

Subject

Introduction to the outcomes of MEPC 71

ClassNK

Technical Information

No. TEC-1133

Date 5 October 2017

To whom it may concern

A summary of the decision taken at the seventieth session of the Marine Environment Protection Committee (MEPC 71) held from 3 to 7 July 2017 is provided as below for your information.

1. Ballast Water Management Convention

Ballast Water Management Convention was adopted in 2004 in order to prevent the adverse effects to the marine environment caused by the transfer of ballast water. The Convention requires ships to conduct ballast water exchange offshore (Regulation D-1) or through Ballast Water Management Systems which meet the standard for the discharge of ballast water (Regulation D-2).

The Convention entered into force on 8 September 2017 since Finland has ratified the Convention on 8 September 2016 and the conditions for entry into force been satisfied.

(1) Installation schedule of Ballast Water Management Systems

At Assembly 28 held in 2013, resolution A.1088(28) was adopted, in which existing ships were allowed to be exempted from installation of the Systems until its first renewal survey for International Oil Pollution Prevention (IOPP) Certificate following the date of entry into force of the Convention. At MEPC 69, draft amendments to regulation B-3 of the Convention reflecting the requirements of resolution A.1088(28) were approved. The draft amendments were expected to be adopted at MEPC 72 which will be held following the entry into force of the Convention.

At MEPC 70, there was an alternative proposal to revise installation schedule of the Systems (application date of Regulation D-2) which allows further additional extension to existing ships. However, there were divergent opinions, and conclusion on this matter could not be reached at MEPC 70.

At this session, a compromise proposal between resolution A.1088(28) and the alternative proposal was considered. As a result of the discussion, the draft amendments to regulation B-3 of the Convention, which revise the installation schedule for new ships and existing ships, were approved as below. MEPC 71 also adopted MEPC resolution to implement the approved regulation B-3 immediately after entry into force of the Convention, while the draft amendments to regulation B-3 will be adopted at MEPC 72 held in April 2018, to avoid the creation of a dual treaty regime. (Refer to MEPC.287(71) as attachment 2)

(To be continued)

NOTES:

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- new ships the keels of which are laid on or after 8 September 2017 shall install the System at its delivery
- existing ships which completed IOPP renewal survey between 8 September 2014 and 7 September 2017 shall install the System at the first renewal survey following the date of entry into force of the Convention
- existing ships other than the above shall install the System at the second IOPP renewal survey following the data of entry into force of the Convention, or the IOPP renewal survey on or after 8 September 2019, whichever occurs first
- existing ships which are not required to possess IOPP certificates (Oil tankers of less than 150 gross tonnage and ships other than oil tanker of less than 400 gross tonnage) shall install the System not later than 8 September 2024

Please refer to ClassNK Technical Information No.TEC-1116 on this matter.

(2) Gravity discharge for topside tanks

Technical obstacles and financial burden are expected when altering existing bulk carriers equipped with the gravity discharge system for the topside ballast tanks. INTERCARGO proposed amendments to the Convention which allow those ships having the topside ballast tanks to conduct the ballast water exchange instead of the installation of the System even after the deadline of the installation of the System.

As a result of the discussion, many countries expressed the view that there were already ships installed the System and the retrofit is not structurally impossible, and no agreement was reached on this proposal.

(3) Contingency measures

At MEPC 68 held in May 2015, it was agreed to develop guidance on contingency measures in case that a ship is unable to manage ballast water in accordance with its approved Ballast Water Management plan.

As a result of the discussion, it was agreed to publish the guidance as BWM circular to stipulate followings. In case of non-compliant ballast water:

(Refer to BWM.2/Circ.62 as attachment 7)

- Discharging ballast water to another ship or land-based reception facility etc., as an alternative measure
- Having considered all the alternative measures, ballast water may be discharged, as acceptable to port State.
- Ships should take appropriate measures such as repair of the System in consultation with the port authority and the flag State.
- During the experience-building phase described later in item 1.(6), the principle of non-penalization for ships which installed the System early should be taken into account.

(To be continued)

(4) Ships operating in areas where ballast water exchange is not possible

Until installation of the BWM System, the ballast water exchange shall be conducted in accordance with requirements of regulation D-1. Regulation B-4 specifies that ballast water exchange shall be conducted in sea areas where distance from the nearest land is at least 200 nautical miles (if not possible, 50 nautical miles) and water depth is at least 200 metres, or in the designated area instructed by the port States if there are no areas which can meet the requirements of regulation B-4.

At this session, several countries proposed to develop guidance for ships operated in the areas which don't satisfy requirements of regulation B-4, in order not to deviate from the intended voyage, or delay the voyages. As a result of the discussion, it was agreed to publish BWM circular which stipulates that ships operating in sea areas where ballast water exchange in accordance with regulation B-4.1 is not possible should record the reasons why ballast water exchange was not conducted in accordance with regulation B-4.5.

(Refer to BWM.2/Circ.63 as attachment 8)

(5) Temporary certification for ships which do not apply the Convention

At MEPC 66, *Guidance on entry or re-entry of ships into exclusive operation within waters under the jurisdiction of a single Party* was approved, intended to allow a domestic ship of a Party to visit a foreign dockyard and then to return to exclusive operation within the Party's waters.

At this session, amendments to the Guidance are approved, to clarify that installation of Ballast Water Management System is not required for the temporary certification.

(Refer to BWM.2 / Circ.52 Rev.1 as attachment 9)

(6) Experience-building phase

At MEPC 68, it was agreed to introduce experience-building phase to gather data and analyze the concerns for implementation of the BWM Convention and to facilitate the implementation of the Convention.

At this session, MEPC resolution, which stipulates a work plan during the experience-building phase, was approved. MEPC resolution structured the experience-building phase as three stages, and the experience-building phase are scheduled to be completed in about 5 years. (Refer to MEPC.290(71) as attachment 3)

Stage 1 : data gathering to collect the concerns over the implementation of the Convention

Stage 2 : data analysis

Stage 3 : review requirements under the Convention

(To be continued)

(7) Code for approval of Ballast Water Management systems

At MEPC 70, the revised G8 Guidelines was adopted to strengthen testing requirements of the Systems. MEPC 70 also agreed to rename the G8 Guidelines as Code after the entry into force of the Convention.

At this session, draft *Code for approval of Ballast Water Management systems* (BWMS Code) and draft amendments to regulation A-1 and D-3 of the Convention to make reference to the Code were approved. The draft Code and the draft amendments to the Convention are expected to be adopted at MEPC 72.

2. Greenhouse Gases (GHG)

Countermeasures against the GHG emissions from international shipping have been deliberated at IMO, and so far, the Energy Efficiency Design Index (EEDI) and the Ship Energy Efficiency Management Plan (SEEMP) have been implemented.

At MEPC 70, amendments to MARPOL Annex VI to include the Data Collection System for fuel oil consumption of ships as a measure to further improve the energy efficiency were adopted.

(1) Review of technological developments for EEDI

Regulation 21.6 of MARPOL Annex VI requires, at the beginning of phase 1 and at the midpoint of phase 2, a review of the status of technological developments which may contribute to the improvement of EEDI. If it is proven necessary, MEPC will amend the relevant requirements, i.e. "when to start the phase", "the EEDI reference line parameters" and "the reduction rate".

At MEPC 70, it was agreed to retain the reduction rates for phase 2 except for ro-ro cargo ships and ro-ro passenger ships. Further, taking into account that some ship types have already complied with the reduction rates for phase 2 and/or phase 3, it was proposed to consider an early implementation of phase 3 and possible introduction of phase 4. As a conclusion at MEPC 70, it was agreed to conduct a review of phase 3 as soon as possible.

At this session, it was agreed to establish a correspondence group, coordinated by Japan, to consider an early implementation of phase 3 and possible introduction of phase 4.

On the other hand, for ro-ro cargo ships and ro-ro passenger ships which have difficulties to comply with phase 2 requirements, it was pointed out that, due to lack of sufficient data when calculating EEDI reference lines, stringent reference line for those ship types were established. As a result of the discussion at this session, it was agreed to increase the reference line for ro-ro cargo ships and ro-ro passenger ships by 20% and draft amendments to MARPOL VI which reflect the increase were approved. The draft amendments are expected to be adopted at MEPC 72.

(To be continued)

(2) Guidelines for determining minimum propulsion power

Guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions were developed in order to avoid construction of extremely under-powered ships along with implementation of EEDI requirements. The guidelines stipulated two assessment methods, i.e. level 1 and level 2. At MEPC 68 held in 2015, amendments to the guidelines were adopted to strengthen requirements of level 1 and to extend application period of the guidelines to phase 1 of EEDI regulation. Further, it was agreed that a review of the level 2 assessment would be conducted on completion of ongoing research projects of SHOPERA and JASNAOE.

At this session, the draft amendments to the guidelines reflecting the results of SHOPERA and JASNAOE projects were introduced. As a result of the discussion, it was agreed to continue discussion on level 2 assessment at MEPC 72 due to the fact that different opinions were expressed on the adverse weather condition etc. Further, for the current guidelines, it was agreed to extend the application period towards phase 2 of EEDI regulation.

(Refer to MEPC.1/Circ.850/Rev.2 as attachment 11)

(3) Data collection system

At MEPC 70, amendments to MARPOL Annex VI to make mandatory the data collection system (DCS) for fuel oil consumption of ships and amendments to the SEEMP guidelines were adopted. Further, it was agreed to establish a correspondence group, coordinated by Japan, to consider necessary guidelines for implementation of the DCS.

At this session, the following guidelines which have been developed by the correspondence group were approved:

(Refer to MEPC.292(71) as attachment 5, MEPC.293(71) as attachment 6 and MEPC.1/Circ.871 as attachment 10)

- Guidelines for Administration verification of ship fuel oil consumption data
- Guidelines for the development and management of the IMO Ship Fuel Oil Consumption Database
- MEPC circular on submission to the IMO data collection system of fuel oil consumption of data from a ship that is not entitled to fly the flag of a party to MARPOL Annex VI

(4) GHG emission reduction target

The Paris Agreement was adopted by consensus in December 2015 at the 21st Conference of the Parties of the UNFCCC (COP 21) and the ambitious target to limit the increase in the global average temperature to well below 2°C above pre-industrial levels, has been shared among the world. Thereafter, the reduction of GHG emissions from international shipping has been an urgent issue at IMO as well.

At MEPC 70, the roadmap for developing a comprehensive IMO strategy on reduction of GHG emissions from ships was approved. In accordance with this road map, initial IMO strategy for reduction of GHG emissions needs to be developed by MEPC 72, which will be held in April 2018.

(To be continued)

At this session, draft outline of the structure of the initial strategy was developed. The initial strategy will be composed of the following contents:

- emission scenarios from international shipping
- level of ambition on reduction of GHG emissions
- short-, mid- and long-term further measures with possible timelines
- Periodic review of the strategy

As a work plan for the development of the strategy, intersessional meetings will be held in 2017 autumn and in 2018 spring to finalize the strategy at MEPC 72.

3. Air pollution prevention

(1) Sulphur content of fuel oils

At MEPC 70, it was agreed to implement the global 0.5% sulphur limit from 1 January 2020. At this session, to implement the global 0.5% sulphur limit, additional measures to promote an appropriate implementation of the global limit were considered. It was agreed that the consideration on this matter will be made at Sub-Committee on Pollution Prevention and Response (PPR), and the completion of this work item should be in 2019.

(2) Guidelines for Exhausting Gas Cleaning Systems

Regulation 14 of MARPOL Annex VI stipulates sulphur contents in fuel oils used onboard to reduce the SO_x emission. Regulation 4 of the Annex VI specifies that alternative methods can be used instead of compliant fuels under acceptance of the ship's flag Administration. Use of "Exhaust Gas Cleaning System" (EGCS) is one of such alternative methods and the IMO EGCS guidelines were developed to specify the technical standards on the system and the method of verification.

At this session, draft amendments to the guidelines, which give clarification on the terms and the schemes for approval, etc., were proposed. MEPC 71 agreed to start consideration on this matter in detail at the 5th session of PPR Sub-Committee which will be held in February 2018.

(3) SCR guidelines

To comply with the NO_x Tier III emission limit, engines equipped with the Selective Catalytic Reduction (SCR) system need to be certified in accordance with the SCR guideline. At this session, amendments to the SCR guideline developed by the PPR Sub-Committee, which clarify the procedure for NO_x emission verification testing and the contents to be entered in NO_x technical files, were adopted. (Refer to MEPC.291(71) as attachment 4)

(To be continued)

(4) Guidelines for discharge of exhaust gas recirculation (EGR) bleed-off water

To comply with the NOx Tier III emission limit, Exhaust Gas Recirculation (EGR) System, which recirculates the exhaust gas to engine intake air to lower the combustion temperature inside cylinders has been developed. Since EGR system is equipped with a scrubber to clean the recirculated exhaust gas, the system needs to bleed off its wash water. Because standards for discharge of bleed off water are not regulated, PPR Sub-Committee developed draft guidelines for discharge of EGR bleed-off water.

At this session, draft guidelines developed by PPR were discussed, however, the need for further clarifications on the terms and the contents in the guidelines was identified. Therefore, it was agreed that the further considerations should be made at PPR 5 which will be held in February 2018.

4. Amendments to mandatory instruments

MEPC 71 adopted amendments to mandatory instruments as follows:

(1) Amendments to MARPOL Annex VI (refer to MEPC.286(70) as attachment 1)

- Amendments to regulation 13.6 of MARPOL Annex VI to designate the Baltic Sea and the North Sea as NOx emission control area.
- Amendments to regulation 13.5 of MARPOL Annex VI to temporarily exempt ships equipped with dual fuel engines or Tier II NOx compliant engines from compliance with the NOx Tier III emission limits, when they navigate immediately following building in a NOx ECA or are repaired or maintained at the shipyard located inside NOx ECA.
- Amendments to appendix V of MARPOL Annex VI, which stipulates information to be included in the bunker delivery note, for ships equipped with SOx scrubbers.

Entry into force: 1 January 2019

(2) Installation schedule of Ballast Water Management Systems (see paragraph 1.(1))

Amendments to Regulation B-3 of Ballast Water Management Convention.

Entry into force: 8 September 2017

A summary of the outcomes of MEPC 71 is also available on the IMO web-site.
<http://www.imo.org/MediaCentre/MeetingSummaries/MEPC/Pages/Default.aspx>

(To be continued)

For any questions about the above, please contact:

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Attachment:

1. Resolution MEPC.286(71)
2. Resolution MEPC.287(71)
3. Resolution MEPC.290(71)
4. Resolution MEPC.291(71)
5. Resolution MEPC.292(71)
6. Resolution MEPC.293(71)
7. BWM.2/Circ.62
8. BWM.2/Circ.63
9. BWM.2 / Circ.52 Rev.1
10. MEPC.1/Circ.871
11. MEPC.1/Circ.850/Rev.2

ANNEX 1

**RESOLUTION MEPC.286(71)
(adopted on 7 July 2017)**

**AMENDMENTS TO THE ANNEX OF THE PROTOCOL OF 1997 TO AMEND THE
INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS,
1973, AS MODIFIED BY THE PROTOCOL OF 1978 RELATING THERETO**

Amendments to MARPOL Annex VI

**(Designation of the Baltic Sea and the North Sea Emission Control Areas
for NO_x Tier III control)
(Information to be included in the bunker delivery note)**

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 from ships,

NOTING article 16 of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocols of 1978 and 1997 relating thereto (MARPOL), which specifies the amendment procedure and confers upon the appropriate body of the Organization the function of considering and adopting amendments thereto,

HAVING CONSIDERED, at its seventy-first session, proposed amendments to MARPOL Annex VI concerning the designation of the Baltic Sea and the North Sea Emission Control Areas for NO_x Tier III control and the information to be included in the bunker delivery note,

1 ADOPTS, in accordance with article 16(2)(d) of MARPOL, amendments to MARPOL Annex VI, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article 16(2)(f)(iii) of MARPOL, that the amendments shall be deemed to have been accepted on 1 July 2018 unless prior to that date, not less than one third of the Parties or Parties the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have communicated to the Organization their objection to the amendments;

3 INVITES the Parties to note that, in accordance with article 16(2)(g)(ii) of MARPOL, the said amendments shall enter into force on 1 January 2019 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article 16(2)(e) of MARPOL, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Parties to MARPOL;

5 REQUESTS FURTHER the Secretary-General to transmit copies of the present resolution and its annex to Members of the Organization which are not Parties to MARPOL.

ANNEX

AMENDMENTS TO MARPOL ANNEX VI

**(Designation of the Baltic Sea and the North Sea Emission Control Areas
for NO_x Tier III control)
(Information to be included in the bunker delivery note)**

ANNEX VI

REGULATIONS FOR THE PREVENTION OF AIR POLLUTION FROM SHIPS

Regulation 13

Nitrogen oxides (NO_x)

- 1 In paragraph 5.1 after the words "an emission control area designated for Tier III NO_x control under paragraph 6 of this regulation" insert the words "(NO_x Tier III emission control area)".
- 2 The existing text of paragraph 5.1.2 is replaced by the following:
 - .2 that ship is constructed on or after:
 - .1 1 January 2016 and is operating in the North American Emission Control Area or the United States Caribbean Sea Emission Control Area;
 - .2 1 January 2021 and is operating in the Baltic Sea Emission Control Area or the North Sea Emission Control Area;
- 3 Between paragraph 5.1.2 and 5.1.3 the word "when" is deleted.
- 4 In paragraph 5.1.3 the words "an emission control area designated for Tier III NO_x control under paragraph 6 of this regulation" are replaced by "a NO_x Tier III emission control area".
- 5 In paragraph 5.2.3 the word "convention" is replaced by "Convention" and the expression "24 m" is replaced by "24 metres".
- 6 Insert new paragraphs 5.4 and 5.5, as follows:

"5.4 Emissions of nitrogen oxides from a marine diesel engine subject to paragraph 5.1 of this regulation that occur immediately following building and sea trials of a newly constructed ship, or before and following converting, repairing, and/or maintaining the ship, or maintenance or repair of a Tier II engine or a dual fuel engine when the ship is required to not have gas fuel or gas cargo on board due to safety requirements, for which activities take place in a shipyard or other repair facility located in a NO_x Tier III emission control area are temporarily exempted provided the following conditions are met:

 - .1 the engine meets the Tier II NO_x limits; and

- .2 the ship sails directly to or from the shipyard or other repair facility, does not load or unload cargo during the duration of the exemption, and follows any additional specific routing requirements indicated by the port State in which the shipyard or other repair facility is located, if applicable.

5.5 The exemption described in paragraph 5.4 of this regulation applies only for the following period:

- .1 for a newly constructed ship, the period beginning at the time the ship is delivered from the shipyard, including sea trials, and ending at the time the ship directly exits the NO_x Tier III emission control area(s) or, with regard to a ship fitted with a dual fuel engine, the ship directly exits the NO_x Tier III emission control area(s) or proceeds directly to the nearest gas fuel bunkering facility appropriate to the ship located in the NO_x Tier III emission control area(s);
- .2 for a ship with a Tier II engine undergoing conversion, maintenance or repair, the period beginning at the time the ship enters the NO_x Tier III emission control area(s) and proceeds directly to the shipyard or other repair facility, and ending at the time the ship is released from the shipyard or other repair facility and directly exits the NO_x Tier III emission control area (s) after performing sea trials, if applicable; or
- .3 for a ship with a dual fuel engine undergoing conversion, maintenance or repair, when the ship is required to not have gas fuel or gas cargo on board due to safety requirements, the period beginning at the time the ship enters the NO_x Tier III emission control area(s) or when it is degassed in the NO_x Tier III emission control area(s) and proceeds directly to the shipyard or other repair facility, and ending at the time when the ship is released from the shipyard or other repair facility and directly exits the NO_x Tier III emission control area(s) or proceeds directly to the nearest gas fuel bunkering facility appropriate to the ship located in the NO_x Tier III emission control area(s)."

7 The existing text of paragraph 6 is replaced by the following:

"6 For the purposes of this regulation, a NO_x Tier III emission control area shall be any sea area, including any port area, designated by the Organization in accordance with the criteria and procedures set forth in appendix III to this Annex. The NO_x Tier III emission control areas are:

- .1 the North American Emission Control Area, which means the area described by the coordinates provided in appendix VII to this Annex;
- .2 the United States Caribbean Sea Emission Control Area, which means the area described by the coordinates provided in appendix VII to this Annex;

- .3 the Baltic Sea Emission Control Area as defined in regulation 1.11.2 of Annex I of the present Convention; and
- .4 the North Sea Emission Control Area as defined in regulation 1.14.6 of Annex V of the present Convention."

Appendix V
Information to be included in the bunker delivery note (regulation 18.5)

8 The items listed in the Appendix are numbered from 1 to 9.

9 In item 7, the comma after "15°C" is deleted and the expression "kg/m³" is replaced by "(kg/m³)".

10 Item 9 is replaced with the following:

"A declaration signed and certified by the fuel oil supplier's representative that the fuel oil supplied is in conformity with regulation 18.3 of this Annex and that the sulphur content of the fuel oil supplied does not exceed:

- the limit value given by regulation 14.1 of this Annex;
- the limit value given by regulation 14.4 of this Annex; or
- the purchaser's specified limit value of _____ (% m/m), as completed by the fuel oil supplier's representative and on the basis of the purchaser's notification that the fuel oil is intended to be used:
 - .1 in combination with an equivalent means of compliance in accordance with regulation 4 of this Annex; or
 - .2 is subject to a relevant exemption for a ship to conduct trials for sulphur oxides emission reduction and control technology research in accordance with regulation 3.2 of this Annex.

The declaration shall be completed by the fuel oil supplier's representative by marking the applicable box(es) with a cross (x)."

ANNEX 4

RESOLUTION MEPC.287(71) (adopted on 7 July 2017)

IMPLEMENTATION OF THE BWM CONVENTION

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 from ships,

RECALLING ALSO that the International Conference on Ballast Water Management for Ships held in February 2004 adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention) together with four conference resolutions,

NOTING that the entry-into-force conditions of the Convention were met on 8 September 2016 and that it will consequently enter into force on 8 September 2017,

BEING COGNIZANT of the fact that by the date of its entry into force more than 13 years will have elapsed since the adoption of the Convention,

NOTING that 60 States, the combined merchants fleets of which constitute approximately 68% of the gross tonnage of the world's merchant shipping, have acceded to the Convention as of 7 July 2017,

BEING CONSCIOUS of the need to provide certainty and confidence in the application of the Convention, thereby assisting shipping companies, shipowners, managers and operators, as well as the shipbuilding and equipment manufacturing industries, in the timely planning of their operations, and to encourage the early installation of ballast water management systems,

BEARING IN MIND that the International Conference on Ballast Water Management for Ships adopted regulation B-3 (Ballast water management for ships) of the Convention to ensure a smooth transition to the ballast water performance standard described in regulation D-2 between the years 2009 and 2019,

RECOGNIZING that time has elapsed since adoption of the Convention, which has resulted in uncertainty for ships regarding the application of regulation B-3 and that such uncertainty can be mitigated through the application of an appropriate timeline for implementing regulations D-1 (Ballast water exchange standard) and D-2 (Ballast water performance standard), upon entry into force of the Convention,

RECALLING that the Assembly, at its twenty-eighth session, adopted resolution A.1088(28) on *Application of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004*, and requested it to keep the resolution under review and report back to the Assembly as appropriate,

HAVING APPROVED, at its seventy-first session, draft amendments to regulation B-3 of the Convention (MEPC 71/17, annex 2) with a view to adoption at its seventy-second session,

1 REQUESTS the Secretary-General to circulate the draft amendments to regulation B-3, in accordance with Article 19 of the Convention, to all Parties to the Convention and to all Members of the Organization immediately after the entry into force of the Convention;

2 RESOLVES that, in lieu of the implementation schedule recommended in resolution A.1088(28) and notwithstanding the schedule set forth in regulation B-3 of the Convention, the Parties should implement the amended regulation B-3 (MEPC 71/17, annex 2) immediately after entry into force of the Convention, with a view to avoiding the creation of a dual treaty regime during the time period between the entry into force of the Convention and the entry into force of the amended regulation B-3;

3 URGES States which have not yet acceded to the Convention to do so as soon as possible, in the understanding that the requirements of the amended regulation B-3 will be implemented upon the entry into force of the Convention;

4 REAFFIRMS the agreement reached at its sixty-eighth session, as contained in the Roadmap for the implementation of the Convention, regarding the provisions for non-penalization of early movers that have installed ballast water management systems approved in accordance with the *Guidelines for approval of ballast water management systems* (G8) (resolution MEPC.174(58), subsequently superseded by resolution MEPC.279(70)).

5 AGREES that this resolution supersedes resolution A.1088(28) on *Application of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004*.

ANNEX 12

**RESOLUTION MEPC.290(71)
(adopted on 7 July 2017)**

THE EXPERIENCE-BUILDING PHASE ASSOCIATED WITH THE BWM CONVENTION

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Articles 38(a) and 38(b) 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 from ships, and its functions for considering appropriate measures to facilitate the enforcement of such conventions,

RECALLING ALSO that the International Conference on Ballast Water Management for Ships held in February 2004 adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention),

CONSIDERING that the entry into force of the Convention on 8 September 2017 will represent the beginning of global ballast water management, and that challenges may arise during the implementation of any new convention that were not foreseen at the time of its adoption,

RECOGNIZING the concerns of the shipping industry regarding the potential penalization of shipowners and operators during the implementation of the Convention due to non-compliance with the performance standard of the Convention for reasons beyond the control of the shipowner and ship's crew, as well as the need to protect the environment, human health, property and resources from the discharge of harmful aquatic organisms and pathogens in any non-compliant ballast water,

DETERMINED to monitor the implementation of the Convention so as to identify aspects of the implementation that are working well and to shed light on issues that require further attention,

PREFERRING to develop most improvements to the Convention as a package, following a systematic and evidence-based approach, and informed by experience gained during the implementation of the Convention,

1 AGREES to establish an experience-building phase associated with the Convention (ballast water experience-building phase), as set out in the annex to this resolution;

2 URGES port States, flag States and other stakeholders to gather, prepare and submit data to the ballast water experience-building phase, taking into account the *Guidelines for port State control under the BWM Convention* (resolution MEPC.252(67)), *Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)* (BWM.2/Circ.42/Rev.1) and the survey guidelines under the Convention;

3 RESOLVES to undertake an analysis of the data gathered and a systematic and evidence-based review of the text of the Convention and develop a package of amendments to the Convention as appropriate;

4 AGREES that, during the ballast water experience-building phase, a ship should not be penalized (sanctioned, warned, detained or excluded) solely due to an exceedance of the ballast water performance standard described in regulation D-2 of the Convention following use of a ballast water management system (BWMS), provided that:

- .1 the BWMS is approved in accordance with regulation D-3.1;
- .2 the BWMS has been installed correctly;
- .3 the BWMS has been maintained in accordance with the manufacturer's instructions;
- .4 the Ballast Water Management Plan approved in accordance with regulation B-1 of the Convention has been followed, including the operational instructions and the manufacturer's specifications for the BWMS; and
- .5 either the self-monitoring system of the BWMS indicates that the treatment process is working properly, or the port State has been advised that the BWMS is defective prior to the discharge of any ballast water;

5 FURTHER AGREES that the measures in paragraph 4 above do not pertain to other actions of the port State pursuant to Articles 9.3 and 10.3 of the Convention concerning protection of the environment, human health, property and resources;

6 RECOMMENDS that the port State, flag State and shipowner should take into account any guidelines developed by the Organization on contingency measures in determining the most appropriate solution to allow for the discharge of non-compliant ballast water.

ANNEX

STRUCTURE OF THE EXPERIENCE-BUILDING PHASE ASSOCIATED WITH THE BWM CONVENTION

Introduction

1 The entry into force of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention) will represent the beginning of global ballast water management. As challenges can be expected with any new global approach, there may be a need for improvements to the Convention in light of experience gained, in accordance with article 2.5 of the Convention (concerning the continued development of ballast water management and standards).

2 The purpose of the ballast water experience-building phase (EBP) is to allow the Marine Environment Protection Committee (the Committee) to monitor the implementation of the Convention. The EBP includes data gathering and analysis to allow the Committee to identify aspects of the Convention's implementation that are working well and to shed light on issues that require further attention. The EBP also includes a systematic and evidence-based process for reviewing and improving the Convention.

3 The EBP is intended to permit port States, flag States and stakeholders (e.g. owners and operators of ships, manufacturers of BWMS, and recognized organizations) to:

- .1 gather and submit data concerning the implementation of the Convention;
- .2 participate in the analysis of this data in the Ballast Water Review Group (BWRG) of the Committee; and
- .3 undertake a review of the text of the Convention to identify any areas where the evidence demonstrates a need for improvement of the Convention, and then develop a package of priority amendments.

4 To this end, the EBP is structured as three stages: a data gathering stage, a data analysis stage, and a Convention review stage (see figure 1). The EBP begins with the entry into force of the Convention and ends with the entry into force of the package of priority amendments. A specific timeline for the stages of the EBP will be included within a data gathering and analysis plan for the ballast water experience-building phase (DGAP) setting out the concrete approach to gathering and analysing data during the EBP.

5 The scope for the EBP is the Convention regime as a whole. The EBP includes, and is broader than, the more specific "trial period" associated with methods for sampling and analysing ballast water during port State control (PSC)¹. The arrangements for the trial period have been updated and incorporated within the EBP, and data associated with the trial period will be gathered and analysed in parallel with data concerning other aspects of the Convention.

¹ See document BLG 17/18, annex 6, *Recommendations related to the trial period for reviewing, improving and standardizing the Guidance for ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)*. These recommendations were agreed in principle by MEPC 65.

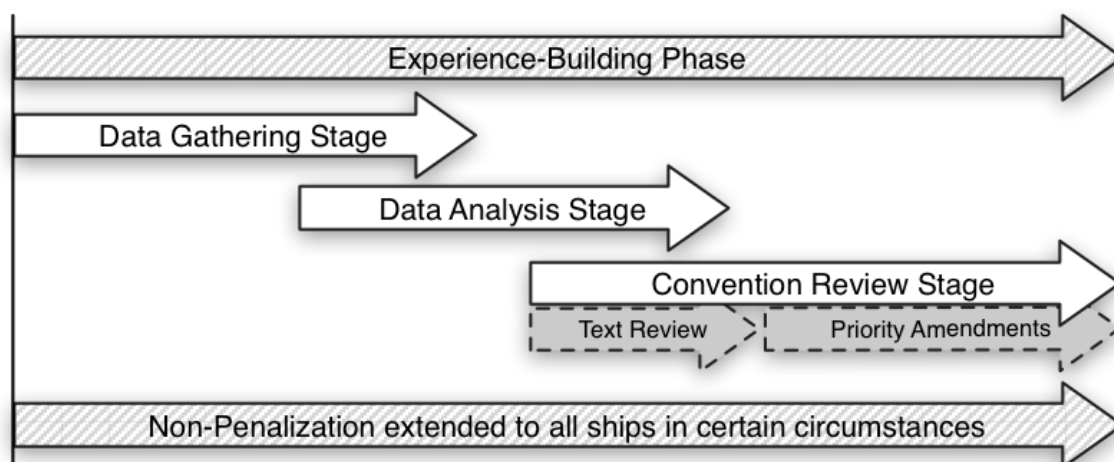


Figure 1: Stages of the ballast water experience-building phase and non-penalization

Non-penalization

6 By way of the resolution adopting the EBP, the Committee has adopted certain non-penalization measures that will be in place during the EBP. These measures are intended to recognize and address concerns expressed by the shipping industry regarding the potential penalization of shipowners and operators during the implementation of the Convention due to non-compliance with the ballast water performance standard described in regulation D-2 of the Convention despite the use of a proper ballast water management system (BWMS). The measures also recognize the need to protect the environment, human health, property and resources in port States from the discharge of non-compliant ballast water.

7 Ships should carry documents on board demonstrating that the preconditions associated with the non-penalization measures have been met (e.g. relating to approval, installation and maintenance of the BWMS). The crew should adhere to the operational instructions and manufacturer's specifications of the BWMS (which should be carried on board). The crew should also attend to the self-monitoring system of the BWMS.

8 This temporary non-penalization that is specific to the EBP has no bearing on other decisions of the Committee concerning other non-penalization arrangements.

9 Aside from this non-penalization, the EBP does not alter the basic roles, responsibilities, obligations and recommendations under the Convention, its guidelines and other guidance.

Data gathering

10 Data gathering is intended to ensure that the Committee has adequate information on the implementation of the Convention. The specific information to be collected is to be set out in the DGAP. The DGAP is intended as a living document and may be revised as appropriate by the Committee during the EBP.

11 Member States are encouraged to participate fully in the EBP in order to maximize the information available to the Committee. EBP data will be gathered from Member States voluntarily through four interfaces: basic interface reports (on data generally collected by port and flag States), supplementary interface reports (on specific topics that might be provided by a limited number of States), trial period interface reports (on methods for sampling and analysis for port State control) and stakeholder reports (e.g. from shipowners, BWMS manufacturers

and classification societies). For practical reasons, stakeholders are invited to provide their voluntary submission to a relevant Member State for aggregation and submission to the stakeholder interface.

12 In order to ensure data quality, the DGAP will include common data templates associated with each interface. These templates will request mainly numerical or categorical data that can be easily combined for global reporting. The submissions will be reports (rather than raw data) from Member States so as to manage the volume of information. In cases where different approaches to data collection by States could significantly affect the comparability of reports, States will be requested to identify the approach used to collect the data.

13 Commercial sensitivities will be protected through the use of aggregate reporting by port States and flag States. The EBP does not require ships or shipowners to be identified in data submissions.

Data analysis

14 The data analysis is intended to ensure that the globally aggregated EBP data is processed to yield useful and timely information and insight into the implementation of the Convention. This information should include matters such as the pace and progress of implementing the Convention, degree to which the standards of the Convention and its other requirements are achieved, unforeseen safety or environmental hazards, etc.

15 The analysis report will be developed once the data gathering stage has concluded. The analysis report will be based primarily on the results of the data gathering stage. The terms of reference for the report will be approved by the Committee in order to focus the analysis and identify any appropriate additional data sources and/or questions. A draft of the analysis report should be provided to the Committee for consideration and comment by its Ballast Water Review Group (BWRG) prior to its completion.

Convention review

16 As the entry into force of the Convention on 8 September 2017 will represent the beginning of global ballast water management, challenges may arise that were not envisioned when the Convention was adopted in 2004. In accordance with Article 2.5 of the Convention (concerning the continued development of ballast water management and standards) there may be a need to amend the Convention in the light of experience gained.

17 The purpose of the Convention review, therefore, is to take a systematic and evidence-based approach to the development of a package of amendments to the Convention for recommendation by the Committee to the Parties. Basing the review on the data gathering and final analysis report developed earlier in the EBP will ensure that amendments to the Convention are developed holistically through an objective, transparent and inclusive approach.

18 The Convention review stage should be undertaken by the Committee with the support of its BWRG, and should consist of two sequential steps:

- .1 a textual review of the Convention as a whole to develop an evidence-based list of issues with the Convention, highlighting those priority issues that need to be addressed before the end of the EBP (and its associated non-penalization arrangements). Guidelines and guidance developed by the Committee in connection with the Convention may be included in the Convention review if warranted based on the data analysis; and

- .2 the development of a package of amendments to the Convention to address the priority issues (amendments to address other issues identified during the textual review may then be developed after the end of the EBP.)

19 In reviewing the Convention, the Committee intends to give due consideration to matters such as the policy goals of the Convention, any challenges identified in its implementation and the considerations outlined in regulation D-5 of the Convention.

20 It is recommended that most amendments to the Convention be developed through the EBP as it provides a systematic and evidence-based approach to improving the Convention. That said, the EBP does not prevent any Party from proposing amendments independently at any time in accordance with article 19 of the Convention.

ANNEX 13

**RESOLUTION MEPC.291(71)
(adopted on 7 July 2017)**

2017 GUIDELINES ADDRESSING ADDITIONAL ASPECTS OF THE NO_x TECHNICAL CODE 2008 WITH REGARD TO PARTICULAR REQUIREMENTS RELATED TO MARINE DIESEL ENGINES FITTED WITH SELECTIVE CATALYTIC REDUCTION (SCR) 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 from ships,

RECALLING ALSO that, at its fifty-eighth session, it adopted, by resolution MEPC.176(58), a revised MARPOL Annex VI (hereinafter "MARPOL Annex VI") and, by resolution MEPC.177(58), a revised Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines (hereinafter "NO_x Technical Code 2008"),

NOTING regulation 13 of MARPOL Annex VI which makes the NO_x Technical Code 2008 mandatory under that Annex,

NOTING ALSO that the use of NO_x-reducing devices is envisaged in the NO_x Technical Code 2008 and that selective catalytic reduction systems (hereinafter referred to as "SCR systems") are such NO_x-reducing devices for compliance with the Tier III NO_x limit,

NOTING FURTHER that, at its sixty-second session, it adopted, by resolution MEPC.198(62), the *2011 Guidelines addressing additional aspects to the NO_x Technical Code 2008 with regard to particular requirements related to marine diesel engines fitted with Selective Catalytic Reduction (SCR) Systems* (hereinafter "the 2011 Guidelines"), and, at its sixty-eighth session, by resolution MEPC.260(68), amendments thereto,

RECOGNIZING the need to update the 2011 Guidelines in line with latest developments,

HAVING CONSIDERED, at its seventy-first session, a draft revision of the 2011 Guidelines, prepared by the Sub-Committee on Pollution Prevention and Response, at its fourth session,

1 ADOPTS the *2017 Guidelines addressing additional aspects to the NO_x Technical Code 2008 with regard to particular requirements related to marine diesel engines fitted with Selective Catalytic Reduction (SCR) Systems*, as set out at annex to the present resolution;

2 INVITES Administrations to take the annexed Guidelines into account when certifying engines fitted with SCR systems;

3 REQUESTS Parties to MARPOL Annex VI and other Member Governments to bring the annexed Guidelines to the attention of shipowners, ship operators, shipbuilders, marine diesel engine manufacturers and any other interested parties;

4 AGREES to keep these Guidelines under review in light of experience gained with their application;

5 SUPERSEDES the 2011 Guidelines, adopted by resolution MEPC.198(62) and amended by resolution MEPC.260(68).

ANNEX

**2017 GUIDELINES ADDRESSING ADDITIONAL ASPECTS TO THE NO_x TECHNICAL
CODE 2008 WITH REGARD TO PARTICULAR REQUIREMENTS RELATED TO MARINE
DIESEL ENGINES FITTED WITH SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEMS**

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1 INTRODUCTION

1.1 The use of NO_x-reducing devices is envisaged in section 2.2.5 of the NO_x Technical Code 2008 (NTC 2008) and a Selective Catalytic Reduction (SCR) system is one of such devices.

1.2 The NTC 2008 contains two ways for pre-certification of engine systems fitted with NO_x-reducing devices:

- .1 engine fitted with SCR: approval in accordance with paragraph 2.2.5.1 and test in accordance with chapter 5 of the NTC 2008; and
- .2 a simplified measurement method in accordance with section 6.3 of the NTC 2008 as regulated in paragraph 2.2.5.2 (Primary failure case) of the Code.

1.3 According to paragraph 2.2.5.1 of the NTC 2008, where a NO_x-reducing device is to be included within the EIAPP certification, it must be recognized as a component of the engine, and its presence shall be recorded in the engine's Technical File. The engine shall be tested with the NO_x-reducing device fitted unless, due to technical and practical reasons, the combined testing is not appropriate and the procedures specified in paragraph 2.2.4.1 of the NTC 2008 cannot be applied, subject to approval by the Administration. In the latter case the provisions of Scheme B as set out in these Guidelines should be applied.

1.4 Administrations are invited to take these Guidelines into account when certifying engines fitted with SCR.

2 GENERAL

2.1 Purpose

The purpose of these Guidelines is to provide guidance in addition to the requirements of the NTC 2008 for design, testing, surveys and certification of marine diesel engines fitted with an SCR system to ensure its compliance with the requirements of regulation 13 of MARPOL Annex VI.

2.2 Application

These Guidelines apply to marine diesel engines fitted with SCR for compliance with regulation 13 of MARPOL Annex VI.

2.3 Definitions

Unless provided otherwise, the terms in these Guidelines have the same meaning as the terms defined in regulation 2 of MARPOL Annex VI and in section 1.3 of the NTC 2008.

2.3.1 "Engine system fitted with SCR" means a system consisting of a marine diesel engine, an SCR chamber and a reductant injection system. When a control device on NO_x-reducing performance is provided, it is also regarded as a part of the system.

2.3.2 "Catalyst block" means a block of certain dimension through which exhaust gas passes and which contains catalyst composition on its inside surface to reduce NO_x from exhaust gas.

2.3.3 "SCR chamber" means an integrated unit, which contains the catalyst block(s), and into which flows exhaust gas and reductant.

2.3.4 "Reductant injection system" means a system, which consists of the pump(s) to supply reductant to the nozzle(s), the nozzle(s) spraying reductant into the exhaust gas stream and control device(s) of the spray.

2.3.5 "AV (area velocity) value" means a value of the exhaust gas flow rate passing through the catalyst blocks (m³/h) per total active surface area of the catalyst blocks in the SCR chamber (m²). Therefore, unit of AV value is (m/h). The exhaust gas flow volume is the volume defined at 0°C and 101.3 kPa.

2.3.6 "SV (space velocity) value" means a value of the exhaust gas flow rate passing through the catalyst block(s) (m³/h) per total volume of the catalyst block(s) in the SCR chamber (m³). Therefore, unit of SV value is (1/h). The exhaust gas flow volume is the volume defined at 0°C and 101.3 kPa.

2.3.7 "Total volume of the catalyst block" means the volume (m³) based on outer dimensions of the catalyst block.

2.3.9 "LV (linear velocity) value" means a value of the exhaust gas flow rate passing through the catalyst blocks (m³/h) per catalyst block's section (m²) in a normal direction of exhaust gas flow. Therefore, unit of LV value is (m/h). The exhaust gas flow volume is the volume defined at 0°C and 101.3 kPa.

2.3.9 "Block section" means the cross-sectional area (m²) of the catalyst block based on the outer dimensions.

2.3.10 "NO_x reduction rate η " means a value deriving from the following formula. Unit of η is (%):

$$\eta = \frac{(c_{inlet} - c_{outlet})}{c_{inlet}} \cdot 100$$

Where: c_{inlet} is NO_x concentration (ppm) as measured at the inlet of the SCR chamber;
 c_{outlet} is NO_x concentration (ppm) as measured at the outlet of the SCR chamber.

2.3.11 "Catalyst block casing or frame" means a casing or frame of an assembly (module) of several catalyst blocks.

3 PRE-CERTIFICATION PROCEDURE

3.1 General

3.1.1 Engine systems fitted with SCR should be certified in accordance with chapter 2 of the NTC 2008. In cases where combined engine/SCR systems cannot be tested on a test bed owing to technical and practical reasons nor an on board test can be performed fully complying with the requirements of chapter 5 of the NTC 2008 the procedures provided by Scheme B of these guidelines should be applied.

3.1.2 The applicant for certification should be the entity responsible for the complete engine system fitted with SCR.

3.1.3 The applicant should supply all necessary documentation, including the Technical File for the complete system, a description of the required on board NO_x verification procedure and, where applicable, the description of the confirmation test procedure.

3.2 Technical File and on board NO_x verification procedures

In addition to the information supplied in paragraph 3.1.3 of these Guidelines and items in section 2.4 of the NTC 2008, engine systems fitted with SCR should include the following information in Technical File:

- .1 reductant: component/type and concentration;
- .2 reductant injection system including critical dimensions and supply volume;
- .3 design features of SCR specific components in the exhaust duct from the engine exhaust manifold to the SCR chamber. The design features are to be specified by the applicant and may include, but are not limited to:
 - .1 any restrictions specified by the applicant relating to exhaust duct configuration/design, including the position and number of bends in exhaust duct along with orientation and geometry, exhaust duct changes of diameter and arrangements fitted to manipulate exhaust flow, where applicable;
 - .2 minimum distance between reductant injection point(s) and SCR chamber;
 - .3 position of reductant injection equipment within duct and the direction of reductant injection, e.g. counter flow or parallel flow;
 - .4 reductant mixing arrangements;
 - .5 reductant lances, nozzles, atomizing arrangement;
 - .6 inlet plenum design, top entry or bottom entry;
 - .7 where an SCR by-pass arrangement is stipulated by the applicant, the control specifications, identification of the by-pass valve and its control device; and
 - .8 where an integrated reductant injection and SCR chamber arrangement is supplied as a packaged item to be fitted into an exhaust duct, the parameters of such a unit which may affect NO_x emissions;
- .4 catalyst block specification and arrangement in the SCR chamber. The details of the catalyst block specification and the arrangement of catalyst blocks within the SCR chamber may include, but are not limited to:
 - .1 installation of blocks within the SCR chamber, including the number of blocks, number of layers and the SCR chamber casing and frame to prevent exhaust gas slip;
 - .2 catalyst block geometry;

- .3 limiting characteristics such as CPSI (cells per square inch) and ranges for physical parameters such as the space velocity (SV), area velocity (AV) and linear velocity (LV), or a part number or specification number specified by the applicant on the catalyst block;
 - .4 catalyst material: this may be identified by means of a part number or specification number. The means to ensure a correct catalyst block installed on board against the Technical File, where a part number or specification number specified by the applicant on the catalyst block casing or frame is acceptable;
 - .5 arrangement of soot blowing equipment;
 - .6 inspection and access arrangements. The inspection of the SCR chamber should be limited to ensuring that the correct catalyst blocks are fitted during assembly of the SCR and the inspection of spare catalyst blocks can be accepted to demonstrate compliance at surveys other than at the initial assembly of the SCR; and
 - .7 any baffle plates or other devices installed within the SCR chamber for exhaust gas and reductant flow distribution;
- .5 inlet parameters including allowable exhaust gas temperature (maximum and minimum) at the inlet of the SCR chamber;
 - .6 cross-unit parameters: allowable pressure loss (Δp) between inlet and outlet of SCR chamber and in the exhaust duct caused by SCR components. Where there is any element of the SCR system upstream and/or downstream of the SCR chamber which affects the allowable pressure loss, then this allowable pressure loss (Δp) is to be based on the entire SCR system;
 - .7 aspects related to the fuel oil quality resulting in continued compliance of the engine with the applicable NO_x emission limit to assure continued NO_x reduction may include, but not be limited to:
 - .1 the maximum allowable sulphur content of fuel oil which can be combusted, while maintaining compliance; and
 - .2 guidance on applicable fuel oil composition and fuel oil contaminants under operational conditions;
 - .8 factors related to the deterioration rate of SCR performance, e.g. exchange condition for SCR catalyst blocks and recommended exchange time of SCR catalyst blocks:
 - .1 where a feedback or a feed forward reductant control strategy is incorporated with a NO_x measurement device, this is acceptable as a means of monitoring catalyst condition/degradation. The exchange criteria of catalyst blocks against the reading of the NO_x measurement device is to be specified by the applicant as well as the maintenance, service, and calibration requirements for the NO_x measurement device;

- .2 where a feed forward reductant control strategy is adopted without a NO_x measurement device, the application is to provide the details of:
 - .1 the expected deterioration curve under expected operating conditions or the life of catalyst under expected operating conditions;
 - .2 factors which can influence catalyst NO_x reduction efficiency; and
 - .3 guidance on how to assess catalyst NO_x reduction efficiency based on periodical spot checks or monitoring as specified by the applicant, if applicable; records are to be kept for inspection during annual, intermediate and renewal surveys. The frequency of periodical spot checks is to be defined by the applicant considering the expected deterioration of the catalyst. The frequency for spot-checks should be at least after installation and once every 12 months; and
- .3 other strategies on monitoring the catalyst condition/degradation are subject to the approval of the Administration;
- .9 controlling arrangements and settings of the SCR, e.g. model, specification of control device. This is to include, but not be limited to:
 - .1 the reductant injection control strategy which may be a feed forward reductant injection control or feedback reductant injection control strategy;
 - .2 instrumentation and sensors which are part of the SCR control arrangement, as applicable;
 - .3 crew instructions for allowable adjustment of control parameters including details of how to prevent unauthorized alteration of the system configuration parameters, programmable logic controller (PLC) data, and central processing units (CPU) as applicable;
 - .4 where a NO_x measurement device is used, the following details should be included:
 - .1 type/model (identification number);
 - .2 calibration, zero and span check procedures and the periodicity of such checks, if applicable;
 - .3 calibration gases to be carried on board if applicable; and
 - .4 maintenance and/or exchange requirements;
 - .5 where the engine system fitted with SCR has different operating modes (e.g. modes for Tier II and Tier III compliance separately), details of the control philosophy for selecting different modes of operation and recording the mode of operation together with means of changing between modes; and

- .6 auxiliary control devices, as mentioned in regulation 13.9 and defined in regulation 2.4 of MARPOL Annex VI, respectively, may be used on engine systems fitted with SCR, covering starting and stopping, low load operation and reversing operation, subject to the approval of the Administration;
- .10 measures to minimize reductant slip. The maximum reductant slip may be specified by the applicant. Supporting information, including reductant injection rates under certain engine loads, the catalyst temperature or exhaust gas temperature when reductant injection occurs, etc. may be included in order to prevent reductant slip from exceeding the specified maximum level. Reductant slip monitoring in the exhaust duct downstream of the SCR or an equivalent means may be accepted as a means to minimize reductant slip. Alternatively, means of alleviating reductant slip (for example through the use of an ammonia slip catalyst or active catalyst thermal management) may be accepted as a means to minimize reductant slip;
- .11 parameter check method as the verification procedure: with regard to the application of the parameter check method, requirements given in paragraph 2.3.6 and guidance given in paragraph 2 of appendix VII of the NTC 2008 should be taken into account in assessing the adequacy of a proposed procedure with analysers meeting or exceeding the requirements of appendix III of the NTC 2008; and
- .12 any other parameter(s) specified by the applicant.

3.3 Measures to minimize reductant slip

When SCR uses urea solution, ammonia solution or ammonia gas as reductant, measures to prevent reductant slip should be provided to avoid the supply of an excessive amount of reductant in the system. The reductant injection system should be designed to prevent emissions of any harmful substance from the system.

3.4 Pre-certification procedure

Test and pre-certification of an engine system fitted with SCR should be conducted either by Scheme A (as given in section 5 of these Guidelines), or by Scheme B (as given in sections 6 and 7 of these Guidelines), as appropriate.

3.5 EIAPP certificate

3.5.1 An Engine International Air Pollution Prevention (EIAPP) Certificate (see appendix I of the NTC 2008) should be issued by the Administration after approval of the Technical File.

3.5.2 When an applicant chooses Scheme B for pre-certification, the IAPP initial survey should not be completed until the on board initial confirmation test provides compliant results. The applicant remains the responsible entity until final acceptance of the system.

3.5.3 When the engine is to be certified to both Tier II and Tier III, the EIAPP Certificate should be completed for both Tier II and Tier III with a single Technical File covering both Tier modes.

4 FAMILY AND GROUP CONCEPTS FOR ENGINE SYSTEMS FITTED WITH SCR

4.1 The requirements in chapter 4 of the NTC 2008 apply equally to engine systems fitted with SCR.

4.2 The parent engine is to be the engine system fitted with SCR with the highest NO_x emission value of the group/family as specified in paragraphs 4.3.9.1 and 4.4.8.1 of the NTC 2008. In cases where there is more than one combined engine/SCR system with the same highest NO_x emission value given to two decimal places (cycle value in g/kWh) within an engine family or an engine group, the parent engine is the system with the highest raw NO_x value emitted from the engine.

4.3 The parent engine for Tier II compliance is not necessarily the same parent of the combined engine/SCR system for Tier III compliance.

5 TEST PROCEDURES FOR SCHEME A

5.1 General

5.1.1 A test for a combined system of an engine fitted with an SCR in Scheme A is to ensure compliance with the applicable NO_x emission limits of MARPOL Annex VI, as required. The test bed measurement procedures of chapter 5 of the NTC 2008 should apply.

5.1.2 Notwithstanding paragraph 5.1.1, the applicant may choose to test the combined system of an engine fitted with an SCR with a by-pass arrangement without that by-pass installed for the purpose of test bed measurement. Any effect to the fluid dynamics or reductant distribution caused by the absence of the by-pass arrangement is to be presented by the applicant.

5.2 Calculation of gaseous emissions

5.2.1 The calculation method in section 5.12 of the NTC 2008 is also applied to engine systems fitted with SCR. No allowance is made for the reductant solution injected into the exhaust gas stream in respect of its effect on exhaust gas mass flow rate calculation (appendix VI) or dry/wet correction factor (equation (11), paragraph 5.12.3.2.2 of the NTC 2008). The NO_x correction factor for humidity and temperature (equations (16) or (17), paragraphs 5.12.4.5 and 5.12.4.6, respectively, of the NTC 2008) should not be applied.

5.2.2 For an engine system fitted with SCR, the following parameters should be measured and recorded in the engine test report in accordance with section 5.10 of the NTC 2008:

- .1 injection rate of reductant at each load point (kg/h);
- .2 exhaust gas temperature at the inlet and outlet of the SCR chamber (°C);
- .3 pressure loss (kPa): it is necessary to measure the pressure at inlet and at outlet of the SCR chamber and to calculate pressure loss Δp . It would also be permissible to measure the pressure loss Δp of the SCR chamber with a differential pressure sensor. The allowable Δp limit should be confirmed; and
- .4 other parameter(s) as specified by the Administration.

6 TEST PROCEDURES FOR SCHEME B

6.1 General

6.1.1 A test for an engine system fitted with SCR in Scheme B is to ensure that the system complies with the applicable NO_x emission limits in MARPOL Annex VI, as required. The test procedures in Scheme B are as follows:

- .1 an engine is tested to obtain the NO_x emission value (g/kWh) in accordance with paragraph 6.2.1 of these Guidelines;
- .2 the SCR NO_x reduction rate may be calculated by modelling tools, taking into account geometrical reference conditions, chemical NO_x conversion models as well as other parameters to be considered;
- .3 for every type of catalytic element, an SCR chamber, not necessarily to full scale, is to be tested in accordance with section 6.3 of these Guidelines in order to generate data for the calculation model as that used in paragraph 6.1.1.2 of these Guidelines;
- .4 the NO_x emission from the engine system fitted with SCR, which is calculated in accordance with section 6.4 of these Guidelines using the NO_x emission value from the engine and the NO_x reduction rate of SCR chamber. At this point the Technical File will be completed and this NO_x emission value will be entered into the supplement of the EIAPP certificate; and
- .5 the NO_x emission performance of the engine combined with the SCR is verified by a confirmation test in accordance with the procedure in paragraph 7.5 of these Guidelines.

6.1.2 The calculation of gaseous emissions in paragraph 6.1.1.1 of these Guidelines should be undertaken in accordance with paragraph 5.2.1 of these Guidelines.

6.2 Verification test procedures for an engine

6.2.1 The purpose of the test of an engine is to establish the emission values for use in section 6.4 of these Guidelines. These measurements should be in accordance with chapter 5 of the NTC 2008.

6.2.2 Paragraph 5.9.8.1 of the NTC 2008 requires engine conditions to be measured at each mode point, for an engine system. This equally applies in the case of an engine fitted with SCR. Additionally, exhaust gas temperature at the intended inlet of the SCR chamber should be determined and recorded in the test report as required by section 5.10 of the NTC 2008.

6.3 Test procedures for SCR chambers

6.3.1 General

6.3.1.1 The SCR chamber for validation testing may be either a full scale SCR chamber or a scaled version. A SCR chamber should demonstrate the reduction in NO_x concentrations (ppm) expected in exhaust gas measured in section 6.2 of these Guidelines. Therefore, NO_x reduction rate of the SCR chamber should be determined for each individual mode point. Where undertaken on a scaled version of the SCR chamber the scaling process should be validated to the satisfaction of the Administration.

6.3.1.2 The scaling process is to correspond with the modelling tool of paragraph 6.1.1.2 of these Guidelines, and take into account geometrical reference conditions, and chemical NO_x conversion models, and other parameters which have influence on NO_x conversion rate in the modelling tool. If the scaling process could not be validated satisfactorily by theoretical analysis or calculations taking into consideration the complex conditions in the SCR chamber, such as uniformity of gas speed, reductant, a combined engine and SCR system validation test in accordance with Scheme A should be undertaken.

6.3.1.3 The modelling tool of paragraph 6.1.1.2 of these Guidelines is acceptable for use in other engine groups which operate within the same defined boundary conditions.

6.3.2 Test conditions at each mode point

Exhaust gas, catalyst, reductant and an injection system should satisfy the following conditions at each mode point:

- .1 Exhaust gas flow
Exhaust gas flow rate for the test should be scaled accordingly to account for the dimension of the catalyst model.
- .2 Exhaust gas component
Exhaust gas for the test should either be diesel engine exhaust gas or simulated gas.

Where diesel exhaust gas is used it should correspond, in terms of concentrations, to the exhaust gas in section 6.2 of these Guidelines, in terms of NO_x, O₂, CO₂, H₂O and SO₂ ($\pm 5\%$ of the required concentration for each emission species).

Where simulated gas is used it should correspond, in terms of concentrations, to the exhaust gas in section 6.2 of these Guidelines, in terms of NO, NO₂, O₂, CO₂, H₂O and SO₂ ($\pm 5\%$ of the required concentration for each emission species) balance N₂.

An exemption for one or more of the above-mentioned gas species' concentration requirements may be allowed subject to a demonstration test showing that the gas or gases do not affect the NO_x reduction rate by more than 2%.

- .3 Exhaust gas temperature
The temperature of exhaust gas used for the test should correspond to the temperatures obtained from testing in section 6.2 of these Guidelines, ensuring that the SCR chamber is activated at every load point, other than as provided for by 3.1.4 of the NTC 2008, and that no ammonia bisulphate formation, or reductant destruction, takes place.
- .4 Catalyst blocks and AV, SV value
The catalyst blocks used in the test should be representative of the catalyst blocks to be used in the SCR chamber in service. AV, SV or LV value should, in the case of full scale tests, be within -5% or above of the required value as obtained in testing from section 6.2 of these Guidelines. In the case of scaled tests it should correspond to the above.

- .5 Reductant
The reductant concentration on the surface of the tested catalyst should be representative of the reductant concentration on the surface of the catalyst during actual engine operation. Ammonia gas may be used as a reductant for the SCR chamber test, provided that it results in an equivalent concentration on the catalyst surface.

6.3.3 Stability for measurement

All measurements should be recorded after they have stabilized.

6.3.4 List of data to be derived from the model

6.3.4.1 Operating data which is to be given in the Technical File should be derived from the modelling process or otherwise justified.

6.3.4.2 Exhaust gas analysers should be in accordance with appendix III and appendix IV of the NTC 2008 or otherwise to the satisfaction of the Administration.

6.3.5 Test report for SCR chamber

Data recorded under paragraph 6.3.1.1 of these Guidelines should be recorded in the test report as required by section 5.10 of the NTC 2008.

6.4 Calculation of the specific emission

6.4.1 The NO_x emission value of the engine system fitted with SCR should be calculated as follows:

$$\text{gas}_x = \frac{\sum_{i=1}^{i=n} ((100 - \eta_i)/100) \cdot q_{\text{mgas}_i} \cdot W_{F_i}}{\sum_{i=1}^{i=n} (P_i \cdot W_{F_i})}$$

Where: η_i NO_x reduction rate (%) derived in accordance with section 6.3 of these Guidelines;

q_{mgas_i} = Mass flow of NO_x gas measured in accordance with section 6.2 of these Guidelines;

W_{F_i} = Weighting factor;

P_i = Measured power at individual mode points in accordance with section 6.2 of these Guidelines.

The weighting factors and number of modes (n) used in above calculation shall be according to the provisions of section 3.2 of the NTC 2008.

6.4.2 The NO_x emission value (g/kWh) calculated in accordance with paragraph 6.4.1 of these Guidelines should be compared to the applicable emission limit. This emission value is entered into 1.9.6 of the Supplement to the EIAPP certificate (appendix I of the NTC 2008).

6.5 Test report to be submitted to the Administration

The test report referenced under paragraphs 6.2.2 and 6.3.5 of these Guidelines, together with the data from section 6.4 of these Guidelines should be consolidated into the overall documentation to be submitted to the Administration.

7 ON BOARD CONFIRMATION TEST FOR SCHEME B

7.1 After installation on board of an engine system fitted with SCR and before entry into service an initial confirmation test should be performed on board.

7.2 The engine system fitted with the SCR should be verified as corresponding to the description given in the Technical File.

7.3 The confirmation test should be undertaken as close as possible to 25%, 50% and 75% of rated power, independent of test cycle.

7.4 At each mode point of the confirmation test the operating values as given in the Technical File should be verified.

7.5 NO_x emission concentrations should be measured at the inlet and outlet of the SCR chamber. The NO_x reduction rate should be calculated. Both values should either be dry or wet. The value obtained for NO_x reduction rate should be compared to the initial confirmation test required value at each mode point as given in the Technical File. Reduction efficiency values obtained at each of the test points should not be less than the corresponding values as given in the Technical File by more than 5%.

7.6 The NO_x analyser should meet the requirements of chapter 5 of the NTC 2008.

7.7 When an engine system fitted with SCR is in a group defined in chapter 4 of these Guidelines, the confirmation test should be conducted only for the parent engine system of the group. Where the parent engine system of the group is not the first one to complete the onboard confirmation test as required by chapter 7 of these Guidelines, the onboard confirmation test is to be done for all installed engine systems within the engine group unless it is an identical NO_x specification member engine or the parent engine system has been installed and tested successfully. Where the parent engine system is not available to be installed on board, the first installed member engine system of the engine group can be chosen and adjusted to the worst case NO_x emission for confirmation test on board instead. The test results should be verified as described in the Technical File.

ANNEX 16

**RESOLUTION MEPC.292(71)
(adopted on 7 July 2017)**

**2017 GUIDELINES FOR ADMINISTRATION VERIFICATION
OF SHIP FUEL OIL CONSUMPTION DATA**

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 from ships,

RECALLING ALSO that it adopted, by resolution MEPC.203(62), amendments to the annex of the Protocol of 1997 to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (inclusion of regulations on energy efficiency for ships in MARPOL Annex VI),

NOTING that the aforementioned amendments to MARPOL Annex VI, which included a new chapter 4 on regulations on energy efficiency for ships in the Annex, entered into force on 1 January 2013,

NOTING ALSO that it adopted, by resolution MEPC.278(70), amendments to MARPOL Annex VI related to the data collection system for ship fuel oil consumption which are expected to enter into force on 1 March 2018 upon their deemed acceptance on 1 September 2017,

NOTING FURTHER that regulation 22A.7 of MARPOL Annex VI requires that ship fuel oil consumption data shall be verified according to procedures established by the Administration, taking into account guidelines developed by the Organization,

RECOGNIZING that the aforementioned amendments to MARPOL Annex VI require relevant guidelines for uniform and effective implementation of the regulations and to provide sufficient lead time for industry to prepare,

HAVING CONSIDERED, at its seventy-first session, draft 2017 Guidelines for Administration verification of ship fuel oil consumption data,

- 1 ADOPTS the *2017 Guidelines for Administration verification of ship fuel oil consumption data* (the 2017 Guidelines), as set out in the annex to the present resolution;
- 2 INVITES Administrations to take the annexed 2017 Guidelines into account when developing and enacting national laws which give force to and implement requirements set forth in regulation 22A of MARPOL Annex VI, as amended;
- 3 REQUESTS the Parties to MARPOL Annex VI and other Member Governments to bring the annexed 2017 Guidelines to the attention of masters, seafarers, shipowners, ship operators and any other interested parties;
- 4 AGREES to keep the 2017 Guidelines under review in light of experience gained with their implementation.

ANNEX

2017 GUIDELINES FOR ADMINISTRATION VERIFICATION OF SHIP FUEL OIL CONSUMPTION DATA

1 INTRODUCTION

1.1 Regulation 22A of MARPOL Annex VI establishes the IMO Ship Fuel Oil Consumption Database, to be administered by the Organization, to which each Administration will submit relevant data for their registered ships of 5,000 gross tonnage (GT) and above. Regulation 22A.7 specifies that "the data shall be verified according to procedures established by the Administration, taking into account guidelines to be developed by the Organization". This document contains the Guidelines referred to in that regulation and is intended to assist Administrations in developing their own verification programme.

1.2 A data verification procedure should ensure the reliability of the collected data while minimizing the costs and associated burdens to the ship and the Administration.

2 DEFINITIONS

For the purpose of these Guidelines, the definitions in MARPOL Annex VI apply.

3 RESPONSIBILITIES

3.1 The responsibilities of Administrations and ships are set out in MARPOL Annex VI. These Guidelines do not change those or create any new obligations.

3.2 Under the data collection system for fuel oil consumption of ships, as specified in MARPOL Annex VI, an Administration may authorize an organization¹ to receive the data from a ship, verify the data for compliance with the requirements, issue the Statement of Compliance, submit the data to the Organization and perform other actions authorized by the Administration with respect to the IMO Ship Fuel Oil Consumption Database. In every case, the Administration assumes full responsibility for all tasks conducted by the Administration or any organization duly authorized by it (hereinafter referred to as "the Administration").

4 VERIFICATION OF THE REPORTED DATA

4.1 To facilitate data verification, the Administration should indicate what additional documentation a ship should submit along with its annual data report. Specification of this documentation can be done on a ship basis, as part of the assessment of the Data Collection Plan², or it may be done as a general policy statement or through such other policy instruments as the Administration deems appropriate. Additional documentation to facilitate data verification may include the following, as well as other documentation that the Administration deems relevant:

- .1 a copy of the ship's Data Collection Plan;

¹ Refer to the *Guidelines for the Authorization of organizations acting on behalf of the Administration*, adopted by the Organization by resolution A.739(18), as amended by resolution MSC.208(81), and the *Specifications on the Survey and Certification Functions of Recognized Organizations Acting on Behalf of the Administration*, adopted by the Organization by resolution A.789(19), as may be amended by the Organization.

² Refer to the 2016 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP), adopted by resolution MEPC.282(70).

- .2 summaries of bunker delivery notes (BDNs), in sufficient detail to show that all fuel oil consumed by the ship is accounted for (see sample form of BDN summary set out in appendix 1);
- .3 summaries of disaggregated data of fuel oil consumption, distance travelled and hours underway, in a format specified by the Administration (see sample form of data summary set out in appendix 2);
- .4 information to demonstrate that the ship followed the Data Collection Plan set out in its SEEMP, including information on data gaps and how they were filled as well as how the event that caused the data gap was resolved; and
- .5 copies of documents containing information on the amount of fuel oil consumption, distance travelled and hours underway for the ship's voyages during the reporting period (e.g. the ship's official logbook, oil record book, BDNs, arrival/noon/departure reports, etc.).

4.2 In addition to the documentation described in paragraph 4.1, the Administration may request a ship to submit such documentation needed to perform a comprehensive review of a ship's annual fuel oil consumption, distance travelled, and hours underway. The Administration may request this documentation be submitted by all ships or a subset of the ships subject to its jurisdiction. This documentation may be used by the Administration to verify whether the ship followed the methodology specified in its Data Collection Plan, with a view to confirming:

- .1 consistency of reported data and calculated values, including with previous reporting periods (if applicable), through recalculating the annual reported values using the underlying data, etc.;
- .2 completeness of data (e.g. perform substantive testing based on reconciliation, recalculations, and document cross-check, for example with official logbook and/or arrival/noon/departure reports, recalculate hours underway and total quantities of fuel oil used and distance travelled); and
- .3 reliability and accuracy of the data (e.g. test that the data quality procedures as described in the Data Collection Plan (see section 9 of sample form of Data Collection Plan, as set out in appendix 2 of the *2016 Guidelines for the development of a ship energy efficiency management plan (SEEMP)*) have been properly implemented, carry out site visits (typically to the Company's offices rather to the ship) to test the systems, processes and the control activities) through corroborating fuel oil consumption data with distance travelled and hours underway, comparing reported fuel oil consumption with that which is expected for the ship size, operational profile, and technical characteristics, and/or comparing reported fuel oil consumption total fuel bunkered, etc.

4.3 Should any discrepancy be identified by the Administration in the reported data, it should be communicated to the Company on a timely basis for correction. On receipt of corrected data from the Company and satisfactory completion of the verification, the Statement of Compliance will be issued by the Administration.

APPENDIX 1

SAMPLE OF THE BDN SUMMARIES

Date of Operations (dd/mm/yyyy)	Fuel Oil Type/Mass(MT)							Descriptions
	DO/GO	LFO	HFO	LPG(P)	LPG(B)	LNG	Others(C _F)	
① BDN								
09/01/2019								
02/05/2019			150					
08/07/2019								
09/10/2019								
10/12/2019			300					
①Annual Supply Amount	0	0	450	0	0	0	0	
② Correction for the tank oil remainings								
01/01/2019			400					
31/12/2019			200					
②Correction for the tank oil remainings	0	0	200	0	0	0	0	The difference in the amount of the remaining tank oil at the beginning/end of the data collection period.
③ Other corrections								
30/03/2019								
15/09/2019								
31/12/2019								
③Annual other corrections	0	0	0	0	0	0	0	
Annual Fuel Consumption								
Annual Fuel Consumption (①+②+③)	0	0	650	0	0	0	0	

Explanatory remarks;

If bunker supply/correction data have been recorded in a Company's electronic reporting system, the data is acceptable to be submitted in the existing format instead of submitting the data by this format.

APPENDIX 2

SAMPLE OF THE COLLECTED DATA SUMMARIES

Date from (dd/mm/yyyy)	Date to* (dd/mm/yyyy)	Distance Travelled (n.m)	Hours Underway (hh:mm)	Fuel Consumption (Metric tons)						
				DO/GO	LFO	HFO	LPG(P)	LPG(B)	LNG	Others(C _F)
01/01/2019		210	24:00	2	3	19	0	0	0	0
02/01/2019		283	24:00	2	0	20	0	0	0	0
03/01/2019		321	24:00	2	0	18	0	0	0	0
04/01/2019		221	24:00	1	0	19	0	0	0	0
05/01/2019		320	18:00	2	0	13	0	0	0	0
06/01/2019		302	24:00	2	0	17	0	0	0	0
07/01/2019		210	24:00	1	0	19	0	0	0	0
08/01/2019		302	24:00	1	0	20	0	0	0	0
09/01/2019		280	24:00	2	0	21	0	0	0	0
10/01/2019		50	01:00	3	0	2	0	0	0	0
11/01/2019		198	24:00	3	0	21	0	0	0	0
.	
.	
.	
30/12/2019		320	24:00	0	0	20	0	0	0	0
31/12/2019		213	24:00	1	0	17	0	0	0	0
Annual Total										

*In the case of daily underlying data, this column would be left in blank.

Explanatory remarks;

If the listed data in the format have been recorded in a Company's electronic reporting system, the data is acceptable to be submitted in the existing format instead of submitting the data by this format.

ANNEX 17

**RESOLUTION MEPC.293(71)
(adopted on 7 July 2017)**

**2017 GUIDELINES FOR THE DEVELOPMENT AND MANAGEMENT OF THE
IMO SHIP FUEL OIL CONSUMPTION DATABASE**

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 from ships,

RECALLING ALSO that it adopted, by resolution MEPC.203(62), amendments to the annex of the Protocol of 1997 to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (inclusion of regulations on energy efficiency for ships in MARPOL Annex VI),

NOTING that the aforementioned amendments to MARPOL Annex VI, which included a new chapter 4 on regulations on energy efficiency for ships in Annex VI, entered into force on 1 January 2013,

NOTING ALSO that it adopted, by resolution MEPC.278(70), amendments to MARPOL Annex VI related to the data collection system for fuel oil consumption which are expected to enter into force on 1 March 2018 upon their deemed acceptance on 1 September 2017,

NOTING FURTHER that regulation 22A.12 of MARPOL Annex VI requires that the IMO Ship Fuel Oil Consumption Database shall be undertaken and managed by the Secretary-General of the Organization, pursuant to guidelines developed by the Organization,

RECOGNIZING that the aforementioned amendments to MARPOL Annex VI require relevant guidelines for uniform and effective implementation of the regulations and to provide sufficient lead time for industry to prepare,

HAVING CONSIDERED, at its seventy-first session, draft 2017 Guidelines for the development and management of the IMO Ship Fuel Oil Consumption Database,

1 ADOPTS the *2017 Guidelines for the development and management of the IMO Ship Fuel Oil Consumption Database* (the 2017 Guidelines), as set out in the annex to the present resolution;

2 INVITES the Secretariat to take the annexed 2017 Guidelines into account when developing the IMO Ship Fuel Oil Consumption Database, in accordance with regulation 22A.12 of MARPOL Annex VI;

3 REQUESTS the Parties to MARPOL Annex VI and other Member Governments to bring the annexed 2017 Guidelines to the attention of masters, seafarers, shipowners, ship operators and any other interested parties;

4 AGREES to keep the 2017 Guidelines under review in light of experience gained with their implementation.

ANNEX

2017 GUIDELINES FOR THE DEVELOPMENT AND MANAGEMENT OF THE IMO SHIP FUEL OIL CONSUMPTION DATABASE

1 INTRODUCTION

1.1 These Guidelines provide guidance on the development and management of the IMO Ship Fuel Oil Consumption Database (hereafter "the database"), and describe methods that will be used to anonymize ship data for use by Parties, in accordance with regulation 22A of MARPOL Annex VI, and to ensure the completeness of the database.

1.2 In general, the purpose of the database is to support consideration of further measures for enhancing energy efficiency of international shipping by enabling robust data analysis.

1.3 With regard to data confidentiality, regulation 22A.11 stipulates that "The Secretary-General of the Organization shall maintain an anonymized database such that identification of a specific ship will not be possible. Parties shall have access to the anonymized data strictly for their analysis and consideration." These Guidelines balance data anonymization with the usability of data for analysis by the Parties and Organization.

1.4 Regulation 22A.12 states that "The IMO Ship Fuel Oil Consumption Database shall be undertaken and managed by the Secretary-General of the Organization, pursuant to guidelines to be developed by the Organization." With regard to the establishment of the database, it will be developed as a module within the Global Integrated Shipping Information System (GISIS) platform, with the integrated IMO Web Accounts framework utilized to manage secure access to the module.

2 DEFINITIONS

For the purpose of these Guidelines, the definitions in MARPOL Annex VI apply.

3 DATA ANONYMIZATION

Pursuant to regulation 22A.11 of MARPOL Annex VI, the data are to be anonymized such that identification of a specific ship will not be possible. For the purpose of the anonymization of the fuel oil consumption data, the following should apply for the database:

- .1 the IMO number and ship flag should not be shown;
- .2 technical characteristics of ships in the database (gross tonnage (GT), net tonnage (NT), deadweight tonnage (DWT), power output (rated power), EEDI (if applicable)) should be rounded to two significant digits, for example, a ship tonnage of 167,430 GT should be shown as 170,000 GT;
- .3 the annual data of fuel oil consumption, distance travelled and hours underway should be provided in full without modification;
- .4 ship types other than those defined in regulation 2 should be shown as "others"; and
- .5 ice class should be shown as "Yes" or "No".

4 DATA SUBMISSION AND ACCESS

4.1 An Administration should be able to log in to the online database to submit its data via an online form. The data input into the database should be checked by the database system to ensure that the data are being submitted in the standardized format and be cross-referenced with the data from the Ship Particulars module of GISIS.

4.2 The Administration should designate a contact person for the purposes of the database who is responsible for communication with the Secretariat if any matter arises with regard to the submission of data by the respective Administration.

4.3 To encourage the consistent submission of data and improve the usability of the database, automatic notifications and reminders concerning data submission, modification and database update could be incorporated as features in the database.

4.4 An Administration will have access to non-anonymized data of ships flying its flag.

4.5 An Administration should be able to log in to the online database to download the anonymized dataset.

5 MEASURES TO ENSURE THE COMPLETENESS OF THE DATABASE

In accordance with the requirements of regulation 22A.10 of MARPOL Annex VI concerning reporting of the status of missing data, the Secretary-General should:

- .1 at the beginning of each calendar year, produce a list of ships falling under the scope of regulation 22A by cross-referencing with the data from the Ship Particulars module of GISIS;
- .2 send the aforementioned list of ships to the Administration for reference, in order to receive feedback in case of any discrepancies;
- .3 check the completeness of the database by comparing the list produced under .1 with the reported data;
- .4 remind Administrations which have failed to submit the data in the required form;
- .5 report the status of missing data to the Committee on an annual basis; and
- .6 request non-reporting Administrations to submit the data of all their registered ships falling under the scope of regulation 22A.

6 ANNUAL REPORT TO THE MARINE ENVIRONMENT PROTECTION COMMITTEE

Regulation 22A.10 states that "the Secretary-General of the Organization shall produce an annual report to the Marine Environment Protection Committee summarizing the data collected, the status of missing data, and such other relevant information as may be requested by the Committee." At a minimum, each annual report should include the following and also any other information as requested by the Committee:

- .1 an aggregated annual amount of each type of fuel oil consumed by all ships of 5,000 GT and above engaged on international voyages;

- .2 the aggregated annual amount of each type of fuel oil consumed, distance travelled and hours underway for ships of 5,000 GT and above engaged on international voyages, by EEDI ship type and EEDI size category, including the "other" category for ships not subject to EEDI;
- .3 the number of ships of 5,000 GT and above engaged on international voyages reported to the database, by EEDI ship type and EEDI size category, including the "other" category for ships not subject to EEDI; and
- .4 the number of ships of 5,000 GT and above engaged on international voyages registered with the Party of Annex VI for which data was not received, by EEDI ship type and EEDI size category including the "other" category for ships not subject to EEDI.

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BWM.2/Circ.62
26 July 2017

**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS'
BALLAST WATER AND SEDIMENTS, 2004**

Guidance on contingency measures under the BWM Convention

1 The Marine Environment Protection Committee, at its seventy-first session (3 to 7 July 2017), approved *Guidance on contingency measures under the BWM Convention* to support ships and port States to apply sound and practical measures in situations where a ship is unable to manage its ballast water as required, as set out in the annex.

2 Member Governments are invited to bring this Guidance to the attention of all parties concerned.

ANNEX

GUIDANCE ON CONTINGENCY MEASURES UNDER THE BWM CONVENTION

Definition

1 *Contingency measure* means a process undertaken on a case-by-case basis after a determination that ballast water to be discharged from a ship is not compliant, in order to allow ballast water to be managed such that it does not pose any unacceptable risks to the environment, human health, property and resources.

Purpose

2 The goal of this Guidance is to support ships and port States to apply sound and practical measures in the case of a ship unable to manage ballast water in accordance with its approved Ballast Water Management plan to meet the D-1 or D-2 standard, with a view to ensuring the protection of the marine environment and ship, safety and minimizing any impacts on the continuity of port and ship operations.

Implementation of contingency measures

3 In the case of non-compliant ballast water, communication between the ship and the port State should occur. The ship and the port State should consider the following as possible contingency measures:

- .1 actions predetermined in the Ballast Water Management plan of the ship;
- .2 discharging ballast water to another ship or to an appropriate shipboard or land-based reception facility, if available;
- .3 managing the ballast water or a portion of it in accordance with a method acceptable to the port State;
- .4 ballast water exchange carried out to an approved plan in accordance with regulation B-4 to meet the standard in regulation D-1. The ship and the port State should consider the potential disruption to the cargo handling operation plan of the ship and the potential impact to relating parties including port operators and cargo owners; or
- .5 operational actions, such as modifying sailing or ballast water discharge schedules, internal transfer of ballast water or the retention of ballast water on board the ship. The port State and the ship should consider any safety issues and avoid possible undue delays.

4 Having considered all of the options in paragraph 3 above, the ballast water may be discharged in the port or any suitable area, as acceptable to the port State. Port State consideration may include environmental, safety, operational and logistical implications of allowing or disallowing the discharge. The discharge of ballast water is subject to any conditions of the port State.

5 The port State should report information on the use of contingency measures in accordance with the experience-building phase (EBP) associated with the BWM Convention (resolution MEPC.290(71)).

6 In any case, the ship is required to do its best to correct malfunction of the Ballast Water Management system as soon as possible and submit its repair plan to the port State control authorities and the flag State.

7 The port State, the flag State and the ship should work together to agree on the most appropriate solution to allow for the discharge of ballast water found to be non-compliant.

8 The ship and the port State should take appropriate measures, bearing in mind that ballast water sampling is still under development, as noted in the *Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)* (BWM.2/Circ.42/Rev.1) and the agreement on non-penalization during the EBP (MEPC.290(71)).

Review

9 The guidance on contingency measures should be kept under review in the light of experience gained through the EBP.

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BWM.2/Circ.63
27 July 2017

**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS'
BALLAST WATER AND SEDIMENTS, 2004**

**Application of the Convention to ships operating in sea areas where ballast water
exchange in accordance with regulations B-4.1 and D-1 is not possible**

1 The Marine Environment Protection Committee, at its seventy-first session (3 to 7 July 2017), approved guidance on *Application of the BWM Convention to ships operating in sea areas where ballast water exchange in accordance with regulations B-4.1 and D-1 is not possible*, as set out in the annex.

2 Member Governments are invited to bring the guidance circular to the attention of all parties concerned.

ANNEX

APPLICATION OF THE BWM CONVENTION TO SHIPS OPERATING IN SEA AREAS WHERE BALLAST WATER EXCHANGE IN ACCORDANCE WITH REGULATIONS B-4.1 AND D-1 IS NOT POSSIBLE

1 The purpose of this circular is to provide guidance on the application of the BWM Convention to ships operating in sea areas where ballast water exchange in accordance with regulation B-4.1 and D-1 is not possible. This guidance is only applicable to ships which are not required to meet the ballast water performance standard prior to its implementation schedule in accordance with regulation B-3.

2 The Committee recommends that, until the date a ship is required to meet the ballast water performance standard described in regulation D-2 (D-2 standard) in accordance with regulation B-3, a ship operating in a sea area where ballast water exchange in accordance with regulation B-4.1 and D-1 is not possible:

- .1 should not be required to meet the D-2 standard;
- .2 should not be required to meet the D-2 standard regardless if the ship does not comply with regulation B-3.6 (Discharge to a ballast water reception facility), B-3.7 (Other methods) or A-4 (Exemptions) of the BWM Convention;
- .3 should not be required to proceed under regulation B-3.6, B-3.7 or A-4 of the BWM Convention; and
- .4 should record the reasons why ballast water exchange was not conducted in accordance with regulation B-4.5.

3 In cases where the port State has established designated areas for ballast water exchange in accordance with regulation B-4.2, regulation B-4.2 should be implemented as referred to in paragraph 10.3 of the *Guidelines on designation of areas for ballast water exchange* (G14) (resolution MEPC.151(55)):

- .1 the ship should comply with the terms of use for those areas provided by the port State. In case no terms of use are provided, the ship should not be required to deviate from its intended voyage, or delay the voyage, in order to conduct ballast water exchange; and
- .2 when a ship does not have sufficient time to carry out the exchange for all of its ballast water complying with the standard in regulation D-1, the ship, taking into account the Ballast Water Management plan, should comply with the terms of use for those areas provided by the port State in accordance with paragraph 10.3 of the Guidelines (G14).

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BWM.2/Circ.52/Rev.1
27 July 2017

**INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT
OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004**

**Guidance on entry or re-entry of ships into exclusive operation within waters
under the jurisdiction of a single Party**

- 1 The Marine Environment Protection Committee, at its sixty-sixth session (31 March to 4 April 2014), approved the *Guidance on entry or re-entry of ships into exclusive operation within waters under the jurisdiction of a single Party* (BWM.2/Circ.52).
- 2 The Marine Environment Protection Committee, at its seventy-first session (3 to 7 July 2017) approved the revised *Guidance on entry or re-entry of ships into exclusive operation within waters under the jurisdiction of a single Party*, as set out in the annex.
- 3 Member Governments are invited to bring the annexed Guidance to the attention of all parties concerned.
- 4 This circular supersedes BWM.2/Circ.52.

ANNEX

GUIDANCE ON ENTRY OR RE-ENTRY OF SHIPS INTO EXCLUSIVE OPERATION WITHIN WATERS UNDER THE JURISDICTION OF A SINGLE PARTY

Background

1 Article 3 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention), identifies the ships to which the Convention applies and does not apply. Article 3.1 of the Convention includes all ships entitled to fly the flag of a Party, and ships not entitled to fly the flag of a Party, but which operate under the authority of a Party, except as provided otherwise in the Convention.

2 Articles 3.2(b) to 3.2(d) set out conditions under which the Convention does not apply to a ship of a Party that operates only in waters under the jurisdiction of that Party, or another Party, or in such waters and on the high seas, respectively. Such ships should be subject to the appropriate national policies, strategies or programmes for Ballast Water Management of the Party or Parties established pursuant to article 4.2.

3 Ships operating pursuant to articles 3.2(b) to 3.2(d) that cease to operate exclusively in the relevant waters lose their exclusion from the Convention, which then fully applies to them on an ongoing basis, except as provided in this Guidance.

Purpose

4 The purpose of this Guidance is to provide advice on entry or re-entry into exclusive operation pursuant to articles 3.2(b) to 3.2(d), which will assist Administrations with respect to a number of situations, including:

- .1 ships (e.g. mobile offshore units) that may be assigned to extended operations in waters under the jurisdiction of a single Party following an international voyage or voyages; and
- .2 ships which operate usually within waters under their jurisdiction, but which may occasionally need to leave these waters and return (e.g. to visit a dry-dock). Such ships may consider that regulations A-4, B-3.6 and B-3.7 provide options that are particularly attractive for short-term compliance with the Convention.

5 The provisions of this Guidance that pertain to entry into exclusive operation do not apply to a ship that is launched into the waters of the Party within which it is constructed until it requires an International Ballast Water Management Certificate.

Guidance

6 Subject to the conditions of articles 3.2(b) to 3.2(d) concerning the environment, human health, property and resources, the application of the Convention to a ship of a Party may cease:

- .1 pursuant to article 3.2(b), if the ship enters or re-enters into exclusive operation in waters under the jurisdiction of that Party;

- .2 pursuant to article 3.2(c), if the ship enters or re-enters into exclusive operation in waters under the jurisdiction of another Party, subject to the authorization of the latter Party for such cessation; and
- .3 pursuant to article 3.2(d), if the ship enters or re-enters into exclusive operation in waters under the jurisdiction of one Party and on the high seas, unless the ship has not been granted an authorization pursuant to article 3.2(c).

7 Before ceasing application of the Convention to a ship referenced in paragraph 4, the Administration (and authorizing Party, if applicable) should verify that the ship:

- .1 is in compliance with the Convention and holds a valid International Ballast Water Management Certificate, if required to do so;
- .2 has fully discharged all ballast water, including any residual ballast water, and has completely removed and disposed of all sediments, in accordance with the Convention and the ship's approved Ballast Water Management plan;
- .3 has a procedure in its approved Ballast Water Management plan for thoroughly cleaning its ballast water tanks, piping and equipment that is satisfactory to the Administration (and authorizing Party, if applicable); and
- .4 has carried out the procedure described in subparagraph 7.3 above, to the satisfaction of the Administration (and authorizing Party, if applicable).

8 Upon cessation of the application of the Convention to a ship, any International Ballast Water Management Certificate issued to the ship should be withdrawn.

9 A ship referred to in paragraph 3 on a single voyage may be granted an exemption under regulation A-4 on the condition that the ship performs ballast water exchange in accordance with regulations B-4 and D-1 and an approved Ballast Water Management plan. The requirements of regulation A-4.1.4 should be addressed to the satisfaction of the countries of origin and destination of the ship.

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MEPC.1/Circ.871
4 September 2017

**SUBMISSION OF DATA TO THE IMO DATA COLLECTION SYSTEM OF FUEL OIL
CONSUMPTION OF SHIPS FROM A STATE NOT PARTY TO MARPOL ANNEX VI**

1 At its seventieth session, the Marine Environment Protection Committee (MEPC 70) adopted, by resolution MEPC.278(70), amendments to MARPOL Annex VI concerning the data collection system for fuel oil consumption of ships.

2 MEPC 71, having considered the data submission from ships not flying the flag of a Party to MARPOL Annex VI, agreed to allow submission of fuel oil consumption data from such ships to the IMO Ship Fuel Oil Consumption Database.

3 MEPC 71 also agreed that an organization¹ duly authorized by a Party to MARPOL Annex VI, upon receipt of reported data specified in appendix IX to MARPOL Annex VI, pursuant to regulation 22A, from a ship of 5,000 GT and above not flying the flag of a Party to MARPOL Annex VI, may determine whether the data has been collected, aggregated, and reported in accordance with the relevant regulations of MARPOL Annex VI and guidelines developed by the Organization. If so, the organization duly authorized may submit the data to the IMO Ship Fuel Oil Consumption Database via electronic communication, separate from the submission of data on behalf of the authorizing Party, or Parties, to MARPOL Annex VI, using the standardized format as per appendix 3 of the *2016 Guidelines for the development of a ship energy efficiency management plan (SEEMP)* (2016 SEEMP Guidelines) (resolution MEPC.282(70)), after attesting that the data has been verified in accordance with regulation 22A.7 of MARPOL Annex VI.

4 MEPC 71 further agreed that a non-Party to MARPOL Annex VI should be encouraged to submit data to the IMO Ship Fuel Oil Consumption Database. A non-Party, upon receipt of reported data specified in appendix IX to MARPOL Annex VI, pursuant to regulation 22A, from a ship of 5,000 GT and above, may determine whether the data has been collected, aggregated, and reported in accordance with the relevant regulations of MARPOL Annex VI and guidelines developed by the Organization. If so, the non-Party may submit the data to the IMO Ship Fuel Oil Consumption Database via electronic communication, using the standardized format as per appendix 3 of the 2016 SEEMP Guidelines, after attesting that the data has been verified in accordance with regulation 22A.7 of MARPOL Annex VI.

¹ Refer to the *Guidelines for the authorization of organizations acting on behalf of the Administration*, adopted by the Organization by resolution A.739(18), as amended by resolution MSC.208(81), and the *Specifications on the survey and certification functions of recognized organizations acting on behalf of the Administration*, adopted by the Organization by resolution A.789(19).

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MEPC.1/Circ.850/Rev.2
30 August 2017

**2013 INTERIM GUIDELINES FOR DETERMINING MINIMUM PROPULSION POWER TO
MAINTAIN THE MANOEUVRABILITY OF SHIPS IN ADVERSE CONDITIONS, AS
AMENDED (RESOLUTION MEPC.232(65), AS AMENDED BY RESOLUTIONS
MEPC.255(67) AND MEPC.262(68))**

1 The Marine Environment Protection Committee, at its sixty-eighth session (11 to 15 May 2015), adopted, by resolution MEPC.262(68), amendments to the *2013 Interim guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions* (resolution MEPC.232(65), as amended by resolution MEPC.255(67)) and agreed to a phase-in period of six months for the application of the amendments. A consolidated text of the Guidelines, as requested by the Committee (MEPC 68/21, paragraph 3.101), is set out in the annex.

2 The Marine Environment Protection Committee, at its seventy-first session (3 to 7 July 2017), agreed to extend the validity of the 2013 Interim Guidelines to EEDI phase 2 and requested the Secretariat to revise MEPC.1/Circ.850/Rev.1 accordingly, for dissemination as MEPC.1/Circ.850/Rev.2 (MEPC 71/17, paragraph 5.47.1).

3 Member Governments are invited to bring the annexed *2013 Interim guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions*, as amended, and the decision taken by MEPC 71 to the attention of Administrations, industry, relevant shipping organizations, shipping companies and other stakeholders concerned.

ANNEX

2013 INTERIM GUIDELINES FOR DETERMINING MINIMUM PROPULSION POWER TO MAINTAIN THE MANOEUVRABILITY OF SHIPS IN ADVERSE CONDITIONS, AS AMENDED (RESOLUTION MEPC.232(65), AS AMENDED BY RESOLUTIONS MEPC.255(67) AND MEPC.262(68))

0 Purpose

The purpose of these interim guidelines is to assist Administrations and recognized organizations in verifying that ships complying with EEDI requirements set out in regulations on energy efficiency for ships have sufficient installed propulsion power to maintain the manoeuvrability in adverse conditions, as specified in regulation 21.5 of chapter 4 of MARPOL Annex VI.

1 Definition

1.1 "Adverse conditions" mean sea conditions with the following parameters:

Significant wave height h_s , m	Peak wave period T_P , s	Mean wind speed V_w , m/s
5.5	7.0 to 15.0	19.0

JONSWAP sea spectrum with the peak parameter of 3.3 is to be considered for coastal waters.

1.2 The following adverse condition should be applied to ships defined by the following threshold values of ship size.

Ship length, m	Significant wave height h_s , m	Peak wave period T_P , s	Mean wind speed V_w , m/s
Less than 200	4.0	7.0 to 15.0	15.7
$200 \leq L_{pp} \leq 250$	Parameters linearly interpolated depending on ship's length		
More than $L_{pp} = 250$	Refer to paragraph 1.1		

2 Applicability*

2.1 These guidelines should be applied in the case of all new ships of types as listed in table 1 of the appendix required to comply with regulations on energy efficiency for ships according to regulation 21 of MARPOL Annex VI.

2.2 Notwithstanding the above, these guidelines should not be applied to ships with non-conventional propulsion systems, such as pod propulsion.

2.3 These guidelines are intended for ships in unrestricted navigation; for other cases, the Administration should determine appropriate guidelines, taking the operational area and relevant restrictions into account.

* These interim guidelines are applied to ships required to comply with regulations on energy efficiency for ships according to regulation 21 of MARPOL Annex VI during phase 0 and phase 1 (i.e. for those ship types as in table 1 of appendix with a size of equal or more than 20,000 DWT).

3 Assessment procedure

3.1 The assessment can be carried out at two different levels as listed below:

- .1 minimum power lines assessment; and
- .2 simplified assessment.

3.2 The ship should be considered to have sufficient power to maintain the manoeuvrability in adverse conditions if it fulfils one of these assessment levels.

4 Assessment level 1 – minimum power lines assessment

4.1 If the ship under consideration has installed power not less than the power defined by the minimum power line for the specific ship type, the ship should be considered to have sufficient power to maintain manoeuvrability in adverse conditions.

4.2 The minimum power lines for the different types of ships are provided in the appendix.

5 Assessment level 2 – simplified assessment

5.1 The methodology for the simplified assessment is provided in the appendix.

5.2 If the ship under consideration fulfils the requirements as defined in the simplified assessment, the ship should be considered to have sufficient power to maintain manoeuvrability in adverse conditions.

6 Documentation

Test documentation should include at least, but not be limited to, a:

- .1 description of the ship's main particulars;
- .2 description of the ship's relevant manoeuvring and propulsion systems;
- .3 description of the assessment level used and results; and
- .4 description of the test method(s) used with references, if applicable.

APPENDIX

ASSESSMENT PROCEDURES TO MAINTAIN THE MANOEUVRABILITY UNDER ADVERSE CONDITIONS, APPLICABLE DURING PHASE 0 AND PHASE 1 OF THE EEDI IMPLEMENTATION

1 Scope

1.1 The procedures as described below are applicable during phase 0 and phase 1 of the EEDI implementation as defined in regulation 21 of MARPOL Annex VI (see also paragraph 0 – Purpose of these interim guidelines).

2 Minimum power lines

2.1 The minimum power line values of total installed MCR, in kW, for different types of ships should be calculated as follows:

$$\text{Minimum Power Line Value} = a \times (DWT) + b$$

where:

DWT is the deadweight of the ship in metric tons; and
a and *b* are the parameters given in table 1 for tankers, bulk carriers and combination carriers.

Table 1: Parameters a and b for determination of the minimum power line values for the different ship types

Ship type	a	b
Bulk carrier which DWT is less than 145,000	0.0763	3374.3
Bulk carrier which DWT is 145,000 and over	0.0490	7329.0
Tanker	0.0652	5960.2
Combination carrier	see tanker above	

2.2 The total installed MCR of all main propulsion engines should not be less than the minimum power line value, where MCR is the value specified on the EIAPP Certificate.

3 Simplified assessment

3.1 The simplified assessment procedure is based on the principle that, if the ship has sufficient installed power to move with a certain advance speed in head waves and wind, the ship will also be able to keep course in waves and wind from any other direction. The minimum ship speed of advance in head waves and wind is thus selected depending on ship design, in such a way that the fulfilment of the ship speed of advance requirements means fulfilment of course-keeping requirements. For example, ships with larger rudder areas will be able to keep course even if the engine is less powerful; similarly, ships with a larger lateral windage area will require more power to keep course than ships with a smaller windage area.

3.2 The simplification in this procedure is that only the equation of steady motion in longitudinal direction is considered; the requirements of course-keeping in wind and waves are taken into account indirectly by adjusting the required ship speed of advance in head wind and waves.

- 3.3 The assessment procedure consists of two steps:
- .1 definition of the required advance speed in head wind and waves, ensuring course-keeping in all wave and wind directions; and
 - .2 assessment whether the installed power is sufficient to achieve the required advance speed in head wind and waves.

Definition of required ship speed of advance

3.4 The required ship advance speed through the water in head wind and waves, V_s , is set to the larger of:

- .1 minimum navigational speed, V_{nav} ; or
- .2 minimum course-keeping speed, V_{ck} .

3.5 The minimum navigational speed, V_{nav} , facilitates leaving coastal area within a sufficient time before the storm escalates, to reduce navigational risk and risk of excessive motions in waves due to unfavourable heading with respect to wind and waves. The minimum navigational speed is set to 4.0 knots.

3.6 The minimum course-keeping speed in the simplified assessment, V_{ck} , is selected to facilitate course-keeping of the ships in waves and wind from all directions. This speed is defined on the basis of the reference course-keeping speed $V_{ck, ref}$, related to ships with the rudder area A_R equal to 0.9% of the submerged lateral area corrected for breadth effect, and an adjustment factor taking into account the actual rudder area:

$$V_{ck} = V_{ck, ref} - 10.0 \times (A_{R\%} - 0.9) \quad (1)$$

where V_{ck} in knots, is the minimum course-keeping speed, $V_{ck, ref}$ in knots, is the reference course-keeping speed, and $A_{R\%}$ is the actual rudder area, A_R , as percentage of the submerged lateral area of the ship corrected for breadth effect, $A_{LS, cor}$, calculated as $A_{R\%} = A_R / A_{LS, cor} \cdot 100\%$. The submerged lateral area corrected for breadth effect is calculated as $A_{LS, cor} = L_{pp} T_m (1.0 + 25.0 (B_{wl} / L_{pp})^2)$, where L_{pp} is the length between perpendiculars in m, B_{wl} is the water line breadth in m and T_m is the draft a midship in m. In case of high-lift rudders or other alternative steering devices, the equivalent rudder area to the conventional rudder area is to be used.

3.7 The reference course-keeping speed $V_{ck, ref}$ for bulk carriers, tankers and combination carriers is defined, depending on the ratio A_{FW} / A_{LW} of the frontal windage area, A_{FW} , to the lateral windage area, A_{LW} , as follows:

- .1 9.0 knots for $A_{FW} / A_{LW} = 0.1$ and below and 4.0 knots for $A_{FW} / A_{LW} = 0.40$ and above; and
- .2 linearly interpolated between 0.1 and 0.4 for intermediate values of A_{FW} / A_{LW} .

Procedure of assessment of installed power

3.8 The assessment is to be performed in maximum draught conditions at the required ship speed of advance, V_s , defined above. The principle of the assessment is that the required propeller thrust, T in N, defined from the sum of bare hull resistance in calm water R_{cw} , resistance due to appendages R_{app} , aerodynamic resistance R_{air} , and added resistance in waves R_{aw} , can be provided by the ship's propulsion system, taking into account the thrust deduction factor t :

$$T = (R_{cw} + R_{air} + R_{aw} + R_{app}) / (1 - t) \quad (2)$$

3.9 The calm-water resistance for bulk carriers, tankers and combination carriers can be calculated neglecting the wave-making resistance as $R_{cw} = (1+k)C_F \frac{1}{2} \rho S V_s^2$, where k is the form factor, $C_F = \frac{0.075}{(\log_{10} Re - 2)^2}$ is the frictional resistance coefficient, $Re = V_s L_{pp} / \nu$ is the Reynolds number, ρ is water density in kg/m^3 , S is the wetted area of the bare hull in m^2 , V_s is the ship advance speed in m/s , and ν is the kinematic viscosity of water in m^2/s .

3.10 The form factor k should be obtained from model tests. Where model tests are not available the empirical formula below may be used:

$$k = -0.095 + 25.6 \frac{C_B}{(L_{pp}/B_{wl})^2 \sqrt{B_{wl}/T_m}} \quad (3)$$

where C_B is the block coefficient based on L_{pp} .

3.11 Aerodynamic resistance can be calculated as $R_{air} = C_{air} \frac{1}{2} \rho_a A_F V_{w,rel}^2$, where C_{air} is the aerodynamic resistance coefficient, ρ_a is the density of air in kg/m^3 , A_F is the frontal windage area of the hull and superstructure in m^2 , and $V_{w,rel}$ is the relative wind speed in m/s , defined by the adverse conditions in paragraph 1.1 of the interim guidelines, V_w , added to the ship advance speed, V_s . The coefficient C_{air} can be obtained from model tests or empirical data. If none of the above is available, the value 1.0 is to be assumed.

3.12 The added resistance in waves, R_{aw} , defined by the adverse conditions and wave spectrum in paragraph 1 of the interim guidelines, is calculated as:

$$R_{aw} = 2 \int_0^{\infty} \frac{R_{aw}(V_s, \omega)}{\zeta_a^2} S_{\zeta\zeta}(\omega) d\omega \quad (4)$$

where $R_{aw}(V_s, \omega) / \zeta_a^2$ is the quadratic transfer function of the added resistance, depending on the advance speed V_s in m/s , wave frequency ω in rad/s , the wave amplitude, ζ_a in m and the wave spectrum, $S_{\zeta\zeta}$ in m^2/s . The quadratic transfer function of the added resistance can be obtained from the added resistance test in regular waves at the required ship advance speed V_s as per ITTC procedures 7.5-02 07-02.1 and 7.5-02 07-02.2, or from equivalent method verified by the Administration.

3.13 The thrust deduction factor t can be obtained either from model tests or empirical formula. Default conservative estimate is $t = 0.7w$, where w is the wake fraction. Wake fraction w can be obtained from model tests or empirical formula; default conservative estimates are given in table 2.

Table 2: Recommended values for wake fraction w

Block coefficient	One propeller	Two propellers
0.5	0.14	0.15
0.6	0.23	0.17
0.7	0.29	0.19
0.8 and	0.35	0.23

Table 2: Recommended values for wake fraction w

Block coefficient above	One propeller	Two propellers
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3.14 The required advance coefficient of the propeller is found from the equation:

$$T = \rho u_a^2 D_P^2 K_T(J) / J^2 \quad (5)$$

where D_P is the propeller diameter, $K_T(J)$ is the open water propeller thrust coefficient, $J = u_a / n D_P$, and $u_a = V_s(1-w)$. J can be found from the curve of $K_T(J)/J^2$.

3.15 The required rotation rate of the propeller, n , in revolutions per second, is found from the relation:

$$n = u_a / (J D_P) \quad (6)$$

3.16 The required delivered power to the propeller at this rotation rate n , P_D in watt, is then defined from the relation:

$$P_D = 2\pi\rho n^3 D_P^5 K_Q(J) \quad (7)$$

where $K_Q(J)$ is the open water propeller torque coefficient curve. Relative rotative efficiency is assumed to be close to 1.0.

3.17 For diesel engines, the available power is limited because of the torque-speed limitation of the engine, $Q \leq Q_{\max}(n)$, where $Q_{\max}(n)$ is the maximum torque that the engine can deliver at the given propeller rotation rate n . Therefore, the required minimum installed MCR is calculated taking into account:

- .1 torque-speed limitation curve of the engine which is specified by the engine manufacturer; and
- .2 transmission efficiency η_s which is to be assumed 0.98 for aft engine and 0.97 for midship engine, unless exact measurements are available.