

**RESOLUTION MEPC.140(54)**

**Adopted on 24 March 2006**

**GUIDELINES FOR APPROVAL AND OVERSIGHT OF PROTOTYPE BALLAST  
WATER TREATMENT TECHNOLOGY PROGRAMMES (G10)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

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

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

NOTING FURTHER that regulation D-4.3 of the Ballast Water Management Convention provides that, in establishing and carrying out any programme to test and evaluate promising Ballast Water technologies, Parties shall take into account Guidelines developed by the Organization,

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

HAVING CONSIDERED, at its fifty-fourth session, the draft Guidelines for approval and oversight of prototype ballast water treatment technology programmes developed by the Ballast Water Working Group,

1. ADOPTS the Guidelines for approval and oversight of prototype ballast water treatment technology programmes as set out in the annex to this resolution;
2. INVITES Governments to apply the Guidelines as soon as possible, or when the Convention becomes applicable to them; and
3. AGREES to keep the Guidelines under review.

ANNEX

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## **GUIDELINES FOR APPROVAL AND OVERSIGHT OF PROTOTYPE BALLAST WATER TREATMENT TECHNOLOGY PROGRAMMES (G10)**

### **1 INTRODUCTION**

#### **General**

1.1 These Guidelines provide recommendations for Administrations on the approval and oversight of programmes for prototype ballast water treatment technologies in accordance with regulation D-4 of the “International Convention for the Control and Management of Ships’ Ballast Water and Sediments, 2004” (the Convention). The intention of regulation D-4 is to provide opportunities to test and evaluate promising ballast water treatment technologies aboard ships with the potential to meet or exceed the performance standards in regulation D-2 of the Convention. The document may also assist manufacturers, ship owners and other stakeholders undertaking development activities in the area of ballast water treatment. The Guidelines also make recommendations on criteria for approval of such programmes. Recommendations outlined in these Guidelines should be applied in an objective, consistent and transparent way and their application should be evaluated periodically by the Organization.

1.2 Regulations referred to in these Guidelines are those contained in the Convention.

1.3 The Guidelines include general recommendations on design and construction, technical procedures for overall performance testing and evaluation, procedures for the issuance of a Statement of Compliance in accordance with regulation D-4 and Administration oversight responsibilities.

1.4 As the level of ballast water management knowledge, experience and subsequently technological achievements continue to develop, these Guidelines may require updating. Periodical review of their content in light of such developments should be carried out and any revisions duly circulated by the Organization.

#### **Purpose**

1.5 The main purpose of these Guidelines is to:

- .1 assist Administrations to approve or reject proposed programmes and in cases where approval is granted, to issue a Statement of Compliance under regulation D-4;
- .2 describe the responsibilities of the Administration in the oversight of the programme’s execution; and
- .3 encourage a uniform interpretation and application of regulation D-4.

### **Applicability**

1.6 These Guidelines apply to programmes established to test and evaluate promising ballast water treatment technologies in accordance with regulation D-4.

### **Programme requirements**

1.7 The Programme for prototype ballast water treatment technologies in accordance with these Guidelines should contain the following three main steps:

- .1 **Programme Application, Submission and Approval:** The submission should include a detailed plan describing the prototype technology and implementation of the programme as described in Section 3. Further, the applicant should include evidence on the potential of the prototype technologies meeting or exceeding the performance standard in regulation D-2. If the prototype ballast water treatment technology makes use of Active Substances, or preparations containing one or more Active Substances, the substances should have received Basic Approval, as described by the Procedure for the Approval of Ballast Water Management systems that make use of Active Substances (G9). All of the above information should be the basis for the Administration in its evaluation and approval of the submitted programme. In the case where a programme is approved, the applicant may proceed in accordance with the approved programme taking into account any conditions set by the Administration.
- .2 **Installation Survey and Statement of Compliance:** The installation of the prototype ballast water treatment technology in accordance with the approved Programme should be verified by an installation survey. Provided that this survey confirms adherence to the approved programme, including any applicable conditions set by the Administration, a Statement of Compliance under regulation D-4 may be issued by the Administration.
- .3 **Performance Evaluations and Reporting:** During the test and evaluation period, a prototype ballast water treatment technology should be subjected to on-going experimental testing and evaluation according to the approved programme to evaluate both the engineering and biological performance under shipboard operating conditions. Reporting to the Administration should be of the form and schedule in accordance with the approved programme.

## **2 DEFINITIONS**

2.1 **Prototype Ballast Water Treatment Technology** - means any integrated system of ballast water treatment equipment as under regulation D-4, participating in a programme for testing and evaluation with the potential of meeting or exceeding the ballast water performance standard in regulation D-2 including treatment equipment, all associated control equipment, monitoring equipment and sampling facilities. A prototype ballast water treatment technology may be a mechanical, physical, chemical, or biological unit process, either singularly or in combination that may or may not use Active Substances that remove, render harmless, or avoid the uptake or discharge of Harmful Aquatic Organisms and Pathogens within ballast water and sediments.

Prototype ballast water treatment technologies may operate at the uptake or discharge of ballast water, during the voyage or in any combination of these phases.

2.2 Ballast Water Management Plan - is the document referred to in regulation B-1 of the Convention describing the ballast water management processes and procedures on board individual ships.

2.3 Active Substances - means a substance or organism, including a virus or a fungus that has a general or specific action on or against Harmful Aquatic Organisms and Pathogens.

2.4 Control Equipment - refers to the installed equipment required for proper functioning of the prototype ballast water treatment technology.

2.5 Monitoring Equipment - refers to the equipment installed for assessment of the correct operation of the prototype ballast water treatment technology.

2.6 Convention - means the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004.

2.7 Sampling Facilities - refers to the means provided for sampling treated or untreated ballast water as needed in these Guidelines.

### **3 PROGRAMME APPLICATION REQUIREMENTS**

3.1 This section provides the detailed elements and documentation that should be included in a Programme and Programme Application as defined in section 1.7.1. The Programme Application should contain information on the following aspects:

- .1 participants
- .2 ballast water treatment technology description
- .3 ship description
- .4 installation and installation survey description
- .5 performance test and evaluation description
- .6 time schedule and reporting

3.2 All relevant and requested documentation describing the Programme for which the applicant is applying for approval should be submitted to the Administration. The application should only encompass one prototype ballast water treatment technology and should not normally result in installations in more than three ships. Prototype installations onboard more than one ship should be justified in the application and may rest upon technology development requirements related to, for example:

- capacity issues;
- geographical areas of operation;
- specific onboard conditions varying as a function of ship type; and
- refit to existing vessels versus installations onboard new vessels.

3.3 The Programme Application should also take into account safety and environmental regulations which have to be met by the ship so as to ensure that other international and/or national requirements are not compromised by the prototype ballast water treatment technology.

3.4 The Programme should implement appropriate quality control measures in accordance with recognized international standards to which all participants specified in Section 3.5 should be required to comply.

### **Participants**

3.5 The Programme should provide an overview of the different participants included in the Programme Application including, as appropriate:

- the ship owner or operator;
- the manufacturer(s); and
- the testing institution or any laboratories, institution(s) or companies carrying out elements of or the entire programme or advising the manufacturer in carrying out the programme.

3.6 The roles and responsibilities of each of the identified participants should be clearly described within the Programme Application.

### **Ballast water treatment technology description**

3.7 The Programme Application should include information regarding design, construction, operation and functioning of the proposed ballast water treatment technology. The information should also include any foreseen conditions limiting its application with respect to voyage duration, ship type, capacity (flow rate and/or volume) or any other such condition if relevant.

3.8 The Programme Application should contain documentation on the potential of the prototype technologies meeting or exceeding the performance standard in regulation D-2. Recognized scientific and statistical practices should have been utilized in the preparation of this documentation.

3.9 The construction, operation and maintenance of the technology should be adequately described to allow for consideration by the Administration and this should include:

- .1 The prototype ballast water treatment technology should have a configuration and construction suitable for shipboard installation and normal onboard operation;
- .2 Design, construction and material should be suitable for the purpose for which the equipment is intended, the working conditions to which it should be subjected and the environmental conditions onboard. This should include considerations of:
  - .1 vibration – to ensure that there are no potential resonance occurring;
  - .2 temperature – to assure safe and proper operations and performance of the technology over a range of temperatures applicable for shipboard installations;

- .3 humidity – to ensure the suitability of equipment exposed to humidity/water as applicable to shipboard installations;
  - .4 power fluctuation – to ensure proper functioning over a voltage/frequency variation; and
  - .5 inclination – to assure that the technology should operate during those scenarios it is intended for, taking into account the motion of the vessel and that it should remain safe and not represent any danger to crew or ship onboard during inclination.
- .3 Routine maintenance of the prototype ballast water treatment technology and trouble-shooting procedures should be clearly described by the manufacturer in a operating and maintenance manual.
  - .4 The prototype ballast water treatment technology should be provided with simple and effective means for its operation and control.
  - .5 In case of a failure compromising the proper operation of the prototype ballast water treatment technology, audible and visual alarm signals are to be activated at all stations from where ballast water operations may be controlled.
  - .6 The prototype ballast water treatment technology programme should provide for record keeping of the entire ballast water operations including:
    - .1 record of operations and any malfunctioning during operations;
    - .2 record of all essential parameters necessary to ensure proper functioning;
    - .3 date and time of start and end of the ballast operation; and
    - .4 ballast operation mode (loading, discharge, transfer).
  - .7 The prototype ballast water treatment technology should allow for sampling such that representative samples of the ship's ballast water can be collected as described in the experimental design as described in the Programme Application.

3.10 The Programme Application should include descriptions of the working principles, use if any Active Substances, operational conditions and application feasibility of the prototype ballast water treatment technology.

3.11 The Programme Application should include an assessment of the potential effects upon other personnel, shipboard systems and structure, highlighting any special safety provisions that maybe necessary due to the characteristics of the installation and/or operation of the prototype ballast water treatment technology.

### **Ship description**

3.12 The Programme Application should include a full and complete description of the ship(s) in which the prototype ballast water treatment technology is to be installed. This description should include:

- ships' name;
- date of construction;
- flag;
- port of registry;
- gross tonnage;
- dead weight;
- IMO number;
- length (bp);
- beam;
- international call sign;
- deepest ballast drafts (normal and heavy weather);
- total ballast capacity of the ship in cubic metres and other units if applicable to the ship.

3.13 The description should also include normal operational ballast flow rates and volumes, and, to the extent possible, typical voyage lengths and routes.

### **Installation and installation survey description**

3.14 The Programme Application should fully describe the manner in which the equipment should be integrated into the ship and should provide the following for the onboard installation:

- .1 process flow diagram of the prototype ballast water treatment technology;
- .2 "equipment arrangement" drawings of the proposed prototype ballast water treatment installation. These should show scaled lay-outs of the spaces and important mechanical and structural features such as major propulsion and electrical components, bulkheads and pillars, and doors and other means of access/egress;
- .3 "piping arrangement" drawing of the prototype ballast water treatment system installation, including ballast and cross-connected piping systems, sample piping, and the operational outlets for treated effluent and any waste streams;
- .4 information relating to onboard safety matters;
- .5 an assessment of the potential effects upon other shipboard systems and the ship's structure, highlighting those aspects of the design and operation of the system, and its integration into the ship, to be put in place to prevent any compromises to crew and ship safety;

- .6 assurance of adequate safety interlocks and failsafe measures to ensure subdivision boundaries, structural integrity, and vessel stability are not compromised;
- .7 assurance that new piping and flows should not result in unsafe ballasting or deballasting situations, e.g., overpressure;
- .8 assurance that escape arrangements in manned spaces are not compromised;
- .9 arrangements for maintaining the integrity any boundary between safe and hazardous spaces;
- .10 attention to restrictions related to the use of electrical equipment in hazardous areas; and
- .11 a provision for safe storage and use of Active Substances.

3.15 The installation survey description should contain a listing of those items which should be validated at the survey and these include, as a minimum, the following:

- .1 updated, as-installed diagrammatic drawings of any additional pumping and piping arrangements, identifying the operational outlets for treated effluent and any waste streams. Special consideration may have to be given to installations on ships that have unusual pumping and piping arrangements, as well as restrictions related to the use of electrical equipment in hazardous areas;
- .2 equipment manuals, supplied by manufacturers, which should contain details of the major components of the treatment system;
- .3 operations and technical manual for the complete installed prototype ballast water treatment. This manual should cover the arrangements and operation of the system as a whole and should specifically describe the parts of the system which may not be covered by the manufacturer's equipment manuals. The operations section of the manual should include normal operational procedures and procedures for the discharge of untreated water in the event of malfunction of the equipment. The technical section of the manual should include adequate information (description and diagrammatic drawings of the pumping and piping arrangements, of the monitoring system and electrical/electronic wiring diagrams) to enable fault finding and should include instructions for keeping a maintenance record;
- .4 the installation should comply with manufacturer's specific installation criteria. A technical installation specification defining, *inter alia*, the location and mounting of components, arrangements for maintaining the integrity of any boundary between safe and hazardous spaces, and the arrangement of the sample piping;
- .5 the Ballast Water Management Plan; and

- .6 any other conditions required by the Administration.

3.16 The Programme Application should provide a recommended test and survey procedure. This procedure should specify all the checks to be carried out in a functional test and should provide guidance for the surveyor when carrying out the on-board survey of the treatment system. This procedure may be amended as necessary prior to the survey and with the concurrence of the Administration.

#### **Performance test and evaluation description**

3.17 A full description of the onboard tests and evaluations to be undertaken should be provided. When available standard methods for the collection, handling (including concentration), storage, and analysis of samples should be applied. These methods should be clearly referenced and described in test plans and in reports. This includes methods for detecting, concentrating, enumerating, and identifying organisms and for determining viability. When non-standard methods are used they should be validated, documented and reported. A description of the experimental design and sampling procedure should be provided.

3.18 The Programme should evaluate:

- .1 the biological efficacy of the installed prototype ballast water treatment technology;
- .2 the operational performance which should include, but not be limited to:
  - unplanned maintenance and manning requirements
  - operational data relative to manufacturer's specification
  - consideration of the environmental conditions identified in section 3.9.2;
- .3 the effects upon the ship's systems and structure; and
- .4 any other characteristics identified by the participants or the Administration.

3.19 Experimental Design and Protocols should include:

- .1 a general description of the experimental test including the experimental hypotheses being tested and methods for the determination of biological efficacy and operational performance. The Programme Application should identify the test locations, source waters, and relevant environmental water conditions, to the extent possible. The overall study plan should take full advantage of the range of locations provided by the vessel's operations, to the extent practicable;
- .2 a detailed description for each of the experiments including:
  - .1 ballast water sample collection for each treatment and control, identification and number of replicate tanks, ballast water samples and time points encompassed in the test;

- .2 description of test runs: replicate tests (tests at same location and environmental conditions) and comparative tests (tests at different locations or environmental conditions). Description of how the efficacy of the treatment process should be evaluated; include a description of how the efficacy should be quantified, as well as a description of the comparison of biological efficacies;
  - .3 the plan should address statistical analysis (including power analysis) and data confidence issues. Fully describe the intended statistical tests, use of controls, and replicates for each experiment; and
  - .4 how the experiment accounts for the range of seasons, organic matter content, turbidity, pH, salinity, etc. likely to be encountered in operation and, to the extent possible, describe the range of these variables;
- .3 the experimental design should address the operation of the ship's systems whose arrangements (e.g., cross connections) have the potential to confound the resulting data.

### **Time schedule and reporting**

3.20 The Programme Application should include procedures and schedules for reporting the progress and status of the Programme through all phases. Reporting to the Administration should occur on a regular basis throughout the Programme. In addition, reporting should include the results and evaluation of all conducted experiments.

3.21 The Programme Application should present an overall time schedule compliant with project management standards. This schedule should include an estimation of major task element time lines. Each of these should have an anticipated period of performance and execution and include events such as approval of the Programme by the Administration, the installation survey, experimental and progress reports. Major task elements should include the installation of the prototype ballast water treatment technology into the ship, initiation and execution of experiments and maintenance periods.

## **4 INSTALLATION SURVEY AND STATEMENT OF COMPLIANCE**

### **Installation survey**

4.1 Following approval of the Programme Application, the Programme may proceed to installing the onboard prototype ballast water treatment technology.

4.2 Following installation a survey should be performed by the Administration, or any designated body appointed by the Administration to act on its behalf, to verify that the system installation has been carried out in accordance with the approved Programme and that the workmanship of the installation is satisfactory.

### **Statement of Compliance**

4.3 Upon successful completion of the Installation Survey a Statement of Compliance may be issued by the Administration, or by a person or organization duly authorized by the Administration. In every case, the Administration assumes full responsibility for the Statement of Compliance. The recommended format for the Statement of Compliance is given in the Appendix.

4.4 The Statement of Compliance should be valid until five years after the dates specified in regulations D-4.1 and D-4.2, as appropriate.

## **5 PERFORMANCE REQUIREMENT FOR ALREADY INSTALLED SYSTEMS**

5.1 Ships with already installed prototype ballast water treatment technologies that wish to make use of the provision of regulation D-4, may do so provided that a Programme Application is approved by the Administration.

## **6 PROGRAMME OVERSIGHT**

6.1 The Administration or any designated body appointed by the Administration to act on its behalf should ensure that the Programme as approved is followed.

6.2 The Administration should revoke the Statement of Compliance if the ship fails to follow the approved Programme or otherwise does not comply with the conditions of regulation D-4.4.

**APPENDIX 1**

**Statement of Compliance for a Prototype Ballast Water Treatment Technology**

(Official seal)

Issued under the provisions of

**GUIDELINES FOR APPROVAL AND OVERSIGHT OF PROTOTYPE BALLAST WATER  
TREATMENT TECHNOLOGY PROGRAMMES (G10)**

(Resolution MEPC.140(54)),

under the authority of the Government of (*full designation of country*)

by (*full designation of the competent person or organization recognized by the Administration*)

**Particulars of ship**

Name of ship

IMO Number\*

Distinctive number or letters

Port of registry

Gross tonnage

Ballast Water Capacity, Volume and Flow Rates

Date on which keel was laid or ship was at a similar stage of construction or, (in the case of a converted ship) date on which conversion was commenced

Date by which the ship is required to comply with regulation D-2

Date on which the prototype ballast water treatment system was installed

Name and address of prototype ballast water treatment technology manufacturer

Trade name of technology

Serial number or other identifying marking

Name of Active Substance and details of Basic Approval

Brief description of the prototype technology

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\* IMO Ship Identification Number Scheme adopted by the Organization by resolution A.600(15).

THIS IS TO CERTIFY:

1. That the ship has a prototype ballast water treatment system which is subject to a programme approved in accordance with regulation D-4 by the Government of (*insert Government title*) on (*insert date of approval of programme*).
2. That the prototype ballast water treatment technology installation has been surveyed in accordance with Section 4 of the annex to resolution MEPC.140(54).
3. A copy of the approved programme is on board the ship together with equipment, operations and maintenance manuals for the prototype ballast water treatment technology.

This Statement is valid until (*date*)

(Place of issue of Statement)

(Date of issue)

(Signature of authorized official issuing the Statement)

(Seal or stamp of the authority, as appropriate)

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