



MARINE ENVIRONMENT PROTECTION
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**PREVENTION OF AIR POLLUTION FROM SHIPS
&
INTERPRETATIONS OF, AND AMENDMENTS TO, MARPOL
AND RELATED INSTRUMENTS
&
REPORTS OF SUB-COMMITTEES**

Report of the Technical Group on ECA and other MARPOL Annex VI related issues

1 INTRODUCTION

1.1 The Technical Group on ECA and other MARPOL Annex VI related issues met from 14 to 16 July 2009 under the Chairmanship of Mr. Zafrul Alam (Singapore).

1.2 The Technical Group was attended by delegates from the Bahamas, Brazil, Canada, China, the Cook Islands, Denmark, Finland, France, Germany, Greece, India, Italy, Japan, Malaysia, the Marshall Islands, New Zealand, Nigeria, Norway, the Republic of Korea, Singapore, South Africa, Spain, Sweden, Turkey, the United Kingdom, the United States, EC, ISO, BIMCO, CLIA, EUROMOT, IACS, FOEI, IBIA, IMarEST, INTERTANKO, IPIECA and IPTA.

2 TERMS OF REFERENCE

The Technical Group, taking into account relevant submissions and comments made in plenary, was instructed to:

- .1 review and finalize the text of the following guidelines;
 - .1 Amendments to the revised survey guidelines under the Harmonized System of Survey and Certification (resolution MEPC.128(53));
 - .2 Guidelines for port State control under MARPOL Annex VI (resolution MEPC.129(53));

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- .3 Guidelines for the sampling of fuel oil for determination of compliance with MARPOL Annex VI (resolution MEPC.96(47));
 - .4 Guidelines for monitoring the world-wide average sulphur content of residual fuel oils supplied for use on board ships (resolution MEPC.82(43));
 - .5 Guidelines for exhaust gas cleaning systems (resolution MEPC.170(57)); and
 - .6 Guidelines for the development of a VOC management plan, as required by regulation 15.6;
- .2 review and finalize the text of the following draft MEPC circulars;
- .1 Definitions for the cost effectiveness formula in regulation 13.7.5 to the revised Annex VI of MARPOL;
 - .2 Guidelines for the application of the NO_x Technical Code relative to certification and amendments of Tier I engines; and
 - .3 Technical information on systems and operation to assist development of VOC Management Plans;
- .3 consider the proposal by the United States and Canada to designate an ECA as proposed in document MEPC 59/6/5 and draft text to amend regulations 13 and 14 of MARPOL Annex VI accordingly based on annex 4 to document MEPC 59/6/5;
 - .4 consider whether monitoring the worldwide average of sulphur content of residual fuel should continue or be expanded to monitor the sulphur content of all fuels;
 - .5 assess the report by ISO (MEPC 59/4/3) and consider whether further action is needed by the Organization on marine fuel oil specifications; and
 - .6 submit a written report to the plenary for consideration and adoption of these amendments on Thursday, 16 July 2009.

3 OUTCOME OF DISCUSSIONS

Amendments to the revised survey guidelines under the Harmonized System of Survey and Certification (resolution MEPC.128(53))

3.1 The Technical Group reviewed the proposed amendments to the revised survey guidelines under the Harmonized System of Survey and Certification to bring these in line with the provisions of the revised MARPOL Annex VI and NO_x Technical Code 2008, as approved at BLG 13 and FSI 17 (annex 3 to document FSI 17/20). The Technical Group approved the proposed amendments without changes, recommending their adoption at this session.

3.2 The final text of the proposed amendments to the revised survey guidelines and the associated resolution on its adoption are set out at annex 1 to this report.

Guidelines for port State control under the revised MARPOL Annex VI (resolution MEPC.129(53))

3.3 The Technical Group reviewed the text of the draft revised Guidelines for port State control under the revised MARPOL Annex VI, as approved at BLG 13 and FSI 17 (annex 1 to document FSI 17/20), and approved the revised text of the Guidelines with amendments, recommending its adoption at this session.

3.4 The final text of the draft revised Guidelines and the associated resolution on its adoption are set out at annex 2 to this report.

Guidelines for the sampling of fuel oil for determination of compliance with MARPOL Annex VI (resolution MEPC.96(47))

3.5 The Technical Group reviewed the draft amendments to the Guidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI approved at BLG 13 (annex 20 to document BLG 13/18), and approved the amendments to the Guidelines with amendments, recommending its adoption at this session.

3.6 The final text of the draft amended Guidelines and the associated resolution on its adoption are set out at annex 3 to this report.

Guidelines for monitoring the worldwide average sulphur content of residual fuel oils supplied for use onboard ships (resolution MEPC.82(43))

3.7 The Technical Group considered the proposed guidelines mentioned in the heading in conjunction with a question from BLG 13 whether the monitoring of worldwide sulphur average should continue or should be expanded to all marine fuel types.

3.8 After a lengthy debate, the Technical Group agreed to the following recommendations:

- .1 the Group approved, with amendments, the revised Guidelines for monitoring the worldwide average sulphur content of residual fuel oils supplied for use on board ships as approved at BLG 13 (annex 19 to document BLG 13/18), recommending their adoption at this session for the continued fulfilment of regulation 14.2;
- .2 on the question whether the monitoring of worldwide sulphur average by mass should continue and also cover other marine fuel types than residual fuel oils, an indicative vote was held with as result that 12 delegations replied “yes” and four delegations replied “no”. One of the arguments for expansion of monitoring was that the revised Annex VI indeed addressed *all* marine fuels; and
- .3 notwithstanding the recommendation to adopt the guidelines, as mentioned in subparagraph 3.1 above, the Group agreed to ask the Committee to instruct BLG to immediately start revising the guidelines to address the expansion to all marine fuels with a preferred completion date of 2010.

3.9 The final text of the draft revised Guidelines and the associated resolution on its adoption are set out at annex 4 to this report.

3.10 To assist the Committee in reaching a decision on the proposed instruction to BLG 14 under paragraph 3.8.3 above, the following draft terms of reference were developed:

BLG 13 raised the issue of whether sulphur monitoring should be expanded or discontinued. [MEPC 59 agreed] that as a consequence of the amendments in the revised Annex VI to MARPOL 73/78, entering into force on 1 July 2010, there is a need to expand the monitoring to include the fuels covered by the revised Annex.

BLG 14 is therefore instructed to:

- .1 review and recommend changes to the Guidelines for monitoring the worldwide average sulphur content to the fuels covered by the revised Annex VI to MARPOL 73/78, taking into account the quantity (in Metric Tons) of each delivery of oil fuel and also taking into account grouping into the different sulphur limits as required by regulation 14.2; and
- .2 recommend whether low sulphur fuels according to the Bunker Delivery Note should be monitored separately and how this can be done.

Guidelines for Exhaust Gas Cleaning Systems (EGCS) (resolution MEPC.170(57))

3.11 For the review of the above-mentioned Guidelines the Group drew on the following documents:

- .1 the Guidelines for EGCS approved at BLG 13 (annex 21 to BLG 13/18);
- .2 MEPC 59/4/19 (Secretariat) providing advice and recommendations from GESAMP on the interim wash water discharge criteria for EGCS (resolution MEPC.170(57)); and
- .3 specific comments and proposals for possible amendments to the Guidelines by Finland (MEPC 59/4/31) and by IMarEST (MEPC 59/10/5).

3.12 The Technical Group agreed to take the document by IMarEST (MEPC 59/10/5) as the base document for the review and amended the Guidelines through a series of edits and the inclusion of new text to bring it in line with the provisions of the revised MARPOL Annex VI and the NO_x Technical Code 2008.

3.13 Norway repeated its comment from the plenary to take into account the equivalency requirement in regulation 4 of the revised Annex VI.

3.14 The observer of IMarEST informed the Group that GESAMP had promised to report to IMO during December 2008. In early 2009 GESAMP was requested on several occasions to submit its report. GESAMP submitted its report in May 2009, at a point when it was too late for IMarEST to submit a response to MEPC 59. IMarEST provided a paper to IMO dealing with all the points raised by GESAMP, which was distributed to the Group. Furthermore IMarEST informed the Group that information on the development of the wash water criteria was offered to GESAMP but GESAMP did not respond to that offer.

3.15 In conclusion, the Technical Group agreed to:

- .1 recommend the draft revised Guidelines for EGCS and the associated resolution, as set out at annex 5 to this report, for adoption at this session; and
- .2 recommend that, after 1 July 2010, Administrations should provide for collection of washwater data under appendix III of the draft revised Guidelines, thereby enabling the Committee, at an appropriate time, to develop a generalized marine environment risk assessment also taking into account other sources of ship-related waste waters, as recommended by GESAMP (MEPC 59/4/19, paragraph 12).

3.16 The delegation of Germany indicated that the draft revised Guidelines for EGCS focussed primarily on wet exhaust gas cleaning systems. Research on other systems, including dry exhaust gas cleaning systems, was ongoing. The delegation suggested that these developments in research should be incorporated in future reviews of these Guidelines.

3.17 The Group noted the suggestions by Germany to include EGCS other than wet-based systems into the guidelines and allow them under the condition of the fulfilment of equivalent safety and environmental requirements as set out in the guidelines, subject to the satisfaction of the Administration. The Group determined that, at this stage, such new systems are still in the development stage with much to be learned regarding the relevant parameters. Consequently, the Group determined that it would be premature at this point in time to revise the guidelines with regard to inclusion of such systems and recommended to Germany to make submissions to the Committee as these systems develop.

Guidelines for the development of a VOC management plan, as required by regulation 15.6

3.18 The Technical Group reviewed the text of the Guidelines for the development of a VOC management plan as approved at BLG 13 (annex 16 to document BLG 13/18), and approved the Guidelines without changes, recommending its adoption at this session.

3.19 The final text of the Guidelines and the associated resolution on its adoption are set out at annex 6 to this report.

Definitions for the cost effectiveness formula in regulation 13.7.5 to the revised Annex VI of MARPOL

3.20 The Technical Group reviewed a draft MEPC circular on definitions for the cost effectiveness formula agreed at BLG 13 (annex 18 to document BLG 13/18) and finalized the draft MEPC circular as set out at annex 7 to this report.

Guidelines for the application of the NO_x Technical Code relative to certification and amendments of Tier I engines

3.21 The Technical Group reviewed a draft MEPC circular on Guidelines for the application of the NO_x Technical Code relative to certification and amendments of Tier I engines agreed at BLG 13 (annex 17 to document BLG 13/18) and finalized the draft MEPC circular with minor changes as set out in annex 8 to this report.

Technical information on systems and operation to assist development of VOC Management Plans

3.22 The Technical Group reviewed a draft MEPC circular on technical information on systems and operation to assist development of VOC Management Plans contained in part A of the annex to document BLG 13/13/3 and finalized the draft MEPC circular as set out in annex 9 to this report.

Proposal to designate an Emission Control Area for the coastal waters of the United States and Canada

3.23 The Technical Group considered the proposal by the United States and Canada (MEPC 59/6/5) for the designation of an Emission Control Area (ECA) for specific portions of United States' and Canadian coastal waters including Hawaii, for the control of NO_x, SO_x and PM emissions, noting the support expressed for the proposal by a large majority in plenary. A chart for a detailed description of the proposed ECA was presented in annex 3 to the document and proposed amendments to regulations 13 and 14 of MARPOL Annex VI were presented in annex 4.

3.24 After a detailed presentation of the North American emission control area proposal by the proponents, the Technical Group agreed that the proposal satisfied the criteria set forth in Appendix III to MARPOL Annex VI. Clarifications were given on several elements in the proposal, including:

- .1 concerning the additional costs of low-sulphur fuels in the proposed ECA, no studies had been carried out on the distribution of these costs over the importer, exporter and end-user of transported goods, but the total costs were calculated and included in the ECA proposal;
- .2 it was assumed that a higher demand for low-sulphur marine fuels would trigger a higher supply for use in the proposed ECA, but that this adaptation in supply would take time;
- .3 the provisions of regulation 18 of the revised Annex VI are important for the operation of a designated ECA. Although it included a "no-penalization" clause in case low-sulphur fuels would not be available to ships, there were several conditions to be fulfilled as outlined in the regulation. Regulation 18 should therefore not be seen as an "escape clause" for a designated ECA;
- .4 information on the costs to the shipping industry of engine modifications towards use of distillate fuels was provided in paragraph 9.3 of the proposal and in chapter 5 of the supporting documentation;
- .5 the influence of the meteorological conditions and the different wind patterns on both the East and the West coasts of North America had been incorporated in the modelling exercises, as shown in chapter 6 of the proposal;
- .6 the proponents confirmed that the equivalency provisions under regulation 4, in particular abatement technology, would apply to voyages of ships while travelling in the proposed ECA, including voyages in the internal waters of the United States and Canada;

- .7 the breadth of the ECA was determined through application of the criteria in Appendix III, and was not based on or linked in anyway to the extent of the proponents' exclusive economic zones;
- .8 the proponents stated that the dimensions of the proposed ECA are not to be viewed as a precedent for future ECA proposals which may be brought forward by Parties;
- .9 the environmental impact of increased greenhouse gas emissions resulting from refineries producing more low-sulphur marine fuels was small compared with the benefits of the ECA;
- .10 the delegation of the United States affirmed that if sulphur reducing technology is used, all US states have the right under current law to require **additional** water quality regulations for the discharge of wash water above the national standard. The delegation stated that the United States Government would *try* to work with the states to ensure that a harmonized effluent standard is developed.

3.25 The delegation of France stated that it was France's intention to have the Saint-Pierre and Miquelon Archipelago included in the proposed North American emission control area. The delegation would be ready to become a co-sponsor of the proposal and contribute to its submission to MEPC 60. The delegations of Canada and the United States welcomed this statement. The Technical Group took note of the intention of France.

3.26 The Technical Group agreed that there should be prior consultation with States bordering an ECA in any future application for the designation of an ECA affecting the interest of more than one State.

3.27 With regard to the text of the proposed amendments to regulation 13 (Nitrogen Oxides), paragraph 6, the Technical Group recommended the proponents to use the full co-ordinates of the North American emission control area when the proposal is circulated for adoption at MEPC 60, so that the ECA boundaries could be easily understood and applied by mariners.

3.28 The Technical Group had no comments on the text of the proposed amendments to regulation 14 (Sulphur Oxides (SO_x) and Particulate Matter), except for some minor edits.

Marine fuel oil specifications

3.29 In light of the observations made in plenary, the Technical Group considered in detail the results of the review by ISO of marine fuel oil specifications with recommendations on the specific parameters related to air quality, ship safety, engine performance and crew health (MEPC 59/4/3).

3.30 Although the proposals by ISO were welcomed by the Group, several points of concern were raised.

3.31 The delegation of Norway welcomed the expansion of the list of the relevant parameters and underlined that the ISO standards must address H₂S at safe levels both in liquid and vapour, and that the human health aspects of H₂S exposure need to be better addressed in the standard.

3.32 The delegation of Japan expressed the view that the fuel oil specifications and overall limiting values provided in annex 2 to document MEPC 59/4/3 contained some problems for limit values that are derived from the existing ISO standards, the incompleteness of the fuel oil categories identified in the document (only distillate fuel oils and residual fuel oils) compared with those in the revised MARPOL Annex VI, and the incomplete characteristics concerning ignition quality. It would be premature recommending the Committee to endorse the parameters and characteristics as proposed.

3.33 The observer from INTERTANKO supported the concerns of Japan and drew the attention to the lack of monitoring and control for compliance with both MARPOL Annex VI regulation 18(1) (18(3) as amended) and the ISO standards. There were ships reporting sometimes that fuels delivered to them were off ISO 8217 specifications. Moreover, test results on fuels delivered to ships indicated these fuels contained chemical waste and inorganic acids. Such fuels were in breach with the provisions of regulation 18(1) of MARPOL Annex VI.

3.34 The revised MARPOL Annex VI has laid down procedures to deal with situations when the content of the sulphur is greater than required. However, there is no provision with regard to the situation when the fuel delivered is off ISO 8217 specifications and thus not compliant with regulation 18. Ships receive information on the inadequacy of bunkers a few days after the delivery. That information is provided by laboratories which perform tests on commercial fuel samples. No authority is involved into this type of monitoring. The observer concluded that, currently, there is no enforcement mechanism for ISO 8217 and for the provisions of regulation 18(1)/18(3) and that the Committee should again consider previous suggestions that marine fuel standards be included into the MARPOL Annex VI provisions and, consequently, to consider setting up an appropriate monitoring mechanism, designed to prevent the delivery on non-compliant fuels to ships.

3.35 The observer from INTERTANKO also noted with concern the limit value of 2 mg/kg of H₂S suggested by ISO. The current limit value, given in liquid phase would roughly correlate to 200 ppm in the vapour phase, which is 20 times over the appropriate TLV of 10 ppm referred to in ISGOTT for health and safety warnings. In the view of the observer, the current proposal by ISO was not acceptable as it was wrong to place a product (through its specification) on the market that is unsafe.

3.36 The observer from OCIMF also expressed concern about the proposed upper limit value for H₂S. If experts could not agree on a test method to set appropriate upper limit values that ensure the safety of personnel, there would be two options:

- .1 to set a level of H₂S permitted in the fuel specification to effectively zero (which may not be practical or reasonable due to the manufacturing process for residual fuels); or
- .2 not to include H₂S in the ISO fuel specification.

The observer suggested that the hazard identification for H₂S was probably best captured and managed within the MSDS process.

3.37 The observer from IPIECA clarified the relationship between liquid and vapour space measurements. When a supplier delivers fuel to a customer, the supplier can measure the presence of H₂S in the liquid phase of the fuel. As indicated by ISO, such measurement provides an indication of the **maximum** amount of H₂S that may emerge from the liquid phase during subsequent handling of the fuel. How much H₂S emerges from the liquid phase and what will be the resulting vapour concentration will depend on many factors, e.g., temperature, movement and

the ullage space. These are factors that are beyond the control of the supplier of the fuel. It is therefore not appropriate to consider a vapour space measurement as part of a sales specification. However vapour space measurements are appropriate to verify operational conditions on board a ship for crew health protection.

3.38 The delegation of Denmark stated that only issues pertaining environmental impact from the use of marine fuels should be considered in amendments to MARPOL Annex VI.

3.39 The representative of ISO provided an additional explanation to document MEPC 59/4/3. In response to the request of MEPC 58 to ISO to make recommendations regarding fuel oil characteristics and limits addressing air quality, ship safety, crew health and engine performance, ISO's approach had been to deliberately avoid using either the limits of the current 3rd edition of ISO 8217 or some aspects of the draft of the future 4th edition of marine specification, which is currently being developed, but to use what would be considered as **maximum values** that may influence these aspects. The list in annex 2 of the document does not reflect the full ISO 8217 menu of grades and limits that are required for diverse engine types, manufacturers, models, power ranges, and ages engaged in different services, and operating conditions, nor does it reflect the commercial aspects dictated by fuel cost and availability. The ISO Working Group's approach was to use maximum value limits. These values represented the overall "envelope" within which any residual fuel oil or distillate fuel oil would be required to conform.

3.40 If ISO was requested to give the new working draft of the 4th revision of ISO 8217 standard parameters and limits, then the report to MEPC can only be submitted at the end of the whole ISO 8217 review and balloting process. The revision process of the 3rd edition of ISO 8217 will be completed by June 2010, ready for publication by 1 July 2010, as requested. ISO wished to advise MEPC that the Working Group had no intension to relax the marine fuels international specification limits, or to create only two grades of marine fuels. In light of the above, the representative emphasized that the recommendations contained in annex 2 of the document did not reflect the limits of the new draft of the future ISO 8217. Finally, ISO had made a commitment to fully support the efforts made by IMO to reduce atmospheric pollution from ships and deliver a document as comprehensively as possible establishing fuel properties and limits to achieve this goal.

3.41 The ISO Working Group acknowledged that whilst H₂S should not be present in marine fuels, the current test methodology cannot guarantee that H₂S gas will not be released during the course of onboard storage and handling. In the view of ISO, the reason for measuring H₂S in liquid phase is to measure the potential latent H₂S concentration of the fuel oil that could be released over a period of time from a bunker fuel at any suitable conditions. Vapour phase measurements in any storage/ship's tank head space are strongly influenced by fuel chemistry, temperature and other (operational) factors. Thus the test method in vapour states that this test method does not simulate the vapour phase H₂S concentration of a fuel storage tank. Therefore, this approach should not be used for setting up specification limits. The results do not relate to the total H₂S entrained in the fuel oil, and are often lower and, therefore, provide false expectations for safe use.

3.42 In light of the above concerns raised and clarifications given, the Technical Group agreed to recommend that:

- .1 it would be too early for the Committee to endorse the parameters and characteristics pertinent to marine fuel oil quality, as proposed by ISO in annex 2 of document MEPC 59/4/3, as concerns about some of the parameters and limits, in particular ignition quality and H₂S still existed; and

- .2 ISO should be invited to further develop its advice in light of the responses received and incorporate, where relevant and possible, the outcome of the ISO 8217 review process currently being conducted, and re-submit its advice for consideration at a future session of MEPC.

4 ACTION REQUESTED OF THE COMMITTEE

The Committee is invited to approve the report of the Technical Group on ECA and other MARPOL Annex VI related issues in general and, in particular, to:

- .1 **adopt** the proposed amendments to the survey guidelines under the Harmonized System of Survey and Certification for the revised MARPOL Annex VI (annex 1);
- .2 **adopt** the draft revised Guidelines for port State control under the revised MARPOL Annex VI (annex 2);
- .3 **adopt** the Guidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI, as amended (annex 3);
- .4 **adopt** the draft revised Guidelines for monitoring the worldwide average sulphur content of residual fuel oils supplied for use onboard ships (annex 4);
- .5 **endorse** the recommendation that BLG should be instructed to start revising the Guidelines to address the expansion to all marine fuels with a preferred completion date of 2010 and **adopt** the draft terms of reference to BLG 14 in this respect (see paragraph 3.10 above);
- .6 **adopt** the draft revised Guidelines for Exhaust Gas Cleaning Systems (annex 5);
- .7 **adopt** the draft Guidelines for the development of a VOC management plan (annex 6);
- .8 **approve** the draft MEPC circular on definitions for the cost effectiveness formula in regulation 13.7.5 to the revised Annex VI of MARPOL (annex 7);
- .9 **approve** the draft MEPC circular on Guidelines for the application of the NO_x Technical Code relative to certification and amendments of Tier I engines (annex 8);
- .10 **approve** the draft MEPC circular on technical information on systems and operation to assist development of VOC Management Plans (annex 9);
- .11 **note** that the Technical Group determined that the ECA proposal for the coastal waters of the United States and Canada satisfied the criteria set forth in Appendix III;
- .12 **note** that the breadth of the ECA was determined through application of the criteria in Appendix III, and was not based on or linked in anyway to the extent of the proponents' exclusive economic zones;

- .13 **approve** the proposal to designate an ECA for the coastal waters of the United States and Canada and the proposed amendments to the revised MARPOL Annex VI, with a view to adoption at MEPC 60, taking into account the comments of the Technical Group (paragraphs 3.23 to 3.28);
- .14 **approve** the recommendation to postpone endorsing parameters and characteristics for marine fuel oil specifications to a future session of MEPC (paragraph 3.42); and
- .15 **invite** ISO to provide further advice, taking into account the concerns raised by the Technical Group (paragraph 3.42).

ANNEX 1**DRAFT MEPC RESOLUTION****AMENDMENTS TO THE SURVEY GUIDELINES UNDER THE HARMONIZED
SYSTEM OF SURVEY AND CERTIFICATION FOR THE
REVISED MARPOL ANNEX VI**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

RECALLING ALSO that MARPOL Annex VI entered into force on 19 May 2005,

RECALLING FURTHER resolution A.997(25) by which the Assembly adopted the Survey Guidelines under the Harmonized System of Survey and Certification, 2007 (the Survey Guidelines),

NOTING that the Assembly, when adopting resolution A.997(25), requested the Maritime Safety Committee and the Marine Environment Protection Committee to keep the Survey Guidelines under review and amend them as necessary,

NOTING ALSO that the revised MARPOL Annex VI was adopted by resolution MEPC.176(58) which is expected to enter into force on 1 July 2010,

RECOGNIZING the need to amend the Survey Guidelines in accordance with provisions of the revised MARPOL Annex VI,

HAVING CONSIDERED the amendments to the Survey Guidelines for the revised MARPOL Annex VI prepared by the Sub-Committee on Bulk Liquids and Gases at its thirteenth session and reviewed by the Sub-Committee on Flag State Implementation at its seventeenth session,

1. ADOPTS the amendments to the Survey Guidelines under the Harmonized System of Survey and Certification for the revised MARPOL Annex VI, as set out in the Annex to the present resolution;
2. INVITES Governments carrying out surveys required by the revised MARPOL Annex VI, to follow the provisions of the Survey Guidelines, as amended by this resolution, from 1 July 2010; and
3. AGREES that, at a later stage, the amendments to the Survey Guidelines, as adopted by this resolution, be adopted as amendments to those adopted by resolution A.997(25).

ANNEX

**AMENDMENTS TO THE SURVEY GUIDELINES UNDER THE HARMONIZED
SYSTEM OF SURVEY AND CERTIFICATION FOR THE
REVISED MARPOL ANNEX VI**

[The text is contained in annex 3 to document FSI 17/20.]

ANNEX 2

DRAFT MEPC RESOLUTION

**REVISED GUIDELINES FOR PORT STATE CONTROL UNDER THE REVISED
MARPOL ANNEX VI**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

RECALLING ALSO that MARPOL Annex VI entered into force on 19 May 2005,

RECALLING FURTHER resolution MEPC.129(53) by which the Committee adopted the Guidelines for port State control for MARPOL Annex VI,

NOTING that the revised MARPOL Annex VI was adopted by resolution MEPC.176(58) which is expected to enter into force on 1 July 2010,

NOTING ALSO that articles 5 and 6 of the MARPOL Convention and regulations 10 and 11 of MARPOL Annex VI provide control procedures to be followed by a Party to the 1997 Protocol with regard to foreign ships visiting its ports,

RECOGNIZING the need to revise the Guidelines for port State control for MARPOL Annex VI, in accordance with provisions of the revised MARPOL Annex VI,

HAVING CONSIDERED the revised Guidelines for port State control under the revised MARPOL Annex VI prepared by the Sub-Committee on Bulk Liquids and Gases at its thirteenth session and reviewed by the Sub-Committee on Flag State Implementation at its seventeenth session,

1. ADOPTS the revised Guidelines for port State control under the revised MARPOL Annex VI, as set out in the Annex to the present resolution;
2. INVITES Governments, when exercising port State control for the revised MARPOL Annex VI, to apply the revised Guidelines from 1 July 2010; and
3. AGREES that, at a later stage, the Guidelines be adopted as amendments to resolution A.787(19) on Procedures for port State control, as amended by resolution A.882(21).

ANNEX

GUIDELINES FOR PORT STATE CONTROL UNDER THE REVISED MARPOL ANNEX VI

Chapter 1 GENERAL

1.1 This document is intended to provide basic guidance on the conduct of port State control inspections for compliance with MARPOL Annex VI (hereinafter referred to as “the Annex”) and afford consistency in the conduct of these inspections, the recognition of deficiencies and the application of control procedures.

1.2 The regulations of MARPOL Annex VI contain the following compliance provisions:

- .1 an IAPP Certificate is required for all ships of 400 GT or above engaged in international voyages. Administrations may establish alternative appropriate measures to demonstrate the necessary compliance in respect of ships under 400 GT engaged in international voyages;
- .2 new installations which contain ozone depleting substances, other than hydro-chlorofluorocarbons, are prohibited on or after 19 May 2005. Each ship which has rechargeable systems that contain ozone depleting substances is required to maintain an Ozone Depleting Substances Record Book;
- .3 in the case of the NO_x controls, Tier I emission limits are applied to all applicable marine diesel engines over 130 kW installed on ships constructed on or after 1 January 2000 and prior to 1 January 2011.

Emission limits equivalent to Tier I may apply to marine diesel engines with a power output of more than 5,000 kW and a per cylinder displacement at or above 90 litres installed on a ship constructed on or after 1 January 1990 but prior to 1 January 2000 according to regulation VI/13.7.

Tier II emission limits are applied to all applicable marine diesel engines over 130 kW installed on ships constructed on or after 1 January 2011 and prior to 1 January 2016.

Subject to the review set forth in regulation 13.10, Tier III emission limits are applied to all applicable marine diesel engines over 130 kW installed on ships constructed on or after 1 January 2016. However, while these ships are operating outside of an Emission Control Area* established for NO_x control, Tier II limits are applied.

Marine diesel engines which are subject to major conversion are to be certified to the required Tier of control according to regulation VI/13.2;

* As of DD/MM/YYYY, there is no area designated as Emission Control Area under regulation VI/13.

- .4 SO_x and particulate matter control should be achieved by either:
- .1 the sulphur content of any fuel oil used on board ships, subject to the provisions of regulation VI/18.2, is required not to exceed the following limits:
- .1 4.50% m/m prior to 1 January 2012;
- .2 3.50% m/m on and after 1 January 2012; and
- .3 0.50% m/m on and after 1 January 2020, subject to the review set forth in regulations VI/14.8, VI/14.9 and VI/14.10.

However, while ships are operating within an Emission Control Area established for SO_x and particulate matter control, the sulphur content of fuel oil used on board ships is required not to exceed the following limits:

- .1 1.50% m/m prior to 1 July 2010;
- .2 1.00% m/m on and after 1 July 2010; and
- .3 0.10% m/m on and after 1 January 2015;

or,

- .2 equivalent method as approved (regulation VI/4);
- .5 only those incinerators installed on or after 1 January 2000 are required to comply with the associated requirements (appendix IV to the Annex), however, the restrictions as to which materials may be incinerated apply to all incinerators; and
- .6 a tanker carrying crude oil is required to have on board and implement a VOC management plan approved by the Administration. Tanker vapour emission control systems are only required where their fitting is specified by the relevant authority.

1.3 Chapters 1 (General), 4 (Contravention and detention), 5 (Reporting requirements) and 6 (Review procedures) of the Procedures for Port State Control adopted by resolution A.787(19), as amended by resolution A.882(21), also apply to these Guidelines.

Chapter 2 INSPECTIONS OF SHIPS REQUIRED TO CARRY THE IAPP CERTIFICATE

2.1 Initial inspections

2.1.1 On boarding and introduction to the master or responsible ship's officer, the port State control officer (PSCO) should examine the following documents, where applicable:

- .1 the International Air Pollution Prevention Certificate (IAPP Certificate) (regulation VI/6), including its Supplement*;
- .2 the Engine International Air Pollution Prevention Certificate (EIAPP Certificate) (paragraph 2.2 of the NO_x Technical Code) including its Supplement, for each applicable marine diesel engine;
- .3 the Technical File (paragraph 2.3.4 of the NO_x Technical Code) for each applicable marine diesel engine;
- .4 depending on the method used for demonstrating NO_x compliance for each applicable marine diesel engine:
 - .1 the Record Book of Engine Parameters for each marine diesel engine (paragraph 6.2.2.7 of the NO_x Technical Code) demonstrating compliance with regulation VI/13 by means of the marine diesel engine parameter check method; or
 - .2 documentation relating to the simplified measurement method; or
 - .3 documentation related to the direct measurement and monitoring method;
- .5 the Approved Method File (regulation VI/13.7);
- .6 written procedures covering fuel oil change over operations where separate fuel oils are used in order to achieve compliance (regulation VI/14.6);
- .7 approved documentation relating to any installed exhaust gas cleaning systems, or equivalent means, to reduce SO_x emissions (regulation VI/4);
- .8 the bunker delivery notes and associated samples or records thereof (regulation VI/18);
- .9 the copy of the type approval certificate of any shipboard incinerator installed on or after 1 January 2000 (for the incinerators with capacities up to 1,500 kW) (resolutions MEPC.76(40) and MEPC.93(45));
- .10 the Ozone Depleting Substances Record Book (regulation VI/12.6);
- .11 the VOC Management Plan (regulation VI/15.6); and
- .12 any notification to the ship's flag Administration issued by the master or officer in charge of the bunker operation together with any available commercial documentation relevant to non-compliant bunker delivery.

* Under regulation 6(2) of MARPOL Annex VI, a ship constructed before the date of entry into force of MARPOL Annex VI shall be issued with an International Air Pollution Prevention Certificate no later than the first scheduled dry-docking after the date of such entry into force, but in no case later than three years after this date.

The PSCO should ascertain the date of ship construction and the date of installation of equipment on board which are subject to the provisions of the Annex, in order to confirm which regulations of the Annex are applicable.

2.1.2 As a preliminary check, the IAPP Certificate's validity should be confirmed by verifying that the Certificate is properly completed and signed and that required surveys have been performed.

2.1.3 Through examining the Supplement to the IAPP Certificate, the PSCO may establish how the ship is equipped for the prevention of air pollution.

2.1.4 If the certificates and documents are valid and appropriate, and the PSCO's general impressions and visual observations on board confirm a good standard of maintenance, the PSCO should generally confine the inspection to reported deficiencies, if any.

2.1.5 In the case where the bunker delivery note or the representative sample as required by regulation VI/18 presented to the ship are not in compliance with the relevant requirements, the master or officer in charge of the bunker operation should have documented that through a Notification to the ship's flag Administration with copies to the port Authority under whose jurisdiction the ship did not receive the required documentation pursuant to the bunkering operation and to the bunker deliverer. A copy should be retained on board the ship, together with any available commercial documentation, for the subsequent scrutiny of port State control.

2.1.6 If, however, the PSCO's general impressions or observations on board give clear grounds (see paragraph 2.1.7) for believing that the condition of the ship or its equipment do not correspond substantially with the particulars of the certificates or the documents, the PSCO should proceed to a more detailed inspection.

2.1.7 "Clear grounds" to conduct a more detailed inspection include:

- .1 evidence that certificates required by the Annex are missing or clearly invalid;
- .2 evidence that documents required by the Annex are missing or clearly invalid;
- .3 the absence of principal equipment or arrangements specified in the certificates or documents;
- .4 the presence of equipment or arrangements not specified in the certificates or documents;
- .5 evidence from the PSCO's general impressions or observations that serious deficiencies exist in the equipment or arrangements specified in the certificates or documents;
- .6 information or evidence that the master or crew are not familiar with essential shipboard operations relating to the prevention of air pollution, or that such operations have not been carried out;
- .7 evidence that the quality of fuel oil, delivered to and used on board the ship, appears to be substandard; or

- .8 receipt of a report or complaint containing information that the ship appears to be substandard.

2.2 More detailed inspections

2.2.1 The PSCO should verify that:

- .1 there are effectively implemented maintenance procedures for the equipment containing ozone-depleting substances; and
- .2 there are no deliberate emissions of ozone-depleting substances.

2.2.2 In order to verify that each installed marine diesel engine with a power output of more than 130 kW is approved by the Administration in accordance with the NO_x Technical Code and maintained appropriately, the PSCO should pay particular attention to the following:

- .1 examine such marine diesel engines to be consistent with the EIAPP Certificate and its Supplement, Technical File and, if applicable, Record Book of Engine Parameters or Onboard Monitoring Manual and related data;
- .2 examine marine diesel engines specified in the Technical Files to verify that no unapproved modifications, which may affect on NO_x emission, have been made to the marine diesel engines;
- .3 examine marine diesel engines with a power output of more than 5,000 kW and a per cylinder displacement at or above 90 litres installed on a ship constructed on or after 1 January 1990 but prior to 1 January 2000 to verify that they are certified, if so required, in accordance with regulation VI/13.7;
- .4 in the case of ships constructed before 1 January 2000, verify that any marine diesel engine which has been subject to a major conversion, as defined in regulation VI/13, has been approved by the Administration; and
- .5 emergency marine diesel engines intended to be used solely in case of emergency are still in use for this purpose.

2.2.3 The PSCO should check whether the quality of fuel oil used on board the ship conforms to the provisions of regulations VI/14 and VI/18*, taking into account appendix IV to the Annex. Furthermore, the PSCO should pay attention to the record required in regulation VI/14.6 in order to identify the sulphur content of fuel oil used while the ship is within an Emission Control Area under regulation VI/14.3, or that other equivalent approved means have been applied as required.

2.2.4 If the ship is a tanker, as defined in regulation VI/2.21, the PSCO should verify that the vapour collection system approved by the Administration, taking into account MSC/Circ.585, is installed, if required under regulation VI/15.

* It should be noted that in the case where bunker delivery note or representative sample as required by regulation VI/18 are not in compliance with the relevant requirements, the master or crew should have documented that fact. Where fuel oil supply was undertaken in a port under the jurisdiction of a Party to the 1997 Protocol, the PSCO should report that non-compliance to the appropriate authority responsible for the registration of fuel oil suppliers (regulation VI/18.10.1).

2.2.5 If the ship is a tanker carrying crude oil, the PSCO should verify that there is on board an approved VOC Management Plan.

2.2.6 The PSCO should verify that prohibited materials are not incinerated.

2.2.7 The PSCO should verify that shipboard incineration of sewage sludge or sludge oil in boilers or marine power plants is not undertaken while the ship is inside ports, harbours or estuaries (regulation VI/16.4).

2.2.8 The PSCO should verify that the shipboard incinerator, if required by regulation VI/16.6.1, is approved by the Administration. For these units, it should be verified that the incinerator is properly maintained, therefore the PSCO should examine whether:

- .1 the shipboard incinerator is consistent with the certificate of shipboard incinerator;
- .2 the operational manual, in order to operate the shipboard incinerator within the limits provided in appendix IV to the Annex, is provided; and
- .3 the combustion chamber flue gas outlet temperature is monitored as required (regulation VI/16.9).

2.2.9 If there are clear grounds as defined in paragraph 2.1.6, the PSCO may examine operational procedures by confirming that:

- .1 the master or crew are familiar with the procedures to prevent emissions of ozone-depleting substances;
- .2 the master or crew are familiar with the proper operation and maintenance of marine diesel engines, in accordance with their Technical Files or Approved Method file, as applicable, and with due regard for Emission Control Areas for NO_x control;
- .3 the master or crew have undertaken the necessary fuel oil changeover procedures, or equivalent, associated with demonstrating compliance within an Emission Control Area for SO_x and particulate matter control;
- .4 the master or crew are familiar with the garbage screening procedure to ensure that prohibited garbage is not incinerated;
- .5 the master or crew are familiar with the operation of the shipboard incinerator, as required by regulation VI/16.6, within the limits provided in appendix IV to the Annex, in accordance with its operational manual;
- .6 the master or crew are familiar with the regulation of emissions of volatile organic compounds (VOCs), when the ship is in ports or terminals under the jurisdiction of a Party to the 1997 Protocol to MARPOL 73/78 in which VOCs emissions are to be regulated, and are familiar with the proper operation of a vapour collection system approved by the Administration (in case the ship is a tanker as defined in regulation VI/2.21);

- .7 the master or crew are familiar with the application of the VOC Management Plan, if applicable; and
- .8 the master or crew are familiar with bunker delivery procedures in respect of bunker delivery notes and retained samples as required by regulation VI/18.

2.3 Detainable deficiencies

2.3.1 In exercising his/her functions, the PSCO should use professional judgment to determine whether to detain the ship until any noted deficiencies are corrected or to allow it to sail with certain deficiencies which do not pose an unreasonable threat of harm to the marine environment. In doing this, the PSCO should be guided by the principle that the requirements contained in the Annex, with respect to the construction, equipment and operation of the ship, are essential for the protection of the marine environment and that departure from these requirements could constitute an unreasonable threat of harm to the marine environment.

2.3.2 In order to assist the PSCO in the use of these guidelines, there follows a list of deficiencies, which are considered, taking into account the provisions of regulation VI/3, to be of such a serious nature that they may warrant the detention of the ship involved:

- .1 absence of valid IAPP Certificate, EIAPP Certificates or Technical Files*;
- .2 a marine diesel engine, with a power output of more than 130 kW, which is installed on board a ship constructed on or after 1 January 2000, or a marine diesel engine having undergone a major conversion on or after 1 January 2000, which does not comply with the NO_x Technical Code or that does not comply with the relevant NO_x emission limit;
- .3 a marine diesel engine, with a power output of more than 5,000 kW and a per cylinder displacement at or above 90 litres, which is installed on board a ship constructed on or after 1 January 1990 but prior to 1 January 2000, and an Approved Method for that engine has been certified by an Administration and was commercially available, for which an Approved Method is not installed after the first renewal survey specified in regulation VI/13.7.2;
- .4 depending on the method used for demonstrating SO_x compliance, the sulphur content of any fuel oil being used on board exceeds 4.5% m/m prior to 1 January 2012, 3.50% m/m on and after a January 2012 and 0.50% m/m on and after 1 January 2020¹, taking into account the provisions of regulation VI/18.2;
- .5 non-compliance with the relevant requirements while operating within an Emission Control Area for SO_x and particulate matter control;

* Under regulation 6.2 of MARPOL Annex VI, a ship constructed before the date of entry into force of MARPOL Annex VI shall be issued with an International Air Pollution Prevention Certificate no later than the first scheduled dry-docking after the date of such entry into force, but in no case later than three years after this date.

¹ Or 2025, depending on the results of the review of regulation VI/14.1.3, as described in regulation VI/14.8.

- .6 an incinerator installed on board the ship on or after 1 January 2000 does not comply with requirements contained in appendix IV to the Annex, or the standard specifications for shipboard incinerators developed by the Organization (resolutions MEPC.76(40) and MEPC.93(45));
- .7 the master or crew are not familiar with essential procedures regarding the operation of air pollution prevention equipment as defined in paragraph 2.2.9 above.

Chapter 3 INSPECTIONS OF SHIPS OF NON-PARTIES TO THE ANNEX AND OTHER SHIPS NOT REQUIRED TO CARRY THE IAPP CERTIFICATE

3.1 As this category of ships is not provided with the IAPP Certificate, the PSCO should judge whether the condition of the ship and its equipment satisfies the requirements set out in the Annex. In this respect, the PSCO should take into account that, in accordance with article 5(4) of the MARPOL Convention, no more favourable treatment is to be given to ships of non-Parties.

3.2 In all other respects the PSCO should be guided by the procedures for ships referred to in chapter 2 and should be satisfied that the ship and crew do not present a danger to those on board or an unreasonable threat of harm to the marine environment.

3.3 If the ship has a form of certification other than the IAPP Certificate, the PSCO may take such documentation into account in the evaluation of the ship.

ANNEX 3

DRAFT MEPC RESOLUTION

AMENDMENTS TO THE GUIDELINES FOR THE SAMPLING OF FUEL OIL FOR DETERMINATION OF COMPLIANCE WITH THE REVISED MARPOL ANNEX VI

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

RECALLING ALSO that MARPOL Annex VI entered into force on 19 May 2005,

RECALLING FURTHER resolution MEPC.96(47) by which the Committee adopted the Guidelines for the sampling of fuel oil for determination of compliance with Annex VI of MARPOL 73/78,

NOTING that the revised MARPOL Annex VI was adopted by resolution MEPC.176(58) which is expected to enter into force on 1 July 2010,

NOTING ALSO that regulation 18.8.1 on fuel oil quality within the revised MARPOL Annex VI requires that the bunker delivery note shall be accompanied by a representative sample of the fuel oil delivered taking into account guidelines to be developed by the Organization,

RECOGNIZING the need to amend the Guidelines for the sampling of fuel oil for determination of compliance with Annex VI of MARPOL 73/78, in accordance with provisions of the revised MARPOL Annex VI,

HAVING CONSIDERED the amendments to Guidelines for the sampling of fuel oil for determination of compliance with Annex VI of MARPOL 73/78 prepared by the Sub-Committee on Bulk Liquids and Gases at its thirteenth session,

1. ADOPTS the amendments to the Guidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI, as set out in the Annex to this resolution;
2. INVITES Governments to apply the Guidelines, as amended by this resolution, from 1 July 2010; and
3. REVOKES resolution MEPC.96(47), as from this date.

ANNEX

**GUIDELINES FOR THE SAMPLING OF FUEL OIL FOR DETERMINATION OF
COMPLIANCE WITH THE REVISED MARPOL ANNEX VI**

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1 Preface

The primary objective of these Guidelines is to establish an agreed method to obtain a representative sample of the fuel oil for combustion purposes delivered for use on board ships.

2 Introduction

The basis for these Guidelines is regulation 18.5 of Annex VI to MARPOL 73/78, as amended by resolution MEPC.176(58), which provides that for each ship subject to regulations 5 and 6 of that Annex, details of fuel oil for combustion purposes delivered to, and used on board the ship, shall be recorded by means of a bunker delivery note which shall contain at least the information specified in appendix V to that Annex. In accordance with regulation 18.8.1 of Annex VI, the bunker delivery note shall be accompanied by a representative sample of the fuel oil delivered. This sample is to be used solely for determination of compliance with Annex VI of MARPOL 73/78.

3 Definitions

For the purpose of these Guidelines:

3.1 *Supplier's representative* is the individual from the bunker tanker who is responsible for the delivery and documentation or, in the case of deliveries direct from the shore to the ship, the person who is responsible for the delivery and documentation.

3.2 *Ship's representative* is the ship's master or officer in charge who is responsible for receiving bunkers and documentation.

3.3 *Representative sample* is a product specimen having its physical and chemical characteristics identical to the average characteristics of the total volume being sampled.

3.4 *Primary sample* is the representative sample of the fuel delivered to the ship collected throughout the bunkering period obtained by the sampling equipment positioned at the bunker manifold of the receiving ship.

3.5 *Retained sample* is the representative sample in accordance with regulation 18.8.1 of Annex VI to MARPOL 73/78, of the fuel delivered to the ship derived from the primary sample.

4 Sampling methods

4.1 The primary sample should be obtained by one of the following methods:

- .1 manual valve-setting continuous-drip sampler; or
- .2 time-proportional automatic sampler; or
- .3 flow-proportional automatic sampler.

4.2 Sampling equipment should be used in accordance with manufacturer's instructions, or guidelines, as appropriate.

5 Sampling and sample integrity

5.1 A means should be provided to seal the sampling equipment throughout the period of supply.

5.2 Attention should be given to:

- .1 the form of set up of the sampler;
- .2 the form of the primary sample container;
- .3 the cleanliness and dryness of the sampler and the primary sample container prior to use;
- .4 the setting of the means used to control the flow to the primary sample container; and
- .5 the method to be used to secure the sample from tampering or contamination during the bunker operation.

5.3 The primary sample receiving container should be attached to the sampling equipment and sealed so as to prevent tampering or contamination of the sample throughout the bunker delivery period.

6 Sampling location

For the purpose of these Guidelines a sample of the fuel delivered to the ship should be obtained at the receiving ship's inlet bunker manifold and should be drawn continuously throughout the bunker delivery period.*

7 Retained sample handling

7.1 The retained sample container should be clean and dry.

7.2 Immediately prior to filling the retained sample container, the primary sample quantity should be thoroughly agitated to ensure that it is homogeneous.

7.3 The retained sample should be of sufficient quantity to perform the tests required but should not be less than 400 ml. The container should be filled to $90\% \pm 5\%$ capacity and sealed.

8 Sealing of the retained sample

8.1 Immediately following collection of the retained sample, a tamper proof security seal with a unique means of identification should be installed by the supplier's representative in the presence of the ship's representative. A label containing the following information should be secured to the retained sample container:

* The phrase "be drawn continuously throughout the bunker delivery period" in paragraph 6 of the Guidelines should be taken to mean continuous collection of drip sample throughout the delivery of bunker fuel covering each bunker delivery note. In case of receiving an amount of bunker fuel necessitating two or more delivery notes, the sampling work may be temporarily stopped to change primary sample container and then resumed as necessary.

- .1 location at which, and the method by which, the sample was drawn;
- .2 date of commencement of delivery;
- .3 name of bunker tanker/bunker installation;
- .4 name and IMO number of the receiving ship;
- .5 signatures and names of the supplier's representative and the ship's representative;
- .6 details of seal identification; and
- .7 bunker grade.

8.2 To facilitate cross-reference details of the seal, identification may also be recorded on the bunker delivery note.

9 Retained sample storage

9.1 The retained sample should be kept in a safe storage location, outside the ship's accommodation, where personnel would not be exposed to vapours which may be released from the sample. Care should be exercised when entering a sample storage location.

9.2 The retained sample should be stored in a sheltered location where it will not be subject to elevated temperatures, preferably at a cool/ambient temperature, and where it will not be exposed to direct sunlight.

9.3 Pursuant to regulation 18.8.1 of Annex VI of MARPOL 73/78, the retained sample should be retained under the ship's control until the fuel oil is substantially consumed, but in any case for a period of not less than 12 months from the time of delivery.

9.4 The ship's master should develop and maintain a system to keep track of the retained samples.

ANNEX 4**DRAFT MEPC RESOLUTION****REVISED GUIDELINES FOR MONITORING THE WORLDWIDE
AVERAGE SULPHUR CONTENT OF RESIDUAL FUEL OILS
SUPPLIED FOR USE ON BOARD SHIPS**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

RECALLING ALSO that MARPOL Annex VI entered into force on 19 May 2005,

RECALLING FURTHER resolution MEPC.82(43) by which the Committee adopted the Guidelines for monitoring the worldwide average sulphur content of residual fuel oils supplied for use on board ships,

NOTING that the revised MARPOL Annex VI was adopted by resolution MEPC.176(58) which is expected to enter into force on 1 July 2010,

NOTING ALSO that regulation 14.2 of the revised MARPOL Annex VI requires monitoring of the worldwide average sulphur content of residual fuel oil supplied for use on board ships, taking into account guidelines developed by the Organization,

RECOGNIZING the need to revise the Guidelines for monitoring the worldwide average sulphur content of residual fuel oils supplied for use on board ships, in accordance with provisions of the revised MARPOL Annex VI,

HAVING CONSIDERED the revised Guidelines for monitoring the worldwide average sulphur content of residual fuel oil supplied for use on board ships prepared by the Sub-Committee on Bulk Liquids and Gases at its thirteenth session,

1. ADOPTS the revised Guidelines for monitoring the worldwide average sulphur content of residual fuel oils supplied for use on board ships, as set out in the Annex to the present resolution;
2. URGES Member Governments and interested organizations to make available the resources and expertise necessary for the implementation of the Guidelines from 1 July 2010; and
3. REVOKES resolution MEPC.82(43), as from this date.

ANNEX

REVISED GUIDELINES FOR MONITORING THE WORLDWIDE AVERAGE SULPHUR CONTENT OF RESIDUAL FUEL OILS SUPPLIED FOR USE ON BOARD SHIPS

Preface

1 The primary objective of the guidelines is to establish an agreed method to monitor the average sulphur content of residual fuel oils supplied for use on board ships.

Introduction

2 The basis for these guidelines is provided in regulation 14.2 of Annex VI of MARPOL and in Conference Resolution 4 (in MP/CONF.3/35), on monitoring the worldwide average sulphur content of residual fuel oil supplied for use on board ships. Among the emissions addressed by Annex VI are emissions resulting from the combustion of fuels containing sulphur. An upper limit for the sulphur content of fuels was set and it was further decided to monitor the average sulphur content of fuel.

3 The independent testing companies analyse over 100,000 samples annually, which cover between 25% and 35% of all deliveries. From the data gathered by these testing services, the current average figures for the sulphur content of residual fuels can be derived. These figures are publicized regularly and are currently in the order of 2.4% by mass².

Definitions

4 For the purpose of these guidelines the following definitions should apply:

(1) *Residual fuel:*

Fuel oil for combustion purposes delivered to and used on board ships with a kinematic viscosity at 50°C greater than or equal to 30.0 centistoke³.

(2) *Provider of sampling and testing services:*

A company that, on a commercial basis, provides testing and sampling services of bunker fuels delivered to ships for the purpose of assessing quality parameters of these fuels, including the sulphur content.

(3) *Reference value A_w :*

The value of the worldwide average sulphur content in residual fuel oils supplied for use on board ships, based on the first three years of data collected and as determined on the basis of paragraphs 4 and 5 of these guidelines.

² See document MEPC 59/4/1.

³ Reference is made to ISO Standard 8217, 2005.

Monitoring and calculation of yearly and three-year rolling average

Monitoring

5 Monitoring should be based on calculation of average sulphur content of residual fuels on the basis of sampling and testing by independent testing services. Every year the average sulphur content of residual fuels should be calculated. After three years the reference value for monitoring will be set as described in paragraph 11.

Calculation of yearly average

6 At the basis of monitoring is the calculation, on an annual basis, of the average sulphur content of residual fuel.

7 The calculation of the average sulphur content is executed as follows:

For a certain calendar year, the sulphur contents of the samples analysed (one sample for each delivery of which the sulphur content is determined by fuel oil analysis) are recorded. The sulphur contents of the samples analysed are multiplied by the corresponding mass of fuel added up and then divided by the total mass of bunker analysed. The outcome of that division is the average sulphur content of residual fuel for that year.

8 As a basis for well informed decisions a graphical representation of the distribution of the global sulphur content in residual fuels in terms of the % sulphur in increments of 0.5% sulphur plotted against the quantity of fuel associated with each incremental sulphur content range should be made available by 31 January of each year.

9 The mathematical formula for the method of calculation described is given in the appendix to these Guidelines.

Three-year rolling average

10 A three-year rolling average should be calculated as follows:

$$A_{cr} = (A_{c1} + A_{c2} + A_{c3})/3$$

in which:

A_{cr} = rolling average S-content of all deliveries tested over a three-year period

A_{c1}, A_{c2}, A_{c3} = individual average S-contents of all deliveries tested for each year under consideration

A_{cr} is to be recalculated each year by adding the latest figure for A_c and deleting the oldest.

Setting of the reference value

11 The reference value of the world wide average sulphur content of residual fuel oils supplied for use on board ships should be A_w , where $A_w = A_{cr}$ as calculated in January of the year following the first three years in which data were collected on the basis of these Guidelines. A_w should be expressed as a percentage.

Providers of sampling and testing services

12 There are presently three providers of sampling and testing services under these Guidelines.

13 Any additional providers of sampling and testing services will be approved by MEPC in accordance with the following criteria:

- .1 be subject to the approval of the Marine Environment Protection Committee, which should apply these criteria;
- .2 be provided with a technical and managerial staff of qualified professionals providing adequate geographical coverage and local representation to ensure quality services in a timely manner;
- .3 provide services governed by a documented Code of Ethics;
- .4 be independent as regards to commercial interest in the outcome of monitoring;
- .5 implement and maintain an internationally recognized quality system, certified by an independent auditing body, which ensures reproducibility and repeatability of services which are internally audited, monitored and carried out under controlled conditions;
- .6 take a significant number of samples on an annual basis for the purpose of globally monitoring average sulphur content of residual fuels.

Standardized method of calculation

14 Each of the providers of sampling and testing services should provide the necessary information for the calculation of the average sulphur content of the residual fuels to the Secretariat of IMO or another agreed third party on the basis of a mutually agreed format, approved by MEPC. This party will process the information and will provide the outcome in the agreed format to MEPC. From the viewpoint of competitive positions the information involved should be considered sensitive.

APPENDIX

CALCULATION OF AVERAGE SULPHUR CONTENT BASED ON QUANTITY

Note: wherever “all deliveries“ are mentioned, this is meant to refer to all deliveries sampled and tested for sulphur and being taken into account for the purpose of monitoring.

Calculation weighted for quantity

$$A_{cj} = \frac{\sum_{i=1}^{i=N_j} a_i \cdot m_i}{\sum_{i=1}^{i=N_j} m_i}$$

in which:

- A_{cj} = the average sulphur content of all deliveries sampled world wide in year j
- a_i = the sulphur content of individual sample for delivery i
- N_j = total number of samples taken in year j
- m_i = the mass of fuel with a sulphur content of a_i

ANNEX 5**DRAFT MEPC RESOLUTION****REVISED GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

RECALLING ALSO that MARPOL Annex VI entered into force on 19 May 2005,

RECALLING FURTHER resolution MEPC.170(57) by which the Committee adopted the Guidelines for exhaust gas cleaning system,

NOTING that the revised MARPOL Annex VI was adopted by resolution MEPC.176(58) which is expected to enter into force on 1 July 2010,

NOTING ALSO that regulation 4 of the revised MARPOL Annex VI allows the use of an alternative compliance methods at least as effective in terms of emission reductions as that required by the revised MARPOL Annex VI, including any of the standards set forth in regulation 14, taking into account guidelines developed by the Organization,

RECOGNIZING the need to revise the Guidelines for exhaust gas cleaning systems, in accordance with provisions of the revised MARPOL Annex VI,

HAVING CONSIDERED the revised Guidelines for exhaust gas cleaning systems prepared by the Sub-Committee on Bulk Liquids and Gases at its thirteenth session,

1. ADOPTS the revised Guidelines for exhaust gas cleaning systems, as set out in the Annex to this resolution;
2. INVITES Governments to apply the revised Guidelines from 1 July 2010;
3. URGES Administrations to provide for collection of data under Appendix III; and
4. REVOKES resolution MEPC.170(57) as from 1 July 2010.

ANNEX

**REVISED GUIDELINES FOR EXHAUST GAS CLEANING (EGC) SYSTEMS –
MARPOL ANNEX VI, REGULATIONS 4, 14.1 and 14.4**

TABLE OF CONTENTS

(to be inserted at a later stage)

GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS MARPOL ANNEX VI, REGULATIONS 4, 14.1 and 14.4

1 INTRODUCTION

1.1 Regulation 14 of Annex VI to MARPOL 73/78 requires ships to use fuel oil with a sulphur content not exceeding that stipulated in regulation 14.1 or 14.4. Regulation 4 allows, with the approval of the Administration, the use of an alternative compliance method at least as effective in terms of emission reductions as that required by the Annex, including the standards set forth in regulation 14. The Administration of a party should take into account any relevant guidelines developed by the Organization pertaining to alternatives provided for in regulation 4.

1.2 Similar to a NO_x emission reduction system, an EGC unit may be approved subject to periodic parameter and emission checks or the system may be equipped with a continuous emission monitoring system. These guidelines have been developed with the intention of being objective and performance oriented. Furthermore, use of the SO₂ (ppm)/CO₂ (%) ratio method will simplify the monitoring of SO_x emission and facilitate approval of an EGC unit. See Appendix II for the rationale explaining the use of SO₂ (ppm)/CO₂ (%) as the basis for system monitoring.

1.3 Compliance should be demonstrated on the basis of the SO₂(ppm)/CO₂(% v/v) ratio values.

Table 1

Fuel oil sulphur limits recorded in regulations 14.1 and 14.4 and corresponding emissions values

Fuel Oil Sulphur Content (% m/m)	Ratio Emission SO ₂ (ppm)/CO ₂ (% v/v)
4.50	195.0
3.50	151.7
1.50	65.0
1.00	43.3
0.50	21.7
0.10	4.3

Note

1. The use of the Ratio Emissions limits is only applicable when using petroleum based Distillate or Residual Fuel Oils. See Appendix II for application of the ratio method.

1.4 These Guidelines are recommendatory in nature; however, Administrations are invited to base their implementation on these Guidelines.

2 GENERAL

2.1 Purpose

2.1.1 The purpose of these Guidelines is to specify the requirements for the testing, survey certification and verification of exhaust gas cleaning (EGC) systems under regulation 4 to ensure that they provide effective equivalence to requirements of regulations 14.1 and 14.4 of Annex VI of MARPOL 73/78.

2.1.2 The Guidelines permit two schemes; Scheme A (Unit Certification with Parameter and Emission Checks, and Scheme B (Continuous Emission Monitoring with Parameter Checks).

2.1.3 For ships which are to use an exhaust gas cleaning system in part or in total in order to comply with regulations 14.1 and/or 14.4 of MARPOL Annex VI there should be an approved SO_x Emissions Compliance Plan (SECP).

2.2 Application

2.2.1 These Guidelines apply to any EGC unit as fitted to fuel oil combustion machinery, excluding shipboard incinerators, installed on board a ship.

2.3 Definitions and Required Documents

Fuel oil combustion unit	Any engine, boiler, gas turbine, or other fuel oil fired equipment, excluding shipboard incinerators
EGC	Exhaust gas cleaning
SO _x	Sulphur oxides
SO ₂	Sulphur dioxide
CO ₂	Carbon dioxide
UTC	Universal Time Co-ordinated
Certified Value	The SO ₂ /CO ₂ ratio specified by the manufacturer that the EGC unit is certified as meeting when operating on a continuous basis on the manufacturers specified maximum fuel sulphur content
In-situ	Sampling directly within an exhaust gas stream
MCR	Maximum Continuous Rating
Load Range	Maximum rated power of diesel engine or maximum steaming rate of the boiler
SECP	SO _x Emissions Compliance Plan
SECC	SO _x Emissions Compliance Certificate
ETM- A	EGC system – Technical Manual for Scheme A
ETM- B	EGC system – Technical Manual for Scheme B
OMM	Onboard Monitoring Manual
EGC Record Book	A record of the EGC unit in-service operating parameters, component adjustments, maintenance and service records as appropriate

Document	Scheme A	Scheme B
SECP	X	X
SECC	X	
ETM Scheme A	X	
ETM Scheme B		X
OMM	X	X
EGC Record Book or Electronic Logging System	X	X

3 SAFETY NOTE

3.1 Due attention is to be given to the safety implications related to the handling and proximity of exhaust gases, the measurement equipment and the storage and use of pressurized containers of pure and calibration gases. Sampling positions and permanent access platforms should be such that this monitoring may be performed safely. In locating discharge outlet of washwater used in the EGC unit, due consideration should be given to the location of the ship's seawater inlet. In all operating conditions the pH should be maintained at a level that avoids damage to the vessel's antifouling system, the propeller, rudder and other components that may be vulnerable to acidic discharges, potentially causing accelerated corrosion of critical metal components.

4 SCHEME A – EGC SYSTEM APPROVAL, SURVEY AND CERTIFICATION USING PARAMETER AND EMISSION CHECKS

4.1 Approval of EGC systems

4.1.1 General

Options under Scheme A of these Guidelines provide for:

- a) Unit approval;
- b) Serially manufactured units;
- c) Production range approval.

4.1.2 Unit approval

4.1.2.1 An EGC unit should be certified as capable of meeting the limit value, (the Certified Value), specified by the manufacturer (e.g., the emission level the unit is capable of achieving on a continuous basis) with fuel oils of the manufacturer's specified maximum % m/m sulphur content and for the range of operating parameters, as listed in 4.2.2.1(b), for which they are to be approved. The Certified Value should at least be suitable for ship operations under requirements given by MARPOL Annex VI regulations 14.1 and/or 14.4.

4.1.2.2 Where testing is not to be undertaken with fuel oils of the manufacturer's specified maximum % m/m sulphur content, the use of two test fuels with a lower % m/m sulphur content is permitted. The two fuels selected should have a difference in % m/m sulphur content sufficient to demonstrate the operational behaviour of the EGC unit and to demonstrate that the Certified Value can be met if the EGC unit were to be operated with a fuel of the manufacturer's specified maximum % m/m sulphur content. In such cases a minimum of two tests, in accordance with section 4.3 as appropriate, should be performed. These need not be sequential and could be undertaken on two different, but identical, EGC units.

4.1.2.3 The maximum and, if applicable, minimum exhaust gas mass flow rate of the unit should be stated. The effect of variation of the other parameters defined in 4.2.2.1(b) should be justified by the equipment manufacturer. The effect of variations in these factors should be assessed by testing or otherwise as appropriate. No variation in these factors, or combination of variations in these factors, should be such that the emission value of the EGC unit would be in excess of the Certified Value.

4.1.2.4 Data obtained in accordance with this section should be submitted to the Administration for approval together with the ETM-A.

4.1.3 Serially manufactured units

In the case of nominally similar EGC units of the same mass flow ratings as that certified under 4.1.2, and to avoid the testing of each EGC unit, the equipment manufacturer may submit, for acceptance by the Administration, a conformity of production arrangement. The certification of each EGC unit under this arrangement should be subject to such surveys that the Administration may consider necessary as to assure that each EGC unit has an emission value of not more than the Certified Value when operated in accordance with the parameters defined in 4.2.2.1(b).

4.1.4 Product range approval

4.1.4.1 In the case of an EGC unit of the same design, but of different maximum exhaust gas mass flow capacities, the Administration may accept, in lieu of tests on an EGC unit of all capacities in accordance with section 4.1.2, tests of EGC systems of three different capacities provided that the three tests are performed at intervals including the highest, lowest and one intermediate capacity rating within the range.

4.1.4.2 Where there are significant differences in the design of EGC units of different capacities, this procedure should not be applied unless it can be shown, to the satisfaction of the Administration, that in practice those differences do not materially alter the performance between the various EGC unit types.

4.1.4.3 For EGC units of different capacities, the sensitivity to variations in the type of combustion machinery to which they are fitted should be detailed together with sensitivity to the variations in the parameters listed in 4.2.2.1(b). This should be on the basis of testing, or other data as appropriate.

4.1.4.4 The effect of changes of EGC unit capacity on washwater characteristics should be detailed.

4.1.4.5 All supporting data obtained in accordance with this section, together with the ETM-A for each capacity unit, should be submitted to the Administration for approval.

4.2 Survey and certification

4.2.1 Procedures for the certification of an EGC unit

4.2.1.1 In order to meet the requirements of 4.1 either prior to, or after installation on board, each EGC unit should be certified as meeting the Certified Value specified by the manufacturer (e.g., the emission level the unit is capable of achieving on a continuous basis) under the operating conditions and restrictions as given by the EGC Technical Manual (ETM-A) as approved by the Administration.

4.2.1.2 Determination of the Certified Value should be in accordance with the provisions of these Guidelines.

4.2.1.3 Each EGC unit meeting the requirements of 4.2.1.1 should be issued with a SECC by the Administration. The form of the SECC is given in Appendix I.

4.2.1.4 Application for an SECC should be made by the EGC system manufacturer, shipowner or other party.

4.2.1.5 Any subsequent EGC units of the same design and rating as that certified under 4.2.1.1 may be issued with an SECC by the Administration without the need for testing in accordance with 4.2.1.1 subject to section 4.1.3 of these Guidelines.

4.2.1.6 EGC units of the same design, but with ratings different from that certified under 4.2.1.1 may be accepted by the Administration subject to section 4.1.4 of these Guidelines.

4.2.1.7 EGC units which treat only part of the exhaust gas flow of the uptake in which they are fitted should be subject to special consideration by the Administration to ensure that under all defined operating conditions that the overall emission value of the exhaust gas down stream of the system is no more than the Certified Value.

4.2.2 EGC System Technical Manual "Scheme A" (ETM-A).

4.2.2.1 Each EGC unit should be supplied with an ETM-A provided by the manufacturer. This ETM-A should, as a minimum, contain the following information:

- (a) the identification of the unit (manufacturer, model/type, serial number and other details as necessary) including a description of the unit and any required ancillary systems;
- (b) the operating limits, or range of operating values, for which the unit is certified. These should, as a minimum, include:
 - (i) maximum and, if applicable, minimum mass flow rate of exhaust gas;
 - (ii) the power, type and other relevant parameters of the fuel oil combustion unit for which the EGC unit is to be fitted. In the cases of boilers, the maximum air/fuel ratio at 100% load should also be given. In the cases of diesel engines whether the engine is of 2 or 4 stroke cycle;
 - (iii) maximum and minimum washwater flow rate, inlet pressures and minimum inlet water alkalinity (ISO 9963-1-2);
 - (iv) exhaust gas inlet temperature ranges and maximum and minimum exhaust gas outlet temperature with the EGC unit in operation;
 - (v) exhaust gas differential pressure range and the maximum exhaust gas inlet pressure with the fuel oil combustion unit operating at MCR or 80% of power rating whichever is appropriate;
 - (vi) salinity levels or fresh water elements necessary to provide adequate neutralizing agents; and
 - (vii) other factors concerning the design and operation of the EGC unit relevant to achieving a maximum emission value no higher than the Certified Value;
- (c) any requirements or restrictions applicable to the EGC unit or associated equipment necessary to enable the unit to achieve a maximum emission value no higher than the Certified Value;

- (d) maintenance, service or adjustment requirements in order that the EGC unit can continue to achieve a maximum emission value no higher than the Certified Value. The maintenance, servicing and adjustments should be recorded in the EGC Record Book;
- (e) corrective actions in case of exceedances of the applicable maximum allowable SO₂/CO₂ ratio, or wash water discharge criteria;
- (f) a verification procedure to be used at surveys to ensure that its performance is maintained and that the unit is used as required (see section 4.4);
- (g) through range performance variation in washwater characteristics;
- (h) design requirements of the washwater system; and
- (i) the SECC.

4.2.2.2 The ETM-A should be approved by the Administration.

4.2.2.3 The ETM-A should be retained on board the ship onto which the EGC unit is fitted. The ETM-A should be available for surveys as required.

4.2.2.4 Amendments to the ETM-A which reflect EGC unit changes that affect performance with respect to emissions to air and/or water should be approved by the Administration. Where additions, deletions or amendments to the ETM-A are separate to the ETM-A as initially approved, they should be retained with the ETM-A and should be considered as part of the ETM-A.

4.2.3 In service surveys

4.2.3.1 The EGC unit should be subject to survey on installation and at Initial, Annual/Intermediate and Renewals Surveys by the Administration.

4.2.3.2 In accordance with MARPOL Annex VI regulation 10, EGC units may also be subject to inspection by port State control.

4.2.3.3 Prior to use each EGC unit should be issued with an SECC by the Administration.

4.2.3.4 Following the installation survey as required by 4.2.3.1, section 2.6 of the Supplement to the ship's International Air Pollution Certificate should be duly completed.

4.3 Emission limits

4.3.1 Each EGC unit should be capable of reducing emissions to equal to or less than the Certified Value at any load point when operated in accordance with the criteria as given within 4.2.2.1(b), as specified in paragraphs 4.3.2 to 4.3.5 of these Guidelines, and as excepted in paragraph 4.3.7.

4.3.2 EGC units fitted to main propulsion diesel engines should meet the requirements of 4.3.1 at all loads between 25-100% of the load range of the engines to which they are fitted.

4.3.3 EGC units fitted to auxiliary diesel engines should meet the requirements of 4.3.1 at all loads between 10-100% of the load range of the engines to which they are fitted.

4.3.4 EGC units fitted to diesel engines which supply power for both main propulsion and auxiliary purposes should meet the requirements of 4.3.3.

4.3.5 EGC units fitted to boilers should meet the requirements of 4.3.1 at all loads between 10-100% of the load range (steaming rates) or, if the turn down ratio is smaller, over the actual load range of the boilers to which they are fitted.

4.3.6 In order to demonstrate performance, emission measurements should be undertaken, with the agreement of the Administration, at a minimum of four load points. One load point should be at 95-100% of the maximum exhaust gas mass flow rate for which the unit is to be certified. One load point should be within $\pm 5\%$ of the minimum exhaust gas mass flow rate for which the unit is to be certified. The other two load points should be equally spaced between the maximum and minimum exhaust gas mass flow rates. Where there are discontinuities in the operation of the system the number of load points should be increased, with the agreement of the Administration, so that it is demonstrated that the required performance over the stated exhaust gas mass flow rate range is retained. Additional intermediate load points should be tested if there is evidence of an emission peak below the maximum exhaust gas mass flow rate and above, if applicable, the minimum exhaust gas flow rate. These additional tests should be sufficient number as to establish the emission peak value.

4.3.7 For loads below those specified in 4.3.2 to 4.3.5, the EGC unit should continue in operation. In those cases where the fuel oil combustion equipment may be required to operate under idling conditions, the SO₂ emission concentration (ppm) at standardized O₂ concentration (15.0% diesel engines, 3.0% boilers) should not exceed 50 ppm.

4.4 Onboard procedures for demonstrating compliance

4.4.1 For each EGC unit, the ETM-A should contain a verification procedure for use at surveys as required. This procedure should not require specialized equipment or an in-depth knowledge of the system. Where particular devices are required they should be provided and maintained as part of the system. The EGC unit should be designed in such a way as to facilitate inspection as required. The basis of this verification procedure is that if all relevant components and operating values or settings are within those as approved, then the performance of the EGC system is within that required without the need for actual exhaust emission measurements. It is also necessary to ensure that the EGC unit is fitted to a fuel oil combustion unit for which it is rated – this forms part of the SECP. A Technical File related to an EIAPP certificate, if available, or an Exhaust Gas Declaration issued by the engine maker or designer or another competent party or a Flue Gas Declaration issued by the boiler maker or designer or another competent party serves this purpose to the satisfaction of the Administration.

4.4.2 Included in the verification procedure should be all components and operating values or settings which may affect the operation of the EGC unit and its ability to meet the Certified Value.

4.4.3 The verification procedure should be submitted by the EGC system manufacturer and approved by the Administration.

4.4.4 The verification procedure should cover both a documentation check and a physical check of the EGC unit.

4.4.5 The Surveyor should verify that each EGC unit is installed in accordance with the ETM-A and has an SECC as required.

4.4.6 At the discretion of the Administration, the Surveyor should have the option of checking one or all of the identified components, operating values or settings. Where there is more than one EGC unit, the Administration may, at its discretion, abbreviate or reduce the extent of the survey on board, however, the entire survey should be completed for at least one of each type of EGC unit on board provided that it is expected that the other EGC units perform in the same manner.

4.4.7 The EGC unit should include means to automatically record when the system is in use. This should automatically record, at least at the frequency specified in paragraph 5.4.2, as a minimum, washwater pressure and flow rate at the EGC unit's inlet connection, exhaust gas pressure before and pressure drop across the EGC unit, fuel oil combustion equipment load, and exhaust gas temperature before and after the EGC unit. The data recording system should comply with the requirements of sections 7 and 8. In case of a unit consuming chemicals at a known rate as documented in ETM-A, records of such consumption in the EGC Record Book also serves this purpose.

4.4.8 Under Scheme A, if a continuous exhaust gas monitoring system is not fitted, it is recommended that a daily spot check of the exhaust gas quality in terms of SO₂ (ppm)/CO₂ (%) ratio, is used to verify compliance in conjunction with parameter checks stipulated in 4.4.7. If a continuous exhaust gas monitoring system is fitted, only daily spot checks of the parameters listed in paragraph 4.4.7 would be needed to verify proper operation of the EGC unit.

4.4.9 If the EGC system manufacturer is unable to provide assurance that the EGC unit will meet the Certified Value or below between surveys, by means of the verification procedure stipulated in 4.4.1, or if this requires specialist equipment or in-depth knowledge, it is recommended that continuous exhaust gas monitoring of each EGC unit be used, Scheme B, to assure compliance with regulations 14.1 and/or 14.4.

4.4.10 An EGC Record Book should be maintained by the shipowner recording maintenance and service of the unit including like-for-like replacement. The form of this record should be submitted by the EGC system manufacturer and approved by the Administration. This EGC Record Book should be available at surveys as required and may be read in conjunction with engine-room log-books and other data as necessary to confirm the correction operation of the EGC unit. Alternatively, this information should be recorded in the vessel's planned maintenance record system as approved by the Administration.

5 SCHEME B – EGC SYSTEM APPROVAL, SURVEY, AND CERTIFICATION USING CONTINUOUS MONITORING OF SO_x EMISSIONS

5.1 General

This Scheme should be used to demonstrate that the emissions from a fuel oil combustion unit fitted with an EGC will, with that system in operation, result in the required emission value (e.g., as stated in the SECP) or below at any load point, including during transient operation and thus compliance with the requirements of regulations 14.1 and/or 14.4 of MARPOL Annex VI.

5.2 Approval

Compliance demonstrated in service by continuous exhaust gas monitoring. Monitoring system should be approved by the Administration and the results of that monitoring available to the Administration as necessary to demonstrate compliance as required.

5.3 Survey and certification

5.3.1 The monitoring system of the EGC system should be subject to survey on installation and at Initial, Annual/Intermediate and Renewals Surveys by the Administration.

5.3.2 In accordance with regulation 10 of MARPOL Annex VI monitoring systems of EGC units may also be subject to inspection by port State control.

5.3.3 In those instances where an EGC system is installed, section 2.6 of the Supplement to the ship's International Air Pollution Prevention Certificate should be duly completed.

5.4 Calculation of emission rate

5.4.1 Exhaust gas composition in terms of SO₂ (ppm)/CO₂ (%) should be measured at an appropriate position after the EGC unit and that measurement should be in accordance with the requirements of section 6 as applicable.

5.4.2 SO₂ (ppm) and CO₂ (%) to be continuously monitored and recorded onto a data recording and processing device at a rate which should not be less than 0.0035 Hz.

5.4.3 If more than one analyser is to be used to determine the SO₂/CO₂ ratio, these should be tuned to have similar sampling and measurement times and the data outputs aligned so that the SO₂/CO₂ ratio is fully representative of the exhaust gas composition.

5.5 Onboard procedures for demonstrating compliance with emission limit

5.5.1 The data recording system should comply with the requirements of sections 7 and 8.

5.5.2 Daily spot checks of the parameters listed in paragraph 4.4.7 are needed to verify proper operation of the EGC unit and should be recorded in the EGC Record Book or in the engine-room logger system.

5.6 EGC System Technical Manual "Scheme B" (ETM-B)

5.6.1 Each EGC unit should be supplied with an ETM-B provided by the Manufacturer. This ETM-B should, as a minimum, contain the following information:

- (a) the identification of the unit (manufacturer, model/type, serial number and other details as necessary) including a description of the unit and any required ancillary systems;
- (b) the operating limits, or range of operating values, for which the unit is certified. These should, as a minimum, include:
 - (i) maximum and, if applicable, minimum mass flow rate of exhaust gas;

- (ii) the power, type and other relevant parameters of the fuel oil combustion unit for which the EGC unit is to be fitted. In the cases of boilers, the maximum air/fuel ratio at 100% load should also be given. In the cases of diesel engines whether the engine is of 2 or 4 stroke cycle;
 - (iii) maximum and minimum washwater flow rate, inlet pressures and minimum inlet water alkalinity (ISO 9963-1-2);
 - (iv) exhaust gas inlet temperature ranges and maximum and minimum exhaust gas outlet temperature with the EGC unit in operation;
 - (v) exhaust gas differential pressure range and the maximum exhaust gas inlet pressure with the fuel oil combustion unit operating at MCR or 80% of power rating whichever is appropriate;
 - (vi) salinity levels or fresh water elements necessary to provide adequate neutralizing agents; and
 - (vii) other parameters as necessary concerning the operation of the EGC unit;
- (c) any requirements or restrictions applicable to the EGC unit or associated equipment;
 - (d) corrective actions in case of exceedances of the applicable maximum allowable SO₂/CO₂ ratio, or washwater discharge criteria;
 - (e) through range performance variation in washwater characteristics;
 - (f) design requirements of the washwater system.

5.6.2 The ETM-B should be approved by the Administration.

5.6.3 The ETM-B should be retained on board the ship onto which the EGC unit is fitted. The ETM-B should be available for surveys as required.

5.6.4 Amendments to the ETM-B which reflect EGC unit changes that affect performance with respect to emissions to air and/or water should be approved by the Administration. Where additions, deletions or amendments to the ETM-B are separate to the ETM-B as initially approved, they should be retained with the ETM-B and should be considered as part of the ETM-B.

6 EMISSION TESTING

6.1 Emission testing should follow the requirements of the NO_x Technical Code 2008, chapter 5, and associated Appendices, except as provided for in these Guidelines.

6.2 CO₂ should be measured on a dry basis using an analyser operating on non-dispersive infra-red (NDIR) principle. SO₂ should be measured on a dry or wet basis using analysers operating on non-dispersive infra-red (NDIR) or non-dispersive ultra-violet (NDUV) principles and with additional equipment such as dryers as necessary. Other systems or analyser principles may be accepted, subject to the approval of the Administration, provided they yield equivalent or better results to those of the equipment referenced above.

6.3 Analyser performance should be in accordance with the requirements of Appendix III sections 1.6 to 1.10 of the NO_x Technical Code 2008.

6.4 An exhaust gas sample for SO₂ should be obtained from a representative sampling point downstream of the EGC unit.

6.5 SO₂ and CO₂ should be monitored using either *in situ* or extractive sample systems.

6.6 Extractive exhaust gas samples for SO₂ determination should be maintained at a sufficient temperature to avoid condensed water in the sampling system and hence loss of SO₂.

6.7 If an extractive exhaust gas sample for determination needs to be dried prior to analysis it should be done in a manner that does not result in loss of SO₂ in the sample as analysed.

6.8 Where SO₂ is measured by an *in situ* system, the water content in the exhaust gas stream at that point is also to be determined in order to correct the reading to a dry basis value.

6.9 In justified cases where the CO₂ concentration is reduced by the EGC unit, the CO₂ concentration can be measured at the EGC unit inlet, provided that the correctness of such a methodology can be clearly demonstrated.

7 DATA RECORDING AND PROCESSING DEVICE

7.1 The recording and processing device should be of robust, tamper-proof design with read-only capability.

7.2 The recording and processing device should record the data required by sections 4.4.7, 5.4.2, and 10.3 against UTC and ships position by a Global Navigational Satellite System (GNSS).

7.3 The recording and processing device should be capable of preparing reports over specified time periods.

7.4 Data should be retained for a period of not less than 18 months from the date of recording. If the unit is changed over that period, the shipowner should ensure that the required data is retained on board and available as required.

7.5 The device should be capable of downloading a copy of the recorded data and reports in a readily useable format. Such copy of the data and reports should be available to the Administration or port State authority as requested.

8 ONBOARD MONITORING MANUAL (OMM)

8.1 An OMM should be prepared to cover each EGC unit installed in conjunction with fuel oil combustion equipment, which should be identified, for which compliance is to be demonstrated.

8.2 The OMM should, as a minimum, include:

- (a) the sensors to be used in evaluating EGC system performance and washwater monitoring, their service, maintenance and calibration requirements;

- (b) the positions from which exhaust emission measurements and washwater monitoring are to be taken together with details of any necessary ancillary services such as sample transfer lines and sample treatment units and any related service or maintenance requirements;
- (c) the analysers to be used, their service, maintenance, and calibration requirements;
- (d) analyser zero and span check procedures; and
- (e) other information or data relevant to the correct functioning of the monitoring systems or its use in demonstrating compliance.

8.3 The OMM should specify how the monitoring is to be surveyed.

8.4 The OMM should be approved by the Administration.

9 SHIP COMPLIANCE

9.1 SO_x Emissions Compliance Plan (SECP)

9.1.1 For all ships which are to use an EGC unit, in part or in total, in order to comply with the requirements of regulations 14.1 and 14.4 of MARPOL Annex VI there should be an SECP for the ship, approved by the Administration.

9.1.2 The SECP should list each item of fuel oil combustion equipment which is to meet the requirements for operating in accordance with the requirements of regulations 14.1 and/or 14.4.

9.1.3 Under Scheme A, the SECP should present how continuous monitoring data will demonstrate that the parameters in paragraph 4.4.7 are maintained within the manufacturer's recommended specifications. Under Scheme B, this would be demonstrated using daily recordings of key parameters.

9.1.4 Under Scheme B, the SECP should present how continuous exhaust gas emissions monitoring will demonstrate that the ship total SO₂ (ppm)/CO₂ (%) ratio is comparable to the requirements of regulation 14.1 and/or 14.4 or below as prescribed in paragraph 1.3. Under Scheme A, this would be demonstrated using daily exhaust gas emission recordings.

9.1.5 There may be some equipment such as small engines and boilers to which the fitting of EGC units would not be practical, particularly where such equipment is located in a position remote from the main machinery spaces. All such fuel oil combustion units should be listed in the SECP. For these fuel oil combustion units which are not to be fitted with EGC units, compliance may be achieved by means of regulations 14.1 and/or 14.4 of MARPOL Annex VI.

9.2 Demonstration of Compliance

9.2.1 Scheme A

9.2.1.1 The SECP should refer to, not reproduce, the ETM-A, EGC Record Book or Engine Room logger system and OMM as specified under Scheme A. It should be noted that as an alternative, the maintenance records may be recorded in the ship's Planned Maintenance Record System, as allowed by the Administration.

9.2.1.2 For all fuel oil combustion equipment listed under 9.1.2, details should be provided demonstrating that the rating and restrictions for the EGC unit as approved, 4.2.2.1(b), are complied with.

9.2.1.3 Required parameters should be monitored and recorded as required under 4.4.7 when the EGC is in operation in order to demonstrate compliance.

9.2.2 Scheme B

9.2.2.1 The SECP should refer to, not reproduce, the ETM-B, EGC Record Book or Engine Room logger system and OMM as specified under Scheme B.

10 WASHWATER

10.1 Washwater discharge criteria¹

10.1.1 When the EGC system is operated in ports, harbours, or estuaries, the wash water monitoring and recording should be continuous. The values monitored and recorded should include pH, PAH, turbidity and temperature. In other areas the continuous monitoring and recording equipment should also be in operation, whenever the EGC system is in operation, except for short periods of maintenance and cleaning of the equipment. The discharge water should comply with the following limits:

10.1.2 pH criteria

10.1.2.1 The washwater pH should comply with one of the following requirements which should be recorded in the ETM-A or ETM-B as applicable:

- (i) The discharge washwater should have a pH of no less than 6.5 measured at the ship's overboard discharge with the exception that during manoeuvring and transit, the maximum difference between inlet and outlet of 2 pH units is allowed measured at the ship's inlet and overboard discharge.
- (ii) During commissioning of the unit(s) after installation, the discharged washwater plume should be measured externally from the ship (at rest in harbour) and the discharge pH at the ship's overboard pH monitoring point will be recorded when the plume at 4 metres from the discharge point equals or is above pH 6.5. The discharged pH to achieve a minimum pH units of 6.5 will become the overboard pH discharge limit recorded in the ETM-A or ETM-B.

10.1.3 PAHs (Polycyclic Aromatic Hydrocarbons)

10.1.3.1 The washwater PAH should comply with the following requirements. The appropriate limit should be specified in the ETM-A or ETM-B.

¹ The washwater discharge criteria should be revised in the future as more data becomes available on the contents of the discharge and its effects, taking into account any advice given by GESAMP.

10.1.3.2 The maximum continuous PAH concentration in the washwater should not be greater than 50 µg/L PAH_{phe} (phenanthrene equivalence) above the inlet water PAH concentration. For the purposes of this criteria, the PAH concentration in the washwater should be measured downstream of the water treatment equipment, but upstream of any washwater dilution or other reactant dosing unit, if used, prior to discharge.

10.1.3.3 The 50 µg/L limit described above is normalized for a washwater flow rate through the EGC unit of 45 t/MWh where the MW refers to the MCR or 80% of the power rating of the fuel oil combustion unit. This limit would have to be adjusted upward for lower washwater flow rates per MWh, and vice-versa, according to the table below.

Flow Rate (t/MWh)	Discharge Concentration Limit (µg/L PAH_{phe} equivalents)	Measurement Technology
0 - 1	2250	Ultraviolet Light
2.5	900	– ” –
5	450	Fluorescence *
11.25	200	– ” –
22.5	100	– ” –
45	50	– ” –
90	25	– ” –

10.1.3.4 For a 15-minute period in any 12-hour period, the continuous PAH_{phe} concentration limit may exceed the limit described above by up to 100%. This would allow for an abnormal start up of the EGC unit.

10.1.4 Turbidity/Suspended Particle Matter

10.1.4.1 The washwater turbidity should comply with the following requirements. The limit should be recorded in the ETM-A or ETM-B.

10.1.4.2 The washwater treatment system should be designed to minimize suspended particulate matter, including heavy metals and ash.

10.1.4.3 The maximum continuous turbidity in washwater should not be greater than 25 FNU (formazin nephelometric units) or 25 NTU (nephelometric turbidity units) or equivalent units, above the inlet water turbidity. However during periods of high inlet turbidity the precision of the measurement device and the time lapse between inlet measurement and outlet measurement are such that the use of a difference limit is unreliable. Therefore all turbidity difference readings should be a rolling average over a 15-minute period to a maximum of 25 FNU. For the purposes of this criteria the turbidity in the washwater should be measured downstream of the water treatment equipment but upstream of washwater dilution (or other reactant dosing) prior to discharge.

10.1.4.4 For a 15-minute period in any 12-hour period, the continuous turbidity discharge limit may be exceeded by 20%.

* For any Flow Rate > 2.5 t/MWh Fluorescence technology should be used.

10.1.5 Nitrates

10.1.5.1 The washwater treatment system should prevent the discharge of nitrates beyond that associated with a 12% removal of NO_x from the exhaust, or beyond 60 mg/l normalized for washwater discharge rate of 45 tons/MWh whichever is greater.

10.1.5.2 At each renewal survey nitrate discharge data is to be available in respect of sample overboard discharge drawn from each EGC system with the previous three months prior to the survey. However the Administration may require an additional sample to be drawn and analysed at their discretion. The nitrate discharge data and analysis certificate is to be retained on board the ship as part of the EGC Record Book and be available for inspection as required by Port State Control or other parties. Requirements in respect of sampling, storage, handling and analysis should be detailed in the ETM-A or ETM-B as applicable. To assure comparable nitrate discharge rate assessment, the sampling procedures should take into account paragraph 10.1.5.1 which specifies the need for washwater flow normalisation. The test method for the analysis of Nitrates should be according to standard seawater analysis as described in Grasshoff *et al.*

10.1.5.3 All systems should be tested for nitrates in the discharge water. If typical nitrate amounts are above 80% of the upper limit, it should be recorded in the ETM-A or ETM-B.

10.1.6 Washwater additives and other substances

10.1.6.1 An assessment of the washwater is required for those EGC technologies which make use of chemicals, additives, preparations or create relevant chemicals *in situ*. The assessment could take into account relevant guidelines such as resolution MEPC.126(53), procedure for approval of ballast water management systems that make use of active substances (G9) and if necessary additional washwater discharge criteria should be established.

10.2 Washwater monitoring

10.2.1 pH, oil content (as measured by PAH levels), and turbidity should be continuously monitored and recorded as recommended in section 7 of these guidelines. The monitoring equipment should also meet the performance criteria described below:

pH

10.2.2 The pH electrode and pH meter should have a resolution of 0.1 pH units and temperature compensation. The electrode should comply with the requirements defined in BS 2586 or of equivalent or better performance and the meter should meet or exceed BS EN ISO 60746-2:2003.

PAH

10.2.3 The PAH monitoring equipment should be capable to monitor PAH in water in a range to at least twice the discharge concentration limit given in the table above. The equipment should be demonstrated to operate correctly and not deviate more than 5% in washwater with turbidity within the working range of the application.

10.2.4 For those applications discharging at lower flow rates and higher PAH concentrations, ultraviolet light monitoring technology or equivalent, should be used due to its reliable operating range.

Turbidity

10.2.5 The turbidity monitoring equipment should meet requirements defined in ISO 7027:1999 or USEPA 180.1.

Temperature recording

10.3 Washwater monitoring data recording

10.3.1 The data recording system should comply with the requirements of sections 7 and 8 and should continuously record pH, PAH and Turbidity as specified in the washwater criteria.

10.4 Washwater residue

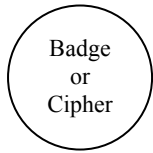
10.4.1 Residues generated by the EGC unit should be delivered ashore to adequate reception facilities. Such residues should not be discharged to the sea or incinerated on board.

10.4.2 Each ship fitted with an EGC unit should record the storage and disposal of washwater residues in an EGC log, including the date, time and location of such storage and disposal. The EGC log may form a part of an existing log-book or electronic recording system as approved by the Administration.

* * *

APPENDIX I

FORM OF SO_x EMISSION COMPLIANCE CERTIFICATE



NAME OF ADMINISTRATION

SO_x EMISSION COMPLIANCE CERTIFICATE

CERTIFICATE OF UNIT APPROVAL FOR EXHAUST GAS CLEANING SYSTEMS

Issued under the provisions of the Protocol of 1997, as amended by resolution MEPC.176(58) in 2008, to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 related thereto under the authority of the Government of:

.....
(full designation of the country)

by.....
*(full designation of the competent person or organization
authorized under the provisions of the Convention)*

This is to certify that the exhaust gas cleaning (EGC) unit listed below has been surveyed in accordance with the requirements of the specifications contained under Scheme A in the Guidelines for exhaust gas cleaning systems – adopted by resolution MEPC.***(**).

This Certificate is valid only for the EGC unit referred to below:

Unit manufacturer	Model/type	Serial number	EGC System Unit and Technical Manual approval number

A copy of this Certificate, together with the EGC System Technical Manual, shall be carried on board the ship fitted with this EGC System unit at all times.

This Certificate is valid for the life of the EGC System unit subject to surveys in accordance with section 4.2 of the Guidelines and regulation 5 of the revised MARPOL Annex VI, installed in ships under the authority of this Government.

Issued at
(place of issue of certificate)

dd/mm/yyyy
.....
(date of issue)

.....
*(signature of duly authorized official
issuing the certificate)*

(Seal or Stamp of the authority, as appropriate)

* * *

APPENDIX II

PROOF OF THE SO₂/CO₂ RATIO METHOD

1 The SO₂/CO₂ ratio method enables direct monitoring of exhaust gas emissions to verify compliance with emissions limits set out in Table 1 in section 1.3 of these Guidelines. In the case of EGC systems that absorb CO₂ during the exhaust gas cleaning process it is necessary to measure the CO₂ prior to the cleaning process and use the CO₂ concentration before cleaning with the SO₂ concentration after cleaning. For conventional low alkali cleaning systems virtually no CO₂ is absorbed during exhaust gas cleaning and therefore monitoring of both gases can be undertaken after the cleaning process.

2 Correspondence between the SO₂/CO₂ ratio can be determined by simple inspection of the respective carbon contents per unit mass of distillate and residual fuel. For this group of hydrocarbon fuels the carbon content as a percentage of mass remains closely similar, whereas the hydrogen content differs. Thus it can be concluded that for a given carbon consumption by combustion there will be a consumption of sulphur in proportion to the sulphur content of the fuel, or in other words a constant ratio between carbon and sulphur adjusted for the molecular weight of oxygen from combustion.

3 The first development of the SO₂/CO₂ ratio considered its use to verify compliance with emissions from 1.5% S fuel. The limit of 65 (1ppm/%) SO₂/CO₂ for 1.5% sulphur in fuel can be demonstrated by first calculating the mass ratio of fuel sulphur to fuel carbon, which is tabulated in Table 1 in this appendix for various fuels and fuel sulphur contents; including 1.5% sulphur for both distillate and residual fuels. These ratios were used to solve for the corresponding SO₂ and CO₂ concentrations in exhaust, which are tabulated in Table 2 of this Appendix. Molecular weights (MW) were taken into account to convert mass fractions to mole fractions. For the 1.5% sulphur fuels in Table 2, the amount of CO₂ is set first at 8% and then changed to 0.5% to show that there is no effect due to changes in excess air. As expected, the absolute SO₂ concentration changes, but the SO₂/CO₂ ratio does not. This indicates that the SO₂/CO₂ ratio is independent of fuel-to-air ratios. Therefore, SO₂/CO₂ ratio can be used robustly at any point of operation, including operation where no brake power is produced.

Note that the SO₂/CO₂ ratio varies slightly from distillate to residual fuel. This occurs because of the very different atomic hydrogen-to-carbon ratios (H:C) of the two fuels. Figure 1 illustrates the extent of the SO₂/CO₂ ratios' sensitivity to H:C over a broad range of H:C and fuel sulphur concentrations. From Figure 1, it can be concluded that for fuel sulphur levels less than 3.00% S, the difference in S/C ratios for distillate and residual fuel is less than 5.0%.

In the case of using non-petroleum fuel oils, the appropriate SO₂/CO₂ ratio applicable to the values given in regulations 14.1 and/or 14.4 will be subject to approval by the Administration.

Table 1: Fuel properties for marine distillate and residual fuel*

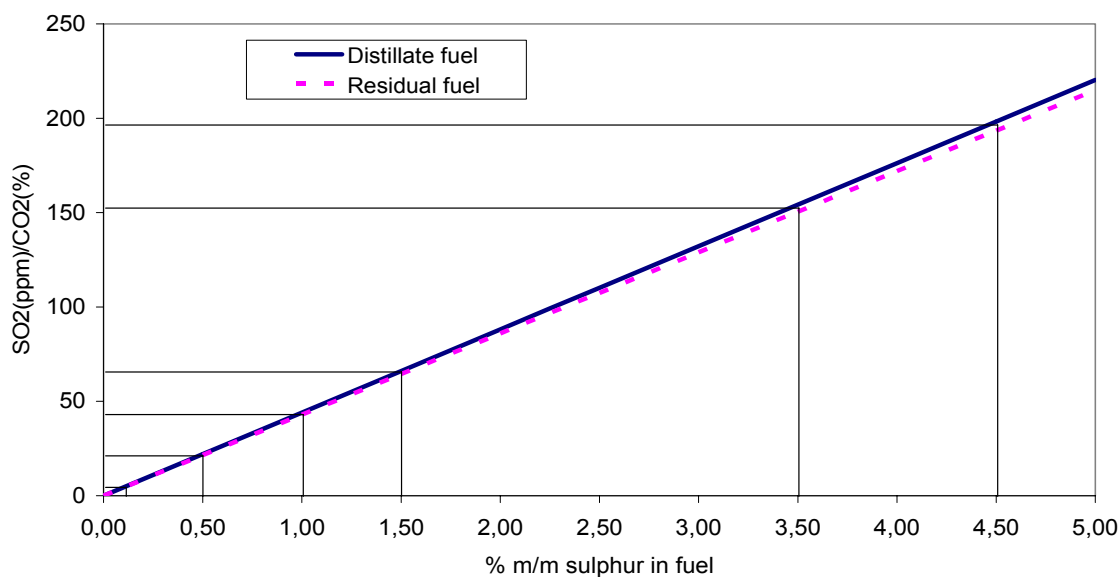
	Carbon	Hydrogen	Sulphur	Other	C	H	S	Fuel S/C	Exh SO ₂ /CO ₂
Fuel Type	%(m/m)	%(m/m)	%(m/m)	%(m/m)	mol/kg	mol/kg	mol/kg	mol/mol	ppm/%(v/v)
Distillate	86.20	13.60	0.17	0.03	71.8333	136	0.0531	0.00074	7.39559
Residual	86.10	10.90	2.70	0.30	71.7500	109	0.8438	0.01176	117.5958
Distillate	85.05	13.42	1.50	0.03	70.8750	134.2	0.4688	0.006614	66.1376
Residual	87.17	11.03	1.50	0.30	72.6417	110.3	0.4688	0.006453	64.5291

* Based on properties in the IMO NO_x Monitoring Guidelines, resolution MEPC.103(49).

Table 2: Emissions calculations corresponding to 1.5 % fuel sulphur

	CO ₂	SO ₂	Exh SO ₂ /CO ₂	Exh S/C
	%	ppm	ppm/%	m/m
Distillate 0.17% S	8	59.1	7.4	0.00197
Residual 2.70% S	8	939.7	117.5	0.03136
Distillate 1.5% S	8	528.5	66.1	0.01764
Residual 1.5% S	8	515.7	64.5	0.01721
Distillate 1.5% S	0.5	33.0	66.1	0.01764
Residual 1.5% S	0.5	32.2	64.5	0.01721

SO₂/CO₂ ratio vs % sulphur in fuel



4 Correspondence between 65 (ppm/%) SO₂/CO₂ and 6.0 g/kWh is demonstrated by showing that their S/C ratios are similar. This requires the additional assumption of a brake-specified fuel consumption value of 200 g/kWh. This is an appropriate average for marine diesel engines. The calculation is as follows:

Note 1 : The S/C mass ratios calculated above, based on 6.0 g/kWh and 200 g/kWh BSFC, are both within 0.10% of the S/C mass ratios in the emissions table (Table 2). Therefore, 65 (ppm/%) SO₂/CO₂ corresponds well to 6.0 g/kWh.

Note 2 : The value of 6.0 g/kWh, hence the 200g/kWh brake-specified fuel consumption is taken from MARPOL Annex VI as adopted by the 1997 MARPOL Conference.

$$S/C_{fuel} = \frac{\text{brake-specific SO}_2 * \left(\frac{MW_s}{MW_{SO_2}}\right)}{BSFC * \left(\frac{\% \text{ carbon in fuel}}{100}\right)}$$

$$\text{brake-specific SO}_2 = 6.0 \text{ g/kW-hr}$$

$$MW_s = 32.065 \text{ g/mol}$$

$$MW_{SO_2} = 64.064 \text{ g/mol}$$

$$BSFC = 200 \text{ g/kW-hr}$$

$$\% \text{ carbon in 1.5\% S fuel (from Table 1)} = 85.05\% \text{ (distillate) \& } 87.17\% \text{ residual}$$

$$\frac{S}{C}_{\text{residual fuel}} = \frac{6.0 * \left(\frac{32.065}{64.064}\right)}{200 * \left(\frac{87.17\%}{100}\right)}$$

$$\frac{S}{C}_{\text{residual fuel}} = 0.01723$$

$$\frac{S}{C}_{\text{distillate fuel}} = \frac{6.0 * \left(\frac{32.065}{64.064}\right)}{200 * \left(\frac{85.05\%}{100}\right)}$$

$$\frac{S}{C}_{\text{distillate fuel}} = 0.01765$$

5 Thus, the working formulas are as follows:

$$\text{For complete combustion} = \frac{SO_2 \text{ (ppm}^*)}{CO_2 \text{ (\%}^*)} \leq 65$$

$$\text{For incomplete combustion} = \frac{SO_2 \text{ (ppm}^*)}{CO_2 \text{ (\%}^*) + (CO \text{ (ppm}^*)/10000) + (THC \text{ (ppm}^*)/10000)} \leq 65$$

* Note: gas concentrations must be sampled or converted to the same residual water content (e.g., fully wet, fully dry).

6 The following is the basis of using the (⁴ppm/%) SO₂/CO₂ as the limit for determining compliance with regulation 14.1 or 14.4:

- (a) This limit can be used to determine compliance from fuel oil burners that do not produce mechanical power.
- (b) This limit can be used to determine compliance at any power output, including idle.
- (c) This limit only requires two gas concentration measurements at one sampling location.
- (d) There is no need to measure any engine parameters such as engine speed, engine torque, engine exhaust flow, or engine fuel flow.
- (e) If both gas concentration measurements are made at the same residual water content in the sample (e.g., fully wet, fully dry), no dry-to-wet conversion factors are required in the calculation.
- (f) This limit completely decouples the thermal efficiency of the fuel oil combustion unit from the EGC unit.
- (g) No fuel properties need to be known.
- (h) Because only two measurements are made at a single location, transient engine or EGCS unit effects can be minimized by aligning signals from just these two analysers. (Note that the most appropriate points to align are the points where each analyser responds to a step change in emissions at the sample probe by 50% of the steady-state value).
- (i) This limit is independent of the amount of exhaust gas dilution. Dilution may occur due to evaporation of water in an EGC unit, and as part of an exhaust sampler's preconditioning system.

* * *

⁴ ppm means "parts per million". It is assumed that ppm is measured by gas analysers on a molar basis, assuming ideal gas behaviour. The technically correct units are actually micro-moles of substance per mole of total amount ($\mu\text{mol/mol}$), but ppm is used in order to be consistent with units in the NO_x Technical Code.

APPENDIX III

WASHWATER DATA COLLECTION

Background

The washwater discharge criteria are intended to act as initial guidance for implementing EGC system designs. The criteria should be revised in the future as more data becomes available on the contents of the discharge and its effects, taking into account any advice given by GESAMP.

Administrations should therefore provide for collection of relevant data. To this end, shipowners in conjunction with the EGC manufacturer are requested to sample and analyse samples of:

- inlet water (for background);
- water after the scrubber (but before any treatment system); and
- discharge water.

This sampling could be made during approval testing or shortly after commissioning and at about twelve-month intervals for a period of two years of operation (minimum of three samples). Sampling guidance and analysis should be undertaken by laboratories using EPA or ISO test procedures for the following parameters:

- pH
- PAH and oil (detailed GC-MS analysis)
- Nitrate
- Nitrite
- Cd
- Cu
- Ni
- Pb
- Zn
- As
- Cr
- V

The extent of laboratory testing may be varied or enhanced in the light of developing knowledge.

When submitting sample data to the Administration, information should also be included on washwater discharge flow rates, dilution of discharge, if applicable, and engine power should be included as well as specifications of the fuel used from the bunker delivery note as a minimum.

It is recommended that the ship that has provided this information to the satisfaction of the Administration should be granted a waiver for compliance of the existing installation(s) to possible future stricter washwater discharge standards. The Administration should forward information submitted on this issue to the Organization for dissemination by the appropriate mechanisms.

ANNEX 6

DRAFT MEPC RESOLUTION

**GUIDELINES FOR THE DEVELOPMENT OF
A VOC MANAGEMENT PLAN**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

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

NOTING that the revised MARPOL Annex VI was adopted by resolution MEPC.176(58) which is expected to enter into force on 1 July 2010,

NOTING ALSO that regulation 15.6 of the revised Annex VI requires a tanker carrying crude oil to have onboard and implement a VOC management plan approved by the Administration, and that such a plan shall be prepared taking into account the guidelines developed by the Organization,

HAVING CONSIDERED the draft Guidelines for the development of a VOC management plan prepared by the Sub-Committee on Bulk Liquids and Gases at its thirteenth session,

1. ADOPTS the Guidelines for the development of a VOC management plan, as set out in the Annex to this resolution;
2. INVITES Governments to apply the Guidelines from 1 July 2010.

ANNEX

**GUIDELINES FOR THE DEVELOPMENT OF
A VOC MANAGEMENT PLAN**

[The text is contained in annex 16 to document BLG 13/18.]

ANNEX 7

DRAFT MEPC CIRCULAR

**DEFINITIONS FOR THE COST EFFECTIVENESS FORMULA IN
REGULATION 13.7.5 OF THE REVISED MARPOL ANNEX VI**

1 The Sub-Committee on Bulk Liquids and Gases, at its thirteenth session (2 to 6 March 2009), recognized the necessity of definitions for the cost effective formula to calculate the cost of the approved method for existing engines in regulation 13.7.5 of the revised MARPOL Annex VI and developed a circular to address the issue.

2 The Marine Environment Protection Committee, at its fifty-ninth session (13 to 17 July 2009), approved the definition for the cost effective formula developed by the BLG Sub-Committee at its thirteenth session.

3 Member Governments are invited to draw this circular to the attention of their Administrations, relevant shipping organizations, recognized organizations, shipping companies and other stakeholders concerned and encourage them to take it into account when applying the cost effective formula for the certification of an approved method for existing engines.

* * *

ANNEX

**DEFINITIONS FOR THE COST EFFECTIVENESS FORMULA IN
REGULATION 13.7.5 OF THE REVISED MARPOL ANNEX VI**

This circular is being made available for use by engine manufacturers, shipowners, designers, naval architects and Administrations, to provide guidance in the use of the Cost/Effectiveness Formula, as set out in regulation 13.7 to MARPOL Annex VI.

This circular will assist those identified in assessing whether Approved Methods for existing engines, as described in regulation 13.7 of MARPOL Annex VI, could be approved.

The values as identified in the aforementioned Formula are defined as follows:

ΔNO_x : The difference between the engine's designed weighted specific NO_x value and the applicable limit as stated in regulation 13.7.4.

Power: The rated power (kW) of the engine(s) as defined on the application for an Approved Method.

Cost: The sale price of the components plus any installation cost above that of regular maintenance.

ANNEX 8**DRAFT MEPC CIRCULAR****GUIDELINES FOR THE APPLICATION OF THE NO_x TECHNICAL CODE
RELATIVE TO CERTIFICATION AND AMENDMENTS OF TIER I ENGINES**

1 The Marine Environment Protection Committee, at its fifty-eighth session (6 to 10 October 2008), adopted, by resolutions MEPC.176(58) and MEPC.177(58), the revised MARPOL Annex VI and the NO_x Technical Code 2008.

2 The purpose of the NO_x Technical Code 2008 is to provide mandatory procedures for the certification, testing, and measurement procedures for the standards set forth in regulation 13 of the revised MARPOL Annex VI. These procedures will enable engine manufacturers, shipowners, and Administrations comply with regulation 13 of the revised Annex VI.

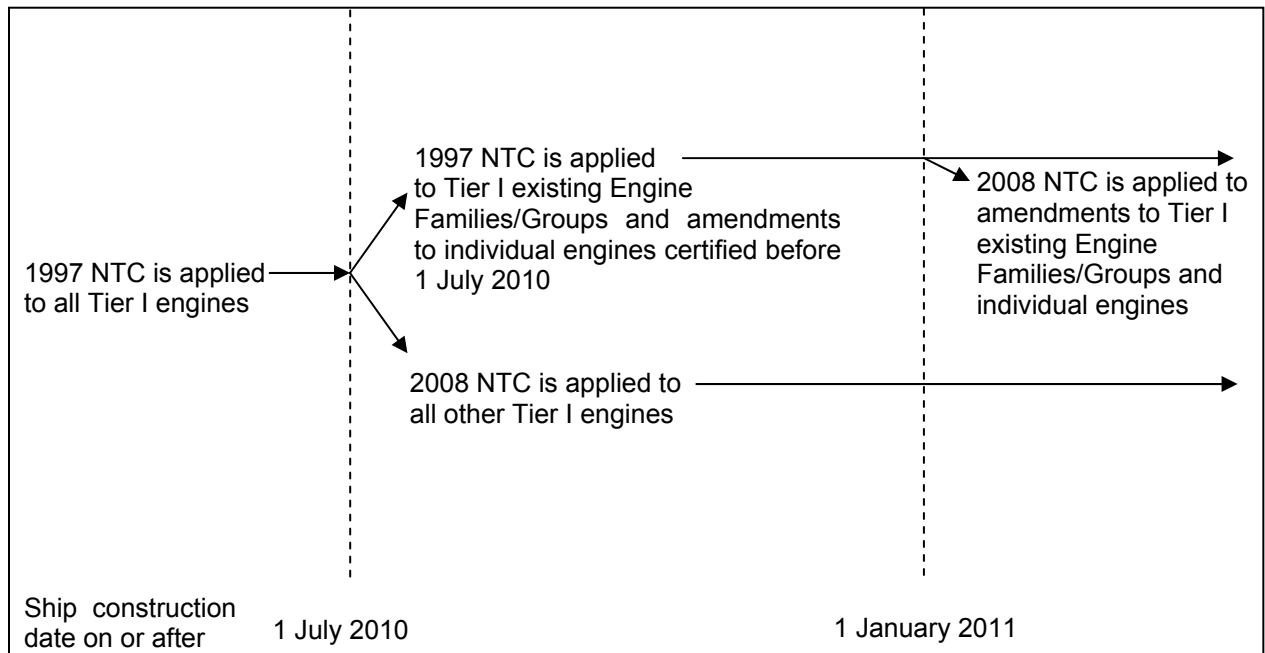
3 On 1 July 2010, the NO_x Technical Code 2008 is expected to enter into force. However, beyond this date, there are circumstances applicable to Tier I certification and amendments where the NO_x Technical Code (1997) should be applied.

4 In order to assist Administrations regarding the application of the appropriate version of the NO_x Technical Code with respect to Tier I engine certification and amendments, for engines installed on ships constructed before 1 January 2011, a flow chart providing guidance is attached as an Annex to this circular and is recommended to be considered by Administrations.

* * *

ANNEX

**APPLICATION OF NO_x TECHNICAL CODE RELATIVE TO
CERTIFICATION AND AMENDMENTS OF TIER I ENGINES INTENDED
FOR SHIPS CONSTRUCTED ON OR BEFORE 31 DECEMBER 2010**



Note:

- 1997 NTC refers to the NO_x Technical Code 1997 adopted by Resolution 2 of the 1997 MARPOL Conference.
- 2008 NTC refers to the NO_x Technical Code 2008 adopted by resolution MEPC.177(58).

ANNEX 9**DRAFT MEPC CIRCULAR****TECHNICAL INFORMATION ON SYSTEMS AND OPERATION TO ASSIST
DEVELOPMENT OF VOC MANAGEMENT PLANS**

1 The Marine Environment Protection Committee, at its fifty-ninth session (13 to 17 July 2009), approved the Guidelines for the Development of a Volatile Organic Compound (VOC) Management Plan for tankers carrying crude oil (resolution MEPC....(59)).

2 In conjunction with consideration of the guidelines, MEPC 59 agreed that additional technical information on vapour pressure control systems and their operation would assist the industry in development of VOC management plans. Therefore, MEPC 59 agreed to the technical information on systems and operation to assist development of VOC management plans for tankers carrying crude oil, as set out in annex to this document.

3 The technical information address the general equipment and systems involved, their operation and conditions onboard a crude oil tanker with respect to the formation and emission of Non-Methane Volatile Organic Compounds (NM-VOC) as well as the ability to control VOC formation and emissions.

4 Member Governments are invited to draw this circular to the attention of their Administrations, relevant shipping organizations, recognized organizations, shipping companies and other stakeholders concerned and encourage them to take it into account when applying the Guidelines for the development of a VOC management plan for crude oil tankers.

* * *

ANNEX

**TECHNICAL INFORMATION ON VAPOUR PRESSURE CONTROL
SYSTEMS AND THEIR OPERATION TO ASSIST DEVELOPMENT OF
VOC MANAGEMENT PLANS FOR TANKERS CARRYING CRUDE OIL**

[The text is contained in part A of annex to document BLG 13/13/3.]
