

**Shipping Consultative Committee**

**Proposed Amendments to Merchant Shipping Regulation**

**Purpose**

1. The purpose of this paper is to seek members' views on the proposed amendments to the Merchant Shipping (Prevention of Sewage Pollution) Regulations (Cap.413K) for implementing the latest amendments to MARPOL Annex IV.

**Background**

2. IMO has adopted resolutions MEPC.143(54), MEPC.164(56) and MEPC.200(62) which set out the amendments to MARPOL Annex IV in 2006, 2007 and 2011 respectively.

**Summary of Amendments**

3. The main amendments in the revised Annex IV of MARPOL 73/78 are:
- (a) to add port state control on operational requirements in regulation 13;
  - (b) to add discharge requirement for sewage originating from spaces containing living animals in regulation 11; and
  - (c) to add the sewage system requirements for passenger ships entering special area in regulation 9 and 11.
4. IMO has also issued the following guidelines and recommendations for prevention of sewage pollution:
- (a) MEPC.159(55) - Revised guidelines on implementation of effluent standards and performance tests for sewage treatment plants installed prior to 1 January 2016 and on or after 1 January 2010.
  - (b) MEPC.227(64) - 2012 guidelines on implementation of effluent standards and performance tests for sewage treatment plants installed on or after 1 January 2016.
  - (c) MEPC.157(55) - Recommendation on standards for the rate of discharge of untreated sewage from ships.

**Implementation of international requirements**

5. As the new requirements and guidelines mentioned in above paragraphs 3 and 4 have not been implemented in the local legislation, it is proposed to implement these requirements by amending the Merchant Shipping (Prevention of Sewage pollution) Regulation (Cap.413K). It is considered that HKSAR should keep in line with the latest international standards.

**Consultation**

6. Members are invited to comment on the above proposal to implement the latest MARPOL Annex IV requirements for Hong Kong registered ships.

## ANNEX 4

## RESOLUTION MEPC.143(54)

Adopted on 24 March 2006

**AMENDMENTS TO THE ANNEX OF THE PROTOCOL OF 1978 RELATING  
TO THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF  
POLLUTION FROM SHIPS, 1973****(Addition of regulation 13 to Annex IV of MARPOL 73/78)**

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 (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution,

NOTING article 16 of the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1973 Convention") and article VI of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1978 Protocol") which together specify the amendment procedure of the 1978 Protocol and confer upon the appropriate body of the Organization the function of considering and adopting amendments to the 1973 Convention, as modified by the 1978 Protocol (MARPOL 73/78),

HAVING CONSIDERED the proposed new regulation 13 of Annex IV of MARPOL 73/78 concerning port State control on operational requirements,

1. ADOPTS, in accordance with article 16(2)(b), (c) and (d) of the 1973 Convention, the new regulation 13 of Annex IV of MARPOL 73/78, the text of which is set out at Annex to the present resolution;
2. DETERMINES, in accordance with article 16(2)(f)(iii) of the 1973 Convention, that the revised Annex IV shall be deemed to have been accepted on 1 February 2007, unless, prior to that date, not less than one third of the Parties to MARPOL 73/78 or by the Parties the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant fleet, have notified to the Organization their objections to the amendments;
3. INVITES Parties to MARPOL 73/78 to note that, in accordance with article 16(2)(g)(ii) of the 1973 Convention, the said amendments shall enter into force on 1 August 2007 upon their acceptance in accordance with paragraph 2 above;
4. REQUESTS the Secretary-General, in conformity with article 16(2)(e) of the 1973 Convention, to transmit to all Parties to MARPOL 73/78 certified copies of the present resolution and the text of the amendments contained in the Annex; and
5. REQUESTS FURTHER the Secretary-General to transmit copies of this resolution and its Annex to Members of the Organization which are not Parties to MARPOL 73/78.

ANNEX

**AMENDMENTS TO THE REVISED MARPOL ANNEX IV**

*The following new chapter 5 and regulation 13 are added after the existing regulation 12:*

**Chapter 5 – Port State Control**

**“Regulation 13 – Port State control on operational requirements”\***

1. A ship when in a port or an offshore terminal of another Party is subject to inspection by officers duly authorized by such Party concerning operational requirements under this Annex, where there are clear grounds for believing that the master or crew are not familiar with essential shipboard procedures relating to the prevention of pollution by sewage.
2. In the circumstances given in paragraph (1) of this regulation, the Party shall take such steps as will ensure that the ship shall not sail until the situation has been brought to order in accordance with the requirements of this Annex.
3. Procedures relating to the port State control prescribed in article 5 of the present Convention shall apply to this regulation.
4. Nothing in this regulation shall be construed to limit the rights and obligations of a Party carrying out control over operational requirements specifically provided for in the present Convention.”

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\* Refer to procedures for port State control adopted by the Organization by resolution A.787(19) and amended by resolution A.882(21); see IMO sales publication IMO-650E.

**ANNEX 14**

**RESOLUTION MEPC.157(55)  
Adopted on 13 October 2006**

**RECOMMENDATION ON STANDARDS FOR THE RATE OF DISCHARGE  
OF UNTREATED SEWAGE FROM SHIPS**

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 (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution,

NOTING resolution MEPC.115(51) by which the Committee adopted the revised MARPOL Annex IV, which entered into force on 1 August 2005,

NOTING ALSO the provisions of regulation 11.1.1 of MARPOL Annex IV,

RECOGNIZING that untreated sewage that has been stored in holding tanks shall not be discharged instantaneously but that the discharge is to be undertaken at a moderate rate approved by the Administration based upon the standards developed by the Organization,

HAVING CONSIDERED the recommendations made by the Sub-Committee on Bulk Liquids and Gases at its tenth session,

1. ADOPTS the Recommendation on standards for the rate of discharge of untreated sewage from ships, the text of which is set out in the Annex to the present resolution;
2. RECOMMENDS member Governments to accept the rate of discharge based upon the annexed Standards,
3. ENCOURAGES operators of ships that may have high discharge requirements to keep calculations of actual discharges to demonstrate compliance to the Administration and to port or coastal State authorities.

## ANNEX

### RECOMMENDATION ON STANDARDS FOR THE RATE OF DISCHARGE OF UNTREATED SEWAGE FROM SHIPS

#### 1 INTRODUCTION

- 1.1 Regulation 11.1.1 of the revised Annex IV of MARPOL 73/78 requires that untreated sewage, which may be discharged at more than 12 nautical miles from the nearest land, should not be discharged instantaneously but at a moderate rate of discharge when the ship is en route and proceeding at a speed not less than 4 knots, while the rate should be approved by the Administration based upon standards developed by the Organization. This Recommendation provides the standard and guidance for the approval and calculation of a moderate rate of discharge.
- 1.2 A moderate rate of discharge applies to the discharge of untreated sewage that has been stored in holding tanks.
- 1.3 This standard does not incorporate the dilution of sewage with water or greywater into calculations of the discharge rate. Therefore the rate is a conservative estimate and it is recognised that discharges of sewage in accordance with this standard will present a higher level of protection to the marine environment due to mixing prior to the actual discharge in addition to the mixing action of the ship's wake.

#### 2 DEFINITIONS

- 2.1 *Swept volume* means ship breadth x draft x distance travelled.
- 2.2 *Untreated sewage* means sewage that has not been treated by a type approved sewage treatment plant, or that has not been comminuted and disinfected.

#### 3 DISCHARGE RATE

- 3.1 The maximum permissible discharge rate is 1/200,000 (or one 200,000th part) of swept volume as follows:

$$DR_{\max} = 0.00926 V D B$$

Where:

$DR_{\max}$  is maximum permissible discharge rate (m<sup>3</sup>/h)  
V is ship's average speed (knots) over the period  
D is Draft (m)  
B is Breadth (m)

- 3.2 The maximum permissible discharge rate specified in 3.1 refers to the average rate as calculated over any 24 hour period, or the period of discharge if that is less, and may be exceeded by no more than 20% when measured on an hourly basis.

#### 4 APPROVAL OF RATE BY ADMINISTRATION

4.1 The Administration should approve the rate of discharge specified in 3.1 based upon the ship's maximum summer draft and maximum service speed<sup>1</sup>. Where sewage is to be discharged at a different combination of draft and speed one or more secondary discharge rates may also be approved<sup>2</sup>.

#### 5 METHOD OF CALCULATION

5.1 The calculated swept volume of the ship is to be determined for drafts up to and including the summer draft assigned in accordance with Article 3 of International Convention on Load Lines, 1966.

5.2 Where a ship is to discharge sewage from a holding tank using a pump calibrated at a fixed rate, the pump can either be:

- calibrated at a the rate permitted at 4 knots; or
- calibrated for a specific minimum ship's speed in excess of 4 knots.

5.3 Where the intended actual discharge rate exceeds that permissible at 4 knots, the actual discharge rate may need to be reduced or the speed increased. The rate and speed is to be detailed in the approval issued by the Administration.

#### 6 COMPLIANCE WITH THE RATE

6.1 Before undertaking a sewage discharge in accordance with this standard, the crew member responsible for sewage operations should ensure that the ship is en route, is more than 12 nautical miles from the nearest land and the navigation speed is consistent with the discharge rate that has been approved by the Administration. Ships with high discharge requirements are encouraged to keep notes of calculations of the actual discharges to demonstrate compliance with the approved rate.

<sup>1</sup> The attention of ship operators and personnel is drawn to the reduction in permissible rate of discharge at reduced draft and/or speed.

<sup>2</sup> Presentation may be tabular, refer to table below. For ships other than those having a high requirement for untreated sewage discharge, such as passenger ships and livestock carriers, the discharge rate criterion will generally not be exceeded at ship speed of 4 knots.

DISCHARGE RATE (m <sup>3</sup> /h)					
SPEED (kt)	4	6	8	10	12
DRAFT (m)					
5	4.63	6.94	9.26	11.57	13.89
6	5.56	8.33	11.11	13.89	16.67
7	6.48	9.72	12.96	16.20	19.45
8	7.41	11.11	14.82	18.52	22.22
9	8.33	12.50	16.67	20.83	25.00

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**ANNEX 26****RESOLUTION MEPC.159(55)  
Adopted on 13 October 2006****REVISED GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS  
AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS**

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 (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution,

NOTING resolution MEPC.2(VI) adopted on 3 December 1976 by which the Marine Environment Protection Committee adopted, at its sixth session, the Recommendation on International Effluent Standards and Guidelines for Performance Tests for Sewage Treatment Plants and invited Governments to apply the Effluent Standards and Guidelines for approving sewage treatment plants; to take steps to establish testing programmes in accordance with the Guidelines for Performance Tests; and provide the Organization with a list of sewage treatment plants meeting the standards,

NOTING ALSO resolution MEPC.115(51) adopted on 1 April 2004 by which the Marine Environment Protection Committee adopted, at its fifty-first session, the revised MARPOL Annex IV and which entered into force on 1 August 2005,

NOTING FURTHER the provisions of regulation 9.1.1 of MARPOL Annex IV, in which reference is made to the above-mentioned guidelines,

RECOGNIZING that resolution MEPC.2(VI) should be amended in order that current trends for the protection of the marine environment and developments in the design and effectiveness of commercially available sewage treatment plants be reflected; and the proliferation of differing unilateral more stringent standards that might be imposed worldwide be avoided,

HAVING CONSIDERED the recommendation made by the Sub-Committee on Bulk Liquids and Gases, at its tenth session,

1. ADOPTS the Revised Guidelines on Implementation of Effluent Standards and Performance Tests for Sewage Treatment Plants, the text of which is set out in the Annex to this resolution;
2. INVITES Governments to:
  - (a) implement the Revised Guidelines on Implementation of Effluent Standards and Performance Tests for Sewage Treatment Plants and apply them so that all equipment installed on board on or after 1 January 2010 meets the Revised Guidelines in so far as is reasonable and practicable; and

- (b) provide the Organization with information on experiences gained from their application and, in particular, on successful testing of equipment against the Standards;

3. FURTHER INVITES Governments to issue an appropriate “Certificate of type approval for Sewage Treatment Plants” as referred to in paragraph 5.4.2 and the annex of the Revised Guidelines and to recognize such certificates issued under the authority of other Governments as having the same validity as certificates issued by them; and

4. SUPERSEDES the Recommendation on International Effluent Standards and Guidelines for Performance Tests for Sewage Treatment Plants contained in resolution MEPC.2(VI).



ANNEX

**REVISED GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS  
AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS**

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## **REVISED GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS**

### **1 INTRODUCTION**

1.1 The Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO) adopted resolution MEPC.2(VI) Recommendation on International Effluent Standards and Guidelines for Performance Tests for Sewage Treatment Plants in 1976.

1.2 This document contains the Revised Guidelines on Implementation of Effluent Standards and Performance Tests for Sewage Treatment Plants (Guidelines). These Guidelines are intended to assist Administrations in establishing operational performance testing programmes for sewage treatment plants for the purpose of type approval under regulation 9.1.1 of Annex IV of the Convention.

1.3 These Guidelines apply to sewage treatment plants installed on board on or after 1 January 2010.

### **2 DEFINITIONS**

Annex IV – the revised Annex IV of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) as amended by resolution MEPC.115(51).

Convention – the International Convention for the Prevention of Pollution from Ships 1973/1978 (MARPOL 73/78).

Geometric mean – the  $n$ th root of the product of  $n$  numbers.

Greywater – is drainage from dishwater, shower, laundry, bath and washbasin drains.

Testing onboard – testing carried out on a sewage treatment plant that has been installed upon a ship.

Testing ashore – testing carried out on a sewage treatment plant prior to installation e.g. in the factory.

Thermotolerant coliforms – the group of coliform bacteria which produce gas from lactose in 48 hours at 44.5°C. These organisms are sometimes referred to as “faecal coliforms”; however, the term “thermotolerant coliforms” is now accepted as more appropriate, since not all of these organisms are of faecal origin.

### **3 GENERAL**

3.1 An approved sewage treatment plant must meet the standards in section 4 and the tests outlined in these Guidelines. It should also be noted that, when ships are operating approved sewage treatment plants, Annex IV also provides that the effluent shall not produce visible floating solids or cause discolouration of the surrounding water.

3.2 It is acknowledged that the performance of sewage treatment plants may vary considerably when the system is tested ashore under simulated shipboard conditions or onboard a ship under actual operating conditions. Where testing ashore demonstrates that a system complies with the standards, but subsequent onboard testing does not meet the standards, the Administration should determine the reason and take it into account when deciding whether to type approve the plant.

3.3 It is recognized that Administrations may wish to modify the specific details outlined in these Guidelines to take account of very large, very small or unique sewage treatment plants.

#### 4 STANDARDS

4.1 For the purpose of regulation 4.1 of Annex IV, a sewage treatment plant should satisfy the following effluent standards when tested for its Certificate of Type Approval by the Administration:

.1 Thermotolerant Coliform Standard

The geometric mean of the thermotolerant coliform count of the samples of effluent taken during the test period should not exceed 100 thermotolerant coliforms/100 ml as determined by membrane filter, multiple tube fermentation or an equivalent analytical procedure.

.2 Total Suspended Solids (TSS) Standard

(c) The geometric mean of the total suspended solids content of the samples of effluent taken during the test period shall not exceed 35 mg/l.

(d) Where the sewage treatment plant is tested onboard ship, the maximum total suspended solids content of the samples of effluent taken during the test period may be adjusted to take account of the total suspended solid content of the flushing water. In allowing this adjustment in maximum TSS, Administrations shall ensure sufficient tests of TSS are taken of the flushing water throughout the testing period to establish an accurate geometric mean to be used as the adjustment figure (defined as  $x$ ). In no cases shall the maximum allowed TSS be greater than 35 plus  $x$  mg/l.

Method of testing should be by:

- .1 filtration of representative sample through a 0.45  $\mu\text{m}$  filter membrane, drying at 105°C and weighing; or
- .2 centrifuging of a representative sample (for at least five minutes with mean acceleration of 2,800-3,200 g), drying at least 105°C and weighing; or
- .3 other internationally accepted equivalent test standard.

.3 Biochemical Oxygen Demand and Chemical Oxygen Demand

Administrations should satisfy themselves that the sewage treatment plant is designed to reduce both soluble and insoluble organic substances to meet the requirement that, the geometric mean of 5-day Biochemical Oxygen Demand (BOD<sub>5</sub>) of the samples of effluent taken during the test period does not exceed 25 mg/l and the Chemical Oxygen Demand (COD) does not exceed 125 mg/l. The test method standard should be ISO 15705:2002 for COD and ISO 5815-1:2003 for BOD<sub>5</sub>, or other internationally accepted equivalent test standards.

.4 pH

The pH of the samples of effluent taken during the test period shall be between 6 and 8.5.

.5 Zero or non-detected values

For thermolerant coliforms, zero values should be replaced with a value of 1 thermotolerant coliform/100 ml to allow the calculation of the geometric mean. For total suspended solids, biochemical oxygen demand and chemical oxygen demand, values below the limit of detection should be replaced with one half the limit of detection to allow the calculation of the geometric mean.

4.2 Where the sewage treatment plant has been tested ashore, the initial survey should include installation and commissioning of the sewage treatment plant.

## 5 TESTING CONSIDERATIONS

5.1 Testing of the operational performance of a sewage treatment plant should be conducted in accordance with the following subparagraphs. Unless otherwise noted, the subparagraphs apply to testing both onboard and ashore.

### 5.2 Raw sewage quality

5.2.1 Sewage treatment plants tested ashore - the influent should be fresh sewage consisting of faecal matter, urine, toilet paper and flush water to which, for testing purposes primary sewage sludge has been added as necessary to attain a minimum total suspended solids concentration appropriate for the number of persons and hydraulic loading for which the sewage treatment plant will be certified. The testing should take into account the type of system (for example vacuum or gravity toilets) and any water or greywater that may be added for flushing to the sewage before treatment. In any case the influent concentration of total suspended solids should be no less than 500 mg/l.

5.2.2 Sewage treatment plants tested onboard - the influent may consist of the sewage generated under normal operational conditions. In any case the average influent concentration of total suspended solids should be no less than 500 mg/l.

### **5.3 Duration and timing of test**

5.3.1 The duration of the test period should be a minimum of 10 days and should be timed to capture normal operational conditions, taking into account the type of system and the number of persons and hydraulic loading for which the sewage treatment plant will be type approved. The test should commence after steady-state conditions have been reached by the sewage treatment plant under test.

### **5.4 Loading factors**

5.4.1 During the test period the sewage treatment plant should be tested under conditions of minimum, average and maximum volumetric loadings.

- .1 For testing ashore, these loadings will be as laid down in the manufacturer's specifications. Figure 1 shows suggested timings for sampling each loading factor.
- .2 For testing onboard, minimum loading will represent that generated by the number of persons on the ship when it is alongside in port, and average and maximum loadings will represent those generated by the number of persons on the ship at sea and will take account of meal times and watch rotations.

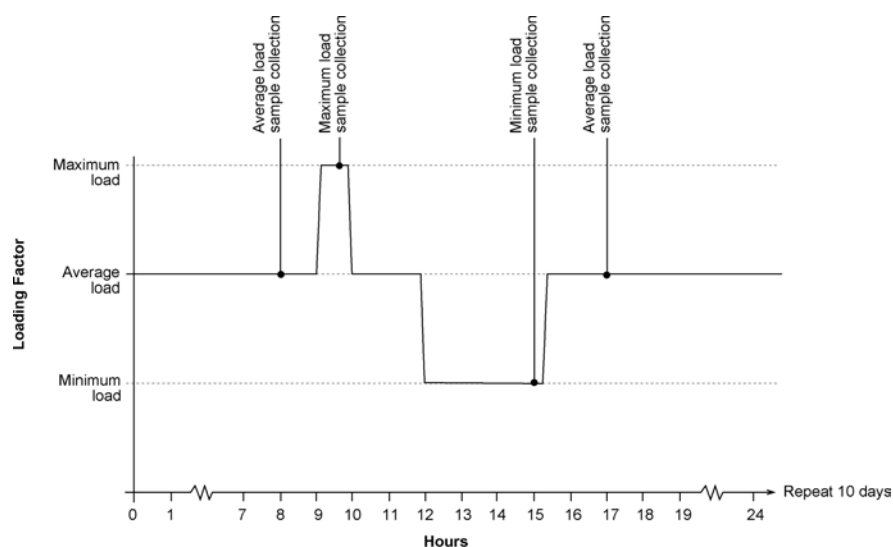
5.4.2 The Administration should undertake to assess the capability of the sewage treatment plant to produce an effluent in accordance with the standards prescribed by section 4 following minimum, average and maximum volumetric loadings. The range of conditions under which the effluent standards were met should be recorded on the Certificate of Type Approval. The form of the Certificate of Type Approval and appendix is set out in the annex to these Guidelines.

### **5.5 Sampling methods and frequency**

5.5.1 Administrations should ensure that the sewage treatment plant is installed in a manner which facilitates the collection of samples. Sampling should be carried out in a manner and at a frequency which is representative of the effluent quality. Figure 1 provides a suggested frequency for sampling, however, the frequency should take account of the residence time of the influent in the sewage treatment plant. A minimum of 40 effluent samples should be collected to allow a statistical analysis of the testing data (e.g. geometric mean, maximum, minimum, variance).

5.5.2 An influent sample should be taken and analyzed for every effluent sample taken and the results recorded to ensure compliance with section 4. If possible, additional influent and effluent samples should be taken to allow for a margin of error. Samples should be appropriately preserved prior to analysis particularly if there is to be a significant delay between collection and analysis or during times of high ambient temperature.

5.5.3 Any disinfectant residual in samples should be neutralized when the sample is collected to prevent unrealistic bacteria kill or chemical oxidation of organic matter by the disinfectant brought about by artificially extended contact times. Chlorine (if used) concentration and pH should be measured prior to neutralization.



**Figure 1: Suggested hydraulic loading factors and sampling frequency for testing sewage treatment plants. May be modified as necessary to take account of characteristics of individual sewage treatment plants**

## 5.6 Analytical testing of effluent

5.6.1 The Administration should give consideration to the recording of other parameters in addition to those required (thermotolerant coliforms, total suspended solids, BOD<sub>5</sub>, COD, pH and residual chlorine) with a view to future technological development. Parameters which might be considered include total solids, volatile solids, settleable solids, volatile suspended solids, turbidity, total phosphorus, total organic carbon, total coliforms and faecal streptococci.

## 5.7 Disinfectant residual

5.7.1 The potential adverse environmental effects of many disinfectant residuals and by-products, such as those associated with the use of chlorine or its compounds, are well recognized. It is, therefore, recommended that Administrations encourage the use of ozone, ultra-violet irradiation or any other disinfectants which minimize adverse environmental effects, whilst pursuing the thermotolerant coliform standard. When chlorine is used as a disinfectant, the Administration should be satisfied that the best technical practice is used to keep the disinfectant residual in the effluent below 0.5 mg/l.

## 5.8 Scaling considerations

5.8.1 Only full-scale marine sewage treatment plants should be accepted for testing purposes. The Administration may certify a range of the manufacturer's equipment sizes employing the same principles and technology, but due consideration must be given to limitations on performance which might arise from scaling up or scaling down. In the case of very large, very small or unique sewage treatment plants, certification may be based on results of prototype tests. Where possible, confirmatory tests should be performed on the final installation of such sewage treatment plants.

## **5.9 Environmental testing of the sewage treatment plant**

5.9.1 The Administration should be satisfied that the sewage treatment plant can operate under conditions of tilt consistent with internationally acceptable shipboard practice.

5.9.2 Tests for certification should be carried out over the range of temperature and salinity specified by the manufacturer, and the Administration should be satisfied that such specifications are adequate for the conditions under which the equipment must operate.

5.9.3 Control and sensor components should be subjected to environmental testing to verify their suitability for marine use. The Test Specifications section in part 3 of the annex to resolution MEPC.107(49) provides guidance in this respect.

5.9.4 Any limitation on the conditions of operation should be recorded on the Certificate.

5.9.5 The Administration should also consider requiring the manufacturer to include in the operating and maintenance manuals, a list of chemicals and materials suitable for use in the operation of the sewage treatment plant.

## **5.10 Other considerations**

5.10.1 The type and model of the sewage treatment plant and the name of the manufacturer should be noted by means of a durable label firmly affixed directly to the sewage treatment plant. This label should include the date of manufacture and any operational or installation limits considered necessary by the manufacturer or the Administration.

5.10.2 Administrations should examine the manufacturer's installation, operating and maintenance manuals for adequacy and completeness. The ship should have on board at all times a manual detailing the operational and maintenance procedures for the sewage treatment plant.

5.10.3 Qualifications of testing facilities should be carefully examined by the Administration as a prerequisite to their participation in the testing programme. Every attempt should be made to assure uniformity among the various facilities.

## **6 RENEWAL AND ADDITIONAL SURVEYS**

6.1 Administrations should endeavour to ensure, when conducting renewal or additional surveys in accordance with regulations 4.1.2 and 4.1.3 of Annex IV, that the sewage treatment plant continues to perform in accordance with the conditions outlined in regulation 4.1.1 of Annex IV.

## **7 FAMILIARIZATION OF SHIP PERSONNEL IN THE USE OF THE SEWAGE TREATMENT PLANT**

7.1 Recognizing that the appropriate regulations relating to familiarization are contained within the Ships Safety Management Systems under the International Safety Management Code, Administrations are reminded that ship staff training should include familiarization in the operation and maintenance of the sewage treatment plant.

ANNEX

FORM OF CERTIFICATE OF TYPE APPROVAL  
FOR SEWAGE TREATMENT PLANTS AND APPENDIX

BADGE  
OR  
CIPHER

NAME OF ADMINISTRATION

**CERTIFICATE OF TYPE APPROVAL  
FOR SEWAGE TREATMENT PLANTS**

This is to certify that the Sewage Treatment Plant, Type .....,  
having a designed hydraulic loading of ..... cubic metres per day, (m<sup>3</sup>/day), an organic loading of  
..... kg per day Biochemical Oxygen Demand (BOD) and of the design shown on Drawings Nos. ....  
manufactured by .....

has been examined and satisfactorily tested in accordance with the International Maritime Organization  
resolution MEPC.159(55) to meet the operational requirements referred to in regulation 9.1.1 of Annex IV  
of the International Convention for the Prevention of Pollution from Ships, 1973/78 as modified by  
resolution MEPC.115(51).

The tests on the sewage treatment plant were carried out  
ashore at\* .....  
onboard at\* .....  
and completed on .....

The sewage treatment plant was tested and produced an effluent which, on analysis, produces:

- (i) a geometric mean of no more than 100 thermotolerant coliforms/100 ml;
- (ii) a geometric mean of total suspended solids of 35 mg/l if tested ashore or the maximum total  
suspended solids not exceeding 35 plus  $x$  mg/l for the ambient water used for flushing purposes if  
tested on board;
- (iii) a geometric mean of 5-day Biochemical Oxygen Demand (BOD<sub>5</sub>) of no more than 25 mg/l;
- (iv) a geometric mean of Chemical Oxygen Demand of no more than 125 mg/l;
- (v) pH of the effluent is between 6 and 8.5.

The Administration is satisfied that the sewage treatment plant can operate at angles of inclination  
of 22.5° in any plane from the normal operating position.

Details of the tests and the results obtained are shown on the Appendix to this Certificate.

A plate or durable label containing data of the manufacturer's name, type and serial numbers, hydraulic  
loading and date of manufacture is to be fitted on each sewage treatment plant.

A copy of this Certificate shall be carried on board any ship equipped with the above described sewage  
treatment plant.

Official stamp Signed .....

Administration of .....

Dated this.....day.....of.....20....

\* Delete as appropriate.



BADGE  
OR  
CIPHER

**APPENDIX TO  
CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS**

Test results and details of tests conducted on samples from the Sewage Treatment Plant in accordance with resolution MEPC.159(55):

Sewage Treatment Plant, Type .....  
 Manufactured by .....  
 Organization conducting the test .....  
 Designed hydraulic loading ..... m<sup>3</sup>/day  
 Designed organic loading ..... kg/day BOD

Number of effluent samples tested .....  
 Number of influent samples tested .....  
 Raw sewage (influent) quality ..... mg/l Total Suspended Solids  
 Maximum hydraulic loading ..... m<sup>3</sup>/day  
 Minimum hydraulic loading ..... m<sup>3</sup>/day  
 Average hydraulic loading ..... m<sup>3</sup>/day

Geometric Mean of Total  
 Suspended Solids ..... mg/l  
 Geometric Mean of the thermotolerant  
 coliform count ..... coliforms/100 ml  
 Geometric Mean of BOD<sub>5</sub> ..... mg/l

Type of disinfectant used .....  
 If Chlorine - residual Chlorine:  
     Maximum ..... mg/l  
     Minimum ..... mg/l  
     Geometric Mean ..... mg/l

Was the sewage treatment plant tested with:  
     Fresh Water flushing? ..... Yes/No\*  
     Salt Water flushing? ..... Yes/No\*  
     Fresh and Salt Water flushing? ..... Yes/No\*  
     Greywater added? ..... Yes – proportion: /No\*

Was the sewage treatment plant tested against the environmental conditions specified in section 5.9 of resolution MEPC.159(55):  
     Temperature ..... Yes/No\*  
     Humidity ..... Yes/No\*  
     Inclination ..... Yes/No\*  
     Vibration ..... Yes/No\*  
     Reliability of Electrical and Electronic Equipment ..... Yes/No\*

Limitations and the conditions of operation are imposed:  
     Salinity .....  
     Temperature .....  
     Humidity .....  
     Inclination .....  
     Vibration .....

Results of other parameters tested .....  
 Official stamp ..... Signed .....  
 Administration of ..... Dated this ..... day of ..... 20 .....

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\* Delete as appropriate.

**ANNEX 11****RESOLUTION MEPC.164(56)****Adopted on 13 July 2007****AMENDMENTS TO THE ANNEX OF THE PROTOCOL OF 1978 RELATING TO  
THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF  
POLLUTION FROM SHIPS, 1973****(Reception facilities outside Special Areas and discharge of sewage)**

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 (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution,

NOTING Article 16 of the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1973 Convention") and article VI of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1978 Protocol") which together specify the amendment procedure of the 1978 Protocol and confer upon the appropriate body of the Organization the function of considering and adopting amendments to the 1973 Convention, as modified by the 1978 Protocol (MARPOL 73/78),

HAVING CONSIDERED proposed amendments to regulation 38.2.5 of Annex I and regulation 11.1.1 of Annex IV to MARPOL 73/78,

1. ADOPTS, in accordance with Article 16(2)(d) of the 1973 Convention, the amendments to Annex I and Annex IV of MARPOL 73/78, the texts of which are set out at Annex 1 and Annex 2 respectively to the present resolution;
2. DETERMINES, in accordance with Article 16(2)(f)(iii) of the 1973 Convention, that the amendments shall be deemed to have been accepted on 1 June 2008, unless prior to that date, not less than one-third of the Parties or Parties the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant fleet, have communicated to the Organization their objection to the amendments;
3. INVITES the Parties to note that, in accordance with Article 16(2)(g)(ii) of the 1973 Convention, the said amendments shall enter into force on 1 December 2008 upon their acceptance in accordance with paragraph 2 above;
4. REQUESTS the Secretary-General, in conformity with Article 16(2)(e) of the 1973 Convention, to transmit to all Parties to MARPOL 73/78 certified copies of the present resolution and the text of the amendments contained in the Annexes; and
5. REQUESTS FURTHER the Secretary-General to transmit to the Members of the Organization which are not Parties to MARPOL 73/78 copies of the present resolution and its Annexes.

ANNEX 1

**AMENDMENTS TO MARPOL ANNEX I**

**(Reception facilities outside Special Areas)**

Regulation 38.2.5 is replaced by the following:

“all ports in respect of oily bilge waters and other residues that cannot be discharged in accordance with regulations 15 and 34 of this Annex; and”

ANNEX 2

**AMENDMENTS TO MARPOL ANNEX IV**

**(Discharge of sewage)**

Regulation 11.1.1 is replaced by the following:

- “1 the ship is discharging comminuted and disinfected sewage using a system approved by the Administration in accordance with regulation 9.1.2 of this Annex at a distance of more than 3 nautical miles from the nearest land, or sewage which is not comminuted or disinfected, at a distance of more than 12 nautical miles from the nearest land, provided that, in any case, the sewage that has been stored in holding tanks, or sewage originating from spaces containing living animals, shall not be discharged instantaneously but at a moderate rate when the ship is *en route* and proceeding at not less than 4 knots; the rate of discharge shall be approved by the Administration based upon standards developed by the Organization<sup>8</sup>; or”

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<sup>8</sup> Refer to the Recommendation on standards for the rate of discharge of untreated sewage from ships adopted by the Marine Environment Protection Committee of the Organization by resolution MEPC.157(55).

**ANNEX 12**

**RESOLUTION MEPC.200(62)**

**Adopted on 15 July 2011**

**AMENDMENTS TO THE ANNEX OF THE PROTOCOL OF 1978 RELATING TO  
THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF  
POLLUTION FROM SHIPS, 1973**

**(Special Area Provisions and the Designation of the Baltic Sea as a Special Area under  
MARPOL Annex IV)**

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 (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution,

NOTING article 16 of the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1973 Convention") and article VI of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1978 Protocol") which together specify the amendment procedure of the 1978 Protocol and confer upon the appropriate body of the Organization the function of considering and adopting amendments to the 1973 Convention, as modified by the 1978 Protocol (MARPOL 73/78),

HAVING CONSIDERED draft amendments to Annex IV of MARPOL 73/78,

1. ADOPTS, in accordance with article 16(2)(d) of the 1973 Convention, the amendments to Annex IV of MARPOL 73/78, the text of which is set out at annex to the present resolution;
2. DETERMINES, in accordance with article 16(2)(f)(iii) of the 1973 Convention, that the amendments shall be deemed to have been accepted on 1 July 2012 unless, prior to that date, not less than one third of the Parties or Parties the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant fleet, have communicated to the Organization their objection to the amendments;
3. INVITES the Parties to note that, in accordance with article 16(2)(g)(ii) of the 1973 Convention, the said amendments shall enter into force on 1 January 2013 upon their acceptance in accordance with paragraph 2 above;
4. REQUESTS the Secretary-General, in conformity with article 16(2)(e) of the 1973 Convention, to transmit to all Parties to MARPOL 73/78 certified copies of the present resolution and the text of the amendments contained in the Annex;
5. REQUESTS FURTHER the Secretary-General to transmit to the Members of the Organization which are not Parties to MARPOL 73/78 copies of the present resolution and its Annex.

ANNEX

**AMENDMENTS TO MARPOL ANNEX IV**

1 *New paragraphs 5bis, 7bis, and 7ter are added to regulation 1:*

"5bis *Special area* means a sea area where for recognized technical reasons in relation to its oceanographical and ecological condition and to the particular character of its traffic the adoption of special mandatory methods for the prevention of sea pollution by sewage is required.

The special areas are:

- .1 the Baltic Sea area as defined in regulation 1.11.2 of Annex I; and
- .2 any other sea area designated by the Organization in accordance with criteria and procedures for designation of special areas with respect to prevention of pollution by sewage<sup>1</sup>.

7bis *A passenger* means every person other than:

- .1 the master and the members of the crew or other persons employed or engaged in any capacity on board a ship on the business of that ship; and
- .2 a child under one year of age.

7ter *A passenger ship* means a ship which carries more than twelve passengers.

For the application of regulation 11.3, a *new passenger ship* is a passenger ship:

- .1 for which the building contract is placed, or in the absence of a building contract, the keel of which is laid, or which is in a similar stage of construction, on or after 1 January 2016; or
- .2 the delivery of which is two years or more after 1 January 2016.

*An existing passenger ship* is a passenger ship which is not a new passenger ship."

2 *New paragraph 2 is added to regulation 9:*

"2 By derogation from paragraph 1, every passenger ship which, in accordance with regulation 2, is required to comply with the provisions of this Annex, and for which regulation 11.3 applies while in a special area, shall be equipped with one of the following sewage systems:

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<sup>1</sup> Refer to Assembly resolution A.927(22), Guidelines for the designation of special areas under MARPOL 73/78 and guidelines for the identification and designation of particularly sensitive sea areas.

- .1 a sewage treatment plant which shall be of a type approved by the Administration, taking into account the standards and test methods developed by the Organization,<sup>2</sup> or
- .2 a holding tank of the capacity to the satisfaction of the Administration for the retention of all sewage, having regard to the operation of the ship, the number of persons on board and other relevant factors. The holding tank shall be constructed to the satisfaction of the Administration and shall have a means to indicate visually the amount of its contents."

3 *Regulation 11 is replaced by the following:*

**Regulation 11**

*Discharge of sewage*

"A *Discharge of sewage from ships other than passenger ships in all areas and discharge of sewage from passenger ships outside special areas*

1 Subject to the provisions of regulation 3 of this Annex, the discharge of sewage into the sea is prohibited, except when:

- .1 the ship is discharging comminuted and disinfected sewage using a system approved by the Administration in accordance with regulation 9.1.2 of this Annex at a distance of more than 3 nautical miles from the nearest land, or sewage which is not comminuted or disinfected at a distance of more than 12 nautical miles from the nearest land, provided that, in any case, the sewage that has been stored in holding tanks, or sewage originating from spaces containing living animals, shall not be discharged instantaneously but at a moderate rate when the ship is *en route* and proceeding at not less than 4 knots; the rate of discharge shall be approved by the Administration based upon standards developed by the Organization<sup>3</sup>; or
- .2 the ship has in operation an approved sewage treatment plant which has been certified by the Administration to meet the operational requirements referred to in regulation 9.1.1 of this Annex, and the effluent shall not produce visible floating solids nor cause discoloration of the surrounding water.

2 The provisions of paragraph 1 shall not apply to ships operating in the waters under the jurisdiction of a State and visiting ships from other States while they are in these waters and are discharging sewage in accordance with such less stringent requirements as may be imposed by such State.

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<sup>2</sup> Refer to the [draft 2012] Guidelines on Implementation of Effluent Standards and Performance Tests for Sewage Treatment Plants adopted by the Marine Environment Protection Committee of the Organization by [resolution MEPC....].

<sup>3</sup> Refer to the Recommendation on standards for the rate of discharge of untreated sewage from ships adopted by the Marine Environmental Protection Committee of the Organization by resolution MEPC.157(55).

*B Discharge of sewage from passenger ships within a special area*

3 Subject to the provisions of regulation 3 of this Annex, the discharge of sewage from a passenger ship within a special area shall be prohibited:

- a) for new passenger ships on, or after 1 January 2016, subject to regulation 12*bis*, subparagraph 2; and
- b) for existing passenger ships on, or after 1 January 2018, subject to regulation 12*bis*, subparagraph 2,

except when the following conditions are satisfied:

the ship has in operation an approved sewage treatment plant which has been certified by the Administration to meet the operational requirements referred to in regulation 9.2.1 of this Annex, and the effluent shall not produce visible floating solids nor cause discoloration of the surrounding water.

*C General requirements*

4 When the sewage is mixed with wastes or waste water covered by other Annexes of MARPOL, the requirements of those Annexes shall be complied with in addition to the requirements of this Annex."

4 *New regulation 12bis is added as follows:*

**"12bis Reception facilities for passenger ships in Special Areas**

.1 Each Party, the coastline of which borders a special area, undertakes to ensure that:

- .1 facilities for the reception of sewage are provided in ports and terminals which are in a special area and which are used by passenger ships;
- .2 the facilities are adequate to meet the needs of those passenger ships; and
- .3 the facilities are operated so as not to cause undue delay to those passenger ships.

.2 The Government of each Party concerned shall notify the Organization of the measures taken pursuant to subparagraph .1 of this regulation. Upon receipt of sufficient notifications in accordance with subparagraph .1 the Organization shall establish a date from which the requirements of regulation 11.3 in respect of the area in question shall take effect. The Organization shall notify all Parties of the date so established no less than twelve months in advance of that date. Until the date so established, ships while navigating in the special area shall comply with the requirements of regulation 11.1 of this Annex."



**AMENDMENTS TO THE  
FORM OF INTERNATIONAL SEWAGE POLLUTION PREVENTION CERTIFICATE**

1 *The following text is added under the heading "Particulars of ship":*

Type of ship for the application of regulation 11.3:<sup>\*</sup>

New/Existing passenger ship

Ship other than a passenger ship

2 *Amend paragraph <sup>\*</sup>1.1. to read as follows:*

<sup>\*</sup>1.1. Description of the sewage treatment plant:

Type of sewage treatment plant .....

Name of manufacturer .....

The sewage treatment plant is certified by the Administration to meet the effluent standards as provided for in resolution MEPC.2(VI).

The sewage treatment plant is certified by the Administration to meet the effluent standards as provided for in resolution MEPC.159(55).

The sewage treatment plant is certified by the Administration to meet the effluent standards as provided for in [resolution MEPC....].<sup>§</sup>

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\* Delete as appropriate.

§ The number of the MEPC resolution will be inserted when the standards have been adopted by the MEPC at a future session.



**ANNEX 22**

**RESOLUTION MEPC.227(64)**

**Adopted on 5 October 2012**

**2012 GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS  
AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS**

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 (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution,

NOTING resolution MEPC.159(55) by which the Committee adopted, at its fifty-fifth session, the *Revised Guidelines on implementation of effluent standards and performance tests for sewage treatment plants* (the Revised Guidelines) and invited Governments to apply the Revised Guidelines when approving sewage treatment plants and provide the Organization with information on experience gained with their application, in particular, on successful testing of equipment against the standards contained in the Revised Guidelines,

NOTING ALSO resolution MEPC.200(62) by which the Committee adopted, at its sixty-second session, amendments to MARPOL Annex IV concerning Special Area provisions and the designation of the Baltic Sea as a special area, which are expected to enter into force on 1 January 2013,

NOTING FURTHER the provisions of regulations 9.1.1 and 9.2.1 of MARPOL Annex IV, in which reference is made to the above-mentioned Revised Guidelines,

RECOGNIZING that the Revised Guidelines should be amended in order that current trends for the protection of the marine environment, the need to address particular oceanographical and ecological conditions of the special area designated, and developments in the design and effectiveness of commercially available sewage treatment plants be reflected; and the proliferation of differing unilateral more stringent standards that might be imposed worldwide be avoided,

HAVING CONSIDERED the recommendation made by the Sub-Committee on Ship Design and Equipment, at its fifty-sixth session,

1. ADOPTS the *2012 Guidelines on implementation of effluent standards and performance tests for sewage treatment plants*, the text of which is set out in the annex to this resolution;

2. INVITES governments to:

- .1 implement the 2012 Guidelines and apply them on or after 1 January 2016;  
and
- .2 provide the Organization with information on experience gained with the application of the 2012 Guidelines;

3. ALSO INVITES Governments to issue an appropriate "Certificate of type approval for sewage treatment plants" as referred to in paragraph 5.4.2 and the annex of the 2012 Guidelines and to recognize certificates issued under the authority of other Governments as having the same validity as certificates issued by them;
4. SUPERSEDES the *Revised Guidelines on implementation of effluent standards and performance tests for sewage treatment plants*, adopted by resolution MEPC.159(55).

ANNEX

**2012 GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS  
AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS**

**TABLE OF CONTENTS**

- 1 Introduction
- 2 Definitions
- 3 General
- 4 Technical specification
- 5 Testing considerations
- 6 Renewal and additional surveys
- 7 Familiarization of ship personnel in the use of the sewage treatment plant
- 8 Maintenance

ANNEX

Form of Certificate of Type Approval for Sewage Treatment Plants and appendix

## 2012 GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS

### 1 INTRODUCTION

#### 1.1 Background

1.1.1 The Marine Environment Protection Committee (MEPC) adopted resolution MEPC.2(VI), *Recommendation on International Effluent Standards and Guidelines for Performance Tests for Sewage Treatment Plants in 1976*. MEPC 55 in October 2006 adopted, by resolution MEPC.159(55), the *Revised Guidelines on implementation of effluent standards and performance tests for sewage treatment plants*, which superseded resolution MEPC.2(VI).

1.1.2 MEPC 62 adopted resolution MEPC.200(62) amending MARPOL by designating the Baltic Sea as a special area under Annex IV and prohibiting the discharge of sewage effluent from passenger ships operating in special areas, unless a passenger ship has in operation an approved sewage treatment plant implementing effluent standards and performance tests defined in the *2012 Guidelines on implementation of effluent standards and performance tests for sewage treatment plants* (the Guidelines).

#### 1.2 Application

1.2.1 These Guidelines amend the *Revised guidelines on implementation of effluent standards and performance tests for sewage treatment plants*, adopted by resolution MEPC.159(55), by including the standards of section 4.2 that only apply to passenger ships which operate in MARPOL Annex IV special areas and which intend to discharge treated sewage effluent into the sea.

1.2.2 The requirements of these Guidelines, with the exception of the requirements in section 4.2, will apply to sewage treatment plants installed on or after 1 January 2016 on:

- .1 ships, other than passenger ships, in all areas; and
- .2 passenger ships outside MARPOL Annex IV special areas.

1.2.3 The requirements of these Guidelines, including those in section 4.2, will apply to sewage treatment plants installed on:

- .1 new passenger ships when operating in a MARPOL Annex IV special area and intending to discharge treated sewage effluent into the sea on or after 1 January 2016; and
- .2 existing passenger ships when operating in a MARPOL Annex IV special area and intending to discharge treated sewage effluent into the sea on or after 1 January 2018.

1.2.4 Sewage treatment plants installed prior to 1 January 2016 and on or after 1 January 2010, on ships other than passenger ships operating in MARPOL Annex IV special areas and intending to discharge treated sewage effluent into the sea, should comply with resolution MEPC.159(55).

1.2.5 Sewage treatment plants installed prior to 1 January 2010 on ships other than passenger ships operating in MARPOL Annex IV special areas and intending to discharge treated sewage effluent into the sea, should comply with resolution MEPC.2(VI).

### 1.3 Purpose

1.3.1 These Guidelines and specifications address the design, installation, performance and testing of sewage treatment plants required by regulations 9.1.1 and 9.2.1 of MARPOL Annex IV.

1.3.2 The purpose of these Guidelines and specifications is:

- .1 to provide a uniform interpretation of the requirements of regulations 9.1.1 and 9.2.1 of MARPOL Annex IV;
- .2 to assist Administrations in determining appropriate design, construction and operational testing and performance parameters for sewage treatment plants when such equipment is fitted in ships flying the flag of their State; and
- .3 to provide guidance for installation requirements.

## 2 DEFINITIONS

2.1 *Annex IV* – the revised Annex IV of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 and 1997 Protocols (MARPOL), as amended by resolutions MEPC.115(51) and MEPC.200(62).

2.2 *Convention* – the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 and 1997 Protocols (MARPOL).

2.3 Dilution ( $Q_d$ ) – is dilution water, grey water, process water, and/or seawater introduced to the sewage treatment plant after the influent sample point and after the influent flow measurement device, see figure 1.

2.4 *Effluent* ( $Q_e$ ) – treated wastewater produced by the sewage treatment plant, see figure 1.

2.5 Flush water – transport medium used to carry sewage or other wastes from toilets or urinals to the treatment system.

2.6 *Geometric mean* – the  $n$ th root of the product of  $n$  numbers.

2.7 *Grey water* – is drainage from dishwater, galley sink, shower, laundry, bath and washbasin drains and does not include drainage from toilets, urinals, hospitals, and animal spaces, as defined in regulation 1.3 of MARPOL Annex IV and does not include drainage from cargo spaces.

2.8 *Hydraulic loading* – system design flow rate of waste water ( $Q_i$ ) into the sewage treatment plant.

2.9 *Influent* ( $Q_i$ ) – Liquid containing sewage, grey water or other liquid streams, to be processed by the treatment plant, see figure 1.

2.10 *Sample point* – A point for manual collection of a representative sample of influent and effluent without opening tanks, voids or vents, see figure 1.

2.11 *Testing on board* – testing, for the purpose of type approval, carried out on a sewage treatment plant installed on a ship.

2.12 *Testing ashore* – testing ashore, for the purpose of type approval, carried out on a sewage treatment plant.

2.13 *Thermotolerant coliforms* – the group of coliform bacteria which produce gas from lactose in 48 hours at 44.5°C. These organisms are sometimes referred to as "faecal coliforms"; however, the term "thermotolerant coliforms" is now accepted as more appropriate, since not all of these organisms are of faecal origin.

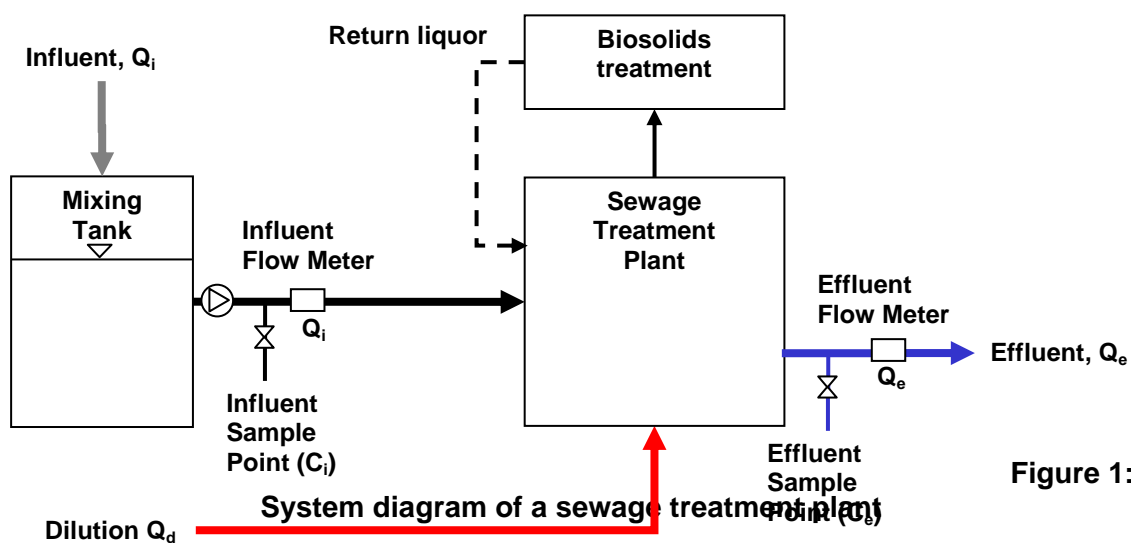


Figure 1:

### 3 GENERAL

3.1 An approved sewage treatment plant should meet the technical specifications in section 4 and the tests outlined in these Guidelines. However, section 4.2 on nitrogen and phosphorous removal applies to passenger ships operating within a special area intending to discharge treated sewage effluent into the sea. It should also be noted that, when ships are operating approved sewage treatment plants, MARPOL Annex IV also provides that the effluent shall not produce visible floating solids or cause discolouration of the surrounding water.

3.2 In meeting the effluent standards in section 4, an approved sewage treatment plant should not rely solely on dilution of wastewater. Where amounts of dilution are deemed essential to a treatment process, the effluent standards in section 4 having concentration limits (mg/l) should be adjusted proportionally using dilution compensation factor  $Q_i/Q_e$  to take account of dilution  $Q_d$ . In addition, for effluent standards in section 4 having a percentage reduction, the geometric mean of the daily percentage reduction values should be calculated using the accumulated flow  $Q_i$  and  $Q_e$  over each 24-hour test day, in terms of l/day, multiplied by the geometric mean of the corresponding concentration  $C_i$  and  $C_e$  for the same 24-hour test day, in terms of mg/l.

The overall percentage reduction over the entire test period  $n$  is:



$$PR = \sqrt[n]{PR_1 \cdot PR_2 \cdots PR_n} \cdot 100,$$

where  $PR_n$  is the daily removal value:

$$PR_n = \frac{\left( \frac{(Q_i)_n \cdot \sqrt[s]{(C_i)_1 \cdot (C_i)_2 \cdots (C_i)_s}}{1000} \right)_n - \left( \frac{(Q_e)_n \cdot \sqrt[s]{(C_e)_1 \cdot (C_e)_2 \cdots (C_e)_s}}{1000} \right)_n}{\left( \frac{(Q_i)_n \cdot \sqrt[s]{(C_i)_1 \cdot (C_i)_2 \cdots (C_i)_s}}{1000} \right)_n},$$

where:

$n$  represents the test day number; and

$s$  represents the sample number collected on test day  $n$

3.3 It is acknowledged that the performance of sewage treatment plants may vary considerably when the system is tested ashore under simulated shipboard conditions or on board a ship under actual operating conditions. Where testing ashore demonstrates that a system complies with the standards, but subsequent onboard testing does not meet the standards, the Administration should determine the reason and take it into account when deciding whether to type approve the plant.

3.4 It is recognized that Administrations may wish to modify the specific details outlined in these Guidelines to take account of very large, very small or unique sewage treatment plants.

## 4 TECHNICAL SPECIFICATION

4.1 For the purpose of regulations 9.1.1 and 9.2.1 of MARPOL Annex IV, a sewage treatment plant should meet the following effluent standards when tested for its Certificate of Type Approval by the Administration:

.1 Thermotolerant Coliform Standard

The geometric mean of the thermotolerant coliform count of the samples of effluent taken during the test period should not exceed 100 thermotolerant coliforms/100 ml as determined by membrane filter, multiple tube fermentation or an equivalent analytical procedure.

.2 Total Suspended Solids (TSS) Standard

.1 The geometric mean of the total suspended solids content of the samples of effluent taken during the test period should not exceed 35 Qi/Qe mg/l.

- .2 Where the sewage treatment plant is tested on board ship, the maximum total suspended solids content of the samples of effluent taken during the test period may be adjusted to take account of the total suspended solid content of the flushing water. In allowing this adjustment in maximum TSS, Administrations should ensure sufficient tests of TSS are taken of the flushing water throughout the testing period to establish an accurate geometric mean to be used as the adjustment figure (defined as  $x$ ). In no cases should the maximum allowed TSS be greater than  $(35 \text{ plus } x) Q_i/Q_e$  mg/l.

Method of testing should be by:

- .1 filtration of representative sample through a  $0.45 \mu\text{m}$  filter membrane, drying at  $105^\circ\text{C}$  and weighing; or
  - .2 centrifuging of a representative sample (for at least five minutes with mean acceleration of  $2,800\text{-}3,200 \text{ g}$ ), drying at least  $105^\circ\text{C}$  and weighing; or
  - .3 other internationally accepted equivalent test standard.
- .3 Biochemical oxygen demand without nitrification and chemical oxygen demand

Administrations should ensure the sewage treatment plant is designed to reduce both soluble and insoluble organic substances to meet the requirement that, the geometric mean of 5-day biochemical oxygen demand without nitrification ( $\text{BOD}_5$  without nitrification) of the samples of effluent taken during the test period does not exceed  $25 Q_i/Q_e$  mg/l and the chemical oxygen demand (COD) does not exceed  $125 Q_i/Q_e$  mg/l. The test method standard should be ISO 5815 1:2003 for  $\text{BOD}_5$  without nitrification and ISO 15705:2002 for COD, or other internationally accepted equivalent test standards.

- .4 pH

The pH of the samples of effluent taken during the test period should be between 6 and 8.5.

- .5 Zero or non-detected values

For thermotolerant coliforms zero values should be replaced with a value of 1 thermotolerant coliform/100 ml to allow the calculation of the geometric mean. For total suspended solids, biochemical oxygen demand without nitrification and chemical oxygen demand values below the limit of detection should be replaced with one half the limit of detection to allow the calculation of the geometric mean.

4.2 For the purpose of regulation 9.2.1 of MARPOL Annex IV, a sewage treatment plant installed on a passenger ship intending to discharge sewage effluent in special areas should additionally meet the following effluent standards when tested for its Certificate of Type Approval by the Administration:

.1 Nitrogen and phosphorus removal standard

The geometric mean of the total nitrogen and phosphorus content of the samples of effluent taken during the test period should not exceed:

.1 total nitrogen<sup>1</sup>: 20 Qi/Qe mg/l or at least 70 per cent reduction<sup>2</sup>;

.2 total phosphorus: 1.0 Qi/Qe mg/l or at least 80 per cent reduction<sup>3</sup>.

.2 Method of testing should be:

.1 ISO 29441:2010 for total nitrogen; and

.2 ISO 6878:2004 for total phosphorus; or

.3 other internationally accepted equivalent test standard.

4.3 Where the sewage treatment plant has been tested ashore, the initial survey should include installation and commissioning of the sewage treatment plant.

4.4 A review of the Nitrogen and Phosphorus removal standard set forth in paragraph 4.2.1 of the Guidelines should be undertaken by the Committee at its sixty-seventh session (second part of year 2014) to determine that the required removal standards for Nitrogen and Phosphorus are met by type approved sewage treatment plants, or such systems in development, taking into account the results of on board and ashore testing in accordance with section 5 of the 2012 Guidelines. In order to accomplish this, the Committee decided to establish a review group at MEPC 67.

4.5 The Committee, based on the information provided by the review group, should decide whether it is possible for ships to comply with the standard in paragraph 4.2.1 with the dates set out in paragraph 1.2.3. If a decision is taken that it is not possible or practicable for ships to comply, then the Guidelines should be amended accordingly.

## 5 TESTING CONSIDERATIONS

5.1 Testing of the operational performance of a sewage treatment plant should be conducted in accordance with the following subparagraphs. Unless otherwise noted, the subparagraphs apply to testing both on board and ashore.

### 5.2 Raw sewage quality

5.2.1 Sewage treatment plants tested ashore – the influent should be fresh sewage consisting of faecal matter, urine, toilet paper and flush water to which, for testing purposes primary sewage sludge has been added as necessary to attain a minimum total suspended solids concentration appropriate for the number of persons and hydraulic loading for which the sewage treatment plant will be certified. The testing should take into account the type of system (for example, vacuum or gravity toilets) and any water or grey water that may be

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<sup>1</sup> Total nitrogen means the sum of total Kjeldahl nitrogen (organic and ammoniacal nitrogen) nitrate-nitrogen and nitrite-nitrogen.

<sup>2</sup> Reduction in relation to the load of the influent.

<sup>3</sup> Reduction in relation to the load of the influent.

added for flushing to the sewage before treatment. In any case the influent concentration of total suspended solids should be no less than 500 mg/l.

5.2.2 Sewage treatment plants tested on board – the influent may consist of the sewage generated under normal operational conditions. In any case the average influent concentration of total suspended solids should be not less than 500 mg/l.

5.2.3 Influent should be assessed without the contribution of any return liquors, wash water, or recirculates, etc., generated from the sewage treatment plant.

### **5.3 Duration and timing of test**

The duration of the test period should be a minimum of 10 days and should be timed to capture normal operational conditions, taking into account the type of system and the number of persons and hydraulic loading for which the sewage treatment plant will be type approved. Noting that the systems need a period of stabilization, the test should commence after steady-state conditions have been reached by the sewage treatment plant under test.

### **5.4 Loading factors**

5.4.1 During the test period, the sewage treatment plant should be tested under conditions of minimum, average and maximum volumetric loadings:

- .1 for testing ashore, these loadings should be as laid down in the manufacturer's specifications. Figure 2 shows suggested timings for sampling each loading factor; and
- .2 for testing on board, minimum loading should represent that generated by the number of persons on the ship when it is alongside in port, and average and maximum loadings should represent those generated by the number of persons on the ship at sea and should take account of meal times and watch rotations.

5.4.2 The Administration should undertake to assess the capability of the sewage treatment plant to produce an effluent in accordance with the standards prescribed by section 4 following minimum, average and maximum volumetric loadings. The range of conditions under which the effluent standards were met should be recorded on the Certificate of Type Approval. The form of the Certificate of Type Approval and appendix is set out in the annex to these Guidelines.

### **5.5 Sampling methods and frequency**

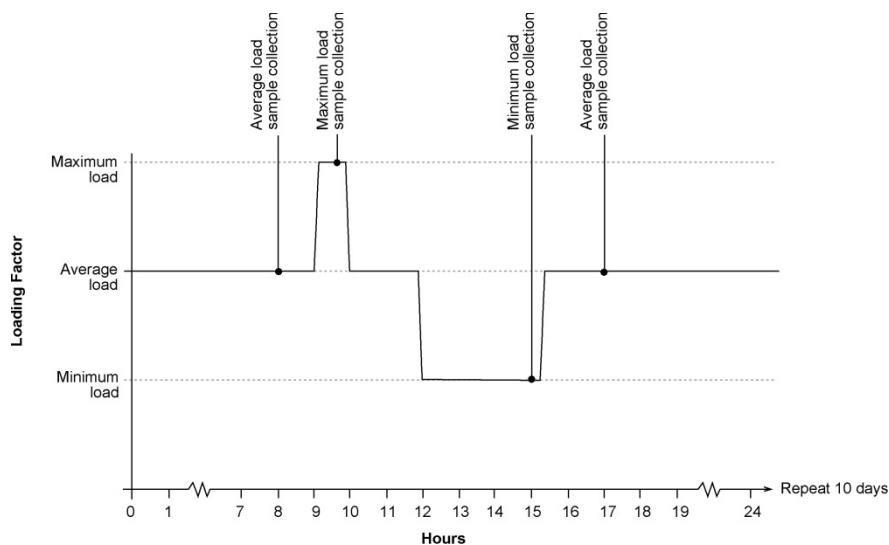
5.5.1 Administrations should ensure that the sewage treatment plant is installed in a manner which facilitates the collection of samples, see figure 1. Sampling should be carried out in a manner and at a frequency which is representative of the effluent quality. Figure 2 provides a suggested frequency for sampling, however, the frequency should take account of the residence time of the influent in the sewage treatment plant. A minimum of 40 effluent samples should be collected to allow a statistical analysis of the testing data (e.g. geometric mean, maximum, minimum and variance).

5.5.2 Influent sample point should be upstream of any return liquors, wash water, or recirculates generated from the sewage treatment plant. Where such a sample point is not readily available on ships, the flows and concentrations of these return liquors, wash water, or

recirculates generated from the sewage treatment plant should be measured, so that the load can be taken away from the load of influent.

5.5.3 An influent sample should be taken and analysed for every effluent sample taken and the results recorded to ensure compliance with section 4. If possible, additional influent and effluent samples should be taken to allow for a margin of error. Samples should be appropriately preserved prior to analysis particularly if there is to be a significant delay between collection and analysis or during times of high ambient temperature.

5.5.4 Any disinfectant residual in samples should be neutralized when the sample is collected to prevent unrealistic bacteria kill or chemical oxidation of organic matter by the disinfectant brought about by artificially extended contact times. Chlorine (if used) concentration and pH should be measured prior to neutralization.



**Figure 2: Suggested hydraulic loading factors and sampling frequency for testing sewage treatment plants. May be modified as necessary to take account of characteristics of individual sewage treatment plants**

## 5.6 Analytical testing of effluent

The Administration should give consideration to the recording of other parameters in addition to those required (thermotolerant coliforms, total suspended solids, BOD<sub>5</sub> without nitrification, COD, pH and residual chlorine) with a view to future technological development. These parameters include total solids, volatile solids, settleable solids, volatile suspended solids, turbidity, total organic carbon, total coliforms and faecal streptococci.

## 5.7 Disinfectant residual

The potential adverse environmental effects of many disinfectant residuals and by-products, such as those associated with the use of chlorine or its compounds, are well recognized. It is, therefore, recommended that Administrations encourage the use of ozone, ultraviolet irradiation or any other disinfectants which minimize adverse environmental effects, whilst pursuing the thermotolerant coliform standard. When chlorine is used as a disinfectant, the Administration should be satisfied that the best technical practice is used to keep the disinfectant residual in the effluent below 0.5 mg/l.

## **5.8 Scaling considerations**

Only full-scale marine sewage treatment plants should be accepted for testing purposes. The Administration may certify a range of the manufacturer's equipment sizes employing the same principles and technology, but due consideration should be given to limitations on performance which might arise from scaling up or scaling down. In the case of very large, very small or unique sewage treatment plants, certification may be based on results of prototype tests. Where possible, confirmatory tests should be performed on the final installation of such sewage treatment plants.

## **5.9 Environmental testing of the sewage treatment plant**

5.9.1 The Administration should ensure that the sewage treatment plant can operate under conditions of tilt consistent with internationally acceptable shipboard practice up to 22.5° in any plane from the normal operating position.

5.9.2 Tests for certification should be carried out over the range of salinity and the range of temperatures for ambient air and flush water specified by the manufacturer, and the Administration should be satisfied that such specifications are adequate for the conditions under which the equipment must operate.

5.9.3 Control and sensor components should be subjected to environmental testing to verify their suitability for marine use. The Test Specifications section in part 3 of the annex to the Revised Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilges of Ships (resolution MEPC.107(49)) provides guidance in this respect.

5.9.4 Any limitation on the conditions of operation should be recorded on the certificate.

5.9.5 The Administration should also consider requiring the manufacturer to include in the operating and maintenance manuals, a list of chemicals and materials suitable for use in the operation of the sewage treatment plant.

## **5.10 Other considerations**

5.10.1 The type and model of the sewage treatment plant and the name of the manufacturer should be noted by means of a durable label firmly affixed directly to the sewage treatment plant. This label should include the date of manufacture and any operational or installation limits considered necessary by the manufacturer or the Administration.

5.10.2 Administrations should examine the manufacturer's installation, operating and maintenance manuals for adequacy and completeness. The ship should have on board at all times a manual detailing the operational and maintenance procedures for the sewage treatment plant, including safety information about the chemicals and materials actually used in the operation of the sewage treatment plant.

5.10.3 Qualifications of testing facilities should be carefully examined by the Administration as a prerequisite to their participation in the testing programme. Every attempt should be made to assure uniformity among the various facilities.

## **6 RENEWAL AND ADDITIONAL SURVEYS**

Administrations should endeavour to ensure, when conducting renewal or additional surveys in accordance with regulations 4.1.2 and 4.1.3 of MARPOL Annex IV, that the sewage treatment plant continues to perform in accordance with the conditions outlined in regulation 4.1.1 of MARPOL Annex IV.

## **7 FAMILIARIZATION OF SHIP PERSONNEL IN THE USE OF THE SEWAGE TREATMENT PLANT**

Recognizing that the appropriate regulations relating to familiarization are contained within the Ships Safety Management Systems under the International Safety Management Code, Administrations are reminded that ship staff training should include familiarization in the operation and maintenance of the sewage treatment plant.

## **8 MAINTENANCE**

Routine maintenance of the system should be clearly defined by the manufacturer in the associated operating and maintenance manuals. All routine and repair maintenance should be recorded.

ANNEX

FORM OF CERTIFICATE OF TYPE APPROVAL  
FOR SEWAGE TREATMENT PLANTS AND APPENDIX

BADGE OR CIPHER
-----------------------

NAME OF ADMINISTRATION

**CERTIFICATE OF TYPE APPROVAL  
FOR SEWAGE TREATMENT PLANTS**

This is to certify that the sewage treatment plant, type....., having a designed hydraulic loading of ..... cubic metres per day, ( $m^3/day$ ), an organic loading of ..... kg per day biochemical oxygen demand without nitrification ( $BOD_5$  without nitrification) and of the design shown on drawings Nos. .... manufactured by ..... has been examined and satisfactorily tested in accordance with the International Maritime Organization resolution MEPC.227(64) to meet the operational requirements referred to in regulations 9.1.1 and 9.2.1 of MARPOL Annex IV of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 and 1997 Protocols (as amended by resolutions MEPC.115(51) and MEPC.200(62)).

The tests on the sewage treatment plant were carried out ashore at\* ..... on board at\* ..... and completed on .....

The sewage treatment plant was tested and produced an effluent which, on analysis, produces:

- .1 a geometric mean of no more than 100 thermotolerant coliforms/100 ml;
- .2 a geometric mean of total suspended solids of 35  $Q_i/Q_e$  mg/l if tested ashore or the maximum total suspended solids not exceeding (35 plus  $x$ )  $Q_i/Q_e$  mg/l for the ambient water used for flushing purposes if tested on board;
- .3 a geometric mean of 5-day biochemical oxygen demand without nitrification ( $BOD_5$  without nitrification) of no more than 25  $Q_i/Q_e$  mg/l;
- .4 a geometric mean of chemical oxygen demand (COD) of no more than 125  $Q_i/Q_e$  mg/l;
- .5 pH between 6 and 8.5;
- .6 a geometric mean of total nitrogen of no more than 20  $Q_i/Q_e$  mg/l or at least 70 per cent reduction; and
- .7 a geometric mean of total phosphorus of no more than 1.0  $Q_i/Q_e$  mg/l or at least 80 per cent reduction\*\*.

The Administration confirms that the sewage treatment plant can operate at angles of inclination of  $22.5^\circ$  in any plane from the normal operating position.

Details of the tests and the results obtained are shown on the appendix to this Certificate.

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\* Delete as appropriate.

\*\* Delete for ships other than passenger ships intending to discharge sewage effluent in Special Areas.



A plate or durable label containing data of the manufacturer's name, type and serial numbers, hydraulic loading and date of manufacture should be fitted on each sewage treatment plant.

A copy of this certificate should be carried on board any ship equipped with the above described sewage treatment plant.

Official stamp ..... Signed

Administration of .....

Dated this ..... day of..... 20.....

**APPENDIX TO  
CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS**

BADGE OR CIPHER
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Test results and details of tests conducted on samples from the sewage treatment plant in accordance with resolution MEPC.227(64):

Sewage treatment plant, Type .....

Manufactured by .....

Organization conducting the test .....

Designed hydraulic loading .....m<sup>3</sup>/day

Designed organic loading ..... kg/day BOD

Number of effluent samples tested .....

Number of influent samples tested .....

Total suspended solids influent quality ..... mg/l

Total nitrogen influent quality.....mg/l as nitrogen\*

Total phosphorus influent quality.....mg/l as phosphorus\*

BOD<sub>5</sub> without nitrification influent quality ..... mg/l

Maximum hydraulic loading ..... m<sup>3</sup>/day

Minimum hydraulic loading ..... m<sup>3</sup>/day

Average hydraulic loading (Qi)..... m<sup>3</sup>/day

Effluent flow (Qe)..... m<sup>3</sup>/day

Dilution compensation factor (Qi/Qe).....

Geometric mean of total suspended solids .....mg/l

Geometric mean of the thermotolerant coliform count..... coliforms/100 ml

Geometric mean of BOD<sub>5</sub> without nitrification ..... mg/l

Geometric mean of COD .....mg/l

Geometric mean of total nitrogen .....mg/l\* or %\*

Geometric mean of total phosphorus.....mg/l\* or %\*

Maximum pH: .....

Minimum pH:.....

Type of disinfectant used .....

If Chlorine - residual Chlorine:

Maximum ..... mg/l

Minimum ..... mg/l

Geometric Mean ..... mg/l

Was the sewage treatment plant tested with:

Fresh water flushing? ..... Yes/No\*

Salt water flushing? ..... Yes/No\*

Fresh and salt water flushing? ..... Yes/No\*

Grey water added? ..... Yes – proportion: /No\*

Was the sewage treatment plant tested against the environmental conditions specified in section 5.9 of resolution MEPC.227(64):

\* Delete as appropriate.

Temperature ..... Yes/No\*  
Humidity ..... Yes/No\*  
Inclination ..... Yes/No\*  
Vibration ..... Yes/No\*  
Reliability of Electrical and Electronic Equipment ..... Yes/No\*

Limitations and the conditions of operation are imposed:

Salinity .....  
Temperature .....  
Humidity .....  
Inclination .....  
Vibration .....

Results of other parameters tested .....

Official stamp ..... Signed  
.....

Administration of .....

Dated this ..... day of..... 20.....

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\* Delete as appropriate.

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