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AMENDMENTS TO THE IGF CODE AND DEVELOPMENT OF GUIDELINES FOR ALTERNATIVE FUELS AND RELATED TECHNOLOGIES

Comments on document CCC 11/3 (Norway) – part 3

Submitted by IACS

SUMMARY

Executive summary:	This document provides the third set of comments by IACS on annex 1 of document CCC 11/3 (Norway) as regards the development of the interim guidelines for the safety of ships using hydrogen fuels.
Strategic direction, if applicable:	2
Output:	2.3
Action to be taken:	Paragraph 24
Related document:	CCC 11/3

Introduction

1 This document is submitted in accordance with the provisions of paragraph 6.12.5 of the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.5/Rev.6) and comments on annex 1 of document CCC 11/3 (Norway) which contains the draft interim guidelines for safety of ships using hydrogen fuels (hereafter referred to as the "draft interim guidelines"). All references are with regard to the draft interim guidelines unless otherwise mentioned.

Discussion and proposals

Comments on section 12

2 It is suggested to include the following provision in section 12.3:

> "The properties of hydrogen contributing to explosion risks need to be considered in the risk assessment required by paragraph 4.2.1 of these interim guidelines."

3 As regards paragraph 12.3.1, it should be clarified that the evaluation of risks due to explosion should be in quantitative terms. Proposed revision to paragraph 12.3.1 is as follows:*

> "12.3.1 ~~An~~ quantitative explosion risk analysis (ERA) of the ship should be carried out to evaluate the risks of explosions in detail…"

4 Paragraph 12.3.5 is suggested to be deleted as this will anyway be considered and be part of a quantitative ERA.

5 Paragraphs 12.4.5, 12.4.6, 12.4.8 and 12.4.9 are suggested to be moved to section 14 on "Electrical installations".

6 Paragraph 12.5.2.1, the phrase "inter-barrier spaces", is suggested to be removed.

7 As regards paragraph 12.5.2.3, IACS prefers to keep the part in square brackets and delete the following paragraphs .3, .4, .5 and .6.

8 In respect of paragraph 12.5.3.1, IACS would prefer the version in square brackets, but with the following addition for that paragraph to read:

> ".1 areas surrounding open or semi-enclosed spaces of zone 1 with an extent based on hydrogen gas dispersion analysis with a zone 2 cut-off at 50% of LEL, but should at least have the extent as prescribed for natural gas in IGF Code Ch.12.5; and".

9 Concerning paragraphs 12.5.3.2 and 12.5.3.3, IACS proposes the following changes:

> ".2 Spaces containing ~~separated from a Zone 1 area with~~ a bolted hatch to tank connection spaces.
>
> .3 airlocks ~~between a zone 1 area and a non-hazardous area~~".

10 It is noted that paragraph 12.5.4.1 provides the areas which should be considered for inclusion within hazardous area zones. However, it does not clearly provide their extent nor clarify which zone is being referred to. It is suggested that paragraph 12.5.4.1 should be deleted. It is considered that the text of the version of section 12.5.4 within square brackets is adequate to authorize determination of hazardous area zones for cases where prescriptive provisions may not be appropriate.

Comments on section 13

11 IACS suggests to revise the functional requirement in paragraph 13.2.2. Ventilation systems may not be appropriate for all forms of hydrogen installations. Therefore, paragraph 13.2.2 should be applicable only for those designs where ventilation systems are installed. The proposed change is as follows:

> "13.2.2 Ventilation systems (where installed) should be arranged to avoid generation of a flammable hydrogen-air mixture in enclosed spaces and ducting with explosion pressure exceeding the enclosure design pressure."

* Here and throughout the document tracked changes are indicated using "grey shading" to highlight new insertions and "strikethrough" to highlight deletion of the text.

12 It is noted that section 13.3 provides general provisions for the ventilation systems. It should be clarified for each specific provision as to whether it applies to liquefied hydrogen systems, including cold hydrogen vapour, or compressed hydrogen systems, as in some cases these provisions may not be appropriate for both systems.

13 IACS considers that the application of ventilation as a safety concept, where liquefied or cold gas can leak, should not be allowed, but that is not mentioned at all in the draft of the interim guidelines. Hence, IACS recommends the inclusion of the following paragraph:

> "13.3.1*bis* Application of mechanical forced ventilation of hazardous spaces where a cryogenic liquid or vapour can occur is not allowed."

14 Concerning paragraph 13.3.2, maximum allowable design pressure in the mechanically ventilated spaces has been removed, and excess flow rate devices are not required. IACS finds this to be a dangerous approach for handling high-pressure gas leakages in semi- and enclosed spaces. Also, no provision to perform gas dispersion analysis and ERA for ventilated hazardous spaces has been included, which IACS considers to be a prerequisite for allowing this type of safety concept. IACS does not support the change in paragraph 13.3.2.

15 With regard to paragraph 13.3.12, it appears that the consideration of protection by a vacuum is missing. Therefore, it is suggested to revise this paragraph as follows:

> "13.3.12 Unless protected by inert gas or vacuum, permanently installed ventilation should be provided in closed or semi-enclosed bunkering stations, tank connection spaces, fuel preparation rooms, machinery spaces and any spaces as identified as part of the risk assessment process."

Comments on section 15

16 In respect of paragraph 15.3.4, similar reasoning as for paragraph 5.9.3 (paragraph 10 of document CCC 11/3/13 containing part 1 of IACS comments) also applies here. Therefore, paragraph 15.3.4 is proposed to be revised as follows (table 1 should be revised accordingly):

> "15.3.4 ~~Tank connection spaces should be arranged with level indicators in bilge wells providing high-level alarm.~~ Low temperature alarms should be provided for tank connection spaces. Low-low temperature ~~indication~~ in the space should activate the safety system."

17 With reference to paragraph 15.4.1, the meaning from the IGF Code has been altered. The IGF Code requires that each liquefied tank shall be fitted with level gauging devices. The new text in the draft interim guidelines is only referring to the fuel containment system, which could mean that, for several fitted tanks, only one device covering all tanks should be accepted, which IACS does not consider to be correct. IACS offers the following change:

> "15.4.1 Each fuel tank ~~Fuel containment systems~~ for liquefied gas should be fitted with liquid level gauging devices that continuously monitor the liquid level…"

18 Regarding section 15.6, it is suggested to include the principle of applying diversity in detection methods, since gas/leakage detection of hydrogen is challenging, as follows:

> "15.6.3*bis* The detection principles for leakage should be based on diversity, i.e. a combination of different detection principles should be applied to ensure adequate coverage for the variety of leakage scenarios in the relevant spaces."

19 With regard to paragraph 15.8.1, it is suggested to add the following provision:

"15.8.1.5 Loss of vacuum in vacuum-insulated liquefied hydrogen containment system."

20 It is suggested to clarify paragraphs 15.9.1 and 15.9.2 as follows:

"15.9.1 Pressure or low temperature detection for vacuum enclosures containing cryogenic systems should result in automatic closing of all valves necessary to isolate the leakage from the inner pipes.

15.9.2 Piping in the fuel system containing cryogenic liquids should be provided with means for detection of leakages from the inner pipes into the secondary enclosure. Detection of leakages should result in automatic closing of all valves required to isolate the leakage. Leakage detection in the secondary enclosure of the bunkering line should immediately result in automatic closing of the bunkering valve."

21 With respect to the actions summarized in table 1, the activation of alarms from the events indicated in paragraphs 9.6.4, 9.6.8 and 9.6.10 should also be incorporated along with the subsequent necessary actions.

Comments on section 18

22 With regard to paragraph 18.2.1.3, it is proposed to also refer to the operations referred to in paragraphs 6.3.3 and 6.3.4. The following revision is proposed:

".3 the ship should be provided with operational procedures including a suitably detailed fuel handling manual, such that trained personnel can safely operate the fuel bunkering, storage and transfer systems, including the provisions of 6.3.3 and 6.3.4 but not limited to; and".

Comments on section 20

23 Regarding paragraph 20.3.1, the corresponding recognized national or international standard should be clarified. In the absence of such standards, this provision is impractical to apply. Therefore, revisions of paragraph 20.3.1 are proposed as follows:

"20.3.1 Suitable protective equipment~~, including cryogenic protection clothes and gloves, eye and ears protection, face shield, respiratory protection to a recognized national or international standard~~ should be provided for protection of crew members engaged in normal operations related to the hydrogen fuel system, considering the specific hydrogen-related hazards specified in 4.2.2 and the ship's operational procedures."

Action requested of the Sub-Committee

24 The Sub-Committee is invited to consider the proposals in paragraphs 2 to 23 and take action, as appropriate.