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CARRIAGE OF CARGOES AND CONTAINERS

Application of the draft amendments to paragraphs 8.4.3.1 and 8.4.3.2 of the IGC Code pertaining to upstream pressure losses of pressure relief valves

Submitted by China, Panama, Republic of Korea and IACS

SUMMARY

Executive summary:	This document highlights the potential design impacts of retroactive application of draft amendments to paragraphs 8.4.3.1 and 8.4.3.2 of the IGC Code concerning upstream pressure losses of pressure relief valves (PRVs). It proposes that these amendments be applied to new ships only and that the deleted sentence currently in draft paragraph 8.4.3.2 be retained to avoid unintended consequences for existing ships.
Strategic direction, if applicable:	Not applicable
Output:	Not applicable
Action to be taken:	Paragraph 17
Related documents:	CCC 9/4/2; MSC 110/WP.7 and CCC 11/16

Introduction

1 This document provides comments on documents MSC 110/WP.7 and CCC 11/16, prepared by the Secretariat.

2 Following a comprehensive review of the IGC Code, the CCC Sub-Committee developed a wide-ranging package of draft amendments, which were initially approved by MSC 109. However, during MSC 110, a significant number of comments and concerns were raised by Member States, and the Committee decided to defer adoption. The draft amendments were therefore referred back to CCC 11 for further considerations, taking into account the issues and texts set out in annexes 14 and 15 to document MSC 110/WP.7.

3 In this context, the Sub-Committee finalized the draft amendments, as contained in annex 9 to document CCC 11/16, for submission to MSC 111. It is accordingly expected that the updated draft amendments to the IGC Code will be considered for approval at MSC 111, with a view to adoption at MSC 112.

Applicability of amendments involving design or construction changes

4 According to paragraph 6.1 of document CCC 10/WP.7, the Working Group on the review of the IGC Code, established at CCC 10, concluded that amendments necessitating changes in ship design or construction should apply only to new ships.

5 Despite this principle, certain amendments requiring design or construction changes were inadvertently drafted to apply to ships constructed on or after 1 July 2016, which would have resulted in retroactive application to existing ships built before 1 July 2028. Consequently, MSC 109 and MSC 110 considered several documents expressing concern regarding the unintended retroactive effect and its potential impact on ship design and construction.

6 CCC 11 reviewed the proposals in accordance with the instruction from MSC 110 and agreed that the applicability of the relevant draft amendments should be revised from ships constructed on or after 1 July 2016 (i.e. existing ships) to ships constructed on or after 1 July 2028 (i.e. new ships only). The table below specifically summarizes those draft amendments for which the applicability has been changed from existing ships to new ships as an outcome of CCC 11. Further details are provided in annex 9 to document CCC 11/16.

Documents	Draft amendments to the IGC Code	Subjects
MSC 109/14/1 MSC 110/3/11	Paragraph 5.11.6.1	Bellows expansion joints used in vapour service
MSC 109/14/1	Paragraph 16.3.4	Separation of gas fuel pipe vents and bleed lines from the cargo vent piping system
MSC 110/3/6	Paragraph 3.2.6.3	Closing devices fitted with gaskets or seals
	Paragraph 5.5.3.3	Manual valves on cargo manifold liquid connections
	Paragraph 13.3.9	Removal of exemptions for high-level alarms and automatic shut-off during cargo tank filling
	Paragraph 13.9.3	Communication and access requirements for integrated system
	Paragraph 16.3.5	Numerical calculation for ventilation capacity in spaces outside the cargo area containing LPG or ethane fuel systems
	Paragraph 16.3.6	Numerical calculation for gas detection head locations for spaces outside the cargo area containing LPG or ethane fuel systems
	Paragraph 16.7.1.4	Pressure relief systems for gas-fired internal combustion engines
MSC 110/3/7	Paragraph 16.4.1.5	Separation between fuel piping and inert gas piping through a double block and bleed valve in combination with a non-return valve

Upstream pressure losses of cargo tanks' pressure relief valves

7 The draft amendments to paragraphs 8.4.3.1 and 8.4.3.2 of the IGC Code are provided in annex 15 to document MSC 110/WP.7, as excerpted below. The submitters in principle support the draft amendments and their intent to ensure the proper functioning of pressure relief valves (hereinafter referred to as PRVs), which were originally proposed in document CCC 9/4/2 (SIGTTO). Through this document, however, the submitters intend to point out their concern that, as currently written, these draft amendments will retroactively apply to ships constructed on or after 1 July 2016, in accordance with the general application provision in paragraph 1.1.2.1 of the IGC Code.

"**8.4.3 Upstream pressure losses**

8.4.3.1 The pressure ~~drop~~ losses in the vent line from the tank to the PRV inlet shall be supported by flow calculations. These losses shall not exceed 3% of the valve set pressure at the calculated flow rate, in accordance with 8.4.1.

8.4.3.2 ~~Pilot-operated PRVs shall be unaffected by inlet pipe pressure losses when the pilot senses directly from the tank dome.~~ Pilot-operated PRV sensing lines shall be sized to avoid pressure losses which affect the function of the PRV. The sensing line shall be self-draining and free from liquid pockets.

~~8.4.3.3 Pressure losses in remotely sensed pilot lines shall be considered for flowing type pilots.~~"

8 Paragraph 8.4.3 of the IGC Code addresses upstream pressure losses that may affect the proper functioning of a PRV. For instance, if the upstream pressure loss exceeds the design threshold of 3%, a PRV may lose its stability or may not function properly. Such a failure may adversely affect the integrity of the cargo containment system.

9 For pilot-operated PRVs, however, upstream pressure losses may not adversely affect PRV functionality when the pilot senses directly from the tank dome rather than from the PRV inlet, as previously recognized in paragraph 8.4.3.2 of the IGC Code (i.e. the deleted sentence). Accordingly, the previous paragraph 8.4.3.2 has served as the technical basis permitting upstream pressure losses exceeding 3%, where the sensing line was not directly supplied from the PRV inlet (i.e. sensing directly from the tank dome). The illustration in figure 1 below explains this mechanism. This principle remains valid in many installations. However, document CCC 9/4/2 highlighted the need for clearer requirements on the sizing and arrangement of pilot sensing lines to ensure consistent performance across different designs.

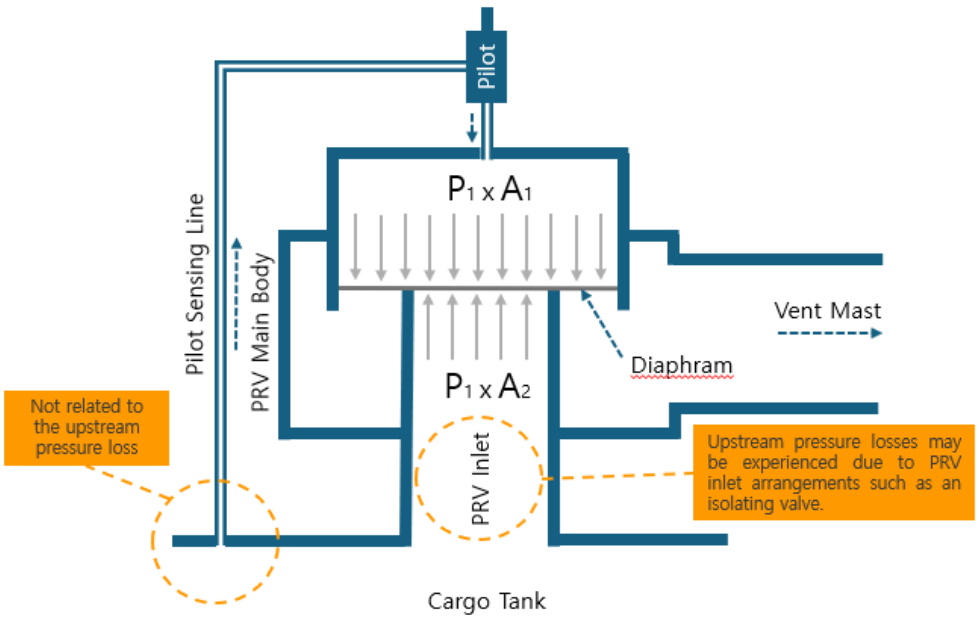

Figure 1

10 Nevertheless, the draft amendments to paragraph 8.4.3.2 remove the previous requirement described above, while introducing new design requirements for the sizing and drainage of pilot-operated PRV sensing lines. Consequently, if applied retroactively, existing gas carriers constructed on or after 1 July 2016 but before 1 July 2028 would need to undergo additional verification to demonstrate compliance with the draft amendments.

11 In cases where compliance cannot be confirmed, physical modifications to the PRV inlet arrangements, including the replacement of isolating valves, upsizing PRV, and/or adjacent piping arrangements, etc. would become unavoidable. The submitters further note that document CCC 9/4/2, which originally proposed the relevant amendments, appears not to have provided sufficient consideration of retroactive application or their potential technical and operational implication. Given also that the amendments to the IGC Code are expected to enter into force on 1 July 2028 without a grace period, existing gas carriers could face significant design and compliance challenges unless the applicability of the draft amendments to paragraphs 8.4.3.1 and 8.4.3.2 is appropriately limited.

Relations with other amendments pertaining to the functionality of PRVs

12 It should also be noted that the draft new paragraph 8.4.2.2 of the IGC Code requires that, for ships constructed on or after 1 July 2028, isolating valves installed upstream of PRVs shall have a flow area equal to or greater than the PRV inlet flow area, so as not to adversely affect PRV flow, capacity or stability, as excerpted below:

> "8.4.2.2 For ships constructed on or after [1 July 2028], the inclusion of isolation valves in which the flow area of the valve is equal to or larger than the inlet flow area of the pressure relief device and does not affect the PRV flow, capacity and stability are acceptable."

13 Isolating valves with internal obstructions, such as globe valves or butterfly valves with reduced flow area, are more vulnerable to the upstream pressure losses. Therefore, this new requirement implies that such isolating valves may no longer be considered acceptable for new ships, whereas full-bore valves (e.g. gate or ball valves) remain suitable. Although the draft new paragraph 8.4.2.2 is technically linked to the draft amendments to paragraphs 8.4.3.1 and 8.4.3.2, it is explicitly intended to apply to new ships only, due to the design implications involved.

14 Finally, it should be noted that the draft amendments to paragraph 8.4.5 of the IGC Code, while addressing the stability of PRV operation with regard to PRV inlet pressure losses, newly incorporate the principle previously contained in the deleted requirement in paragraph 8.4.3.2, namely, that upstream pressure losses do not affect the performance of pilot-operated PRVs where their sensing lines are not subject to the upstream pressure loss of PRVs. The relevant provision, as excerpted below, applies to ships constructed on or after 1 July 2016, including existing ships:

> "8.4.5 To ensure stable PRV operation, the blow-down shall not be less than the sum of the inlet pressure loss and 0.02 MARVS at the rated capacity. This limitation does not apply to pilot-operated PRV fitted with a remote sensing line if confirmed by the PRV manufacturer."

15 Considering the close technical relations, the submitters are of the opinion that the applicability of the draft amendments to paragraphs 8.4.3.1 and 8.4.3.2 should be aligned with that of the other related amendments referenced in paragraphs 12 to 14.

Proposal to revise the applicability

16 In light of the above, the submitters propose that the deleted sentence in the draft amendments to paragraph 8.4.3.2 of the IGC Code be retained, and that the draft amendments to paragraphs 8.4.3.1 and 8.4.3.2 of the IGC Code be modified to apply to new ships, as follows:

"**8.4.3 Upstream pressure losses**

8.4.3.1 The pressure losses in the vent line from the tank to the PRV inlet shall ~~be supported by flow calculations. These losses shall~~ not exceed 3% of the valve set pressure at the calculated flow rate, in accordance with 8.4.1. For ships constructed on or after 1 July 2028, the compliance shall be documented by flow calculations.

8.4.3.2 Pilot-operated PRVs shall be unaffected by inlet pipe pressure losses when the pilot senses directly from the tank dome. For ships constructed on or after 1 July 2028, p~~P~~ilot-operated PRV sensing lines shall be sized to avoid pressure losses which affect the function of the PRV. The sensing line shall be self-draining and free from liquid pockets."

Action requested of the Committee

17 The Committee is invited to consider the discussions in paragraphs 4 to 15 above and the modifications proposed in paragraph 16 above, and take action as appropriate.