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Agenda item 4

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## GOAL-BASED NEW SHIP CONSTRUCTION STANDARDS

### Comments on document MSC 109/4/1

#### Submitted by IACS

#### SUMMARY

*Executive summary:* This document comments on document MSC 109/4/1 (Secretary-General) containing the final audit report on the revision 2 of IACS Recommendation 34 "Standard Wave Data" (IACS Rec.34/Rev.2), which intended to address IACS/2015/FR1-8/OB/02.

*Strategic direction, if applicable:* 7

*Output:* 7.24

*Action to be taken:* Paragraph 7

*Related documents:* MSC 96/5, MSC 96/5/1/Add.1; MSC 109/4/1 and resolution MSC.454(100)

#### Introduction

1 On 18 September 2023, a request on behalf of IACS members was submitted to the Secretary-General for an independent GBS audit outside the three-year cycle, concerning the revision of IACS Recommendation 34 "Standard Wave Data" (IACS Rec 34/Rev.2), which intended to address IACS/2015/FR1-8/OB/02. The request was made pursuant to paragraph 27.6 of resolution MSC.454(100) on *Revised guidelines for verification of conformity with goal-based ship construction standards for bulk carriers and oil tankers* (Revised GBS Guidelines).

#### Discussion

2 IACS appreciates the arrangement put in place by the Secretary-General to conduct the GBS audit of revision 2 of IACS Rec.34 and the work done by the Audit Team in a short period of time. IACS is also grateful to the Audit Team, in the framework of the Revised GBS Guidelines, for providing an opportunity to comment on the interim audit report.

3 Having carefully reviewed the final audit report contained in document MSC 109/4/1, IACS would like to make the following general comments, while the more detailed technical comments are provided in the annex.

***General comments on the recommendations in the final GBS audit report***

4 In general, IACS accepts the recommendations stated in section 3 of the final GBS audit report (annex to document MSC 109/4/1).

5 In particular, as recommended in paragraph 3.1.3 of the audit report (annex to document MSC 109/4/1), IACS agrees to develop a new revision of IACS Rec.34 which will contain more detailed information about the assumptions, the synchronization process and the statistical modelling adopted to derive the wave data, accompanied by a more comprehensive technical background document.

6 Furthermore, as recommended in paragraphs 3.1.4 and 3.2 of the audit report (annex to document MSC 109/4/1), IACS agrees that the following audit on a new revision of IACS Rec.34 will be carried out in conjunction with consequential rule changes in CSR for which IACS will submit a full package in due course. The package will also include a consequence assessment and hull scantling benchmarking report.

**Action requested by the Committee**

7 The Committee is invited to note the comments in the paragraphs above and to take action, as appropriate.

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## ANNEX

### COMMENTS ON THE DETAILED INFORMATION STATED IN SECTION 4 OF THE AUDIT REPORT (ANNEX TO DOCUMENT MSC 109/4/1)

1 Paragraph 4.2 of the audit report (annex to document MSC 109/4/1) states: "Therefore, the interpretation and application of the obtained information in rule development should be carried out by duly considering the data origin and the elaboration process adopted to obtain the data presented in IACS Rec.34/Rev.2."

IACS would like to mention that Rec.34/Rev.2 forms a very similar basis for the development of rule (load) requirements as does Rec.34/Rev.1.

2 Paragraph 4.4 of the audit report (annex to document MSC 109/4/1) states: "However, as long as such approach follows underlying design criteria, i.e. the effects of ships operation embedded in wave data, it runs the risk that it may be interpreted *prima facie*, i.e. as "representative of North Atlantic environmental conditions". Therefore, the underlying principle of IACS Rec.34/Rev.2 should be made clearer and more transparent in the technical background documentation, as well as in IACS Rec.34 next revision for the benefit of all the shipping community stakeholders."

In this regard, IACS would like to clarify that there are no other operational limitations for ships than before and as given in the Tier I goal of the *International goal-based ship construction standards for bulk carriers and oil tankers*, as adopted by resolution MSC.287(87) and as implemented in SOLAS regulation II-1/3-10. However, the purpose, application and possible limitations of Rec.34/Rev.2 can be made clearer and more transparent, as proposed by the auditors. Furthermore, ship operation was also embedded in the wave data used in Rec.34/Rev.0 and Rev.1. The purpose of the recommendation is described in paragraph 1 of Rec.34/Rev.2 restricting the application to seagoing ships of length 90 m and greater in unrestricted service. Therefore, the risk of misinterpretation of application of the scatter diagram in Rec.34/Rev.2 is already limited.

3 Paragraph 4.5 of the audit report (annex to document MSC 109/4/1) states: "However, although numerical hindcast data have been validated with buoys and altimeter data, some uncertainties remain."

In this regard, IACS would like to comment that some extent of uncertainties remains in all engineering assumptions. As mentioned in the previous sentence of the interim report the hindcast model provides more accurate wave characteristics than human eyeball observations from ships. The uncertainties compared to the previous data and wave scatter diagram are obviously reduced.

4 Paragraph 4.6.4 of the audit report (annex to document MSC 109/4/1) states: "However, the figure mentioned in paragraph 4.6.3 above shows that Rev.1 and the "unrouted scatter diagram" yield similar significant wave heights in quite a large range of return periods. It might be concluded that the less severe sea states of the NA definition adopted by the "unrouted scatter diagram" yield an effect comparable to the ships' operation effects in Rev.1, at least for the highest wave heights."

With respect to this conclusion, IACS would like to provide the following background:

- .1 The visual observations (known as Global Wave Statistics (GWS)) were originally classed regarding the wave heights and the highest class includes waves above 11-12 m in height, indicating that observed wave heights beyond 12 m were summed up in this class. For the purpose of the scatter diagram of Rec.34/Rev.1 the wave heights for waves higher than 11-12 m were extrapolated. It is not clear if this extrapolation was reflecting the observed wave heights. Therefore, especially for the highest wave heights in Rec.34/Rev.1, comparisons should be taken with care. Please refer to the background for IACS Rec.34/Rev.1 included in TB report Rep\_Pt1\_Ch04\_Sec06 Re-examination of the Environmental Data for use in CSR-H.
- .2 In addition, Rec.34/Rev.1 still includes sea states that are violating the breaking criterion, i.e. unrealistic sea states, that should not be included in comparisons.
- .3 The difference in mean wave height between the scatter diagram based on the northern polygon and the finally selected polygon is 30 cm; the difference in the extreme loads for these two different areas is only 3% which makes it very unlikely that the "less severe sea states" of the NA definition adopted by the "unrouted scatter diagram" will have an effect comparable to bad weather avoidance.

5 Paragraph 4.6.5 of the audit report (annex to document MSC 109/4/1) states: "...However, the magnitude of this impact was not assessed. Anyway, the qualitative analysis from the figure mentioned above shows that Rev.2 yields a significant reduction of extreme values in relation to Rev.1. Thus, it might be concluded that this is due to the combination of the NA extension and the aforementioned "synchronizing process" to account for bad weather avoidance and clustering of ships around specific trading routes ("ships' operation effects")."

In this regard, IACS would like to point out that Rec.34/Rev.2 is based on the same principles as Rec.34/Rev.1 but the change that was made is the data used, thereby improving data quality. A quantitative evaluation of the effect of the data quality is a comprehensive task that was not considered necessary considering the efforts to provide more information on the background of Rec.34/Rev.1, which will not be used in future. However, based on the above, the conclusion that the diminution is caused by "the combination of the NA extension" and the aforementioned "synchronizing process" to account for bad weather avoidance and clustering of ships around specific trading routes ("ships' operation effects"), is considered misleading, as the effect on data uncertainty in Rec.34/Rev.1 might be considerable. It needs to be noted that the so-called "synchronizing process" is implicitly included in the data of Rec.34/Rev.1.

6 Paragraph 4.6.8 of the audit report (annex to document MSC 109/4/1) states: "Thus, this relatively short period of time (seven years) could result in a non-conservative approach for estimating ship response in high return periods."

To avoid this effect, IACS investigated the environmental conditions using different time periods. The period considered for Rec.34/Rev.2 reflects quite harsh environmental conditions compared to longer periods. It is therefore more likely that the selected data are more conservative than non-conservative as also described in the Technical Background document.

7 Paragraph 4.6.8 of the audit report (annex to document MSC 109/4/1) states: "... concluded that, depending on the vessel and response type, the extreme loads may be reduced from 10% to 30% in relation to Rev.1 scatter diagram."

This is only true for direct load assessment, but not for rule requirements. Many of the current load requirements were developed before the publication of Rec.34/Rev.1. Furthermore, the impact on the rule loads will be quite different from what was reported in the referenced report and the rule loads will rather increase than decrease. IACS agrees that a special focus of the next audit should be on the consequence assessment and hull scantling benchmarking.

8 Paragraph 4.6.9 of the audit report (annex to document MSC 109/4/1) states: "However, due to the relatively short period of the sample, there is a significant probability of missing any or several of these events in the long-term statistics, as the return period of certain extreme events is rather longer than seven years and no statistical correlation (or independency) between AIS synchronized wave data has been outlined. Hence, no evidence was found in the audit on how these matters were included in IACS Rec.34/Rev.2, benchmarking and validating the aforementioned conclusion."

In this regard, IACS would like to clarify that, as the data cover all ships and all events during the selected period within the selected area, the listed events are represented in the data when they occurred. IACS would like to mention that the coverage of these events is not related to the time duration (number of years), but to the amount of available data. As the data reflect about 4,500 ship-years, these events are represented in the data with their statistical probability of occurrence. Furthermore, these events are the same way represented as in the data before, based on visual observations and used for the development of Rec.34/Rev.1.

9 Paragraph 4.7 of the audit report (annex to document MSC 109/4/1) states: "It is understood that there is not a one-to-one correspondence between the annual probability of exceeding a given sea state and the annual probability of the expected maximum response in that sea. However, for design purposes, due consideration of uncertainties needs to be taken individually on both sides: "structural capacity" and "environmental actions". The information contained in IACS 34 Rev.2 refers to basic input to evaluate the demand (i.e. motions and loads). Therefore, the scope of the present audit was limited accordingly."

It is understood that the scope of the audit was limited and the final impact on the loads could not be considered during the audit. Consequential rule changes to the CSR as a result of Rec.34/Rev.2 will be submitted for GBS verification in due time as a full package in order to assess their conformity to the Standards.

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