日本財団 The Nippon Foundation 助成事業

研究資料　No.05-17

汚水処理に関する調査研究（RSW）

（2005 年度報告書）

2006 年 3 月

財団法人　日本船舶技術研究協会

はしがき

本報告書は、日本財団の平成 17 年度助成事業「船舶関係諸基準に関する調査研究」の一環として、汚水処理プロジェクト（RSW）において実施した「汚水処理に関する調査研究」の成果をとりまとめたものである。

汚水処理プロジェクト（RSW）　ステアリング・グループ　委員名簿（順不同、敬称略）

ﾌﾟﾛｼﾞｪｸﾄ･ﾏﾈｰｼﾞｬｰ	久野　勝秀（日本舶用品検定協会）
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１．　はじめに

2005年4月に開催されたIMO/BLG9（国際海事機関／第9回ばら積み液体・ガス小委員会）において、MARPOL 附属書IVに関連し、次のことを内容とする見直しを行うことが決議された。

(1)　汚水処理プラントの基準に関するMEPC決議（MEPC.2(VI)）の改訂
(2)　タンクに保存された汚水の排出比の作成
(3)　12海里以上の海域における家畜運搬船からの未処理の廃水の条約上の取扱い

今後の予定は、BLG10 にて審議、その後 IMO/MEPC55（国際海事機関／第 55 回海洋環境保護委員会）にてこれら案件が採択される予定となっている。

本年度は、通信部会（Correspondence Group、メールベースの通信部会）を設置し、審議することとしているため、これら案件の国内での審議、対応する場として「汚水処理プロジェクト（RSW）」を設置することとした。

２．　調査研究の目的・内容及び背景

2.1　目的

本プロジェクトでは、現行及び開発段階の汚水の処理技術の調査、船舶からの汚水の排出量の調査を行い、決議MEPC.2(VI)の見直し及び現実的な排出（比）の基準の作成に関する通信部会の審議への対応を行うと共に、必要に応じて我が国の意見をIMOに提案することを目的とする。

2.2　研究内容

(1)　現行及び開発段階の処理技術の調査及び船舶からの汚水の排出量の調査
(2)　現実的な排出（比）基準の検討
(3)　決議MEPC.2(VI)の見直し及び改正案の検討

2.3　背景

BLG9 にて MARPOL 付属書 IV「船舶の汚水による汚染の防止のための規則」に関連した決議 MEPC.2(VI)（汚水処理プラントの承認ガイドライン/1976 年採択）の見直し作業及び汚水排出比に関する基準の策定に関する審議が行われた。決議 MEPC.2(VI)（汚水処理プラントの承認ガイドライン）は、29 年前に採択されたものであるため、現在の技術や科学を考慮し、見直しを行う必要があることが確認されている。

また、未処理の汚水の排出比に関して、MARPOL 付属書 IV では、一定の条件において未処理の汚水の船外排出が認められており、その排出比に関し基準を作成することを目的に BLG9 で討議されたが、家畜運搬船等大量の未処理の汚水が排出された場合、環境に対する影響が懸念されること、更に客船や商船においても未処理の汚水の船外排出に関しては検討が必要であることが BLG9 で指摘され、結論に至らなかった。

よって、BLG9 では、上記決議 MEPC.2(VI)の改正及び汚水排出比に関する基準の策定について、通信部会において審議を行い、その後、翌年に開催される BLG10 で更なる審議を行うことで合意されている。

３．　IMOでの審議状況

決議MEPC.2(VI)（汚水処理プラントの承認ガイドライン/1976年採択）の見直し作業については、MEPC 51にてBLG小委員会の作業計画に組み入れることが合意され、BLG9から検討が開始されている。目標としている作業の完了日は2006年である。BLG9では議題7として取り上げられ、オーストラリアより決議MEPC.2(VI)の改正の提案文書（BLG9/7）が提出され、審議が行われた。BLG9では、BLG9/7を基本の文書とした決議MEPC.2(VI)の改正作業を行うため通信部会の設置が合意されている。

一方、汚水排出比に関する基準の策定についても、MEPC51 にて BLG 小委員会の作業計画に組み入れられることで合意され、BLG9 では議題 8 として検討が開始された。本件についても、目標としている作業の完了日は 2006 年である。BLG9 での審議の結果、MARPOL 付属書 IV　11.1.1 項で要求される貯留タンクに保持された汚水の排出レートの原案の作成、及び MARPOL 付属書 IV　11.1.1 項に関連し、家畜運搬船からの貯留タンクに保持されない汚水の排出に関する解釈について、上記通信部会でその原案を作成し BLG10 へ報告することで合意されている。

通信部会は、下記のスケジュールで審議が行われた。

Round 1:　7 月 12 日までとし、同日までに審議のための叩き台となる提案文書に対するコメントを通信部会議長に対し送付し、通信部会議長が取り纏めを行った。

Round 2:　7月下旬から9月下旬までとし、通信部会議長が取り纏めたRound 1でのコメントを審議し、BLG10 への提案文書の原案の作成を行った。

Round 3:　10 月中旬から 11 月中旬に、提案文書の原案の最終チェックを行い IMO へ提案を行った（通信部会からの報告書は、既に通信部会議長国オーストラリアより、文書番号 BLG10/7 の提案文書として提出されている）。

通信部会からの報告書は、2006年4月3日から7日まで開催されるBLG10において、議題7として審議が行われる予定である。

４．　RSWの活動状況

今年度は、BLG9において設置された通信部会の国内対応を行うため、以下の日時、議題で汚水処理プロジェクト（RSW）ステアリング・グループ会議を行った他、必要に応じてE-mailベースで検討を行った。

- 第1回　2005年6月24日（金）　13:30～16:00　　霞山会館　ふようの間
  議題　(1) 決議MEPC.2(VI)の見直し作業、(2) 船上の貯蔵タンクに貯留された汚水の排出比の確立のための基準案の検討、(3) 12海里以上の距離における、貯留タンクに貯留されない家畜運搬船からの処理されていない動物汚水の排出の検討、(4) その他
- 第2回　2005年10月18日（火）　14:00～17:00　（財）日本船舶技術研究協会　会議室
  議題　(1) 決議MEPC.2(VI)の見直し作業、(2) 船上の貯蔵タンクに貯留された汚水の排出比の確立のための基準案の検討、(3) 12海里以上の距離における、貯留タンクに貯留されない家畜運搬船からの処理されていない動物汚水の排出の検討、(4) その他
- 第3回　2006年2月15日（水）　13:30～15:30　　霞山会館　ふようの間
  議題　(1) BLG10対応について（・決議MEPC.2(VI)の見直し作業、・船上の貯蔵タンクに貯留された汚水の排出比の確立のための基準案の検討、・12海里以上の距離における、貯留タンクに貯留されない家畜運搬船からの処理されていない動物汚水の排出の検討）、(2) 報告書について、(3) その他

５．　汚水処理に関する調査研究

「汚水処理に関する調査研究（RSW）」では通信部会への対応として次ような審議が行われた。

通信部会の付託事項は下記の通りそれぞれ、Task 1 から Task 3 として割り振られ、審議のための叩き台となる提案文書が通信部会議長国であるオーストラリアにより作成された。

(1) Task 1: BLG9/7 を基本の文書とした決議 MEPC.2(VI)の改正原案の作成。
(2) Task 2: MARPOL 付属書 IV　11.1.1 項で要求される貯留タンクに保持された汚水の排出レートの原案の作成。
(3) Task 3: MARPOL 付属書 IV　11.1.1 項に関連し、貯留タンクに保持されない汚水の排出に関する統一解釈の原案の作成。(Task 3)

5.1　審議概要

5.1.1　Task 1: 決議 MEPC.2(VI)の見直し作業

5.1.1.1　Round 1 の審議

(1) 処理装置の排出基準値である、「排泄物大腸菌基準」、「懸濁固形物基準」、「5 日間生物化学的酸素要求量(BOD)」の変更について、これまで日本では、船舶の汚水による環境への悪影響は報告されてないので、特に厳しい排出規制は必要と考えてない。よって現状の値を保つことを支持する旨コメントする。
(2) 現行の決議 MEPC.2(VI)で曖昧な表現の箇所については、JG「ふん尿処理装置型式承認試験基準」の内容をコメントすることとする。
(3) 国内コメントについては、プロジェクト・マネージャーが意見を取り纏めた後、委員に回覧し、Round 1 のコメントとして通信部会議長へ送付した。

5.1.1.2　Round 2 の審議

BOD の値、生汚水の質、記録すべきパラメータ等に関し、国内汚水処理メーカー3 社の委員により更に検討し、対処案を作成することとした。なお、現時点の各国コメントを勘案した場合、新しいガイドラインの基準値が厳しくなることが予想され、処理装置の設計変更を伴う可能性があることが考えられる。よって、次回 BLG10 での国内製造者のコメントの反映及び設計変更の準備を確実にするため、処理装置メーカーの代表者に同会合へ出席頂くことが了承された。また、改正決議 MEPC.2(VI)の適用日の文章の提案内容に関し審議が行われ、了承された。

5.1.1.3　BLG10 の対応

通信部会の BLG10 への報告書が BLG10/7（添付資料）として昨年 12 月 23 日に IMO へ提出された。RSW として、本案については基本的に合意しているが、下記に関し我が国より BLG10 の議場で主張することとした。

(1) Task 1: 決議 MEPC.2(VI)の改正の内容に関しては、既に大筋で合意した。[　]で明記された箇所については緩やかな数値を日本として主張する。

(2) BLG10/7 ANNEX 第 5.7 項 Disinfectant residual で提案されている残留塩素濃度（[0.1][0.5][2.5]mg/l）については、2.5mg/l を支持する。

(3) ANNEX 第 7 章に、Sewage 処理装置取り扱いに関する乗組員の訓練が規定されているが、当該装置の操作はマニュアルを参照すれば十分理解できるものであり、特別な訓練は必要ないと考えられることから、7.1 項の前者を支持する。ただし、全乗組員がマニュアルに精通しておく必要は無く、責任者および操作に携わる乗組員のみ精通していれば問題は無いと思われることから、Crew を Each person responsible for operating any sewage treatment plant 等に修正すべきである。

5.1.2 Task 2: MARPOL 付属書 IV 11.1.1 項で要求される貯留タンクに保持された汚水の排出レートの原案の作成

5.1.2.1 Round 1 での審議

日本では、船舶の汚水による環境への悪影響は報告されていないため、厳しい排出規制が必要とは考えていない。なお、通信部会議長国であるオーストラリアが現在提案している排出比（1/200,000 (時間当たりの工程容積)）は、日本の船主が保有している船舶で考えた場合、妥当と考えられる数値であることが確認されたため、支持することとした。但し、「工程容積」は一般に使用されていないため、用語を定義することをコメントとすることで了承された。

補足：原文では、「工程容積」は「swept volume」と表記されている。MEPC51/17/5 にて、Swept volume は「ship breadth x draft x daily distance travelled」と記載されている。

5.1.2.2 Round 2 での審議

排出比（1/200,000 (時間当たりの工程容積)）の妥当性の検討を行い、了承された。

5.1.2.3 BLG10 の対応

下記に関し我が国より BLG10 の議場で主張することとした。

・記録要件が船外に排出される汚水全てに適用される場合、船外直接排出される汚水を管理することは不可能であること、また、提案されている排出比 1/200,000 は、巡航速度で航行している一般貨物船および客船共に十分にクリアできる数値であることから、船外直接排出される汚水については記録要件を除外とする。

5.1.3 Task 3: MARPOL 付属書 IV 11.1.1 項に関連し、貯留タンクに保持されない汚水の排出に関する統一解釈の原案の作成

5.1.3.1 Round 1 での審議

現在の MARPOL 付属書 IV でも、沿岸から 12 海里以遠の海域であれば、（動物運搬船等の）船舶の種類に関わらず、汚水の船外直接排出は認められる。また、家畜運搬船自体の数も少ないため、海洋に与える影響はそもそも小さいと考える。従って、MARPOL 附属書 IV 規則 11.1 の改正は必要ない旨コメントをした。

本件に関し BLG10/7 では、MARPOL 附属書 IV 規則 11 に関し下線部のような改正を行うことを提案している。

Regulation 11 Discharge of Sewage

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, paragraph 1.2 of this Annex at a distance of more than 3 nautical miles from the nearest land, or sewage which is not communited or disinfected, at a distance of more that 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; or

６．　まとめ（今後の対応、検討事項）

改正決議MEPC.2(VI)（汚水処理プラントの承認ガイドライン/1976年採択）及び汚水排出比に関する基準については、BLG10において審議が行われ、その後MEPC55において決議される見込みである。

改正決議MEPC.2(VI)（汚水処理プラントの承認ガイドライン/1976年採択）については、適用日が2009年10月又は2010年1月となることが考えられるため、この間に基準に適合しうる装置の開発及び認証体制を整えておく必要がある。

また、決議される汚水排出比に関する基準については、今後、関連する法令の改正等の検討が必要と考えられる。

添付資料

BLG10/7: AMENDMENTS TO RESOLUTION MEPC.2(VI)

DEVELOPMENT OF STANDARDS REGARDING RATE OF DISCHARGE FOR SEWAGE

Report of the Correspondence Group

INTERNATIONAL MARITIME ORGANIZATION

IMO

E

SUB-COMMITTEE ON BULK LIQUIDS AND GASES
10th session
Agenda items 7 and 8

BLG 10/7
23 December 2005
Original: ENGLISH

AMENDMENTS TO RESOLUTION MEPC.2(VI)

DEVELOPMENT OF STANDARDS REGARDING RATE OF DISCHARGE FOR SEWAGE

Report of the Correspondence Group

Submitted by Australia

SUMMARY	
Executive summary:	This document provides the outcome of the correspondence group on amendments to resolution MEPC.2(VI) and development of standards regarding rate of discharge for sewage.
Action to be taken:	Paragraph 52
Related documents:	BLG 9/7; BLG 9/8; BLG 9/17, paragraphs 7 to 8.9; MEPC 51/17/5; MEPC 51/22, paragraphs 17.13 to 17.15.

Background

1 MEPC 49 agreed that there was an urgent need to develop standards for the establishment of a "moderate rate" for the discharge of sewage that has been stored in holding tanks on board ships as required by regulation 11.1.1 of MARPOL Annex IV. MEPC 51 further recognized that this issue needed careful consideration in relation to sewage generated by humans onboard ships as well as effluent produced by livestock cargo on board specific ships, and referred the issue to BLG 9.

2 MEPC 49 also agreed to review the "Recommendation on international effluent standards and guidelines for performance tests for sewage treatment plants" adopted by resolution MEPC.2(VI) in 1976. A submission by Australia to MEPC 51 proposed that the resolution should be reviewed and amended in order to reflect the current trends for the protection of the marine environment, developments in the design and effectiveness of commercially available sewage treatment plants and to avoid the proliferation of differing unilateral more stringent standards that might be imposed. MEPC agreed to this proposal and referred the matter to BLG 9 for consideration as a high priority item with a target completion date of 2006.

3 A further submission by Australia, document BLG 9/7, identified a number of issues requiring more detailed examination and clarification when reviewing the resolution. BLG 9 agreed that BLG 9/7 would provide a basis for further work and that this review should not only aim to identify and correct problems related to the implementation of the resolution but also to

take into account and reflect in the final outcome the current technological progress and development in the field of onboard sewage treatment. BLG 9 also agreed that the review of resolution MEPC.2(VI) should take into account, as necessary, any relevant standards or guidelines developed by the World Health Organization (WHO).

4 BLG 9 agreed to establish a Correspondence Group under the leadership of Australia to consider these sewage related issues. The Correspondence Group worked under the following Terms of Reference:

.1 develop a draft text of proposed amendments to resolution MEPC.2(VI) using document BLG 9/7 as a basis;

.2 prepare a draft standard for the establishment of the rate of discharge for sewage that has been stored in holding tanks on board ships, as required by regulation 11.1.1 of the revised MARPOL Annex IV;

.3 consider further the issue of the discharge of untreated animal effluent from livestock carriers, not stored in holding tanks, at a distance of more than 12 nautical miles and to develop an appropriate recommendation for consideration at the next BLG; and

.4 submit a report to BLG 10.

Participation

5 The following Member States and non-governmental organization participated in the Correspondence Group:

Australia, Germany, Ireland, Japan, the Republic of Korea, the United Kingdom, the United States, Venezuela, and International Council of Cruise Lines (ICCL).

6 The Group conducted its work in accordance with the provisions of paragraphs 3.29 to 3.38 of the Guidelines on the organization and method of work of the MSC and the MEPC and their subsidiary bodies as amended (MSC/Circ.1099 – MEPC/Circ.405) and the outcome is summarized in the following paragraphs.

Task 1 - Revision of and proposed amendments to resolution MEPC.2(VI)

7 The Correspondence Group participants considered a number of issues using BLG 9/7 as a basis and also taking into account comments at BLG 9 to develop updated standards and testing requirements for sewage treatment plants. The WHO “Guide to Ship Sanitation” (draft revision of October 2004) was reviewed and it was noted that it contained standards were less stringent than MEPC.2(VI). Annex 1 contains the draft revised guidelines with amendments underlined as well square brackets (1.3, 3.2, 5.2.2, Figure 1, 5.7, 5.10, 7.1 and 7.2) on issues that the Group was unable to decide upon. BLG is requested to consider the draft amendments and also to decide upon the outstanding issues. The following provides discussion on all the issue that have been addressed during this review.

8 The group also briefly considered the application of the revised guidelines. It was noted that adoption of the guidelines was envisaged to take place at MEPC 55 and that manufacturer may require three years to ensure availability of approved equipment. There were two

suggestions: [..] October 2009 or 1 January 2010. There currently is no text within the guidelines addressing an application date. BLG is invited to consider the application of the guidelines.

9 A new title has been developed "Revised international guidelines on the implementation of effluent standards and performance tests for sewage treatment plants for compliance with MARPOL Annex IV". The title is a compromise between suggestions made by two participants. Introductory paragraphs have been agreed and all references to Annex IV have been updated (paragraphs 4.1 and 6.1) to reflect the requirements of the revised Annex IV as adopted on 1 April 2004. References to sewage treatment plants have been standardized throughout the document.

10 Relevant definitions have been incorporated in paragraph 2 including Annex IV, Convention, Geometric mean, Greywater, Testing onboard, Testing ashore and Thermotolerant coliforms (Section 2). The definition of Greywater is consistent with 1.7.8 of the Guidelines for the implementation of Annex V of MARPOL 73/78. All references to "faecal coliforms" have been replaced by the defined term "thermotolerant coliforms".

11 The requirement specified in regulation 11.1.2.2 that effluent should not produce any visible floating solids or discolouration of the surrounding water has been reflected in the general section of the guidelines (paragraph 3.1).

12 MEPC.2(VI) implied that systems tested onboard may exceed the standards by a factor of two for faecal coliforms and biological oxygen demand, and explicitly quantified the two standards for total suspended solids. MEPC.2(VI) states that "A review of actual test data implies that this difference could be as high as a factor of two". The Group was unable to decide whether plants tested onboard under "normal operational conditions" should meet the same standards as sewage treatment plants tested ashore prior to installation under more controlled conditions. Participants did not come to an agreement on whether dual standards should continue to be acceptable, and if so, whether the standards for testing ashore should be explicitly quantified. Paragraph 3.2 therefore contains several options in square brackets for the consideration of BLG 10.

13 In considering this issue the BLG Sub-Committee should note that 4.1.2(b) explicitly sets out the testing onboard standard for Total Suspended Solids. It is considered useful here because this parameter is affected by the Total Suspended Solids concentration of the water used for flushing toilets on the ship. The decision on paragraph 3.2, may further involve a reconsideration of paragraph 4.1.2(b).

14 The words "in addition to the above conditions" have been removed from paragraph 4.1.3 as they were considered unnecessary in the context of the revised and accordingly renumbered list of requirements. The chapeau makes it clear that all standards in 4.1.1-5 must be met.

15 MEPC.2(VI) allowed Administrations flexibility in application of the guidelines for very large equipment. The Group agreed to extend this flexibility to very small systems, so **"very large" wording has been changed to "various sized"** (paragraphs 3.3 and 5.7.1).

16 The Group considered clarification of the "test period". No definitive recommendations for a test period were forthcoming, although some participants considered that the test period will vary with the type of ship and sewage treatment plant. It was agreed to retain a minimum of 10 days duration of testing and also to encourage Administrations to require the timing of the test period to be representative of "normal operational conditions" (paragraph 5.2.1, also relevant to 4.1.1-2)

17 The geometric mean of the thermotolerant coliforms count has been reduced from 250 faecal coliforms/100ml M.P.N. (most probable number) to 100 thermotolerant coliforms/100ml. This figure represents a compromise between suggestions ranging from 20 to 200 thermotolerant coliforms/100ml (paragraph 4.1.1). The membrane filter method has been added to the acceptable methods for quantifying thermotolerant coliforms with the retention of multiple tube fermentation and "equivalent analytical procedure" which will allow Administrations to choose the most appropriate and practical method for varying circumstances and in light of advancing technology (paragraph 4.1.1).

18 The total suspended solids standards for equipment tested on shore has been reduced from 50mg/l to 35mg/l. Several participants suggested total suspended solids standards of 30 – 35 mg/l, and although there was minority support for retaining the existing standard (100mg/l), 35mg/l is proposed as the new standard for testing ashore (paragraph 4.1.2).

19 The Group agreed to reduce the 5-day Biological Oxygen Demand (BOD_5) standard from 50mg/l to 25mg/l (paragraph 4.1.3). Several participants suggested BOD_5 standards of 20 to 25mg/l; therefore, 25mg/l has been agreed. One participant was of the view that the standard should remain at 50mg/l. It was agreed that BOD_5 could not be estimated from the simpler Chemical Oxygen Demand (COD) test; therefore, BOD_5 was retained and the Group agreed to include COD as a new parameter. The COD standard was agreed at 125mg/l. It was also noted that seawater used as flushing water may skew the testing results. In the final round of comments, one participant suggested that the methods CODMn and CODCr be specified. This suggestion has been included in square brackets (paragraph 4.1.3).

20 The Group agreed that pH be included as part of the testing regime and that the pH of the effluent should be within the range 6 to 8.5 (paragraph 4.1.4).

21 As the calculation of geometric mean presents difficulties when zero values or values below the limit of detection are present, the Group agreed that guidance should be provided for Administrations. A distinction was drawn between values that were truly zero and values that were below the limit capable of detection by a particular analytical technique. Analytical methods for bacteria are capable of detecting true zero results. Participants supported a proposal to substitute 1 thermotolerant coliform/100ml for zero values. In the case of total suspended solids (TSS) and BOD, it was considered that true zero results are not possible for TSS analyses, only a result "below the limit of detection". In this case a value of one half the limit of detection should be substituted (paragraph 4.1.5).

22 The Group agreed to include the wording "Where the sewage treatment plant has been tested ashore in accordance with 4.1, the initial survey should include installation and commissioning of the sewage treatment plant" (paragraph 4.2).

23 In respect to raw sewage quality, some participants considered that the existing influent suspended solids concentration standard for testing ashore was too low and not representative of conditions aboard, particularly where vacuum toilet systems were used. It was also noted that in some systems the dilution of sewage by water or greywater occurs before treatment. Rather than proliferate the TSS concentration standards, the Group decided to add wording to encourage Administrations to require better simulation of shipboard conditions in shore-based testing (paragraph 5.2.1). One participant maintained that for testing onboard, a minimum total suspended solids concentration should be specified. The words "In any case, the influent concentration of total suspended solids should be no less than 500mg/l" are therefore included in square brackets for the consideration of BLG (paragraph 5.2.2).

24 The Group considered the issue of the volumetric loadings under which sewage treatment plants are tested. Clarification was provided on minimum, average and maximum loadings (paragraph 5.4.1-2). The requirement for testing at zero volumetric loading was removed since it was agreed that this would be impractical for many sewage treatment plants, and may actually be detrimental to the operation of biological treatment systems.

25 A recommendation for the sampling regime for testing ashore was incorporated into the guidelines through a diagram (Figure 1) based on current procedures used in Japan. Modifications have been made to Japan's original diagram to take account of the removal of 'zero loading' tests. In the final round of comments, one participant suggested that the period of operation at minimum load prior to minimum load sample collection be increased to 3-4 hours to better simulate operational conditions. An alternative diagram has been prepared and both have been contained in square brackets for BLG consideration (paragraphs 5.4.1.1 and 5.5.1 refer to Figure 1).

26 In order to ensure the testing is in accordance with the raw sewage quality standard (paragraph 5.2), guidance has been provided that an influent sample should be taken and analyzed for every effluent sample taken (paragraph 5.5.2).

27 It was agreed to add guidance where samples should be preserved prior to analysis particularly if there is to be a significant delay between collection and analysis or during times of high ambient temperature. Guidance has also been included for when chlorine concentration is determined before disinfectant neutralization due to an agreement to set a guideline level for residual chlorine (see paragraph 31 below). Effluent pH should also be measured before chemicals are added to samples for preservation (paragraph 5.5.3). No specific preservation techniques are included in the guidelines. Standard texts on wastewater analysis should be consulted for appropriate preservation techniques but may include for example refrigeration, disinfectant, neutralization or exclusion of air from sampling containers.

28 One participant suggested the removal of paragraph 5.6.1 as they considered there were other effluent parameters that Administrations may consider testing, however as there was no specific support for its removal, this paragraph has been retained. COD, pH and residual chlorine has been added to the list of required parameters since it has been agreed to require compliance with standards for these parameters in section 4.

29 With regard to residual chlorine, the Group agreed to remove the vague wording "as low as practicable" from the original resolution. The majority of participants supported setting a maximum level for residual chlorine with several figures suggested however the group could not reach agreement.. These figures are presented in square brackets for the consideration of BLG (paragraph 5.7.1).

30 The Group agreed to include a new "Environmental Testing of Equipment" section to incorporate the "Salinity and Temperature" and "Tilt and Vibration" sections from MEPC.2(VI). In addition, temperature, humidity and reliability of electrical and electronic equipment has been included by referencing the specifications for environmental testing for type approval of pollution prevention equipment as set out in Part 3 of resolution MEPC.107(49).

31 The Group considered that additional information should be recorded on the label affixed to the sewage treatment plant by the manufacturer. The suggested wording in square brackets reflects similar requirements from resolution MEPC.107(49). In the final round of comments, one participant opposed this addition on the basis that such detail should be recorded in the

manual and operating instructions, not on the sewage treatment plant. BLG is asked to consider and decide on the text (paragraph 5.10.1).

32 The Group agreed that operating and maintenance manuals should be kept on board the ship (paragraph 5.10.2).

33 References to "Periodic Surveys" have been removed and references to "Renewal and Additional Surveys" added where appropriate to reflect the requirements of regulation 4 of the revised Annex IV (paragraph 6).

34 There were diverse views on whether an additional section on training of ship personnel in the operation of the sewage plant was appropriate in these guidelines. Two proposed texts are included for consideration. The first paragraph is preferred by two participants, however, BLG is requested to consider the issue and decide as appropriate.

Task 2 – Establishment of the rate of discharge for sewage that has been stored in holding tanks on board ships, as required by regulation 11.1.1 of the revised MARPOL Annex IV

35 Regulation 11.1.1 of Annex IV provides for a rate of discharge to apply to certain types of sewage that has been stored in holding tanks:

> "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 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; or ….".

36 The Correspondence Group has focussed specifically on developing a rate of discharge that could be applied to sewage that is <u>not</u> communited or disinfected, that is sewage considered to be untreated or raw, stored in holding tanks. The discharge conditions for this type of sewage are: a distance more than 12nm from the nearest land, the ship being en route and proceeding en route at 4 knots or more, and at a moderate rate (as proposed below) and not instantaneously. Time has not permitted the Group to address a rate of discharge for sewage that <u>is</u> communited or disinfected that has been stored in holding tanks.

37 In addressing this task, the Group recalled that MEPC 51 recognized that this issue needed careful consideration from the viewpoint of sewage generated by humans onboard ships as well as effluent produced by livestock cargo on board specific ships. The Group recalled the initial draft proposal contained in MEPC 51/17/5 (paragraph 6) suggesting that the maximum permissible discharge rate could be 4.9 grammes/cubic metres of swept volume. This figure corresponds to a mixing/dilution rate of 204,000:1 compared with a measured minimum dilution rate of 195,000:1 reported in the United States Environment Protection Agency report "Cruise Ship Plume Tracking Survey Report" 2002 (pages 17 and 18). This report notes further that the sewage effluent undergoes dramatic and rapid dilution after mixing with seawater in the propeller wash.

38 In discussing the issue, it was suggested that the maximum permissible discharge rate of undiluted sewage should be 1/200,000 of hourly swept volume. The majority of participants agreed with this suggested rate but noted that it may be problematic to monitor and control. One participant was concerned that this rate would be variable depending on the daily distance traveled by the ship and may require a complicated recording procedure. The Group generally agreed that ships undertaking such discharges will need to be able to measure and verify that the discharge is in accordance with the rate.

39 The majority of participants agreed with the suggestion that the standard rate of discharge of untreated and undiluted sewage should be **"1/200,000 of hourly swept volume"** as a maximum permissible discharge and that this rate should apply to all types of ships. To practically apply this discharge rate, a definition of swept volume was considered necessary to allow ships to effectively calculate this rate. A definition of swept volume was determined to be **"ship breadth x draft x distance travelled"**. It is anticipated that when a standard for the rate of discharge is approved by MEPC, an MEPC circular would be issued to advise the standard and to explain this definition.

40 One participant undertook a case study to test the application of this rate on various types of ships (see Tables 1 and 2). The preliminary calculations on several sample ships show that the 1/200,000 hourly swept volume could easily be met by cargo ships as well as passenger ships, even where the speed of 4 knots is assumed. For livestock ships the 1/200,000 may be difficult to attain at a speed of 4 knots, but at their normal navigation speed it could be readily attained.

Table 1 - Estimate of sewage quantity generated (from MEPC 51/17/5 Australian submission)

Species		Number	Weight (Kg)	Total Weight (Tonnes)	Total effluent (m3/day)	Effluent (m3/h)
Livestock carrier	**Cattle**	22,500	300	6757	392	**16.3**
	Sheep	130,000	45	5850	234	**9.75**
Passenger Ship	**Humans**	5,000	75	375	5	**0.2**

Table 2 - Case study for 1/200,000 of hourly swept volume

Type of ship	GT	L	B	D	Draught	4 Knots			Navigational speed		
						Sea Speed (Knot)	Swept Volume (m3/h)	MPDQ (m3)	Sea Speed (Knot)	Swept Volume (m3/h)	MPDQ (m3)
Passenger Ship	28,856	171.08	24.70	15.95	6.718	4	1,229,244	**6.1**	21.0	6,453,528	**32**
Livestock carrier	49,849	196.82	32.20	17.90	8.526	4	2,033,772	**10.2**	14.6	7,423,266	**37**
Bulk carrier	50,578	230.25	43.00	18.55	12.856	4	4,095,202	**20.5**	14.3	14,640,346	**73**
Oil Carrier(VLCC)	149,407	323.24	60.00	28.90	20.428	4	9,079,837	**45.4**	16.1	36,546,346	**183**
Fishing boat 1	439	51.2	9.00	3.95	3.839	4	255,954	**1.28**	12.5	799,856	**4**
Fishing boat 2	409	49.9	8.80	3.84	3.742	4	243,942	**1.22**	12.8	780,616	**4**

MPDQ = Maximum permissible discharge quantity (m3)

41 Although beyond the Terms of Reference for this task, the Group considered that it would be difficult to verify discharges unless there was some form of recording requirements for all discharges made under Regulation 11.1.1 (i.e. beyond 3nm from comminuted and disinfected systems and 12 nm for all untreated sewage). Entries in the ship's log book should be used for the documentation of the discharge of sewage including start position/time, end position/time and vessel speed etc. In addition the ship should record calculations of the actual discharge rate achieved for the voyage to determine that it had complied with the swept volume criterion. BLG should consider how such recording requirements should be applied.

42 One participant suggested that the approved rate of discharge under regulation 11.1.1 should be listed on the International Sewage Pollution Prevention Certificate. However, there were no comments on this issue, as it was apparent that the rate of discharge varies with the ships draft and speed. It was also recognized that Administrations would only be likely to approve a stricter discharge rate if they wished to depart from the standard. The Sub-Committee may wish to consider whether allowance should be made in the Sewage Pollution Prevention Certificate for an entry to be made if a stricter discharge rate is to be applied by the Administration.

43 As noted in paragraph 39, the work undertaken on the rate of discharge is only for sewage that is not communited or disinfected. The Sub-Committee may wish to further consider a rate of discharge for application to sewage that is communited or disinfected. The following options are suggested:

a. Apply the same discharge rate that has been developed for sewage that is not communited or disinfected;

b. Develop a separate discharge rate.

44 In recalling the discussions at MEPC 51 and BLG 9 on holding tanks, the Group considered whether the definition of "holding tank" contained in Regulation 1 of Annex IV should be clarified. Some participants were of the view that the definition should be wider and include any sewage held or stored anywhere onboard a ship. The view of other participants was that the pumping and piping systems together with any associated drainage sumps should be included in the definition of "holding tank", but pens and spaces found on livestock ships should be excluded as it would be impractical to include such spaces in surveys conducted under Annex IV. It was also noted that the outcome of discussions on task 3 also affected the decision on this issue. There was no clear consensus on this issue and therefore no changes to the definition are recommended.

Task 3 – Discharge of untreated animal effluent from livestock carriers, not stored in holding tanks, at a distance of more than 12 nautical miles

45 The Group recalled comments made at BLG 9 noting that livestock vessels must still comply with regulation 9 of the revised Annex IV and rejecting the initial proposal contained in BLG 9/8 that all untreated sewage discharged directly overboard (i.e. without necessarily passing through a holding tank) should not be subject to the standards established under regulation 11.1.1 of the revised Annex IV. BLG's concerns were based upon the potential for unrestricted discharge of large volumes of sewage generated onboard livestock carriers and the possible adverse environmental impact especially in environmentally sensitive areas or shallow waters. BLG 9 recognized that:

- the effluent generated by animals on board livestock carriers needs to be disposed of in a practical, effective and environmentally friendly manner; and

- there is currently no realistic cost-effective alternative to overboard discharge in the open sea.

46 The Group received further information concerning the actual processes involved in disposing of livestock effluent and noted that most livestock effluent enters the drainage system; however, depending on the particular ship and the type of livestock carried, some effluent is discharged directly overboard from the pens or livestock spaces. Where effluent is washed overboard, wash-down water is used in varying volumes to the effluent constituents disposed of in the sea. The number, age and type of livestock, as well as wash-down water volume and frequency, will determine the quantity of solids and nutrients discharged during any particular part of a voyage. Actual concentrations of solids, nutrients or organisms in the mixing zone behind the ship are difficult to estimate accurately, but will depend on rate of discharge, ship speed and the concentration of components in the effluent.

47 The Group considered that an instantaneous discharge of livestock sewage, even at distances greater than 12 nautical miles from the nearest land, may have the potential for environmental damage. In the absence of detailed research on livestock sewage discharges into the sea, the Group considered that any direct livestock sewage discharges should be limited to areas outside 12 nautical miles and be subject to the same requirements as untreated sewage discharges from holding tanks.

48 Under these requirements a moderate discharge rate would also apply to these discharges. To practically achieve this rate the ship's personnel will need to estimate and calculate the total of all untreated sewage discharges (from the holding tanks and directly overboard) to demonstrate meeting the 1/200,000 of hourly swept volume criterion for the overall voyage including the ballast journey. As noted in paragraph 42, for livestock ships the 1/200,000 may be difficult to attain at a speed of 4 knots, but at their normal navigation speed it could be readily attained. (See Task 2 table 1). The Group noted the recommendation under Task 2 for consideration of recording requirements however the recording of direct overboard discharges of sewage from livestock ships could be difficult.

49 The Group agreed to recommend that Regulation 11 of Annex IV be amended to clearly include untreated animal sewage not originating from holding tanks and therefore apply the same conditions upon these discharges as those for sewage that is stored in holding tanks (i.e. beyond 12 nautical miles, en route, moderate rate of discharge and ship speed). This amendment would clarify that <u>all</u> sewage discharges will fall within the Annex IV regulations and provide clear direction for the operators of livestock vessels.

50 The following draft amendment to Annex IV (as underlined) is suggested:

"Regulation 11 – Discharge of Sewage

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, paragraph 1.2 of this Annex at a distance of more than 3 nautical miles from the nearest land, or sewage which is not communited or disinfected, at a distance of more that 12 nautical miles from the nearest land, provided that, in any case, the sewage that has been stored in holding tanks<u>, or sewage originating from spaces containing living animals,</u> 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; or

.2 the ship has in operation …".

51 The Group further noted that under international law (UNCLOS Article 211(6)) it would be possible for individual coastal States to introduce special mandatory measures for environmentally sensitive areas within their EEZ (for example prohibiting the discharge of untreated animal effluent).

Action requested of the Sub-Committee

52 The Sub-Committee is invited to consider the report of the Correspondence Group and, in particular, to:

.1 consider the revised text of resolution MEPC.2(VI) and decide as appropriate;

.2 agree to the draft standard rate of discharge and swept volume definition for the discharge from holding tanks of sewage that is not communited or disinfected, and request MEPC 55 to issue the standard as an MEPC circular;

.3 consider a standard rate for the discharge from holding tanks of sewage that is comminuted or disinfected;

.4 consider recording requirements for sewage discharges under regulation 11.1.1 of the revised MARPOL Annex IV; and

.5 agree to recommend to the MEPC an amendment to regulation 11 of the revised MARPOL Annex IV to include untreated sewage from spaces containing living animals.

***

ANNEX

RESOLUTION MEPC....( )
adopted on ……..

REVISED INTERNATIONAL GUIDELINES ON EFFLUENT STANDARDS AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS

(To be developed)

ANNEX

REVISED INTERNATIONAL GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS FOR COMPLIANCE WITH MARPOL ANNEX IV

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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. MEPC 49 agreed to review the resolution and MEPC 51 referred the task to BLG 9 in 2005.

1.2 This document contains the revised Guidelines for Effluent Standards and Performance Tests for Sewage Treatment Plants. 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 fitted to ships, the keel of which was laid or which is at a similar stage of construction on or after [DD/MM/YY]]

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 44.5ºC. 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. [A review of actual test data indicates that this difference could be as high as a factor of two]. [Where testing onboard demonstrates that the system exceeds the effluent standards by up to a factor of two, Administrations should endeavour to determine the reason and take it into account when deciding whether to type approve the plant.]

[Where testing ashore demonstrates that a system complies with the standards, but subsequent onboard testing does not meet the standards, Administrations should review these occurrences on a case-by-case basis.] [The standards in section 4 may therefore be exceeded by a factor of two for systems tested ashore.]

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

4 STANDARDS

4.1 For the purpose of regulation 4.1 of Annex IV to the MARPOL Convention, 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 Standard

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

(b) Where the sewage treatment plant is tested onboard a ship, the geometric mean of the total suspended solids content of the samples of effluent taken during the test period shall not be more than 70mg/l above the suspended solids content of ambient water used for flushing purposes.

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

.3 Biological 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~~, in addition to the above conditions,~~ the geometric mean of 5-day Biochemical Oxygen Demand (BOD_5) of the samples of effluent taken during the test period does not exceed 25 mg/l and the Chemical Oxygen Demand does not exceed 125mg/l. [Appropriate methods include CODMn and CODCr.]

.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/100ml to allow the calculation of the geometric mean. For total suspended solids, biological 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 in accordance with 4.1, 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 ~~(hereafter referred to as "equipment")~~ should be conducted in accordance with the following subparagraphs. Unless otherwise noted, the sub-paragraphs 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 500mg/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 influent concentration of total suspended solids should be no less than 500mg/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 (described in paragraph 5.2) 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.

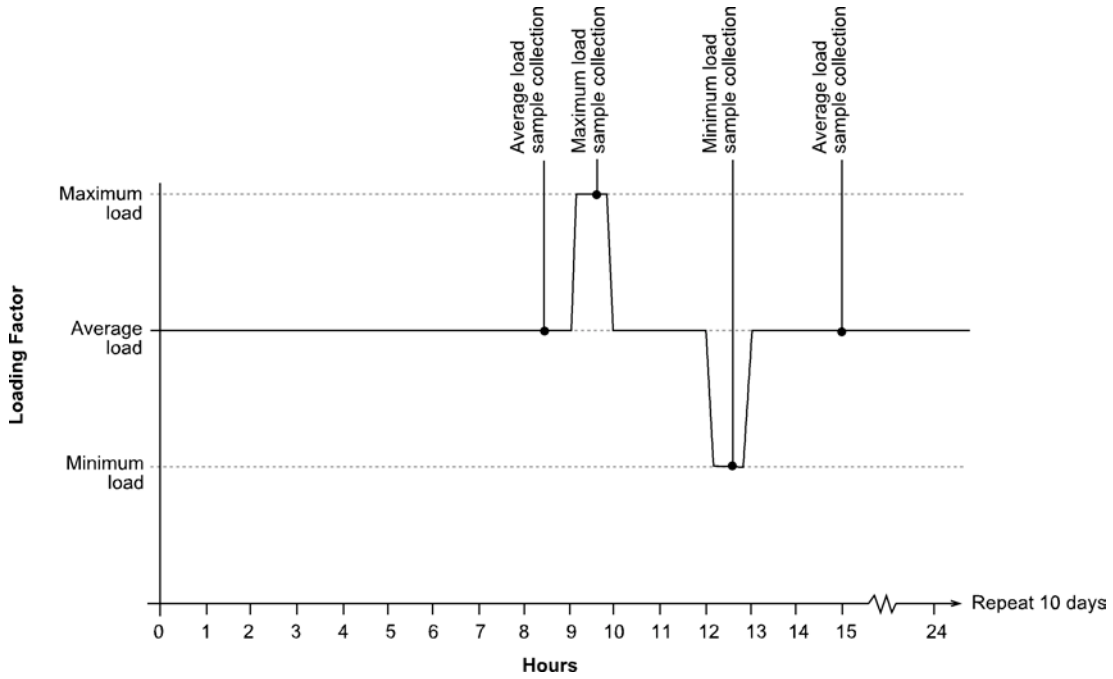
5.4.2 The Administration should undertake to assess the capability of the sewage treatment plant to produce an effluent in accordance with the standards prescribed by section 2.1 following minimum, average and maximum volumetric loadings. The range of conditions under which the effluent standards were met should be recorded on the Certificate of Type Approval (annex 1).

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 (geometric mean, maximum, minimum, variance etc.).

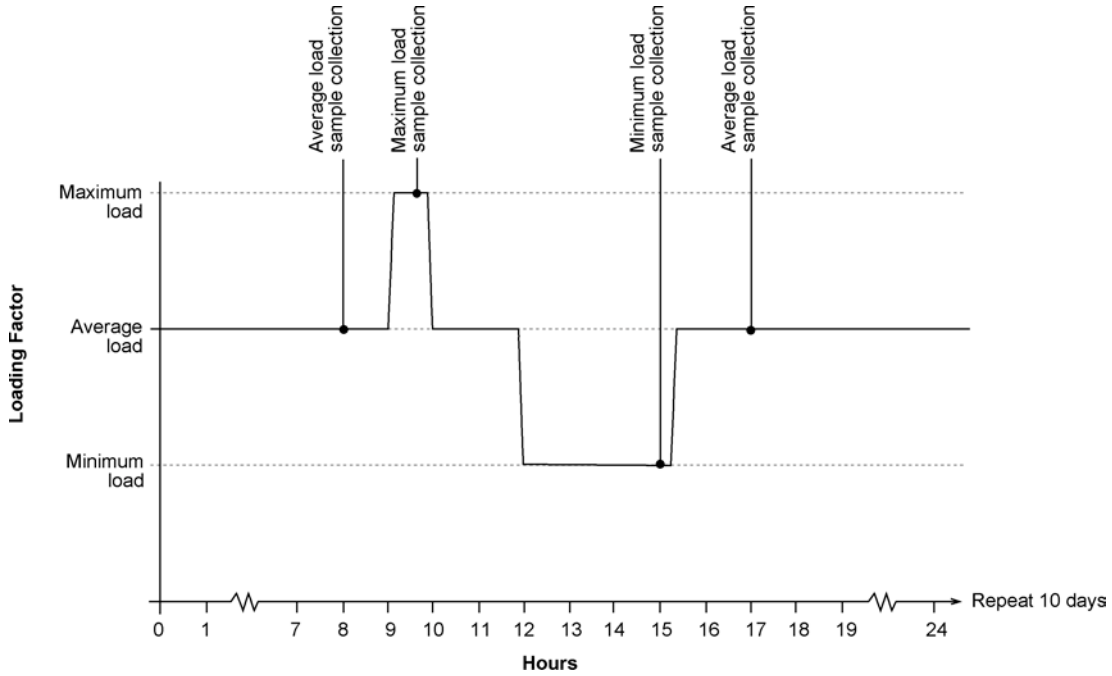
5.5.2 An influent sample should be taken and analyzed for every effluent sample taken and the results recorded to ensure compliance with section 4.1. If possible, additional influent and effluent samples should be taken to allow for a margin of error. Samples should be appropriately preserved prior to 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 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.]

Note to MEPC 54: there is a current proposal to amend this diagram to recommend a period of 3-4 hours of operation of the sewage treatment plant at minimum load before collecting the minimum load sample. The proponent considers this would better represent operational conditions of minimum load (e.g. night time). An alternative configuration for the Figure 1 is therefore presented below.



[Figure 1 (ALTERNATIVE): Suggested 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, BOD5, COD, pH and residual chlorine) with a view to future technological development. Parameters which might be considered include total solids, volatile solids, settlable solids, volatile suspended solids, ~~chemical oxygen demand,~~ turbidity, total phosphorus, ~~pH,~~ 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 [0.1][0.5][2.5]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 various sized 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.

~~**3.8 Salinity and temperature**~~
~~**3.9 Tilt and vibration**~~

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 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 whose input may inhibit 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 ~~unit~~ 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 regulation 4 1.2 and 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 TRAINING OF SHIP PERSONNEL IN THE USE OF THE SEWAGE TREATMENT PLANT.]

[7.1 Crew should be familiar with the requirements of Annex IV of MARPOL and the shipboard or manufacturer's procedures for the management of sewage relevant on that ship. Relevant training and education should be undertaken if necessary.]

OR

[7.1 Each person responsible for operating any sewage treatment plant must be trained and be capable of implementing the guidance provided in the manufacturer's operating manual.]

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/d), 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.[]([])……) 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 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/100ml;
(ii) a geometric mean of total Suspended Solids of 35mg/l if tested ashore OR a geometric mean of total suspended solids of 70mg/l above the ambient water used for flushing purposes if tested onboard;
(iii) a geometric mean of 5-day Biochemical Oxygen Demand (BOD_5) of no more than 25mg/l;
(iv) a geometric mean of Chemical Oxygen Demand of no more than 125mg/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.[...]:

Sewage Treatment Plant, Type .....
Manufactured by .....
Organization conducting the test .....
Designed hydraulic loading ..... m^3/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^3/day
Minimum hydraulic loading ..... m^3/day
Average hydraulic loading ..... m^3/day

Geometric Mean of Total
Suspended Solids ..... mg/l
Geometric Mean of the thermotolerant
coliform count ..... coliforms/100 ml
Geometric Mean of BOD_5 ..... 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 5.8 of resolution MEPC.[...]:
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.

執筆担当者

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本書は、日本財団の助成金を受けて作製したものです。