

SUB-COMMITTEE ON CARRIAGE OF  
CARGOES AND CONTAINERS  
9th session  
Agenda item 3

CCC 9/3/14  
31 July 2023  
Original: ENGLISH  
Pre-session public release:

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

**Comments on document CCC 9/3 pertaining to the use of ammonia as fuel**

**Submitted by International Association of Classification Societies (IACS)**

**SUMMARY**

*Executive summary:* This document provides comments on document CCC 9/3 proposing to develop the interim guidelines for ships using ammonia as fuel.

*Strategic direction,  
if applicable:* 2

*Output:* 2.3

*Action to be taken:* Paragraph 32

*Related documents:* CCC 9/3 and CCC 9/3/Add.1

**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.5) and provides comments on the report of the Correspondence Group on Alternative Fuels and Related Technologies as contained in document CCC 9/3, pertaining to ammonia as fuel.

2 In document CCC 9/3, the Correspondence Group proposed the basic principles and directions for the development of the interim guidelines for ammonia as fuel. The Correspondence Group believes that the Interim guidelines for ships using ammonia as fuel should be considered based on the draft submitted by Japan (annex 5 of document CCC 9/3/Add.1) and the draft submitted by Norway (annex 6 of document CCC 9/3/Add.1). Also, annex 4 of document CCC 9/3 provides draft interim guidelines for ammonia as fuel as the basis for further deliberation by the CCC Sub-Committee.

3 IACS appreciates the hard work of the Correspondence Group and its Coordinator. IACS agrees with the basic principles and directions for the development of interim guidelines for ships using ammonia as fuel contained in document CCC 9/3. At the same time, IACS has specific technical comments on the draft guidelines contained in "proposed text by JAPAN, modified by the Group" in annex 4 of document CCC 9/3, as presented below.

## Discussion

4 Unless otherwise specified, the section or clause numbers appearing below are the numbers corresponding to the proposed text of the column "proposed text by JAPAN, modified by the Group" in annex 4 of document CCC 9/3.

### **Comments on draft guidelines in annex 4 of document CCC 9/3**

5 In clause 2.2.2, "water dissolution" should be used instead of "water solution".

6 In clause 2.2.6, the term "Fuel only engine" is not used in the draft. This term should be deleted or replaced by "ammonia-only engines" which is used in chapters 10 and 15 of the draft.

7 In clause 2.2.10, "Non-hazardous area" should refer only to the risk of fire/explosion. Areas where there is no "risk of generation of ammonia gas that is hazardous to human life" (please see paragraph 2.2.10.2 of annex 4 of document CCC 9/3) should be referred to as "non-toxic zones".

8 Clause 2.2.12 should be changed to read as follows:

"A detailed evaluation regarding the hazard potential of injury from a possible explosion or ~~exposure to toxic concentration in case of~~ leakage of ammonia is to be carried out and reflected in the safety concept of the engine."

9 In clause 2.2.16, only open decks are considered for toxic zones. It is suggested that enclosed area may also be included. The definition of toxic areas proposed in section 2.2.2 in column "Proposed text by Norway" is more appropriate.

10 In clause 3.2.8, "Sources of toxicity" seems to mean "Sources of release", and "toxicity" is not appropriate in the context of hazardous areas.

11 Hazardous areas should only consider fire and explosion, and toxicity should be considered in the toxic zone. Therefore, clause 3.2.8 is suggested to be amended as follows:

"Sources of ignition ~~or toxicity~~ in hazardous areas should be minimized to reduce the probability of explosions ~~or ammonia exposure to human~~."

12 Regarding clause 3.2.9, in IACS' opinion, there should be no direct release of ammonia vapours into the atmosphere in normal conditions, including bunkering. The ammonia treatment system referred to in clause 2.2.2 should be used for that purpose. Accordingly, it is suggested to modify the text as follows:

"3.2.9 Safe and suitable fuel supply, storage and bunkering arrangements should be made, capable of receiving and containing the fuel in the required state without leakage. Other than ~~when necessary for safety reasons, the system should be designed to prevent venting under all normal operating conditions including idle periods~~, when necessary for safety reasons under normal operation (e.g. a relief valve lifts), the system should be designed to prevent direct release to air. Direct venting of ammonia vapours into the atmosphere is not permitted in normal operating conditions including bunkering."

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\* Throughout the document, tracked changes are indicated using "strikeout" for deleted text and "grey shading" to highlight all modifications and new insertions, including deleted text.

13 Regarding clause 3.2.12, the relationship between the toxic effect and the loss of power is not properly understood; it is suggested to delete the added wording "or toxic effect on human health" in the clause.

14 Clause 3.2.21 is not deemed correct as the ammonia concentration in the immediate vicinity of the source of leakage would be of course close to 100%, decreasing while moving away from this source. The access to a space containing a possible source of release should not be necessary in normal operational condition of the ship. The access to the space is to be provided with locking arrangements which shall be under the control of the responsible ship's officer. A procedure is to be available on board specifying the conditions to be observed for safe access to the space. A warning notice with safety instructions is to be provided outside the space, adjacent to each access door.

15 For section 4.2, the proposal in the column "Proposed text by NORWAY" is preferred.

16 The title in section 4.3, "toxic consequences" should be reworded as "toxicity consequences" or "toxic vapour release consequences".

17 In clause 4.3.4, the term "damage" should be replaced by "cause injury to".

18 The second sentence in clause 5.8.2 reading: "The bilge system should not lead to pumps in spaces having no risks of ammonia" should be further clarified. IACS proposes to use the text in the second sentence of clause 5.8.3 reading: "The bilge system should not lead to pumps in safe spaces" appearing in the column "Proposed text by NORWAY".

19 In section 5.9, it is suggested to add the following: "5.9.5 Effluents containing dissolved ammonia are to be drained to a dedicated drain tank fitted with a discharge connection to reception facilities."

20 Clause 5.10.5 is suggested to be modified as follows:

"5.10.5 Arrangements for fuel storage hold spaces, void space, fuel tanks and other spaces classified as hazardous or toxic areas, should be such as to allow entry and inspection of any such space by ship personnel wearing protective clothing and breathing apparatus as well as to allow for the evacuation of injured or unconscious ship personnel. Such arrangements should comply with the following:..."

21 The requirements for the sill height of the fuel preparation room entrance in clause 5.7.1.6 and provisions for safe havens in section 5.11 in the column "Proposed text by NORWAY" have a good protective effect on ammonia leakage and are recommended to be included in the Interim guidelines after evaluation.

22 The storage temperature of liquid ammonia is usually around -34°C and higher than -55°C. It is suggested to include in section 6.4.4 the relevant requirement from the IGC Code that hull structure can be used as a secondary barrier.

23 Clause 8.4.2 is not properly understood. The kind of equipment to which the "effective equipment" refers would need clarification. Further, clarification is needed whether an enclosure may be considered as effective equipment.

24 Regarding section 9.5, IACS suggests that the proposal in the column "Proposed text by NORWAY" should be considered.

25 IACS agrees to use normative division and gas diffusion analysis to divide toxic areas in section 12B.3. The normative division methods in the drafts of annex 4 take into account all possible locations where ammonia fuel or vapour may appear; however the division methods are too complicated and there are great differences between the two draft texts, which need further discussion.

26 In section 12B.3, the distances used in the determination of the "toxic zones" should be justified; the proposal in section 12.7 of the column "Proposed text by NORWAY" should be considered. There are some regulations confusing the "toxic areas" and the "hazardous areas" (e.g. clause 12B.8.1), which should be clarified.

27 In clause 12B.8.2, there is no definition for "toxic atmosphere" in terms of ppm.

28 The reference to IEC standard 62990-1 (toxic detectors) can be considered in clause 15.8.4.

29 In clause 15.8.5, it is noted that only two sensors are proposed. However, three sensors are required to have proper voting principle.

30 IACS notes that the ammonia concentration threshold is set to be 25/300 ppm in clause 15.8.5. The alarm should be activated at 25 ppm, and the safety systems should be activated at 300 ppm. The exposure time pertaining to these concentrations (which may have adverse effects on persons in the concerned space) should also be considered and specified when finalizing the thresholds.

31 Finally, IACS notes that there are large gaps in certain parts of annex 4 between the text in the column "Proposed text by JAPAN, modified by the Group" and the one in the column "Proposed text by NORWAY" (e.g. clauses 6.8.1 vs 6.9.1, 7.4.3.2 vs 7.4.1.3) which could not be addressed in detail in this document, but that require further consideration.

#### **Action requested of the Sub-Committee**

32 The Sub-Committee is invited to consider comments from paragraphs 5 to 31 and take action, as appropriate.

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