

INTERSESSIONAL MEETING ON
CONSISTENT IMPLEMENTATION OF
REGULATION 14.1.3 OF MARPOL ANNEX VI
Agenda item 3

ISWG-AP 1/3/3
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DEVELOPMENT OF DRAFT AMENDMENTS TO MARPOL ANNEX VI

Verification issues and control mechanism and actions

Submitted by Panama, ICS, BIMCO, INTERTANKO, INTERCARGO and WSC

SUMMARY

Executive summary: This document provides draft amendments to Appendix VI of MARPOL Annex VI "fuel verification for MARPOL Annex VI fuel sample" and their rationale following the IMO Secretariat's indicative suggestions to assist ISWG-AP in preparing draft 2020 Guidelines (ISWG-AP1/2). Easy-to-understand, easy-to-implement and uniform verification procedures for both MARPOL samples (representative samples at the time of bunkering) and in-use fuel oil samples will achieve clarity and uniformity across the globe when the 0.50% m/m fuel oil sulphur limit enters into force on 1 January 2020. The document highlights that the amended procedures provide enforcement authorities with verification methods widely accepted in science and engineering disciplines without having to refer to industry standards.

Strategic direction, if applicable: 1

Output: 1.17

Action to be taken: Paragraph 23

Related documents: PPR 5/12/1, PPR 5/13/5, PPR 5/13/9, PPR 5/13/11, PPR 5/13/12; MEPC 72/5/7 and ISWG-AP 1/2

Background

1 MEPC 70 agreed that the effective date of implementation of the fuel oil standard in regulation 14.1.3 of MARPOL Annex VI should be 1 January 2020. At MEPC 71, the Committee further approved a new output on "Consistent implementation of regulation 14.1.3 of MARPOL Annex VI" for inclusion on the PPR Sub-Committee's biennial agenda for the 2018-2019 biennium and the provisional agenda for PPR 5, with a target completion year of 2019.

2 PPR 5 agreed to convene an intersessional meeting of the Sub-Committee. The Intersessional Meeting on Consistent implementation of regulation 14.1.3 of MARPOL Annex VI was instructed to develop the following amendments to MARPOL Annex VI with an entry into force in summer 2021:

- .1 definition of "Sulphur content" (amendments to regulation 2); and
- .2 testing and verification procedure of in-use fuel oil samples (amendments to regulation 14 and associated consequential amendments to regulation 18 and appendix VI), as set out in annex 5 to document PPR 5/WP.6.

3 MEPC 72 authorized the Intersessional Meeting on Consistent implementation of regulation 14.1.3 of MARPOL Annex VI to be held between 9 to 13 July 2018, and instructed to report its outcome concerning the development of draft amendments to MARPOL Annex VI on fuel oil sulphur content verification to PPR 6 (February 2019) for consideration.

Discussion

4 This document aims to assist enforcement authorities verify whether or not the sulphur content of a fuel oil sample meets the limits set out in regulation 14 of MARPOL Annex VI in a uniform manner across the globe.

5 The co-sponsors fully support the timely implementation of the 0.50% m/m global sulphur limit on 1 January 2020 and welcome the resulting significant reduction in sulphur emissions to the atmosphere from the world fleet.

6 It is imperative that the shipping industry is provided with measures to ensure consistent implementation of the 0.50% m/m global sulphur limit. In particular, from regulatory, practical and statistical viewpoints, cosponsors believe that robust sulphur content testing and verification procedures should be put in place, yielding consistent results without areas of ambiguity and complexity.

7 Fuel oil sampling, testing and verification are three different activities with their own distinctive features. These three activities are well described in paragraph 4.7.13 of the *Guidance on best practice for fuel oil purchasers/users for assuring the quality of fuel oil used onboard ships* (MEPC 72/WP.8, annex 2):

"4.7.13 While a fuel oil purchaser/user may choose to use ISO 13739, ISO 4259, or some other testing protocol, it should be remembered that MARPOL Annex VI sets out the procedures for compliance and enforcement, including Appendix VI fuel oil verification procedure for MARPOL Annex VI fuel oil samples; also, MEPC.182(59) for fuel oil sampling, and the Guidelines for onboard sampling for the verification of the sulphur content of the fuel oil used on board ships (MEPC.1/Circ.864). If a different test or a different accreditation is desired, it can be specified in the fuel oil purchase contract itself. However, that contract will not over-ride the requirements of MARPOL Annex VI with respect to determining compliance with the mandatory standards in a compliance or enforcement action brought by a flag, port, or coastal State."

8 Documents PPR 5/13/11 and PPR 5/13/12 (INTERTANKO) provide an analysis of reported verification cases where:

- .1 marginal exceedances of the sulphur content limit (0.10% m/m) led to non-compliance verifications; and
- .2 the lack of uniformity in decimal placing and rounding led to non-compliance verifications, highlighting the need to establish uniformly agreeable and workable verification procedures for both MARPOL samples and in-use fuel oil samples.

The referenced documents further provide possible ways forward to address the concerns raised.

9 Documents PPR 5/13/9 (IBIA) and MEPC 72/5/7 (China) propose an alternative solution to address the same concerns by adding a new definition of sulphur content in regulation 2 of MARPOL Annex VI.

10 This document first comments on documents PPR 5/13/9 and MEPC 72/5/7, and further elaborates possible solutions based on documents PPR 5/13/11 and PPR 5/13/12 in greater detail.

Proposal to add a definition of "sulphur content" in regulation 2 of MARPOL Annex VI

11 Document PPR 5/13/9 proposes adding a definition of sulphur content in regulation 2 of MARPOL Annex VI to ensure the analysis of sulphur content is done in a uniform way and further proposes that the test method shall be the latest edition of ISO 8754 as mandatory. Document MEPC 72/5/7 (China) further proposes including ISO 14596:2007 in the test methods of sulphur content for both MARPOL samples and in-use fuel oil samples. These documents have been forwarded to the Intersessional Meeting for consideration.

12 In the commercial world, ISO test methods are normally accepted. ISO 8217, which specifies the requirements for fuels for use in marine diesel engines and boilers and provides purchasers with different grades of residual fuels and distillates, determines ISO 8754 as the reference test method for sulphur contents. In case of disputes of not only sulphur but also other properties such as viscosity, density and flash points, ISO 4259 should be used, which covers the use of precision data in interpretation of test results.

13 Concerning the proposal to make ISO 8754:2003 or ISO 14596:2007 mandatory under MARPOL Annex VI as the test method of sulphur content of fuel oil, it is noted that:

- .1 ISO 8754 covers the sulphur content ranging from 0.030% m/m to 5.00% m/m;
- .2 ISO 14596 covers the sulphur content ranging from 0.001% m/m to 2.50% m/m; and
- .3 as China indicated in MEPC 72/5/7, some fuel oils delivered to ships had a sulphur content lower than 0.030 % m/m in which case the ISO 14596 test method would have more accurately recorded the sulphur content of such fuel oils.

As reported in document MEPC 72/WP.1, paragraph 5.11, for the purpose of compliance verification by enforcement authorities, the test range of ISO 8754 meets all the regulatory requirements as 0.030% m/m is well below 0.10% m/m, which is the lowest sulphur limit covered by regulation 14 of MARPOL Annex VI. For this reason, the co-sponsors consider that the ISO 8754 test method alone or equivalent is sufficient when testing various fuel oil samples and verifying their compliance with MARPOL Annex VI sulphur limits.

14 However, the complexity of the subject lies in the fact that at present, ISO test methods are referenced in MARPOL Annex VI in various forms of language, making it difficult for ship operators and PSC authorities to understand the overall picture. For example, ISO 4259, which is referenced by ISO 8754 which is then included in a footnote to appendix V (Bunker Delivery Note), takes an approach that in any two or more test measurements of the same property of the same sample by any test method would not usually give exactly the same result. This approach is reflected in the current appendix VI of MARPOL Annex VI in a different form of language.

15 Document MEPC 57/4/37 (ICS) discusses that duplication of the ISO standard in MARPOL Annex VI is bound to create long-term alignment problems between the two organizations, to confuse suppliers and customers and ultimately inhibit compliance with the amended Annex VI.

16 The co-sponsors therefore believe that codifying the best workable verification procedures using clear and unambiguous language within the regulatory regime will best serve the purposes of fuel suppliers, fuel users/purchasers, test laboratories, Member States and port/coastal States. This approach would also eliminate the need to take into consideration documents that are only available in the commercial marketplace.

Proposal to unify verification procedures for MARPOL samples and in-use fuel oil samples

17 Document MEPC 71/5/9 (China) points out that no harmonized test method and verification procedures for sulphur content have been developed for in-use fuel oil samples, and suggests that appendix VI of MARPOL Annex VI should also be applied to verification of in-use fuel oil samples. Document PPR 5/13/11, whilst recognizing that the proposal was logical in closing the gap in MARPOL Annex VI, raises concerns that it does not mirror the complexities in the verification methods specifying criteria of non-compliance. This situation arises because the verification procedures set forth in appendix VI of MARPOL Annex VI was not widely applied in practice. Document PPR 5/13/12 confirms the same finding.

18 A simple uniform application of the current appendix VI of MARPOL Annex VI to both MARPOL samples and in-use fuel oil samples, without addressing the wide acceptability of the verification procedures, would not mitigate inconsistent interpretations. This has led the co-sponsors to conclude that:

- .1 appendix VI of MARPOL Annex VI should be amended in such a way that it is easily understood and widely applied without quoting industry standards; and
- .2 the so amended Appendix VI is made uniformly applicable to both MARPOL samples and in-use fuel oil samples.

19 To achieve the second item of the above two objectives, the co-sponsors propose draft amendments to regulation 14.5 of MARPOL Annex VI bearing in mind the non-mandatory nature of MEPC.1/Circ.864. The missing link between regulation 18 of MARPOL Annex VI and MEPC.1/Circ.864 is also addressed. An additional observation about the expression "an Administration" is also provided. The proposed draft amendments may be found in annex 1 to this document.

Proposal to amend appendix VI of MARPOL Annex VI

20 Document PPR 5/13/12 discusses the need to have an acceptable range below and above the absolute limit or true value according to ISO 4259. The usual approach adopted is in terms of 95% confidence, i.e. that a single test result either satisfies or does not satisfy the specified limit. This means that in 95% of all measurements, the true value of sulphur content of a given sample will be within the confidence interval (e.g. between the upper limit and the lower limit), as shown in table 1.

Table 1: Comparison between appendix VI and ISO 4259/8754

Limit in regulation14 (% m/m)	Sulphur test result per ISO 8754	
	Lower limit (% m/m)	Upper limit (% m/m)
0.50	0.47	0.53
0.10	0.090	0.11

21 In the shipping industry, it is an acceptable practice recommended by ISO 4259 and the relevant CIMAC Guidelines¹ that ship operators are advised, at the time of their bunker procurement, to request the bunker suppliers to target a lower acceptance limit of the required sulphur content. In the case of 0.10% m/m sulphur requirement, the target is min. 0.090% m/m for the supplied fuel sulphur content, rather than the upper limit, 0.11% m/m, or the absolute limit. Likewise, for the 0.50% m/m sulphur content limit, the target for the bunker suppliers should be 0.47% m/m.

22 With this approach in mind, and as discussed in the foregoing paragraph 19, the co-sponsors believe that the best way forward would be to amend appendix VI of MARPOL Annex VI as follows:

- .1 simplify the verification procedures by deleting the second stage (see stage 2 of figure 1 below), thereby adopting a single test result and subsequent verification;
- .2 separate test and verification procedures for MARPOL samples and in-use fuel oil samples. See below figure 2 and figure 3 respectively; and
- .3 include a reporting protocol of decimal placing and rounding.

¹ The Interpretation of Marine Fuel Oil Analysis Test Results with Particular Reference to Sulphur Content.

The proposed amendments still keep the principles of Reproducibility (R) and repeatability (r).

Figure 1: Appendix VI currently in force

**MARPOL Annex VI
Appendix VI
for MARPOL sample**
(using 0.50% limit for illustration purposes)

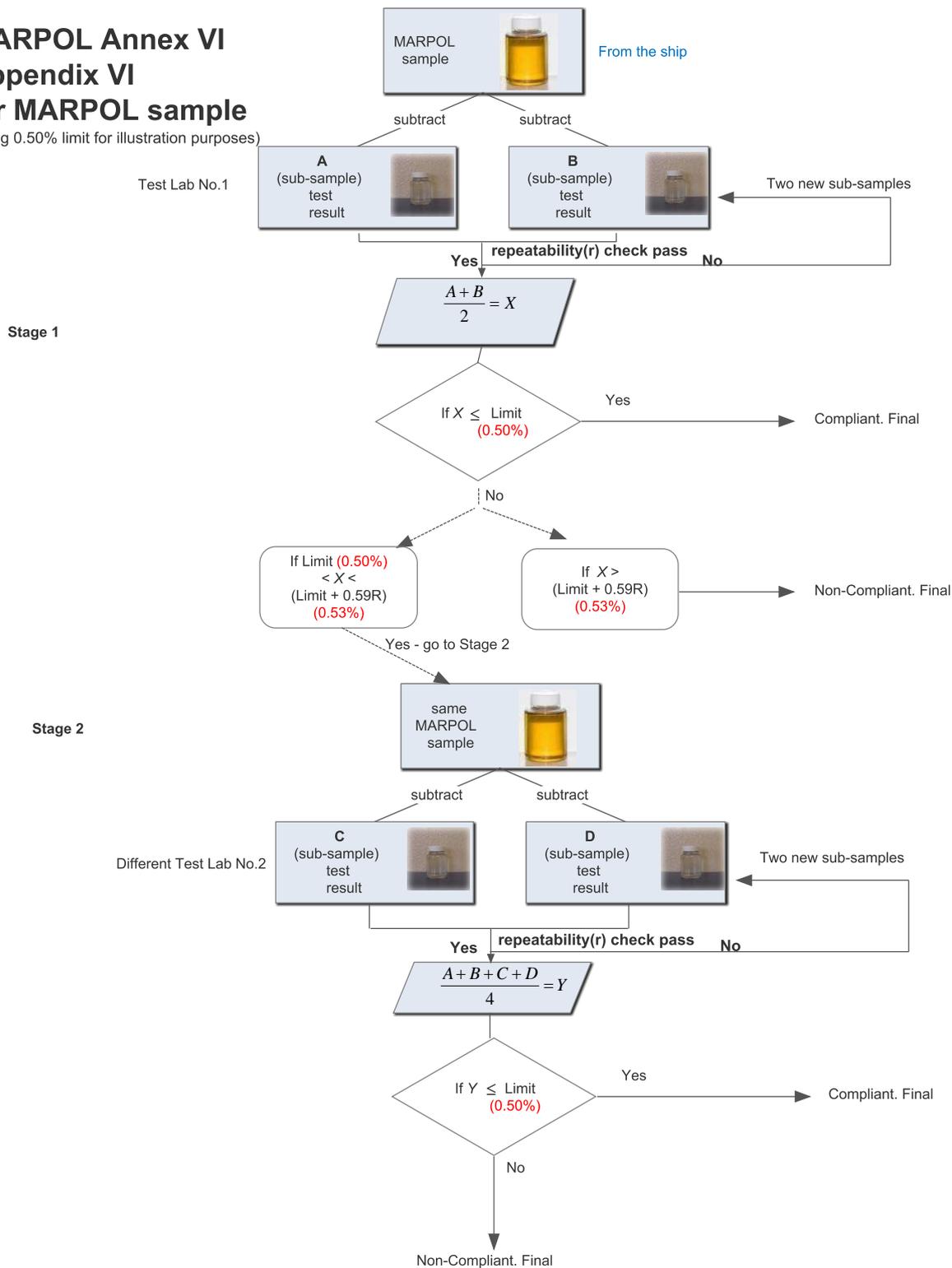


Figure 2: Proposed test and verification procedures for MARPOL sample

**MARPOL Annex VI
Appendix VI
for MARPOL sample**
(using 0.50% limit for illustration purposes)

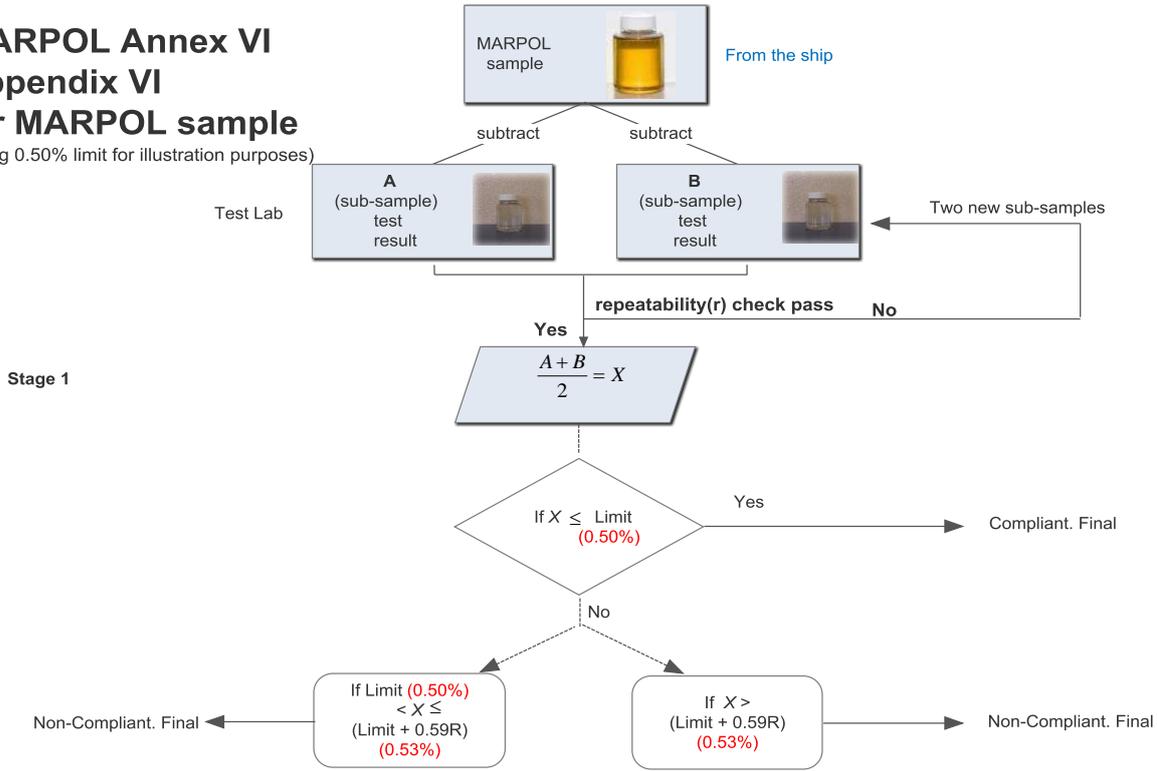
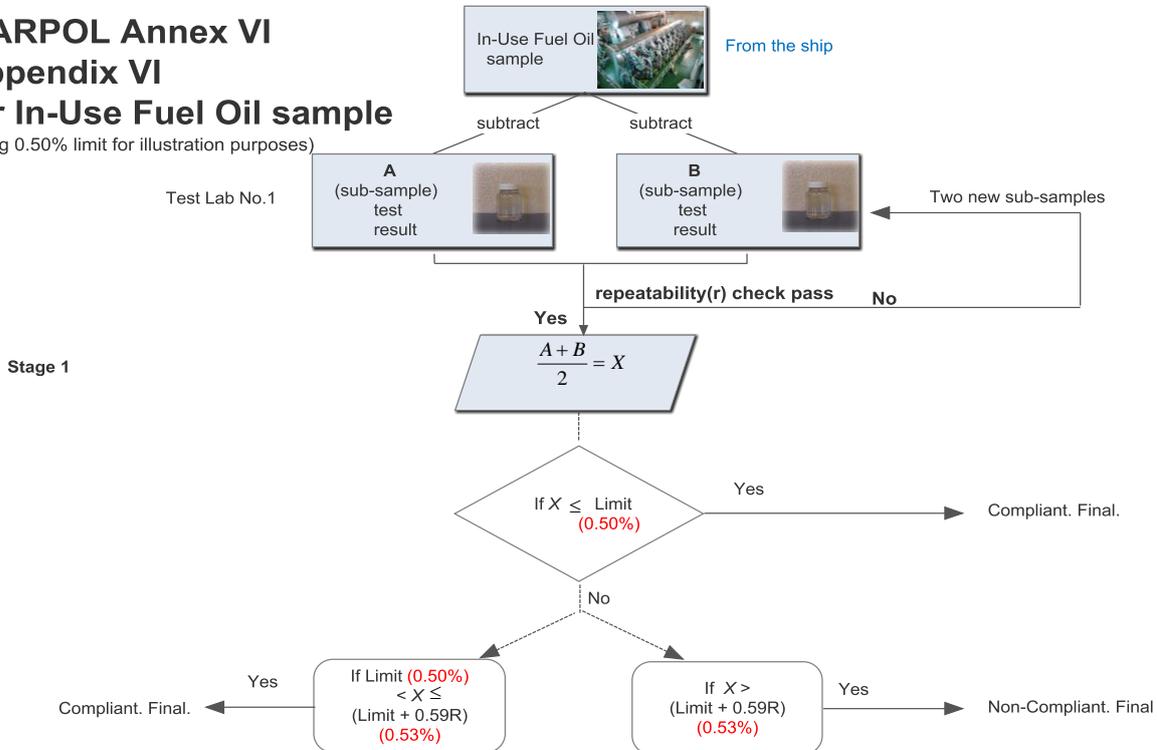


Figure 3: Proposed test and verification procedures for In-Use Fuel Oil sample

**MARPOL Annex VI
Appendix VI
for In-Use Fuel Oil sample**
(using 0.50% limit for illustration purposes)



A complete set of draft amendments to appendix VI of MARPOL Annex VI is contained in annex 2 to this document.

Action requested of the Intersessional Meeting

23 The Intersessional Meeting is invited to consider the draft amendments to regulation 14.5 and appendix VI of MARPOL Annex VI proposed in this document and take action as appropriate.

References:

- The ISO Guide to the Expression of Uncertainty in Measurement (GUM)
- ISO 4259, Petroleum products – determination and application of precision data in relation to methods of test
- ISO 8754, determination of sulphur content – energy dispersive X-ray fluorescence spectrometry
- ISO 80000-1, Quantities and units
- ISO 5725-1, Accuracy (trueness and precision) of measurement methods and results
- CIMAC 2014 Guidelines – the interpretation of marine fuel oil analysis test results with particular reference to sulphur content

ANNEX 1

DRAFT AMENDMENT TO REGULATION 14.5 OF MARPOL ANNEX VI

(Proposed amendments are shown in additions/~~deletions~~)

Regulation 14

Sulphur Oxides (SO_x) and Particulate Matter

Requirements within Emission Control Areas

14.5 The sulphur content of fuel oil referred to in paragraph 1 and paragraph 4 of this regulation shall be documented by its supplier as required by regulation 18 of this Annex.

If an Administration requires the in-use fuel oil sample to be analysed, it shall be done in accordance with the verification procedure set forth in appendix VI to determine whether the fuel oil being used meets the requirements of this Annex.

The sample of such fuel oil being used onboard the ship shall be taken taking into account the guidelines developed by the Organization*.

* MEPC.1/Circ.864, "Guidelines for onboard sampling for the verification of the sulphur content of the fuel oil on board ships".

Note: The co-sponsors note that document PPR 5/13/5 discusses shortcomings of the expression "an Administration" in MARPOL Annex VI and appendix VI. It proposes to clarify that port States can require a MARPOL sample to be analysed under given circumstances. Though this is beyond the scope of this document, the co-sponsors consider that it could be addressed by amending the related 2009 Guidelines for port state control under the revised MARPOL Annex VI (resolution MEPC.181(59)) by [requiring][recommending] that port States that require a sample to be analysed also have it done in accordance with the verification procedures in appendix VI.

Paragraphs 13 and 14 of PPR 5/13/5 read as follows:

13 The Convention refers to "an Administration" (as opposed to the usual term "the Administration") that can potentially require the representative sample to be analysed in accordance with the verification procedure set forth in appendix VI to MARPOL Annex VI. This procedure is, however, not widely applied in practice. The fact that the Convention refers to "an Administration" has led to a lack of clarity if a port State authority (or only the flag State) can require the MARPOL sample to be analysed without consent from the flag State. This could be relevant in cases where PSC has reasons to believe that the BDN is not representative of the fuel oil delivered to the ship from January 2020, or in cases of potential fuel contamination between two fuel grades.

14 It is necessary to clarify that port States can require a MARPOL sample to be analysed under given circumstances (i.e., if there is evidence or indications of fuel oil supplier delivering non-compliant fuel). This could be formalized through an MEPC circular.

ANNEX 2

(Proposed amendments are shown as additions/deletions.)

Appendix VI

Fuel verification procedure for MARPOL Annex VI fuel oil samples (regulation 14.5, regulation 18.8.2)

"The following verification procedure shall be used to determine whether the sulphur content of ~~the~~ fuel oil delivered to ~~or~~ and the fuel oil used onboard ~~ships~~ a ship ~~are~~ is compliant with the sulphur limits required by regulation 14 of Annex VI.

1 General Requirements

1.1 The representative fuel oil sample, which is required by paragraph 8.1 of regulation 18 (the "MARPOL sample") shall be used to verify the sulphur content of the fuel oil ~~supplied~~ delivered to a ship.

1.2 The in-use fuel oil sample, when required by paragraph 5 of regulation 14, shall be used to verify the sulphur content of the fuel oil being used on board a ship.

~~1.2 An Administration, through its competent authorities, shall manage the verification procedure.~~

1.3 The laboratories ~~responsible for the verification procedure~~ responsible for the testing procedure set forth in this appendix shall be fully accredited¹⁾ for the purpose of conducting the tests.

1.4 An Administration, through its competent authority, shall conduct the verification of the sulphur content following the verification procedures set forth in this appendix based on the results of the test analysis submitted by the accredited laboratories.

2 Verification procedure for MARPOL sample stage 1

2.1 The MARPOL sample²⁾ shall be delivered by the competent authority to the laboratory.

2.2 The laboratory shall:

- .1 record the details of the seal number and the sample label on the test record;
- .2 confirm that the condition of the seal on the MARPOL sample has not been broken; and
- .3 reject any MARPOL sample where the seal has been broken.

¹⁾ Accreditation is in accordance with ISO 17025 or an equivalent standard.

²⁾ A MARPOL sample should be drawn and handled in accordance with the Guidelines developed by the Organization (resolution MEPC.182(59) as amended).

2.3 If the seal of the MARPOL sample has not been broken, the laboratory shall proceed with the verification procedure and shall:

- .1 ensure that the MARPOL sample is thoroughly homogenized;
- .2 draw two sub-samples from the MARPOL sample; and
- .3 reseal the MARPOL sample and record the new reseal details on the test record.

2.4 The two sub-samples shall be tested in succession, in accordance with the specified test method referred to in Appendix V³⁾. For the purposes of this verification procedure, the results of test analysis shall be referred to as "A" and "B":

- .1 If the results of "A" and "B" are within the repeatability (r)⁴⁾ of the test method, the results shall be considered valid.
- .2 If the results of "A" and "B" are not within the repeatability (r) of the test method, both results shall be rejected and two new sub-samples ~~shall~~ should be taken by the laboratory and analysed. The sample bottle ~~shall~~ should be resealed in accordance with paragraph 2.3.3 above after the new sub-samples have been taken.

2.5 If the test results of "A" and "B" are valid, an average of these two results should be calculated thus giving the result referred to as "X":

- .1 If the result of "X" is equal to or falls below the applicable limit required by Regulation 14.1 or 14.4 of Annex VI, the fuel oil shall be ~~deemed to meet~~ considered compliant with the requirements.
- .2 If the result of "X" is greater than the applicable limit required by Regulation 14.1 or 14.4 of Annex VI, the fuel oil shall be considered non-compliant with the requirement and no further testing is necessary. ~~Verification Procedure Stage 2 should be conducted; however, if the result of "X" is greater than the specification limit by 0.59R (where R is the reproducibility of the test method), the fuel oil shall be considered non-compliant and no further testing is necessary.~~

³⁾ Fuel oil sample shall be tested in accordance with the ISO 8754:2003.

⁴⁾ The lower case "r" means repeatability of the test method according to ISO 4259 as amended. It is the closeness of agreement, usually found, between independent results obtained in the normal and correct operation of the same method on identical test material, in a short interval of time, and under the same test conditions (same operator, same apparatus, same calibration standard and same laboratory).

3 Verification procedure for in-use fuel oil sample Stage-2

3.1 The ~~MARPOL~~ in-use fuel oil sample⁵⁾ shall be delivered by the competent authority to the laboratory.

3.2 The laboratory shall:

- .1 record the details of the seal number and the sample label on the test record;
- .2 confirm that the condition of the seal on the ~~MARPOL~~ in-use fuel oil sample has not been broken; and
- .3 reject any ~~MARPOL~~ in-use fuel oil sample where the seal has been broken.

3.3 If the seal of the MARPOL sample has not been broken, the laboratory shall proceed with the verification procedure and shall:

- .1 ensure that the ~~MARPOL~~ in-use fuel oil sample is thoroughly homogenized;
- .2 draw two sub-samples from the ~~MARPOL~~ in-use fuel oil sample; and
- .3 reseal the ~~MARPOL~~ in-use fuel oil sample and record the new reseal details on the test record.

3.4 The two sub-samples shall be tested in succession, in accordance with the specified test method referred to in Appendix V³⁾. For the purposes of this verification procedure, the results of test analysis shall be referred to as "A" and "B":

- .1 If the results of "A" and "B" are within the repeatability (r)⁴⁾ of the test method, the results shall be considered valid.
- .2 If the results of "A" and "B" are not within the repeatability (r) of the test method, both results shall be rejected and two new sub-samples ~~shall should~~ be taken by the laboratory and analysed. The sample bottle ~~shall should~~ be resealed in accordance with paragraph 3.3.3 above after the new sub-samples have been taken.

⁵⁾ An in-use fuel oil sample should be drawn and handled in accordance with the Guidelines developed by the Organization (Circular MEPC.1/Circ.864 as amended).

3.5 If the test results of "A" and "B" are valid, an average of these two results should be calculated thus giving the result referred to as "X":

- .1 If the result of "X" is equal to or falls below the applicable limit required by Regulation Annex VI, the fuel oil shall be considered compliant with the requirements.
- .2 If the result of "X" is greater than the applicable limit required by regulation 14.1 or 14.4 of Annex VI but equals to or falls below the applicable limit plus $0.59R^6$ (where R is the reproducibility of the test method), the fuel oil shall still be considered compliant with the requirement and no further testing is necessary.
- .3 If the result of "X" is greater than the applicable limit plus $0.59R$, the fuel oil shall be considered non-compliant with the requirement and no further testing is necessary.

~~3.1 If stage 2 of the verification procedure is necessary in accordance with paragraph 2.5.2 above, the competent authority shall send the MARPOL sample to a second accredited laboratory.~~

~~3.2 Upon receiving the MARPOL sample, the laboratory shall:~~

- ~~.1 record the details of the reseal number applied in accordance with 2.3.3 and the sample label on the test record;~~
- ~~.2 draw two sub-samples from the MARPOL sample; and~~
- ~~.3 reseal the MARPOL sample and record the new reseal details on the test record."~~

~~3.3 The two sub-samples shall be tested in succession, in accordance with the test method specified in appendix VI. For the purposes of this verification procedure, the results of the test analysis shall be referred to as "C" and "D":~~

- ~~.1 If the results of "C" and "D" are within the repeatability (r) of the test method, the results shall be considered valid.~~
- ~~.2 If the results of "C" and "D" are not within the repeatability (r) of the test method, both results shall be rejected and two new sub-samples shall be taken by the laboratory and analysed. The sample bottle should be resealed in accordance with paragraph 3.2.3 after the new sub-samples have been taken.~~

⁶⁾ The upper case, R, the Reproducibility of the test method according to ISO 4259 as amended. It is the closeness of agreement, usually found, between individual results obtained in the normal and correct operation of the same method on identical test material but under different test conditions (different operators, different apparatus, different calibration standards and different laboratories).

~~3.4 If the test results of "C" and "D" are valid, and the results of "A", "B", "C", and "D" are within the reproducibility (R) of the test method then the laboratory shall average the results, which is referred to as "Y":~~

~~.1 If the result of "Y" is equal to or falls below the applicable limit required by Annex VI, the fuel oil shall be deemed to meet the requirements.~~

~~.2 If the result of "Y" is greater than the applicable limit required by Annex VI, then the fuel oil fails to meet the standards required by Annex VI.~~

~~3.5 If the result of "A", "B", "C" and "D" are not within the reproducibility (R) of the test method then the Administration may discard all of the test results and, at its discretion, repeat the entire testing process.~~

~~3.6 The results obtained from the verification procedure are final.~~

4 Reporting protocol

Test results in the range between 0.10% m/m and 5.00% m/m and those in the range between 0.030 % m/m and 0.099 % m/m shall be reported to 2 decimal placing and 3 decimal placing respectively.

The following principles for rounding apply:

- The greater in magnitude multiple is selected as the rounded number if the last digit is ≥ 5 ; and
 - The lower in magnitude multiple is selected as the rounded number if the last digit is < 5 .
-