dangerous area' (i.e., in the cargo area), the system must be certified 'gas safe'.
f) Power requirements and onboard systems
   Some systems may have very high power requirements. It is suggested to check whether it is needed to run another generator when the system is in operation or even install an additional generator set. Another consideration is whether a spare breaker is available in the electrical distribution board to provide power to the BWTS. If not, it is needed to find an alternative solution.
g) Effects on tank coatings and corrosion considerations
   Corrosion and coating degeneration are two potential effects that system substances and processes may have on tanks. It is important to get assurance from the system manufacturer that tanks will not be adversely affected.
h) Controls and alarms
   It is advantageous to integrate the alarms and controls for the treatment system with those for the ballast pumping system, so that both can be operated from all control panels.
i) Space constraints
   System footprints range from approximately 0.25 m^2 to 145 m^2, depending on their TCR. Some are single units while others can be installed as separate components. This may be useful if there is not a single space on board ship which is big enough or if access for bringing a single system on board is difficult.

6.1.3 Treatment options

As described in Chapter 3, different treatment options can be chosen to comply with the Convention's requirements:

a) Combination filtration and treatment
b) Chemical options such as chlorination, ozonation, deoxygenation and peracetic acid
c) Mechanical means such as cavitation
d) UV radiation
e) Ultrasounds.

A synthetic description of the main carachteristics of the above mentioned options can be found in item [3.2].

6.1.4 Vendor selection, approvals and commercial considerations

The following aspects should be considered in the process of selecting the most reliable vendor:

a) Vendor experience in supplying similar systems b) Equipment approvals
b) As mentioned in paragraph [2.1.5], to install a BWTS on board a ship, it must be 'type approved' by the flag administration or a Recognised Organisation in accordance with the relevant IMO Guidelines. If the system uses an active substance, this will need to have received final

approval from the IMO before type approval can be granted.

c) Commercial considerations

d) A BWTS 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.

6.1.5 Installation planning

The installation planning differs for new and existing ships.

a) Existing ships
   For existing ships it is needed to decide if the system will be fitted at sea or in drydock. If the latter, it is suggested to combine the retrofitting with a scheduled drydocking. Whether this is possible will depend on the ship's survey schedule and how it aligns with the Convention compliance dates. It is also needed to make sure that the system can be delivered by the preferred time.

b) New ships
   For new ships the installation is to be included in build specifications.

6.2 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. The following tables include the above mentioned information as well as the information that ship operators should require that suppliers include in their offer.

Table 8: Procurement Specification

Technical requirements of the ship	Importance	Information expected to be included in the suppliers' offer
- Ballast water pump flow rates that the treatment system will be required to cope with - A copy of the ballast system pipework diagrams showing the connections, pumping capacities and valves	Critical	Confirmation that their system has sufficient capacity to meet the ship's maximum ballast flow rates An estimate of the reduction in the ship's ballasting rate following installation of the treat- ment 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. Retention time: minimum time the ballast water has to be retain in tanks for safe discharge without neutralizer
Compartment details for the installation of treatment equipment and storage of consumable materials	Critical	Types of technology employed in the system. 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 EX restrictions: If the system can installed in hazardous areas, where required
Power supply availability and routing for control cabling	Critical	The system's power consumption (excluding the ship's fitted ballast pumps) and any other electrical requirements.
Certification requirements	Secondary	The work plan for supply to ship, installation, commissioning and test.
Details of the ballast tank coatings	Critical	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

Table 9: Other Information to be considered

Other Information that operators should consider when shortlisting potential suppliers	Importance
Costs: price of the equipment installation and commissioning costs estimated operating costs including consumables	Critical
Training requirements for system operation, calibration, monitoring and health and safety	Secondary
Maintenance requirements of the systems	Critical
Operating experience of the suppliers	Secondary
Any special docking requirements or ship modifications required for equipment installation	Critical

6.3 Engineering checks

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

a) 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).

   In general the installation onboard of the ballast water treatment system requires an increment of the electric power generation. The main contributions to the increase of electrical power are:

   Increase of electrical power required by ballast pumps

   Electrical power required by ballast water treatment system.

   The increase of dimensions of diesel generators depends mainly on the ratio between ballast water pumps capacity and the electrical power required to be installed onboard in the hypothesis that no BWT system is fitted. The percentage of additional required electrical power increases proportionally to the above mentioned ratio.

   In the worst situation it could be necessary to increase the number of diesel generators (e.g. case of Panamax Bulkcarrier gearless), in the remaining cases it could be necessary to change the type or the rating of diesel generators.

b) Check that treatment equipment can be easily integrated into existing ballast systems. The installation of the water treatment system can impact the number and the characteristics of ballast pumps. in fact the power of the pumps might be increased in order to cover the pressure drop of the treatment system.

c) Check the suitability of control requirements, including alarms and protective devices

   Ballast water management systems should incorporate a visual alarm which is always activated whenever the BWMS is in operation for purposes of cleaning, calibration, or repair, and these events should be recorded by the control equipment. It is recommended that automatic ballast water treatment controls and alarms are integrated with, or located close to, the ship's ballast water controls.

d) Conduct a review of local versus remote operating systems and ease of integration with existing machinery controls.

e) Assess ease of maintenance, calibration and ballast water sampling.

   Manufacturers' maintenance requirements should be reviewed 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).

f) Assess the need for venting or other measures for compartments where active substances (chemical or otherwise) are stored or at risk of escape.

   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 Sheet 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 "Guidance to ensure safe handling and storage of chemicals and preparations used to treat ballast water and the development of safety procedures for risks to the ship and crew resulting from the treatment process".

g) Assess how sediments will be managed.

   Regulation B-5.1 of the Convention requires that all ships remove and dispose of sediments from spaces designated to carry ballast water in accordance with the Ballast Water Management Plans. Ship designers, shipbuilders, owners and operators should design and operate ships in order to minimize the retention of sediment. Guidance on the management of sediment is contained in the "Guidelines for ballast water management and development of ballast water management plans (G4)". Reference should be made also to the "2012 Guidelines on design and construction to facilitate sediment control on ships (G12)" (resolution MEPC.209(63).

h) Ensure ballast tank gauging will not be affected by the ballast water treatment system (pneumatic tank gauges may be affected by inerting of ballast tanks).

i) Ensure that the ballast water treatment 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. Typically, this applies to oil and chemical tankers.

7 DOCUMENTATION TO BE SUBMITTED

7.1 Ship plans and operational manuals

Once identified the most appropriate ballast water treatment plant, Tab 10 below shows the general ship plans and operational manuals that should be submitted for review/approval or information, as applicable. Specific documents that need to be placed onboard the ship for presentation to the Tasneef Surveyor at appropriate surveys are also annotated in the Tab 10.

Due to a wide range of treatment systems, Tasneef may require the submission of additional plans or supporting information as called for by the specific treatment system.

Table 10: General ship plans and operational manuals to be submitted for review/approval or information

Type of Ship Plans and Manuals	Additional Description	For Approval (AP) or Information (I)	Placed Onboard
Ship for Survey (S)			
General arrangement drawings of the BWMS	Installation arrangement drawings on the ship including location and layout	AP	-
Arrangement and capacity of ballast tanks and pumps		I	-
Ballast piping system drawings	Layout, filling arrangement, and booklet of construction details of piping system	AP	-
Location of ballast water			
sampling facilities		AP	-
Electrical circuit drawings and			
main power cable drawings		AP	-
Power calculation document	Including electrical load analysis	AP	-
Control, monitoring and safety			
system documentation	Especially where the controls and monitoring of the BWMS have been connected to or integrated with the ship's control and monitoring system(s)	AP	-
Local instrumentation			
arrangement plan		AP	-
Structural plans	Showing installation details of		
attachment, supports and			
foundations of principal			
components of the BWMS	AP	-	
Hazardous area plan		AP	
List of electrical equipment in hazardous area		I	
Storage tanks and day tanks containing chemicals and preparations used to treat ballast water	Include complete piping details of filling, drain system, vents, drip trays, and safety precautions, etc.	AP	S
Safety documentation for hazardous chemicals	In recognized industry format, such as MSDS, CHRIS Code, Cole-Palmer	I	-
Leakage detection system and safety features associated with the generation of toxic or flammable gases	Safety features include sensor, alarms and shutdown settings, etc. together with proper suitable certification. Schematic plans detailing arrangement and location of sensor are to be provided	AP	S
Safety assessment documentation, where applicable	For BWMS that employs active substances and preparations; include arrangement, handling and safety plans of auxiliary systems for the treatment system, as applicable	AP	-
Ballast water management plan (BWMP)	BWMP is specific to the ship and in a standard format per G4 Guidelines	AP	S
BWMS operating and safety manual	Manual specific to the actual installation onboard the ship;	AP	S
Shipboard function test plan for sea or quay trial	Function test of the installed BWMS at the sea trial or quay trial in the presence of Tasneef Surveyor; function test plan per paragraph 5.1.9 of G8 Guidelines	AP	-
Ballast water record book	Ballast water record book is specific to the ship	I	S

7.2 Required specific certification and documentation

The ballast water management system installed onboard shall be type-approved by an IMO Member State, and some specific certificates and documentation of the treatment system are to be provided for record, information or reference, as appropriate.

The certificate/documentation requirements are shown in Tab 11.

In accordance with the Convention, specific documents are to be retained onboard the ship for presentation or inspection at appropriate surveys.

Table 11: Certificate/documentation requirements

Type of Document for BWMS	Additional Description	For Record (R) or Information (I)	Placed Onboard Ship for Survey (S)
Type Approval Certificate of BWMS	G8 Guidelines, paragraph 8.1.1. Information for the Certificate is to include main particulars of BWMS, approved application, limiting conditions and others as stipulated in G8 Guidelines, Section	R	S
Results of test analysis for BWMS	Copy of test results showing the effectiveness and ability to meet IMO discharge standards per G8 Guidelines, paragraph 6.5.4.	I	S
International Ballast Water Management Certificate (after entry into force)	In accordance with the Convention Regulation E-2.	I	S
Type Approval Certificate of BWMS	G8 Guidelines, paragraph 8.1.1; Information for the Certificate is to include main particulars of BWMS, approved application, limiting conditions and others as stipulated in G8 Guidelines, Section 6	R	S
Results of test analysis for BWMS	Copy of test results showing the effectiveness and ability to meet IMO discharge standards per G8 Guidelines, paragraph 6.5.4	I	S
International Ballast Water Management Certificate (after entry into force)	In accordance with the Convention Regulation E-2	I	S
Documentation verifying IMO Basic Approval of BWMS to G9 Guidelines, if applicable	In a suitable format: i.e., basic approval application and GESAMPBWWG review report, etc.	R	-
Documentation verifying IMO Final Approval of BWMS to G9 Guidelines, if applicable	In a suitable format: i.e., final approval application and GESAMPBWWG review report, etc.	R	-
Statement confirming BWMS type tested in accordance with the environmental testing specifications of the Convention. Equipment manuals for major components of BWMS	G8 Guidelines, paragraph 8.1.2; from the BWMS manufacturer	I	S
Equipment manuals for major components of BWMS	G8 Guidelines, paragraphs 5.1.1 and 8.1.3; manual should include equipment list and specifications from the BWMS manufacturer	R	S
Operations and technical manual	Manual is specific to the ship and approved by the Administration per G8 Guidelines, paragraphs 8.1.4, 5.1.3-7; from the BWMS manufacturer	R	S
Installation specifications	G8 Guidelines, paragraphs 8.1.5 and 5.1.8; from the BWMS manufacturer	R	S
Installation commissioning Procedures	G8 Guidelines, paragraph 8.1.6; from the BWMS manufacturer	R	S
Initial calibration procedures G8	Guidelines, paragraph 8.1.7; from the BWMS manufacturer	R	S
Documentation relating to the environmental and public health effects of the BWMS	BWM.2/Circ.28, paragraph 3.1.13.7 and G8 Guidelines, Part 1, Section 1.6.4; BWMS manufacturer is to provide information to ship owner	I	-
Documentation relating to the corrosion effects of the BWMS on the ship's tank coatings, steel plating or ballast water system	BWM.2/Circ.28, paragraph 3.1.13.2 ; BWMS manufacturer is to provide information to ship owner	I	-
Note: Where "R" is indicated, submission of the documentation to Tasneef is mandatory, as it will be used as reference for the engineering review.			

7.3 Engineering review

Hull plans showing the foundation and attachments to ship's structure for each component of the BWMS are to be submitted and approved. These plans are to clearly indicate the scantlings and details of welding.

Machinery plans showing the installation design of the BWMS on the ship including location, piping and electrical details/drawings, general arrangement and layout, installation and equipment plans are to be submitted and approved before proceeding with the installation. Plans are to include applicable arrangements for hazardous areas acceptable to Tasneef, if applicable.

8 SYSTEM RELATED AND INSTALLATION CRITERIA

8.1 General

In order to minimize the risk associated with the discharge of harmful aquatic invasive species resulting from ballast water transfers, the ballast water management system must be effective under the range of typical ship operating conditions without negatively impacting the safety of shipboard personnel or the ship or the environment into which the ballast water is discharged. Ballast water management systems must meet international protocols under various environmental conditions, aquatic organisms, flow rates, volumes, and retention times.

However the Type approval of a system does not ensure that a given system will work on all ships or in all situations. The provisions in this Section address the supplementary classification requirements that apply when a ballast water management system is installed on board a ship.

As general rule, the ballast water management system (BWMS) must be designed, constructed and installed such that:

- it is proven safe for the shipboard personnel and ship operations
- it complies with the international regulations
- it does not degrade the quality of local marine environments upon discharge.

8.2 Common criteria

The design and installation of a ballast water management system is to comply with the following criteria:

a) The treatment rated capacity (TRC) is to be sufficient to meet the ship's ballast capacity and normal ballast operations rate
b) Capable of operating effectively at the minimum discharge rate of the ballast pumps or stripping system
c) Capable of operating effectively with all connected ballast system pumps and eductors
d) Capable of effectively treating all ballast water regardless of tank location, size or structure
e) Provide for ballast flow to the furthermost tank at maximum capacity stated in the ship's BWMS specification
f) Shall not adversely affect any parts, materials, equipment, structures or coatings
g) Shall not exceed the electrical generating capacity of the shipboard power supply under normal in port operating conditions
h) Shall not discharge hazardous vapours or by products to the atmosphere, other than as considered in the type approval of the BWMS
i) All parts of the BWMS are to be easily accessible for inspection and maintenance
j) Have suitable bypasses or overrides to protect the safety of the ship and personnel in the event of an emergency (See para 8.2.5.9 "Bypass arrangements")
k) Comply with all requirements, restrictions and conditions identified in the type approval certificate issued by the IMO Member State.

8.2.1 BWMS Locations

a) General

1. A ballast water management system may be installed in various locations throughout a ship. The acceptability of the location and arrangements depend on the type of treatment system under consideration, the installation specifications and the type of ship involved. Each installation must be carefully evaluated to verify that potential safety concerns and pollution hazard issues are adequately addressed
2. Regardless of the location, all BWMS installations shall be in accordance with all relevant requirements listed in this Guide, the Tasneef Rules and Guides, and international regulations, standards, guidelines and recommendations
3. BWMS equipment enclosures may not be constructed on weather deck locations that will reduce the navigational bridge visibility
4. New or retrofitted enclosed deckhouse is to comply with Part B of Tasneef Rules for structural requirements and deck openings
5. For tankers transporting combustible, corrosive, or toxic cargo, the BWMS is required to comply with the criteria relevant to the cargo transported and the ship arrangements as specified in Common Structural Rules for Double Hull Oil Tankers and Part E of Tasneef Rules

b) Locations of BWMS not involving hazardous areas

Ballast water management systems that do not serve ballast tanks considered to be hazardous may be installed in the following locations, unless specifically prohibited due to the treatment method involved:

1. Machinery space or engine room
2. Void spaces with or without direct access or adjacent to the machinery room
3. Dedicated enclosure

c) Locations of BWMS serving hazardous areas

Unless the system configuration, arrangements, locations and isolation arrangements have been specifically accepted by Tasneef, ballast water management systems that serve ballast tanks considered to be hazardous are to be installed in a void space, weather deck enclosure, or enclosed compartment on the cargo deck, complying the below compartment criteria:

1) Determined to be suitable for the service intended

2) Treated as “other machinery spaces” with respect to the fire protection
3) Positioned outside of any combustible, corrosive, toxic, or hazardous areas unless specifically approved
4) Arranged with no direct access to accommodation spaces, service space, machinery space, control stations or other spaces containing sources of ignition, unless specifically approved
5) Watertight integrity of all bulkhead openings and penetrations to be maintained
6) Watertight integrity of all deck openings and penetrations to be maintained
7) Minimize the extent of bulkhead and deck openings and penetrations
8) Additional restrictions and requirements may apply to installations of BWMS serving ballast tanks of oil and chemical carriers. See Section 9 for additional details.”

8.2.2 Ventilation Systems

a) BWMS located in non-hazardous areas serving tanks located in non-hazardous areas.
   A BWMS that does not generate dangerous gas is to be located in an adequately ventilated area.
   A BWMS that generates dangerous gas is to be located in a space fitted with a mechanical ventilation system providing at least 6 air changes per hour or as specified by the BWMS manufacturer, whichever is greater.
   Where the operating principle of the BWMS involves the generation of a dangerous gas, the following requirements are to be satisfied.
   1) A gas detection equipment is to be fitted in the spaces where dangerous gas is likely to be present, and an audible and visual alarm is to be activated at a local area and a manned BWMS control station in case of leakage. Gas detection device is to be designed and tested in accordance with IEC 60079-29-1 or recognized standards acceptable by the Society
   2) The ventilation line of a space where dangerous gas may be present is to be led to a safe area on open deck
   3) The arrangements used for gas relieving, i.e. degas equipment or equivalent, are to be provided with monitoring measures with independent shutdown. The open end of the gas relieving device is to be led to a safe area on open deck.
b) BWMS located in hazardous areas serving tanks located in hazardous areas
   A BWMS, regardless of generating dangerous gas, is to be located in a space fitted with mechanical ventilation complying with relevant requirements, i.e. IEC60092-502, IBC code, IGC code, etc.
   Where the operating principle of the BWMS involves the generation of a dangerous gas, the following requirements are to be satisfied:
   a) A gas detection equipment is to be fitted in the spaces where dangerous gas is likely to be present, and an audible and visual alarm is to be activated at a local area and a manned BWMS control station in case of leakage. Gas detection device is to be designed and tested in accordance with IEC 60079-29-1 or recognized standards acceptable by the Society
   b) The ventilation line of a space where dangerous gas may be present is to be led to a safe area on open deck.
      The arrangements used for gas relieving, i.e. degas equipment or equivalent, are to be provided with monitoring measures with independent shutdown. The open end of the gas relieving device is to be led to a safe area on open deck.
   c) Additional requirements
      Additional ventilation requirements may apply depending on the type of treatment system utilized and the location involved

8.2.3 Structural Considerations

The treatment unit and related equipment must be efficiently supported and the adjacent structures are to be adequately stiffened as required. Structural considerations are subject to all relevant requirements listed in this Guide and the Tasneef Rules, and international regulations, standards, guidelines and recommendations.
The installation of a ballast water management system on a new or existing ship shall not compromise the integrity of the ship hull, framing, decks, bulkheads, tank structures, existing equipment foundations, or additional structural members. Additionally, the application of a BWMS is not to adversely affect the ballast loading conditions, loading instrumentation, intact stability, damage stability and fire safety. Any modification to a ship's structure, stability, or safety considerations, as a result of the ballast water treatment equipment, shall be designed, constructed, and surveyed as indicated in this Guide and the Tasneef Rules Part B and Part C. Careful attention to the BWMS design, foundation, supports, and distribution of weight is to be regarded as of the utmost importance for all BWMS installations, and especially for machinery space installations due to necessary openings in the machinery space, limited support for decks, and maintenance of side and bottom stiffness.

8.2.4 Corrosion Effects

Ballast water management systems are not to deteriorate, degrade, or reduce the functional life expectancy of the ballast tank coatings or means of corrosion prevention. Additionally, the treatment

method employed is prohibited from resulting in damage, deterioration, or degradation to ballast piping and integral joints that are protected against corrosion by means of a coating or lining.

Several official IMO documents address the potential corrosive effects that ballast water management systems may have on the ballast tanks (including coatings) and the ballast system. Shipyards, BWMS manufacturers, owners and operators are to consider and where appropriate, address the following:

a) The active substances and preparations used for the BWMS as well as the treated ballast water must be compatible with the coating system (G9 Guidelines, Section 3.4)
b) Data-set on the corrosivity to the materials or equipment of normal ship construction should be provided (G9 Guidelines, Section 4.2.1.4)
c) Application should include corrosion testing of uncoated substrates and marine epoxy coated steel; coating in accordance with IMP Performance Standard for Protective Coatings) (MEPC 59/2/16, Section 5.1)
d) Documentation of preliminary assessment of the corrosion effects of the BWMS system (BWM.2/Circ.28)
e) Long term corrosion effects of the treated ballast water on the ballast system and other spaces (Annex to G8 Guidelines, Part 1, Paragraph 1.3).

Copies of the documentation relating to the corrosion effects of the BWMS, including the test report or preliminary assessment report, which are a part of the IMO Member State's type approval dossiers are to be provided to Tasneef for reference.

8.2.5 Ballast System

a) General

The ballast systems are to provide a reliable means of filling, transferring and draining ballast tanks employing a ballast water management system through the provisions of redundancy, certification of BWMS pumps and suitable remote control, where fitted.

A ballast system design including piping, pumps, valves, and other piping equipment must comply with all criteria for ballast systems as indicated in this Guide and Part C of the Tasneef Rules.

Additional ballast system piping requirements for oil, liquefied natural gas, and chemical carriers including safety arrangement are to comply with the relevant sections of Part E of the Tasneef Rules. Where the ballast system has a capacity exceeding the treatment rated capacity of an in-line BWMS, an appropriate flow control arrangement is to be provided for the ballast pumps.

b) Ballast Pumps

Any modification to the existing ballast pumps, installation of new ballast pumps, or installation of booster pumps are to comply with the requirements in Part C of the Tasneef Rules.

c) Piping Components Materials and Design

1) The materials and design of all BWMS piping components are subject to the requirements of Part C, Ch 1, Section 10 of the Tasneef Rules
2) In addition, BWMS piping using miscellaneous non-metallic components made of thermoplastic or thermosetting plastic material such as polyvinyl chloride (PVC), fiber reinforced plastic (FRP), etc., in general, are to comply with the requirements of Part C, Ch 1, Appendix 3 of the Tasneef Rules.

However, special considerations may be given to the fire endurance and flammable spread requirements subject to the additional requirements specified below for acceptance by Tasneef:

- The components of the ballast water treatment equipment are to be arranged on a skid. Modular installation design will be subject to special consideration
- The inlet, outlet and drain pipes connected to the skid-mounted unit are to be made of steel or equivalent materials. However, fiber reinforced plastic pipe of approved type and suitable design, which has passed at least the level 3 (L3) fire endurance tests, is considered acceptable
- Depending on the exact location of the installed skid-mounted unit within an approved space, local fire fighting arrangements and/or a metallic enclosure covering the non-metallic components may be required at the discretion of Tasneef.

  In case of emergencies, suitable remote
- operable bypasses are to be provided to isolate the complete non-metallic piping system on the skid-mounted unit from the rest of the ship's piping system
- For the skid-mounted ballast water treatment equipment installed in hazardous locations, the requirements in this section are applicable in addition to the requirements specified in Section 9 of the Guide
- The requirements of the ship's Flag Administration for non-metallic components made of thermoplastic or thermosetting plastic material are to be satisfied.

d) Vent Piping

The vent pipe location of a ballast water management system that vents explosive and toxic gases is to comply with the intent of Part E, Chapter 7, Section 6 of the Tasneef Rules as applicable. A spherical distance within 3 m (10 feet) measured spherically with the vent outlet as the center is to be considered as hazardous.

e) Ballast Water Sampling Piping

Ballast water management systems are required to include all necessary access, piping and

equipment for ballast water sampling to maintain operational safety and regulatory compliance. The sampling system is to provide for compliance with Section 5 of the Resolutions MEPC.173(58) Guidelines for Ballast Water Sampling (G2).

Piping is to be arranged such that samples are to be taken from the ballast water discharge piping as close to the point ofdischarge as feasible. BWMS that employ treatment during discharge operations must use in-line sampling. Details regarding the sampling facility design as required for compliance are located in Section 5, and Parts 1 and 2 of the G2 Guidelines

f) Remote Control Valves

Remote control valves, where fitted, are to be arranged so that they will close and remain closed in the event of a loss of control power or emergency shutdown. Additionally, remote control valves are to be provided with position indicators in the BWMS instrumentation display at the ballast control station.

g) Damage Stability Consideration

BWMS piping, where installed within zones of the assumed extent of damage under damaged stability conditions, is to comply with Part F, Chapter 13, Section 11 of the Tasneef Rules.

h) Ballast Water Stripping

For ballast water management systems that employ a double passage method (i.e., treating the ballast water both at intake and at discharge), appropriate arrangements are to be provided such that, in the ballast stripping operation, the water stripped from the ballast tank can also be routed through all the required treatment equipment and processes identified in the IMO Member State's type approval for the ballast discharge operation without damaging or incapacitating the BWMS due to sediment and particles in the stripped ballast.

For chemical treatment systems that need to neutralize the residual oxidants in the ballast water before discharge, the driving fluid for any eductor involved in the stripping operation could affect the efficacy of the neutralization, depending on where the neutralizer is applied (before or after the eductor) and where are the measurements of the TRO (total residual oxidants) level in the ballast system which cause the adjustment of the amount of neutralizer needed. The effectiveness of the neutralization is to be appropriately addressed in the ballast water stripping design and operation. For oil and chemical carriers, protection measures are to be provided to address the interconnection of piping between the fire/general service pump in the machinery space (non-hazardous space) and the ballast eductor in the cargo pump room (hazardous space). See para 9.3 of this Guide.

i) Bypass Arrangements

Suitable bypass and interlocking arrangements specifically accepted by Tasneef are to be provided to isolate the BWMS from the ballast system piping such that the ballast system can be operated totally independent of the BWMS in the event of emergency.

In case of any by-pass or override operation of BWMS, an audible and visual alarm is to be given and these events are to be automatically recorded in control equipment. The valves in the by-pass line which trigger the by-pass operation are to be remote-controllable by control equipment or fitted with open/close indicator for automatic detection of the by-pass event.

8.2.6 Electrical System

a) General

Unless specifically stipulated otherwise in this Guide, the electrical system and electrical equipment are to be in accordance with the electrical requirements of the Tasneef Rules.

b) Electrical Load Analysis

The total electrical load of a BWMS is to be such that under the normal in port operating conditions of ballasting or de- ballasting the electrical generating capacity installed on the ship is adequately demonstrated by an electrical load analysis.

8.2.7 Instrumentation

a) Local Instrumentation

Local instrumentation and controls of the BWMS are to be fitted so as to enable safe operation, maintenance and effective control in the event of an emergency or failure of any remote controls.

Local instrumentation is to indicate ballast operating conditions and status of the ballast water treatment equipment. For installations where the ballast water treatment equipment is not located in the same space as the ballast pumps, the operational status of the ballast pumps is to be indicated near the ballast water treatment equipment. The local instrumentation is to include:

1) Ballast pump operational status (e.g., pressure gauge)
2) BWMS and equipment operational status
3) Remote control valve, where fitted, position indication
4) Necessary instrumentation for all BWMS equipment parameters and specific conditions, as applicable.

b) Ballast Control Station Displays

Where remote control stations are fitted, the instrumentation parameters as indicated in [4.2.6] a)1) and 3) and the ballast tank level indications are to be displayed at the remote control station.

Display of items in [4.2.6] a)2) and 4) at the remote control station is advisable.

A tank level gauging system, where fitted, is to be capable of measuring the full height of all ballast tanks individually and provided at the ballast control station. The selection of a tank level gauging system and the connection between the level gauging system and the BWMS are to be specially considered to verify the system compatibility such that the level gauging system work correctly with the BWMS.

8.3 Mechanical separation systems

Ballast water management systems utilizing mechanical separation are to comply with the following:

a) The maximum pressure loss across the BWMS is not to prevent or impair the ability of the ballast system to supply the most hydraulically remote ballast tank at an acceptable flow rate identified in the BWMS manual
b) The arrangements for backwashing, including the flow rate, pressure differential, sizing and routing of the overboard discharge piping, etc., are to be designed such that all wastes will be adequately removed from the system when taking into account the maximum static head imposed when the ship is at its maximum draft
c) Arrangements (e.g., controls, procedures, etc.) are to be designed such that the separation system and associated piping will be backwashed and flushed clean upon completion of ballasting operations before the ship departs the ballasting port; and if applicable, before the ship departs the de-ballasting port
d) The backwash is not to have an adverse impact on the local marine environment upon discharge when located downstream of an additional treatment measure, unless such arrangements have been approved by the IMO Member State in the type approval of the system.

8.4 Physical treatment systems

The primary physical treatments used in ballast water management systems include cavitation, thermal (heat), inert gas, ultrasound, and ultraviolet irradiation (UV). Additional criteria are included, as applicable, within the individual treatment subsection.

8.4.1 Cavitation and Ultrasound Systems

Any pressure loss across the cavitation or ultrasound treatment system shall not impair the ballast water flow to the furthest ballast tank at maximum capacity.

8.4.2 Thermal Systems

The application of thermal (heat) treatment for ballast water management systems shall require a review of all plans, energy balances, structural considerations and operations. Equipment installed for the application of heat to ballast water shall be subject to all relevant requirements in the Tasneef Rules.

8.4.3 Inert Gas De-oxygenation Systems

The design, construction and operational criteria for a treatment system supplying inert gas to ballast tanks are to comply with the Tasneef Guide for Inert Gas System. Where inert gas is injected directly into the ballast piping, equivalent arrangements for safety, monitoring and controls specified in the Guide for Inert Gas System are to be provided.

Any interconnections of a shipboard inert gas system and a vendor supplied inert gas generator intended for ballast treatment is to be subject to special consideration, and arrangements for isolation, interlocks and controls are to be submitted for review. Additionally, any pressure loss across the treatment shall not impair or prevent the ballast water flow to the furthest ballast tank at maximum capacity. Inert gas ballast water management systems are required to comply with all applicable criteria as specified in this Guide, the above-referenced Guide, Tasneef Rules, and international regulations and standards.

8.4.4 Ultraviolet Irradiation (UV) Systems

Ultraviolet irradiation ballast water management systems are required to comply with all applicable criteria in this Guide, the Tasneef Rules, and international regulations, standards, guidelines and recommendations. Arrangements are to be provided such that the crew will not be exposed to excessive amounts of UV light during operation, maintenance or repairs of the system. Additionally, the following arrangements are to be provide:-

a) A high temperature alarm and high-high temperature automatic shutdown.
b) Means to prevent the accumulation of air in the top of the lamp enclosure or treatment chamber
c) A means to prevent operating the UV lamps without water in the treatment chamber in order to avoid over-heating the UV unit. Such means may include an interlock or an appropriate piping arrangement that maintains a constant flow of water through the treatment chamber to dissipate the heat, etc.
d) Protection of electrical equipment with respect to the degree of enclosure, insulation materials and maximum ambient temperatures in accordance with Part C, Chapter 2 of the Tasneef Rules and the manufacturer's specifications.

Document confirming the instrumentation, monitoring and control equipment for all vital parameters such as the UV dose, lamp power, intensity, etc., including the application conditions for effective assessment of the treatment operations, as specified in the IMO Member State's type approval is to be submitted to Tasneef.

8.5 Chemical treatment/active substances systems

8.5.1 Prepared Chemical Treatment Systems

a) General

Ballast water management systems employing a chemical treatment are required to comply with all criteria in this Guide, the Tasneef Rules and Guides, international standards, flag Administration criteria, recommendations or requirements specified in the chemical manufacturer's Material Safety Data Sheet (MSDS), and local standards involving the discharge of chemical substances. All equipment, piping and components storing, conveying, or creating flammable, toxic or corrosive chemicals as provided for, created by, or resulting from a BWMS must be designed, constructed, operated and maintained in accordance with Part C, Chapter 1, Section 10 of the RINA Rules, and flag Administration criteria. These documents, standards, and criteria are to be reviewed and applied in conjunction with this Guide.

Additionally, the following arrangement/procedures as applicable to the specific chemical treatment system are to be satisfied:

1) Implementation of a safe and secure means of transferring chemical onto the ship. Such measures may include a containment that is impact resistant, leak-proof, airtight, and watertight. Volume, weight, and concentration standards may.
2) Design and installation of containment system for all liquid chemicals stored and in use. The containment system shall be designed to prevent any chemicals from escaping under the maximum inclination conditions and to accommodate the type and volume of chemical being used in the event the primary containment barrier fails
3) When chemicals are provided as a gas the system shall comply with Part C, Chapter 1, Section 10, Para 19 of the Tasneef Rules
4) A safe means is to be provided to apply the stored chemicals into operation
5) An approved gas detection system shall be installed in all spaces housing the chemicals and chemical treatments to provide a safe environment, proper air supply and ventilation, and leakage detection. Alarm levels will be based on a case-by-case basis acceptable to Tasneef
6) Chemical storage tank air pipes are to be led to a safe area on open deck
7) A high temperature and pressure alarm is to be provided, with its shutdown conditions identified.
8) A low pressure alarm is to be provided, with its shutdown conditions identified
9) Chemical level indication, alarms, and automatic shutdown are to be arranged at remote and local control stations
10) An adequate system capable of self-monitoring and recording of chemical dosages or treatment intensities is to be provided
11) An adequate means to prevent overflowing the ballast tanks and unintentional ballast discharge prior to discharge treatment or at any point during the ballast retention above acceptable residual limits is to be provided. Such measures may not impair the safety and stability of the ship under all operating conditions
12) All equipment, piping, components and coatings exposed to the chemical treatments shall be compatible with the chemical. Chemical treatments shall not induce or accelerate the corrosion of any BWMS or ballast system component
13) Chemical storage tanks, and other components of the BWMS subject to leakage, If applicable, are to be provided with spill trays of ample size - large enough to cover the leakage points such that manholes, drain valves, gauge glass, filer, pumps, etc
14) An operation manual containing chemical injection procedures, alarm systems, measures in case of emergency, etc, is to be kept onboard.

b) Safety Assessment

A safety assessment study to address the risk to the ship and its crew is to be conducted. The scope of the safety assessment is to include at least the following subjects:

1) The loading and storage of chemicals or preparations onto the ship
2) The transfer and application of chemicals or preparations from storage to the BWMS
3) The position of the BWMS and associated piping
4) Operation of the BWMS, specifically any potential impacts on the ship's crew e) Maintenance of the BWMS and safe work procedures
5) Spillages from the BWMS and emergency response plan.

Specifically, this safety assessment is to address the adequacy of the chemical containment system, the ventilation system, fire protection and extinction of those spaces where the chemicals or preparations are stored as applicable, the ship-specific details concerned with the loading of the ballast water treatment chemicals onto the ship, the handling and applying of chemicals/ preparations into the BWMS, and the development of ship-specific health and safety procedures for the normal operation of the BWMS; as well as the procedures to be followed in

the event of a spillage on board or crew exposure to the treated ballast water, chemicals or preparations. The safety assessment should be undertaken prior to the installation of the BWMS, so that any mitigation measures identified during the assessment study can be rectified either prior to, or during installation. This safety assessment is to be reviewed by Tasneef to confirm the adequacy of the proposed arrangements. Relevant information resulted from the safety assessment is to be documented in the ship's ballast water management plan (BWMP). Additional guidance can be found in the IMO BWM.2/Circ.20, "Guidance to ensure safe handling and storage of chemicals and preparations used to treat ballast water and the development of safety procedures for risks to ship and crew resulting from the treatment process".

8.5.2 OZONE INJECTION SYSTEMS

a) Gas Detection

Ozone sensors are to be installed in the immediate vicinity of the ozone generating unit and along the route of the ozone piping where ozone gas could accumulate. The ozone sensors are to activate an alarm at a manned location when a concentration of 0.1 ppm or more is detected.

b) Ozone Pipe Routing

The routing of the ozone piping is to comply with the manufacturer's recommendations and is not to pass through accommodations or service spaces.

c) Specific System Arrangements

The arrangements of an ozone system are to comply with the following:

1) Independent vents from the oxygen receiver safety relief valve and any ozone destructor unit are to be led directly to a place on the open deck where the discharges will not cause a safety or health hazard.
2) Arrangements are to be provided to automatically shut down the system immediately, close the power operated valves and stop all pumps under the following conditions:
   - High ambient oxygen concentration (25%)
   - High ambient ozone concentration (0.2 ppm)
   - The "ozone destructor" (VOD) not being available, if part of the approved system
   - Activation of fire alarm in area of installation; and
   - Emergency stop push bottom pressed.
3) Permanent warning plates are to be installed near any areas into which the oxygen or ozone ould escape.

8.5.3 Electrochloration Systems

a) Installation Arrangement

The electrochloration unit (ECU) of the electrochlorination BWMS is to be installed in an enclosed dedicated space unless specifically approved otherwise. The owner is to confirm that the electrochlorination unit will not result in the generation of excessive amounts of chlorine gas. The selection process shall take into consideration of the ship's operating conditions with specific reference to the pH of the ballast water to be treated by the treatment system.

b) Ventilation Requirements

The space in which the electrochlorination unit is installed is to comply with the ventilation requirements of [4.2.2] b) 2). The ventilation fans are to be non-sparking, suitable for use in hazardous areas and interlocked with the equipment so that the fans will be in operation any time when the electrochlorination unit is in operation.

c) ECU Vents

The exhaust vents for any gases generated in the electrochlorination process that could be flammable or harmful to the crew are to be led directly to a place in the open deck where such discharges will not cause a fire or explosion hazard. Where the vented gas could be flammable, the area within 3 meters (10 feet) around the vent outlet is to be considered to be a hazardous area. If the vented gas could be toxic, the location of the vent outlet is to be based on a gas dispersion analysis.

d) Additional Control Arrangements

Where the potential exists for flammable gases to accumulate inside the ECU when the system is not in operation, the system controls are to be arranged such that the electrodes cannot be energized until the unit is full of water. Similar controls are to be provided for any other portions of the system where flammable gases could accumulate if electrical equipment is installed therein.

e) Gas Detection Arrangements

A fixed hydrogen gas detection system is to be provided in the space housing the ECU and arranged such that the activation of the gas detection alarm will result in an automatic shutdown of all electrical power to the BWMS and activation of the ventilation system.

f) Potential Discharge to Ballast Tanks

The potential of any flammable or toxic gas released into the ballast tanks due to the operation of the electrochlorination system and the associated concentration and volume are to be identified and assessed. Where the concentration and/or volume of any flammable or toxic gases released into the ballast tanks could present a danger to the ship or a hazard to the crew, arrangements are to be provided for the safety of the ship and crew (e.g., suitability of level gauging system in tank, venting location and arrangements, etc.).

8.6 Combination treatment

Installation requirements for combination treatments are subject to all criteria and standards for the individual treatment methods applied to the combination treatment.

8.7 Other treatment types

Ballast water management systems involving process other than those specifically addressed in [8.3] through [8.5] above are subject to special consideration

8.8 Special fire fighting equipment and arrangements

8.8.1 General

The requirements for fire safety are to be identified by the BWMS manufacturer and are to be based on the following principles:

a) The provision of appropriate fire detection and extinguishing system and equipment capable of extinguishing the type and scale of fire likely to occur in association with the installed BWMS.

b) The space containing the BWMS is to be such that the boundaries, will continue the fire for a period of at least one hour, to guard against the escape of flammable or toxic gases, and to minimize the likelihood of ignition.

c) The identification of fire risk of the BWMS, including the active substances or preparations used or generated, and the provisions of effective means to prevent and extinguish fires in the BWMS space is to be submitted for review by Tasneef.

d) Where such special instructions and/ or requirements may interfere with the fire-fighting equipment or system being provided in accordance with other Rule requirements, the same must be clearly identified and addressed to the satisfaction of Tasneef.

8.8.2 Recording in Ship's Manual

The special fire fighting instructions and/or requirements in [8.8.1] above are to be identified in the ship's operating and safety manuals, and placards indicating the same are to be posted in appropriate locations.

9 SEDIMENT CONTROL

9.1 General

Ballast water tanks and their internal structure should be designed to minimize accumulation of sediments and permit for easy cleaning and maintenance. Design guidance of ballast tanks and other design enhancements given in the G12 Guidelines are to be adhered to as far as practicable. There are also practical steps or procedures that can be implemented in the ballast water operation for sediment control. The recommendations given in the G4 Guidelines, Part A, Section 1.3, are to be adhered to as far as practicable. Details of the methods and operational procedures for the sediment management on board the ship, including the disposal of sediments and the associated safety considerations, etc., are to be documented in the ship's ballast water management plan (BWMP)

9.2 Basic requirements

The provisions in this Section address the special requirements associated with the treatment of ballast water from tanks located adjacent to cargo tanks or other hazardous areas on oil or chemical carriers and are to be applied in conjunction with the requirements in Part E, Chapter 7 of the Tasneef Rules.

9.3 BWMS equipment locations

For tankers carrying flammable liquids having a flashpoint not exceeding 60°C or products listed in IBC Code, in general, two independent BWMS may be required - i.e. one for ballast tanks in hazardous areas and the other for ballast tanks in non-hazardous areas.

The possibility exist for BWMS to be located in non-hazardous areas, although serving tanks located in hazardous areas, only if BWMS:

- does not require after treatment, or
- requires after treatment, but it is of the injection type.

Examples of permitted arrangements are shown in Figures 15 and 15.

9.4 Ventilation requirements

The ventilation systems serving spaces containing BWMS equipment are to comply with the requirements in [8.2.2] of this Guide.

9.5 Piping system

9.5.1 General

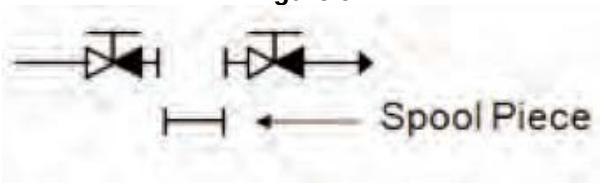
The design and installation of the piping system of a BWMS on an oil or chemical carrier are to comply with the applicable requirements in Part E, Chapter 7 of the Tasneef Rules.

9.5.2 Interconnection Considerations

The interconnection of ballast piping between hazardous areas and in non-hazardous areas may be accepted if an appropriate isolation arrangement is applied. Means of the appropriate isolation are as follows:

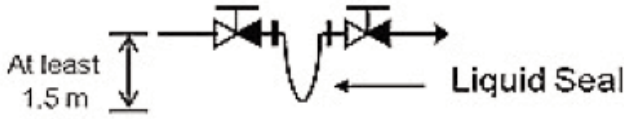
a) Two screw down check valves in series with a spool piece, or

Figure 9



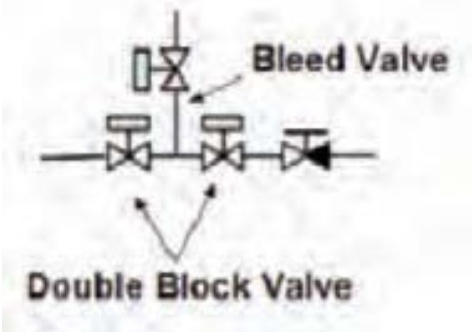
b) Two screw down check valves in series with a liquid seal at least 1.5 m in depth, or

Figure 10



c) Automatic double block and bleed valves and a non-return valve

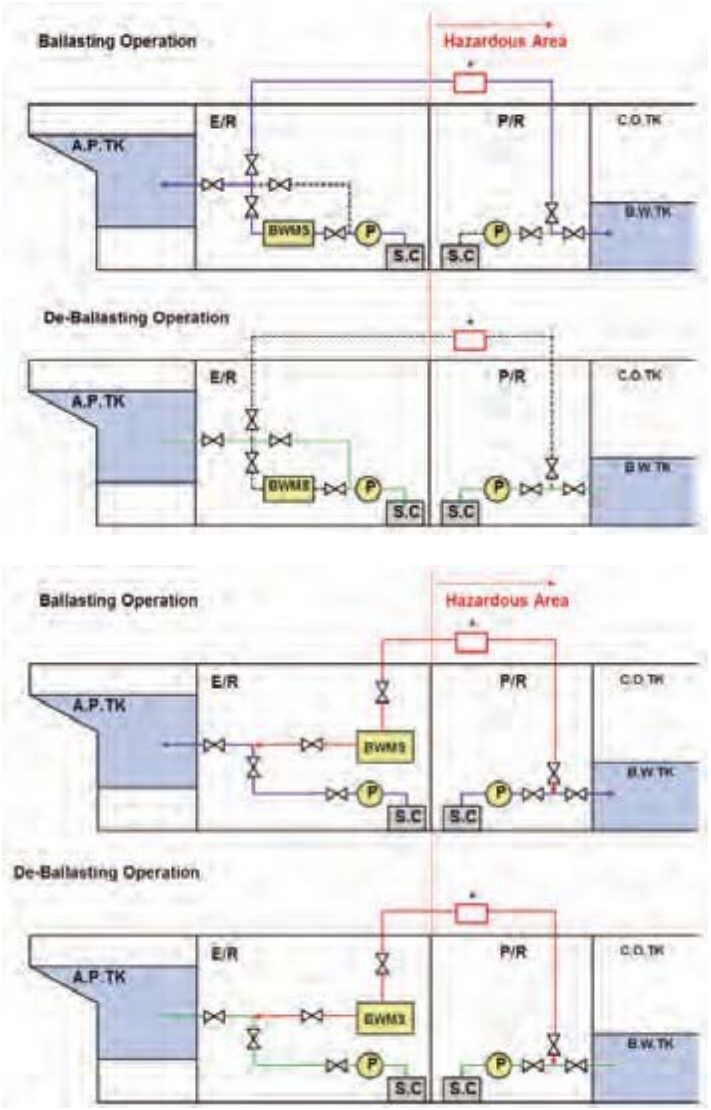
Figure 11



Ballast water originating from a hazardous area is not to discharge in to non-hazardous area, except as allowed for sampling purposes.

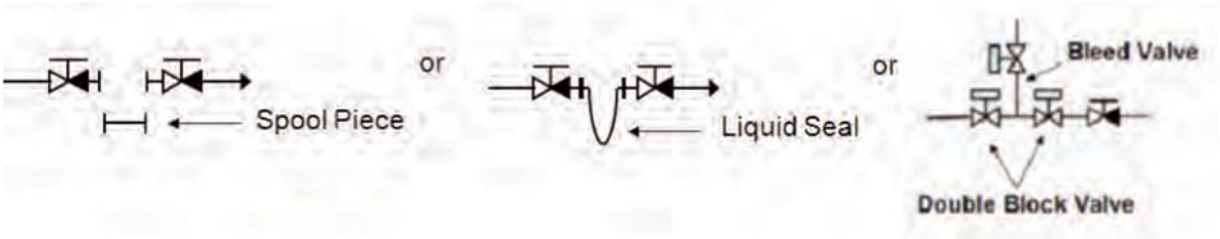
Some examples of appropriate isolation arrangement are shown in the following Fig 12 and Fig 13:

Figure 12: BWMS that does not require after-treatment



: Appropriate Isolation Means: Two (2) screw down check valves in series with a spool piece or a liquid seal, or automatic double block and bleed valves

Figure 15: BWMS that requires after-treatment [Injection type]



Means of the appropriate isolation is to be fitted on the exposed deck of hazardous area.

For BWMS equipment arranged with piping components made of thermoplastic or thermosetting plastic material, it is to comply with the requirements in [8.2.5] c) 2) of this Guide.

9.5.3 Sampling lines and facility

Ballast piping including sampling lines from ballast tanks considered as hazardous areas is not to be led to an enclosed space, regarded as a safe area, without any appropriate measures. However, a sampling point of ballast water containing dangerous gas may be located in a safe area for checking the

performance of BWMS provided the following requirements are fulfilled.

a) The sampling facility is to be located within a gas tight enclosure (hereinafter, referred to as a 'cabinet'), and the following (i) through (iii) are to be complied.
   i) In the cabinet, a stop valve is to be installed in each sample pipe.

   ii) A gas detection equipment is to be installed in the cabinet and the valves specified in i) above are to be automatically closed upon the activation of gas detection

   iii) Audible and visual alarm signals are to be given at a local area and a manned BWMS control station when the concentration of explosive gases reaches a pre-set value, which is not higher than 30% of the lower flammable limit(LFL) of the concerned product.
b) The standard inside diameter of sampling pipes is not to exceed 12 mm
c) The measuring system is to be installed as close to the bulkhead as possible, and the measuring pipe is to be as short as possible in safe areas
d) Stop valves are located in both the suction pipe and return pipe near the penetrations of bulkhead at safe side. A warning plate stating "Keep valve closed when not performing measurements" is to be provided near the valve. Furthermore, in order to prevent the backflow, a water seal is to be installed on the hazardous area side of the return pipe
e) A safety valve is to be installed on the hazardous area side of a sampling line.

9.6 Safety assessment

Where determined to be necessary by Tasneef, a safety assessment study to address the risk to the ship and its crew is to be carried out. The scope of the assessment study is to include at least the following subjects:

a) Equipment locations and hazards associated with the location
b) System monitoring, control and safety systems
c) Operational procedures for the BWMS
d) Maintenance requirements for the BWMS
e) Potential release from the BWMS
f) Interconnection between piping systems and hazards associated with the same g) Ship operations during ballasting and de-ballasting.

The risk/safety assessment should be undertaken prior to the installation of the BWMS, so that any mitigation measures identified during the assessment study can be rectified either prior to, or during installation. This safety assessment study is to be reviewed by Tasneef to confirm the adequacy of the proposed arrangements.

Relevant information resulted from this safety assessment is to be documented in the ship's ballast water management plan (BWMP).

10 BALLAST WATER MANAGEMENT PLAN

10.1.1 General Content

Each ship shall have on board and implement a Ballast Water Management plan. Such a plan shall be approved by the Administration taking into account Guidelines developed by the Organization ("Guidelines for ballast water management and development of ballast water management plans", MEPC.127(53)). The Ballast Water Management plan shall be specific to each ship and shall at least:

a) detail safety procedures for the ship and the crew associated with Ballast Water Management as required by this Convention. Detailed operating and safety manuals are to be provided on board the ship as indicated in [4.1 2], Table 1 and key elements of the manuals are to be included in the ship's Ballast Water Management Plan (BWMP), as appropriate. The manuals are to include the operational, safety and maintenance requirements, as well as occupational health hazards relevant to the ballast water treatment.
b) contain information on Ballast Water Management System used on board
   The operating manuals are to include an outline of the system design conditions that are to be maintained over the life of the system to comply with the approved design. Details of special tools and gauges required for service or repair are to be provided in the manuals. Additionally, the operating manuals are to include detailed instructions for both local and remote control, and guidance on procedures to be followed in the event of a fault or failure of the system.
c) provide a detailed description of the actions to be taken to implement the Ballast Water Management requirements and supplemental Ballast Water Management practices.
   The Ballast Water Management Plan should give guidance on the ballast handling procedures to be followed, including:
   - uptake of ballast water
   - step-by-step procedures and sequences for the Ballast Water Management System used
   - any operational or safety restrictions including those associated with the Ballast Water Management System used.
d) detail the procedures for the disposal of Sediments
   The Plan should include procedures for the disposal of sediments and in particular:
   on the sediment removal or reduction at sea, and when cleaning of the ballast tanks to remove sediments regarding the safety consideration to be taken if tank entry is required to remove sediments regarding the use of port reception facilities for sediments.
e) include the procedures for coordinating shipboard Ballast Water Management that involves discharge to the sea with the authorities of the State into whose waters such discharge will take place
f) designate the officer on board in charge of ensuring that the plan is properly implemented
   A BWM Officer is to be assigned on board the ship. This individual is responsible for the implementation of the BWMP and verifying that all applicable ballast water handling, treatment and maintenance procedures of the ballast water management system are followed and for recording and mainaining the appropriate logs and records.
g) contain the reporting requirements for ships provided for under this Convention
   The Plan should contain guidance on the recording requirements according to ship's Ballast Water Record Book provided for under this Convention including details of exemptions granted to the ship.
h) contain provisions for crew training and familiarization (see [6.1.2])
i) be written in the working language of the ship
j) If the language used is not English, French or Spanish, a translation into one of these languages shall be included.

10.1.2 Provisions for crew training and familiarization

To assist in the implementation of the Ballast Water Management Plan (BWMP), the ship's BWM Officers and crew must be trained in the operation of installed the ballast water management system (BWMS) that they serve and be familiar with the duties assigned and the tasks expected to them. Specifically, the training should include the following, as appropriate:

a) General Information
   - General nature of ballast water management
   - Requirements of the ballast water management convention
   - Information on ballast water management and sediment management practices
   - General aspects of ballast water exchange
   - General aspects of ballast water treatment technologies and approved treatment systems
   - General safety considerations
   - Documentation requirements - ballast water management plan, ballast water management activity logs, and ballast water record book.
b) Ship-Specific
   - Details of the installed ballast water management system – features, components, system processes, control and monitoring, etc.
   - Operating procedures of the BWMS Maintenance requirements and procedures
   - Safety aspects of the treatment system and safe work procedures employed onboard the ship
   - Emergency response plan and preparedness

- Safety precautions for tank entry for sediment removal Procedures for safe handling and packaging of sediment Storage of sediment.

11 USCG REGULATION ON BALLAST WATER MANAGEMENT

11.1 Introduction

- 33 CFR Part 151 Subparts C (Ballast Water Management for Control of Nonindigenous Species in the Great Lakes and Hudson River), D (Ballast Water Management for Control of Non-indigenous Species in Waters of the United States) and Part 162 (Engineering Equipment) entered into force on 21st June 2012.
- 33 CFR Part 151 Subparts C and D provide requirements for ships operating in the Great Lakes, Hudson River and waters of the United States respectively, whilst Part 162 is addressed to manufacturers of ballast water management systems and provides procedures and requirements for their approval with the purpose of complying with the ballast water discharge standard of 33
- CFR part 151 subparts C and D.

11.2 The main requirements

All non-recreational vessels equipped with ballast tanks and operating in the waters of the United States are required to use an approved ballast water treatment system (BWTS) meeting the US ballast water discharge standard (equivalent to the IMO D-2 standard) according to the following scheme:

a) New ships with any ballast capacity have to be in compliance on or after 1st December 2013.
b) Existing ships with less than 1,500 m3 ballast water capacity have to be in compliance by the first scheduled drydocking after 1st January 2016.
c) Existing ships with 1,500 - 5,000 m^3 ballast water capacity have to be in compliance by the first scheduled drydocking after 1st January 2014.
d) Existing ships with more than 5,000 m^3 ballast water capacity have to be in compliance by the first scheduled drydocking after 1st January 2016

In the period between the entry into force of the new requirements (21st June 2012) and the installation onboard of the BWTS as per points b), c) and d) above, existing ships are required to perform complete ballast water exchange in an area of 200 nautical miles from any shore prior to discharging ballast water.

Existing ships means ships constructed before 1st December 2013.

11.3 Tasneef publications on this issue

In order to keep all the stakeholders informed on the latest developments of the USCG regulation on ballast water management Tasneef published, starting from April 2012, the following Marine Information Notices (MNO), which can be found in the Annex to this Technical Bulletin:

a) Issue no. 48 (April 2012) - New US regulations on ballast water management
b) Issue no. 65 (June 2013) - Ballast Water Management: Revised Implementation Scheme of the IMO Convention, Ships < 400GT – Compliance with the IMO Convention, Certification of Mobile Offshore Units, Use of Drinking Water as Ballast Water and Update on Alternate Management System (AMS) Accepted by the USCG
c) Issue no. 74 (December 2013) - US Ballast Water Rules: extension request clarifications provided by USCG;
d) Issue no. 82 (May 2014) - US Ballast Water Rules: extension request clarifications provided by USCG – REVISED;
e) Issue no. 102 (November 2015) - US Ballast Water Rules: revised guidance to owners and operators seeking to extend compliance dates.