

RESOLUTION MEPC.227(64)  
Adopted on 5 October 2012  
2012 GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS  
AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS

**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**

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#### ANNEX

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## 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.

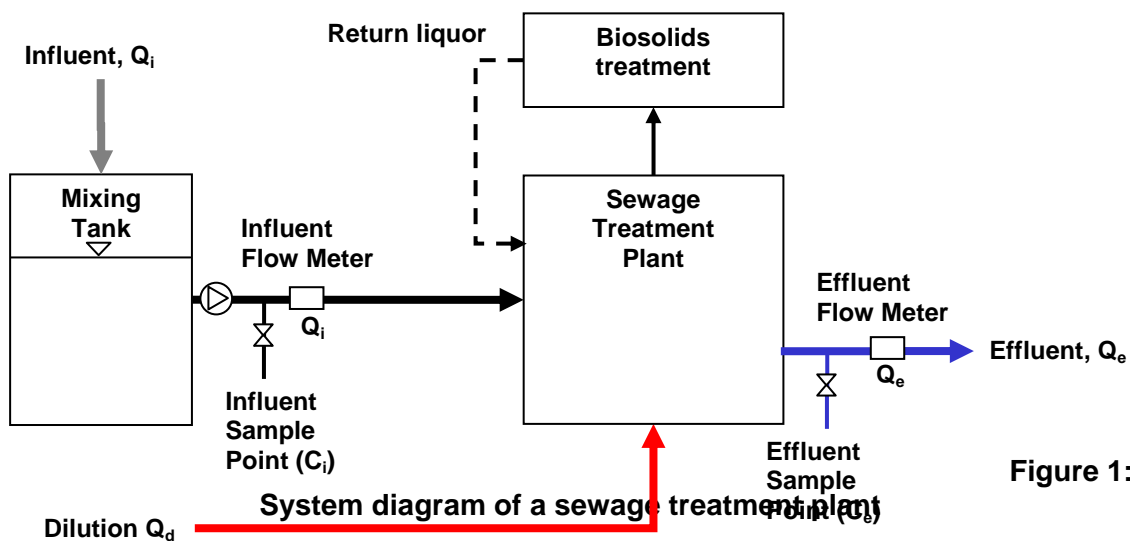


Figure 1:

### 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°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 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 (BOD<sub>5</sub> 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 BOD<sub>5</sub> 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

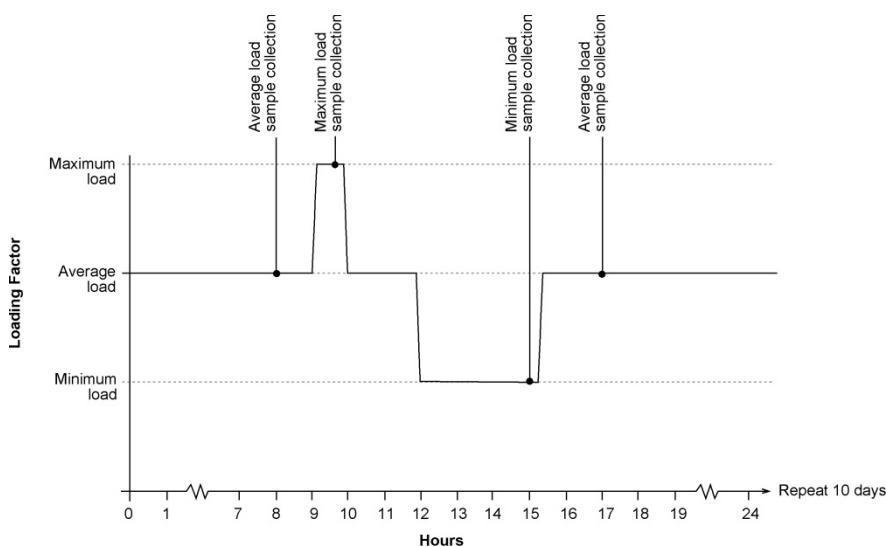
5.5.1 Administrations should ensure that the sewage treatment plant is installed in a manner which facilitates the collection of samples, see figure 1. Sampling should be carried out in a manner and at a frequency which is representative of the effluent quality. Figure 2 provides a suggested frequency 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

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):

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\* 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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