

ANNEX 4  
RECOMMENDATION ON INTERNATIONAL EFFLUENT STANDARDS AND GUIDELINES FOR  
PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS  
Resolution MEPC.2(6)  
adopted on 3 December 1976

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ANNEX IV

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FOR PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS

Resolution MEPC.2(VI)

adopted on 3 December 1976

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

NOTING Resolution A.297(VIII) by which the Assembly designated the Committee as the appropriate body to perform such functions as are or may be conferred upon the Organization under international conventions for the prevention and control of pollution from ships,

NOTING FURTHER Regulation 3(1)(a)(i) of Annex IV of the International Convention for the Prevention of Pollution from Ships, 1973 which provides that a sewage treatment plant shall meet operational requirements based on standards and test methods developed by the Organization,

NOTING ALSO Resolution 20 of the International Conference on Marine Pollution, 1973 which urges the Organization to take action to develop the above-mentioned standards and test methods as soon as possible,

HAVING CONSIDERED proposals of the Member Governments for effluent standards and test methods for sewage treatment plants aboard ships,

ADOPTS the Effluent Standards for Sewage Treatment Plants and the Guidelines for Performance Tests for Sewage Treatment Plants with respect to Effluent Standards, appearing at Annex A and Annex B hereto for the purposes of Regulation 3(1)(a)(i) of Annex IV of the above-mentioned Convention,

INVITES Member Governments:

- (a) to apply the Effluent Standards and Guidelines for approving sewage treatment plants;
- (b) to take steps to establish testing programmes in accordance with the Guidelines for Performance Tests as soon as possible;
- (c) to provide the Organization with a list of sewage treatment plants successfully meeting the standards; and

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(d) to issue an appropriate "Certificate of Type Test" as referred to in paragraph 1 of Annex A and to recognize such Certificates issued under the authority of other Governments as having the same validity as Certificates issued by them,

REQUESTS the Secretariat on the basis of the information received, to maintain and update a list of approved sewage treatment plants and to circulate it periodically to Governments.

ANNEX A

INTERNATIONAL EFFLUENT STANDARDS FOR SEWAGE TREATMENT PLANTS

1. For the purpose of Regulation 3(1)(a)(i) of Annex IV to the Convention, a sewage treatment plant should satisfy the following effluent standards when tested for its certificate of type test by the Administration:

(i) Faecal Coliform Standard

The geometric mean of the faecal coliform count of the samples of effluent taken during the test period should not exceed 250 faecal coliforms/100 ml M.P.N. (most probable number) as determined by a multiple tube fermentation analysis or an equivalent analytical procedure.

(ii) Suspended Solids Standard

(a) Where the equipment is tested on shore, the geometric mean of the total suspended solids content of the samples of effluent taken during the test period shall not exceed 50 mg/l.

(b) Where the equipment is tested aboard ship, the geometric mean of the total suspended solids content of the samples of effluent taken during the test period shall be not more than 100 mg/l above the suspended solids content of ambient water used for flushing purposes.

Analysis for suspended solids should be conducted in accordance with gravimetric methods approved by the Administration.

2. In addition to the above conditions, the plant should be so designed that the geometric mean of 5-day Biochemical Oxygen Demand ( $BOD_5$ ) of the samples of effluent taken during the test period does not exceed 50 mg/l.

Administrations should satisfy themselves that the plant is designed to reduce both soluble and insoluble organic substances to meet this requirement.

ANNEX B

GUIDELINES FOR PERFORMANCE TESTS FOR SEWAGE TREATMENT  
PLANTS WITH RESPECT TO EFFLUENT STANDARDS

I. GENERAL

1.1 These guidelines are intended to assist Administrations in establishing operational performance testing programmes for sewage treatment plants for the purpose of Regulation 3(1)(a)(i) of Annex IV of the Convention.

1.2 It is acknowledged that the performance of sewage treatment plants may vary considerably when the system is tested on-shore under shipboard simulated conditions or on-board ship under actual operating conditions. A review of actual test data showed this difference could be as high as a factor of two.

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

II. TESTING CONSIDERATIONS

A test for operational performance of a sewage treatment plant (hereafter referred to as "equipment") should be conducted in accordance with the following items. Unless otherwise noted, the items apply to both testing ashore and on board.

2.1 Raw Sewage Quality

For equipment 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 concentration of 500 mg/l of suspended solids.

For equipment tested aboard ship the influent may consist of the sewage generated aboard the vessel under normal operational conditions.

## 2.2 Duration of Test

The duration of the test period should be ten (10) days after steady-state conditions have been reached by the equipment under test.

## 2.3 Loading factors

The equipment should be tested under conditions of average, minimum and maximum volumetric loadings, as laid down in the manufacturer's specification. The Administration should undertake to assess the capability of the equipment to produce an effluent in accordance with the standards prescribed in Part I following zero, maximum, minimum and average volumetric loadings. The range of conditions under which the effluent standards were met should be recorded on the certificate.

## 2.4 Sampling Methods and Frequency

Administrations should ensure that the equipment 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 effluent quality. Sampling frequency should take account of the residence time of the influent in the equipment. A minimum of 40 effluent samples should be collected to permit a statistical analysis of the data (geometric mean, maximum, minimum, variance, etc.). An adequate number of influent samples should be collected to ensure compliance with item 1. 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.

## 2.5 Analytical Testing of Effluent

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

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#### 2.6 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, ultra-violet irradiation or any other disinfectant, which minimizes the adverse environmental effects, whilst pursuing the faecal coliform standard. When chlorine is used as a disinfectant the Administrations should be satisfied that the best technical means are used to keep the disinfectant residual in the effluent as low as practicable.

#### 2.7 Scale-up consideration

Only full-scale marine equipment should be accepted for test purposes. Administrations 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. In the case of large or unique equipment, certification may be based on results of prototype equipment tests. Where possible confirmatory tests should be performed on the final installation of such equipment.

#### 2.8 Salinity and Temperature

Tests for certification should be carried out over the range of temperature and salinity specified by the manufacturers, and Administrations should be satisfied that such specifications are adequate for the conditions under which the equipment must operate. Any limitation on the conditions of operation should be recorded on the certificate.

#### 2.9 Tilt and Vibration

Administrations should be satisfied that the equipment can operate under conditions of tilt consistent with internationally acceptable shipboard practice. It may be necessary to subject control and sensor components to shock and vibration testing to verify their suitability for marine use.

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2.10 Other Considerations

2.10.1 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 unit.

2.10.2 Administrations should examine the manufacturer's installation, operating and maintenance manuals for adequacy and completeness.

2.10.3 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.

III. PERIODIC SURVEYS

3. Administrations should endeavour to ensure, when conducting periodical surveys in accordance with Regulation 3(1)(b) of Annex IV, that the equipment continues to perform in accordance with the conditions outlined in Regulation 3(1)(a) of Annex IV.

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