GUIDANCE FOR THE APPROVAL AND TYPE APPROVAL OF MATERIALS AND EQUIPMENT FOR MARINE USE

Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use 2017 AMENDMENT NO.2

Notice No.74 8 September 2017
Resolved by Technical Committee on 30 January 2017

ClassNK
NIPPON KAIJI KYOKAI

Notice No.74 8 September 2017
AMENDMENT TO THE GUIDANCE FOR THE APPROVAL AND TYPE APPROVAL OF MATERIALS AND EQUIPMENT FOR MARINE USE

"Guidance for the approval and type approval of materials and equipment for marine use" has been partly amended as follows:

Part I GENERAL

Chapter 1 GENERAL

1.1 Application

Sub-paragraph -1 has been amended as follows.

1 This guidance applies to tests and inspection of materials and equipment for marine use for which advance approval or type approval by the NIPPON KAIJI KYOKAI (hereinafter referred to as "the Society") are required by the relevant requirements in **Rules for the Survey and Construction of Steel Ships**, **Rules for Cargo Handling Appliances**, **Rules for Cargo Refrigerating Installations**, **Rules for Diving Systems, Rules for Marine Pollution Prevention Systems**, **Rules for Ballast Water Management Installations**, **Rules for Safety Equipment**, **Rules for the Survey and Construction of Passenger Ships**, **Rules for High Speed Craft**, **Rules for the Survey and Construction of Inland Waterway Ships**, **Rules for the Survey and Construction of Ships of Fibreglass Reinforced Plastics** and **Rules for Floating Docks**, and their Guidance (hereinafter referred to as "Rules etc.").

Part 2 EQUIPMENT

Chapter 11 has been added as follows.

Chapter 11 BALLAST WATER MANAGEMENT SYSTEMS

11.1 General

11.1.1 Scope

This chapter applies to the procedures and testing requirements for the approval of manufacturing processes of ballast water management systems (*BWMS*) which are to be equipped on ships in accordance with the requirements of in **3.3-1(1), Part 3 of the Rules for Ballast Water Management Installations**.

11.1.2 Definitions

The definitions of terms which appear in this chapter are to be as specified in **Chapter 2, Part 1 of the Rules for Ballast Water Management Installations** and according to the following:

(1) "Ballast water performance standard" means **3.2, Part 3 of the Rules for Ballast Water Management Installations**.

(2) "Land-based testing" is a test of the *BWMS* carried out in a laboratory, equipment factory or pilot plant including a moored test barge or test ship in order to confirm that the *BWMS* meets the ballast water performance standards.

(3) "Shipboard testing" is a full-scale test of a complete *BWMS* carried out on board a ship to confirm that the system meets the ballast water performance standards.

(4) "Full-scale test" means shipboard testing carried out on a ship with ballast tanks having enough capacity for the treatment of ballast water as well as the *BWMS* without affecting normal ballast operation.

(5) "Minimum dimension" is the smallest dimension of width, length or thickness of the organisms.

(6) "Treatment Rated Capacity" (*TRC*) is the maximum continuous capacity expressed in cubic meters per hour for which the *BWMS* is type approved. It states the amount of ballast water that can be treated per unit time (m^3/h) by the *BWMS* to meet the ballast water performance standard.

(7) "Viable organisms" are organisms and any life stages thereof that are living.

(8) "Test plan" describes the detailed schedule of all testing, including environmental testing, land-based testing and shipboard testing.

(9) "Invalid test cycle" means the density (organisms greater than or equal to 50μm and less than 50μm in minimum dimension, test organisms of greater than or equal to 10μm or more in minimum dimension) of viable organisms when both untreated and treated ballast water are uptaken at a rate equal to or less than 10 times the ballast water performance standard during shipboard testing.

(10) "Unsuccessful test cycle" means shipboard test cycles other than successful test cycles, invalid test cycles and test cycles which cannot satisfy the ballast water performance standard.

(11) "Replicate sample" means a sample which is taken by repeating the same action.

11.1.3 Requirements of International Convention

With respect to the approval tests and inspections for *BWMS*, the Society may apply special

requirements as instructed by the flag-governments of ships in addition to the requirements in this part.

11.2 Approval Application

11.2.1 Approval Application Forms

Manufacturers who apply for the manufacturing process approval for *BWMS* in accordance with this chapter are to submit an approval application form to the Society.

11.2.2 Documents to be Submitted

1 The drawings and documents listed below are to be submitted in triplicate together with the application specified in **11.2.1**.

(1) Documents describing the manufacturing plant outline
(2) Documents related to the quality control standards of *BWMS*
(3) Records of manufacture and delivery of the *BWMS*
(4) Drawings and documents for the *BWMS*
  (a) Complete description of the *BWMS*
  (b) Construction drawings (with all dimensions necessary for evaluation) of the *BWMS*
  (c) Drawings of the main components (showing clearly all materials used) of the *BWMS*
  (d) Diagrammatic drawings (including the pumping and sampling facilities)
  (e) Drawings for sampling facilities
  (f) Electrical and electronic wiring diagrams (including information for trouble-shooting, etc.)
  (g) Operation, maintenance, emergency and trouble-shooting manuals
  (h) Process description of the treatment of the ballast water
  (i) Technical installation specifications of the *BWMS*
(5) Record of the "Basic and Final Approval of Active Substances and Preparations" (in cases where the system results in changes to the chemical composition of the treated water)
(6) Approval test plan (including information on the place and scheduled date of the test)
(7) Test records (if any preliminary tests were carried out)
(8) Other information deemed necessary by the Society

2 In cases where the system makes use of active substances or preparations, the following documents are to be submitted in triplicate for reference in addition to those listed in **1** above.

(1) Documents related to *IMO* approval in accordance with *IMO* Resolution *MEPC.*169(57) "*Procedure for Approval of Ballast Water Management Systems that Make Use of Active Substances (G9)*", as amended.
(2) Documents of items pointed out by *IMO* during the approval process and any relevant follow-up action taken as a result.

3 Notwithstanding the requirements in **1** and **2** above, submission of part or all of the documents may be omitted if the manufacturer has previously obtained Society approval for a *BWMS*, and the duplicated items are included therein.

11.3 Preliminary Review

11.3.1 Approval of Test Plan

In cases where the approval test plan specified in **11.2.2-1** is considered appropriate, the Society will approve it and return to the applicant.

11.3.2 Confirmation Survey of Manufacturing Factory or Facility

When judged necessary, the Society may carry out a confirmation survey of the facilities, manufacturing techniques, and product quality control as well as an internal inspection of the manufacturing factory or facility based upon the data specified in **11.2** in order to verify the factory's or facility's ability to manufacture the ballast water treatment system at a stable quality.

11.4 Requirements of Construction and Performance

11.4.1 Ballast Water Management System (*BWMS*)

(1) The *BWMS* is not to contain or use any substance of a dangerous nature, unless adequate arrangements for storage, application, mitigation, and safe handling, acceptable to the Society, are provided to mitigate any hazards introduced thereby.

(2) In case of any failure compromising the proper operation of the *BWMS*, audible and visual alarm signals are to be given in all stations from which ballast water operations are controlled.

(3) All working parts of the *BWMS* that are liable to wear or to be damaged are to be easily accessible for maintenance.

(4) To avoid any incorrect operation of the *BWMS*, its specifications and construction are be as follows.

  (a) Every access of *BWMS* beyond the essential requirements of **(3)** above is to require the breaking of a seal.

  (b) The *BWMS* is to be so constructed that a visual alarm is always activated whenever *BWMS* is in operation for purposes of cleaning, calibration or repair, and these events are to be recorded by the control equipment.

  (c) In the event of an emergency, suitable by-passes or overrides to protect the safety of the ship and personnel are to be installed.

  (d) The installations specified **(c)** above are to activate an audible and visual alarm, and the event is to be recorded by the control equipment.

11.4.2 Ballast Water Treatment Equipment

(1) Ballast water treatment equipment is to be robust and suitable for working in the shipboard environment, is to be of a design and construction adequate for the service for which it is intended and is to be so installed and protected as to reduce to a minimum any danger to persons onboard, due regard being paid to hot surfaces and other hazards. The design is to have regard to materials used in construction, the purpose for which the equipment is intended, the working conditions to which it will be subjected and the environmental conditions on board.

(2) Ballast water treatment equipment is to be provided with simple and effective means for its operation and control. It is to be provided with a control system that is to be such that the services needed for the proper operation of the ballast water treatment equipment are ensured through the necessary automatic arrangements.

(3) Ballast water treatment equipment and its relevant electrical equipment are to be of explosion-protected type, if intended to be fitted in locations where flammable atmospheres may be present. Any moving parts fitted in such locations are to be arranged so as to avoid the formation of static electricity.

11.4.3 Control and Monitoring Equipment

(1) The *BWMS* is to incorporate control equipment that automatically monitors and adjusts necessary treatment dosages or intensities or other aspects of *BWMS* of the vessel, which while not directly effecting treatment, are nonetheless required for proper administration of

the necessary treatment.

(2) Control equipment is to incorporate a continuous self-monitoring function during the period in which the *BWMS* is in operation.

(3) Monitoring equipment is to record the proper functioning or failure of the *BWMS*.

(4) Control equipment is to be able to store data for at least 24 months, and is to be able to display or print a record for inspections. In the event the control equipment is replaced, means is to be provided to ensure the data recorded prior to replacement remains available on board for 24 months.

(5) Control equipment is to be provided with the ability to correct and re-zero the control equipment meters and the repeatability of the values obtained from measurements.

11.4.4 Sampling Facilities

(1) The *BWMS* is to be provided with sampling facilities so arranged as to collect representative samples of the ship's ballast water.

(2) Sampling facilities are to in any case be located on the *BWMS* intake, before the discharging points, and any other points necessary for sampling to ascertain the proper functioning of the equipment as may be determined by the Society.

11.4.5 Other

Electrical and electric equipment installed on weather decks is to comply with IP56 in accordance with *IEC Publication*, or any equivalent thereto.

11.5 Approval Test

11.5.1 General

In cases where products for which approval tests are required are produced, the approval test is to be carried out in accordance with an approval test plan approved by the Society.

11.5.2 Test Witnessing by the Society's Surveyor

The Society's Surveyor is to be present, as a rule, to witness the approval test when the test is being carried out.

11.5.3 Test Items

Test items are the following items and the details of each test is specified in **11.5.4** to **11.5.6**. However, additional tests may be required in cases where deemed necessary by the Society.

(1) Environmental testing

(2) Land-based testing

(3) Shipboard testing

11.5.4 Environmental Testing

As for the electrical and electronic sections which make up the *BWMS*, tests are to be carried out in accordance with the test conditions and test methods specified in **Table.2.11-1**, and the satisfaction of the acceptance criteria in **Table.2.11-1** is to be confirmed. In addition, equipment is to be operated satisfactory upon completion of each of the operating environment tests specified in **Table.2.11-1**.

11.5.5 Land-based Testing

1 The test set-up

Land-based testing is to be carried out by using test facilities which satisfy the following

specifications.

(1) The following facilities are to be provided in accordance with the typical character and the arrangement of the ship (refer to **Fig.2.11-1**).
   (a) The *BWMS*;
   (b) Pumps in accordance with the treated capacity and pipping; and
   (c) The control and treated simulated ballast tanks to simulate a ballast tank, constructed such that the water in the tank is completely shielded from light.

(2) The requirements for the control and treated simulated ballast tanks that simulates a ballast tank are as follows.
   (a) a minimum capacity of 200 m^3;
   (b) normal internal structures, including lightening and drainage holes;
   (c) follow standard industry practices for design, construction and surface coatings for ships; and
   (d) incorporate the minimum modifications required for structural integrity on land.

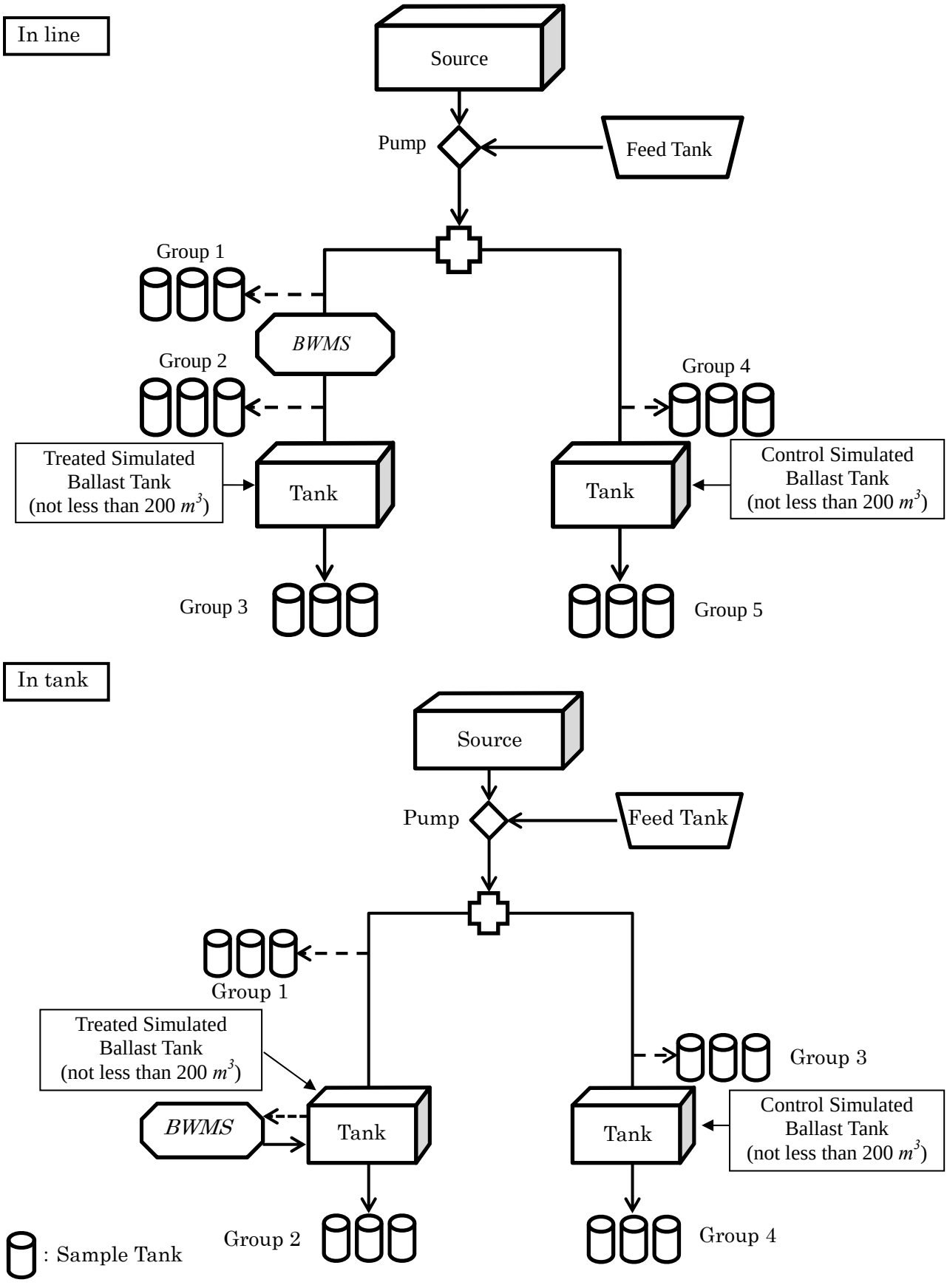
(3) The test set-up is to include facilities to allow sampling and provisions to supply influent test water to the *BWMS*.

(4) The test set-up is to be pressure-washed with tap water, dried and swept to remove loose debris, organisms and other matter before starting the testing procedures.

Table 2.11-1 Methods and Acceptance Criteria for Environmental Testing

<table>
<tr><th>Test Items</th><th>Test Condition and Test Method</th><th>Acceptance Criteria</th></tr>
<tr><td>Vibration Tests</td><td>(1) An oscillation frequency of 2 Hz to 80 Hz at the operational condition of the equipment, sweep tests which sweeps at vibration amplitude or acceleration specified in below resonance and searches the resonance are to be carried out in each of the three orthogonal planes at a rate sufficiently low to permit resonance detection.
<table>
<tr><th>Oscillation Frequency</th><th>Vibration Amplitude or Acceleration</th></tr>
<tr><td>2 Hz to 13.3 Hz
13.2 Hz to 80 Hz</td><td>Vibration Amplitude ±1.0 mm
Acceleration ±0.7 g</td></tr>
</table>
(2) In the absence of any resonant frequency, the equipment is to be vibrated in each plane at 30 Hz with an acceleration of 0.7 g for a period of two hours.
(3) In the presence of any resonant frequency, the equipment is to be vibrated by the resonant frequency (the vibration amplitude or acceleration is to be the same as for the sweep test.) for a period of two hours.
(4) After completion of the above test, a sweep test is to be carried out in accordance with the condition specified in above (1).</td><td>(1) (2) (3): There is no break, deformation or erroneous system performance.
(4): There is no break, deformation, erroneous system performance or significant change in the vibration pattern.</td></tr>
<tr><td>Temperature Tests</td><td>(1) Equipment that is to be installed in an enclosed space which is environmentally controlled, including engine-rooms, is to be subjected, for a period of not less than two hours, to temperature conditions of 0°C and 55°C. At the end of each test referred to in the subparagraphs above, the equipment is to be switched on and is to function normally under the test conditions.
(2) Equipment that may be installed in exposed areas on open decks, or in an enclosed space not environmentally controlled is to be subjected, for a period of not less than two hours, to temperature conditions of -25°C and 55°C. At the end of each test referred to in the subparagraphs above, the equipment is to be switched on and is to function normally under the test conditions.</td><td>Confirm that there is no break, deformation or erroneous system performance.</td></tr>
<tr><td>Humidity Tests</td><td>Equipment is to be left switched off for a period of two hours at a temperature of 55°C in an atmosphere with a relative humidity of 90%. At the end of this period, the equipment is to be switched on and is to operate satisfactorily for one hour under the test conditions.</td><td>Confirm that there is no break, deformation or erroneous system performance.</td></tr>
<tr><td>Fluctuation in Power Supply</td><td>Equipment is to operate satisfactorily when affected by the following external power sources:
(1) a voltage variation of ±10% together with a simultaneous frequency variation of ±5%; and
(2) a transient voltage of ±20% together with a simultaneous frequency transient of ±10%, with a transient recovery time of three seconds.</td><td>Confirm normal operation</td></tr>
<tr><td>Inclination Test</td><td>The BWMS is to be designed to operate when the ship is upright and when inclined at any angle of list up to and including 15° either way under static conditions and 22.5° under dynamic conditions (rolling) either way and simultaneously inclined dynamically (pitching) 7.5° by bow or stern. The Society may permit deviation from these angles, taking into consideration the type, size and service conditions of the ship and operational functioning of the equipment.</td><td>Confirm normal operation</td></tr>
</table>

Fig.2.11-1 Schematic Diagram of Land-based Testing



2 The application of downsized similarity of *BWMS* for land-based testing

With respect to the land-based testing of *BWMS*, downsized similarity may be accepted only if the *BWMS* satisfies the following conditions.

(1) There is no alternation in the basic design of the *BWMS*.

(2) An in-line method *BWMS* is to be one of the following **(a)** to **(c):**

(a) The *TRC* of the *BWMS* exceeds 200 m^3/h;

(b) The *BWMS* whose *TRC* exceeds 200 m^3/h but is less than 1,000 m^3/h may be downscaled to a maximum of one-fifth scale. In such cases, however, it is not to be smaller than 200 m^3/h.

(c) The *BWMS* whose *TRC* is 1,000 m^3/h or larger may be downscaled to a maximum of one-one hundredth scale in the similarity range, but is not to be smaller than 200 m^3/h.

(3) The performance of an in-tank method *BWMS* is to be tested in the demonstrable similarity range.

(4) Any downscaling is not to affect the ultimate functioning and effectiveness of the *BWMS*. This is to be certified by using mathematical modelling and/or calculations.

(5) In cases where the applicant desires approval of a smaller treated capacity model than a land-based testing model which satisfies **(1)** to **(4)** above, it is to be certified that the similarity scaling and flow rate will not affect the performance of the *BWMS*.

3 Influent Water

(1) Test organisms may be either naturally occurring in the test water, or cultured species that may be added to the test water. The organism concentration in the influent water is to comply with following requirements. Furthermore, the treatment of in case of adding cultured species is to be followed in accordance with Part 4 of Annex *IMO* Resolution *MEPC.*174(58) "*Guidelines for Approval of Ballast Water Management Systems (G8)*"(as amended) or the methods which are deemed equivalent thereto by the Society.

(a) Viable organisms of greater than or equal to 50 μm or more in minimum dimension are to be present in a total density of preferably 10^6 but not less than 10^5 individuals per cubic meter, and are to consist of at least 5 species from at least 3 different phyla/divisions ;

(b) Viable organisms greater than or equal to 10 μm and less than 50 μm in minimum dimension are to be present in a total density of preferably 10^4 but not less than 10^3 individuals per milliliter, and are to be consisted of at least 5 species from at least 3 different phyla/divisions; and

(c) Heterotrophic bacteria are to be present in a density of at least 10^4 living bacteria per milliliter.

(2) Land-based testing is to be carried out taking into account quarantine and discharge regulations.

(3) At least two sets of tests cycles (5 replicates is considered a set) are to be carried out using influent water which includes with 2 kinds of salinity ranges and the density of Dissolved Organic Carbon (*DOC*), Particulate Organic Carbon (*POC*) and Total Suspended Solids (*TSS*) prescribed in **Table 2.11-2**. Furthermore, in cases where two sets of tests are carried out under adjacent salinity ranges, each salinity range is to be separated by at least 10 *PSU* (*Practical Salinity Unit*). For a *BWMS* which makes use of active substances, in cases where the density of *DOC*, *POC* and *TSS* are adjusted artificially, the change of the density active substance and relevant residual production as well as the formation of relevant residual production which were applied and approved are to be confirmed in accordance with *IMO* Resolution *MEPC.*169(57) "*Procedure approval of ballast water management systems that use of active substances (G9)*", as amended.

4 Test Items

The methods and acceptance criteria for land-based testing are specified in **Table 2.11-3**.

Table 2.11-2 Influent Water

	Salinity		
	>32 *PSU*	3 to 32 *PSU*	<3 *PSU*
Dissolved Organic Carbon (*DOC*)	>1 *mg/l*	>5 *mg/l*	>5 *mg/l*
Particulate Organic Carbon (*POC*)	>1 *mg/l*	>5 *mg/l*	>5 *mg/l*
Total Suspended Solids (*TSS*)	>1 *mg/l*	>50 *mg/l*	>50 *mg/l*

Table 2.11-3 Methods and Acceptance Criteria for Land-based Testing.

Test Items	Test Method	Acceptance Criteria
Land-based Testing	1. A single test cycle is to be as follows, and 5 test cycles are to be carried out. (refer to **Fig.2.11-1**) (1) the uptake of ballast water by pumping; (2) the storage of ballast water for at least 5 days *[1]; (3) treatment of ballast water within the *BWMS*, except the influent water in the simulated ballast water tank*[2]; and (4) the discharge of ballast water by pumping.	・To be carried out in accordance with the test plan. ・No incorporating of sea water and tank leakage. ・To be performed in accordance with the *TRC* specified in the test plan.
	2. The following items are to be recorded for each sample taken . (1) The number of viable organisms is to be measured and recorded. The phylum and kind of the organisms is to be based upon size class in accordance with the minimum dimension of the sample. (2) The number of the following bacteria in the sample is to be measured and recorded: (a) Coliform group and coliform; (b) Enterococcus group and enterococcus; (c) Vibrio cholerae and vibrio cholera of toxin production (serotype O-1 and O-139); and (d) Heterotrophic bacteria. (3) Parameters (e.g., treatment flow rate, *UV* transmission, concentration of injection medicine, filter differential pressure, concentration of total residual oxidants (*TRO*) and power consumption, etc.) which affected the *BWMS* during the test cycle are to be recorded. It is to be verified that the treatment equipment performs within its specified parameters, such as power consumption and flow rate, during the test cycle. (4) When the sample is taken, its *pH*, temperature, salinity, dissolved oxygen, *DOC*, *POC*, *TSS* and turbidity (*NTU: Nominal Turbidity Unit*) are to be recorded.	・The organism concentration of the influent water is to satisfy **11.5.6-3.**

Table 2.11-3 Methods and Acceptance Criteria of Land-based Testing (continued)

Test Items	Test Method	Acceptance Criteria
Land-based Testing	3. Samples are to be taken in accordance with the following, and an analysis of the organisms and bacteria found in each sample is to be carried out. (1) Samples during the test are to be taken immediately before the treatment equipment, immediately after the treatment equipment and upon discharge. (2) The control*[3] and treatment*[4] cycles may be run simultaneously or sequentially. The influent water is to be taken upon influent and discharge. (3) The preparation and facilities for samples are to be taken into consideration so as to have as little adverse effects as possible on the organisms. (4) When taking the samples specified in Fig. **2.11-1**, each sample is to be taken 3 times from groups 1 to 5 in the case of in-line types, from groups 1 to 4 in the case of in-tank types. (5) Samples for measuring the following organism and bacteria are to be collected as separate samples each. (a) organisms greater than or equal to 50 μm in minimum dimension; (b) organisms greater than or equal to 10 μm and less than 50 μm in minimum dimension; and (c) Coliform group and coliform, enterococcus group and enterococcus, vibrio cholerae and vibrio cholera of toxin production (serotype O-1 and O-139) and heterotrophic bacteria.	・For 1 test cycle, the average discharge result of organisms of greater than or equal to 50 μm, no greater than 50 μm and greater than or equal to 10 μm in minimum dimension from control water is to be over 10 times of ballast water performance standard. ・As for the treated water at the time of discharge, the average number of viable organisms greater than or equal to 50 μm in minimum diameter in the replicate sample is to be less than 10 viable organisms per cubic metre. ・As for the treated water at the time of discharge, the average number of viable organisms of greater than or equal to 10 μm and less than 50 μm in minimum dimension during replicate sampling are to be no greater than 10 per 1 *ml*. ・As for the treated water at the time of discharge, the average number of the colony of vibrio cholera of toxin production (serotype O-1 and O-139) is to be less than 1 *cfu* per 100 *ml*, or less than 1 *cfu* per 1 *g* (wet weight) of zooplankton samples. ・As for the treated water at the time of discharge, the average number of the colony of coliform in the replicate samples is to be less than 250 *cfu* per 100 *ml*. ・As for the treated water at the time of discharge, the average number of the colony of enterococcus in the replicate samples is to be less than 100 *cfu* per 100 *ml*.
	4. Analysis of the amount of sample water, organism and bacteria is to be carried out in accordance with the following: (1) For a comparison of organisms of greater than or equal to 50 μm in minimum dimension included in the sample water against the ballast water performance standard, at least 20 *l* of influent water and l cubic metre of treated water are to be collected 3 times. If samples are concentrated for enumeration, the samples are to be concentrated using a sieve no greater than 50 μm mesh in the diagonal dimension. (2) For the evaluation of organisms greater than or equal to 10 μm and less than 50 μm in minimum dimension included in sample water, at least 1 *l* of influent water and at least 10 *l* of treated water are to be collected. If samples are concentrated for enumeration, the samples are to be concentrated using a sieve no greater than 10 μm mesh in the diagonal dimension. (3) For the evaluation of bacteria, at least 500 *ml* of each sample is to be collected in sterile bottles. (4) The samples are to be analysed for viable organisms within 6 hours of being taken or treated in such a way so as to ensure that proper analysis can be performed.	・The statistical analysis of *BWMS* is to consist of a t-test*[5] which compares the water of the control and treatment or a similar statistical test. ・The live/dead judgement of the organism and the measurement of the number of viable organisms are to be according to the methods specified in Part 4 of the *Annex* of *IMO* Resolution *MEPC.*174(58) "*Guidelines for Approval of Ballast Water Management Systems (G8)*" (as amended) or methods which are deemed equivalent thereto by the Society.

Notes:

The order of (*1) and (*2): To be taken using the actual treatment method of the *BWMS.*

(*3) The control cycle: The leading cycle of the influent water from the source tank to the control tank.

(*4) The treatment cycle: The leading cycle of the influent water from the source tank to the control tank through the *BWMS.*

(*5) t-test: the statistical number using a mathematical distribution (t-distribution).

11.5.6 Shipboard Testing

During shipboard testing, it is to be verified that the entire *BWMS* is in good working order and complies with the ballast water performance standard on a ship in which it is actually in use.

1 Testing Conditions

(1) Shipboard testing is to be carried out in accordance with the test plan.

(2) The *BWMS* is to be operated at the *TRC* described in the test plan.

(3) The amount of ballast water tested during shipboard testing is to be consistent with the normal ballast operations of the ship.

(4) The discharge of treated ballast water in three consecutive valid test cycles is to be in compliance with the ballast water performance standard.

(5) The viable organism concentrations contained in both the untreated ballast water and ballast water intended to be treated (limited to organisms greater than or equal to 50 μm in minimum dimension and organisms greater than or equal to 10 μm and less than 50 μm) are to exceed 10 times the value of the ballast water performance standard upon uptake, and the viable organism concentration contained in the untreated ballast water (limited to organisms greater than or equal to 50 μm in minimum dimension and organisms greater than or equal to 10 μm and less than 50 μm) is to exceed the values of the ballast water performance standard upon discharge.

(6) The test cycles, including invalid and unsuccessful test cycles, are to span a trial period of not less than six months.

(7) The quality of water such as *pH*, temperature, salinity, dissolved oxygen, *DOC*, *POC*, *TSS* and turbidity is to be measured and recorded at the time the samples are taken.

(8) The following items relevant to the *BWMS* are to be recorded during the shipboard testing:

(a) Ballast water operations including the volumes and locations (port or location information) of uptake and discharge, and if heavy weather was encountered;

(b) Investigations and reports of the possible reasons for the occurrence of an unsuccessful test cycle, or a test cycle discharge failing the ballast water performance standard;

(c) A record of any maintenance and repairs performed on the *BWMS* during the testing;

(d) The operation record of any parameters (e.g., treatment flow rate, *UV* transmission, concentration of injection medicine, filter differential pressure, concentration of total residual oxidants (*TRO*) and power consumption, etc.) which affected the *BWMS*; and

(e) Functioning of the control and monitoring equipment of the *BWMS*.

2 Test Items

The test method and acceptance criteria are shown in **Table 2.11-4**.

Table 2.11-4 Test Method and Acceptance Criteria of Shipboard Testing

Test items	Test method	Acceptance criteria
Shipboard testing	**1** A shipboard test cycle includes steps (1) to (4) below: (1) The uptake of ballast water of the ship; (2) The storage of ballast water on the ship*[1]; (3) The treatment of the ballast water, except in control tanks*[2]; and (4) The discharge of ballast water from the ship.	・No contamination by sea water and leakage from tanks, etc. is observed. ・The *BWMS* is operated at the *TRC* described in the test plan.
	2 Samples are to be taken in accordance with the following, and the analysis of the organisms and bacteria included in each sample is to be carried out. (1) For the control tank (a) Three replicate samples of influent water, collected over the period of uptake (beginning, middle, and end). (b) Three replicate samples of discharge control water, collected over the period of discharge (beginning, middle, and end). (2) For treated ballast water Three replicate samples of discharge treated water, collected at each of three times during the period of discharge (3 times at the beginning, 3 times at the middle, and 3 times at the end). (3) Sample size (a) For the enumeration of organisms greater than or equal to 50 *μm* in minimum dimension, samples of at least 1 m^3 are to be collected. If samples are concentrated for enumeration, the samples are to be concentrated using a sieve no greater than 50 *μm* mesh in diagonal dimension. (b) For the enumeration of organisms greater than or equal to 10 *μm* and less than 50 *μm* in minimum dimensions, samples of at least 1 *l* are to be collected. If samples are concentrated for enumeration, the samples are to be concentrated using a sieve no greater than 10 *μm* mesh in in diagonal dimension. (c) For the evaluation of bacteria, a sample of at least 500 *ml* is to be taken from both the influent and the treated water. In the absence of laboratory facilities on board, toxicogenic tests based upon requirements are to be conducted in an appropriately approved laboratory. However, this may limit the applicability of this test.	・The viable organism concentration contained in the uptake water (limited to organisms greater than or equal to 50 *μm* in minimum dimension and organisms greater than or equal to 10 *μm* and less than 50 *μm*) exceeds 10 times the value of the ballast water performance standard, and control tank viable organism concentration exceeds the values of the ballast water performance standard upon discharge. ・The average density of organisms greater than or equal to 50 *μm* in minimum diameter in replicate samples is less than 10 viable organisms per cubic meter upon discharge. ・The average density of organisms less than 50 *μm* and greater than or equal to 10 *μm* in minimum diameter in replicate samples is less than 10 viable organisms per milliliter upon discharge. ・The average density of vibrio cholera (serotype O-1 and O-139) is less than 1 *cfu* per 100 *ml*, or less than 1 *cfu* per 1 *g* (wet weight) zoo plankton samples upon discharge. ・The average density of E.coil in the replicate samples is less than 250 *cfu* per 100 *ml* upon discharge. ・The average density of intestinal enterococci in the replicate samples is less than 100 *cfu* per 100 *ml* on discharge. ・Determination of the viability and the enumeration of viable organism concentration is to be carried out in accordance with Part 4 of the *Annex* of *IMO Res. MEPC.*174(58) *"Guidelines for Approval of Ballast Water Management Systems (G8)"*, as amended, or by methods which are deemed equivalent by the Society.

Note:

The order of (*1) and (*2) : To be taken using the actual treatment method of the *BWMS.*

11.6 Approval

11.6.1 Test Records

The manufacturer is to prepare records of the approval test after completion of the test, to obtain verification by the Society's attending surveyor and then to submit them, in triplicate, to the Society.

11.6.2 Notification of Approval

The Society, when satisfied upon examination of the submitted documents and the attending surveyor's report, will issue a certificate of approval specifying the approval number, approval date, items of approval and approval conditions. In addition, the Society will affix approval stamps onto documents it deems necessary out of those submitted in accordance with **11.2**, and return them back to the applicant.

11.6.3 Renewal of Approval

1 The term of validity of approval in the preceding **11.6.2** will be 5 years.

2 In cases where renewal of validity is intended, the manufacturer is to submit the necessary documents together with the existing certificate in accordance with the requirements of **11.2**. In such cases, the documents specified in **11.2** may be limited to the portion subjected to modification only.

3 When approval has been granted to an application with partial changes in the content of approval, the Society may require additional tests for approval.

11.6.4 Revocation of Approval

When any of the following **(1)** to **(5)** cases applies, the Society will revoke the type approval and notify the manufacturer of such accordingly.

(1) When the plant or system for which the approval was granted is no longer deemed suitable for the approval in line with the implementation or revision of international conventions, laws, and regulations.

(2) In cases where the validity of approval is overdue and no application for renewal of the approval has been submitted.

(3) When serious shortcomings are found in the structure or quality of a plant or system already approved after it has been installed onboard ship.

(4) When an application for revocation is made by the manufacturer.

(5) Where there is any doubt as to the implementation status and results of the quality and the quality control of the production.

11.7 Examination of Products

11.7.1 Examination of Products

For each component of a system supplied to an individual ship after obtaining approval by the Society, the following tests and examinations are to be carried out in the presence of the Surveyor in order to confirm that the products have been manufactured to the same specifications as those used for the approval test of the system. However, where the quality management system of the manufacturers who produce each component of the system is to the satisfaction of the Society, the frequency of the Surveyor's attendance at examinations of a product may be reduced based upon the provisions set forth in **B2.1.4-6 of Part B of the Guidance for the Survey and Construction of Steel Ships**.

(1) Visual inspection;
(2) Dimensional inspection and examination of construction;
(3) Performance tests of safety devices and alarms; and
(4) Other tests deemed as necessary by the Society.

11.8 Announcement of Approval

11.8.1 Announcement of Approval

A system approved by the Society is to be marked with the following items.

(1) Type and name of product
(2) Mark to prove that the product is approved by the Society. It may be marked simply with "NK".
(3) Name of manufacturer
(4) Approval number

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 8 September 2017.