

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

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

**Proposal maintaining existing text of part A-1 of the IGF Code regarding  
minimum distances for type C tank designs**

**Submitted by CESA**

**SUMMARY**

*Executive summary:* Commenting to the report of the Correspondence Group on Amendments to the IGF Code and Review of the IGF Code, this document provides important considerations regarding the fire protection of type C tanks with vacuum insulation and those with conventional foam insulation. It concludes that proposed new wording for part A-1 of the IGF Code should be rejected and the existing wording should be kept as is.

*Strategic direction,  
if applicable:* Other work

*Output:* 2.22

*Action to be taken:* Paragraph 18

*Related documents:* CCC 8/3/2; CCC 8/18 and CCC 9/4/Add.1

**Introduction**

1 This document provides comments to document CCC 9/4/Add.1 and is submitted in accordance with the provisions of paragraph 6.12.5 of MSC-MEPC.1/Circ.5/Rev.4.

2 More specifically, it comments upon paragraph 4 of document CCC 9/4/Add.1 which reads as follows:

"4. *There is general support for amendments to IGF Code 11.3.3.1, measuring the minimum distance to an A-60 boundary from the outer surface of the insulation system in a type C tank. Two delegations subsequently expressed a different point of view and suggested that further consideration of the text was required.*"

## Background

3 Document CCC 8/3/2 proposes an amendment to the IGF Code in provision 11.3.3.1 that for fuel tanks of type C-design the distance of 900 mm between tank room bulkhead and second bulkhead constituting the cofferdam of the containment system should be measured to the outer surface of the tank insulation rather than to the outer surface of the shell of the tank.

4 The argument put forward to justify the new interpretation is that the cofferdam should be measured to the containment system surface and the insulation system does form a part of the containment system (IGF provision 2.2.15) and that the distance between cofferdam and insulation surface of the tank is relevant for fire protection.

5 CCC 8 did not conclude on the issue and instructed the Correspondence Group reporting to CCC 9 to clarify the term "outer shell" used in provision 11.3.3.1 based on the draft text set out in annex 2 of CCC 8/WP.4 (CCC 8/18 paragraph 3.40). Paragraph 4 of document CCC 9/4/Add.1 reflects the discussion in the Correspondence Group noting that no further consideration of the text has taken place yet.

## Discussion

6 Paragraphs 5, 6 and 7 of document CCC 8/3/2 provide technical descriptions of type C tanks with vacuum insulation and those with conventional foam insulation. However, it does not mention that there is a fundamental difference between these insulation types with regard to the effect of an external fire to a tank (which is protected from direct fire effect and in a hold space).

7 The outer shell of a vacuum insulated tank is a pressure vessel designed to withstand the pressure difference between the vacuum in the insulation space and the atmospheric pressure outside of the vacuum space. As a rule of thumb, the design of the tank with regard to wall thickness is approximately equal to a design for 5 bar gauge inner pressure. In other words, the outer shell of the tank is designed as a pressure vessel and typically made of steel similar to a bulkhead.

8 With conventional foam insulation, the cover of a foam insulation is a protection layer to prevent small impacts (e.g. from maintenance work in the hold space) and to act as a moisture barrier. It is a thin metal or polymeric cover.

9 In case of fire, the heat radiation would heat the outer shell of a vacuum insulated tank just as it would heat the cover of a foam insulated tank.

10 A vacuum insulated tank may fail at relatively low wall temperatures (some hundred degrees Celsius) because as long as the wall is intact, the vacuum will act as a nearly adiabatic wall meaning that the heat is only heating up the outer shell. In case of failure of the outer shell of a vacuum insulated tank (loss of vacuum), the insulation effect is lost and the heat flux into the tank will be very high immediately. It can be assumed that the heat flux would be at least 50 times higher than normal.

11 By comparison, a foam insulated tank will not lose its insulation capability in case of failure of the outer shell to such a large extent as a vacuum insulated tank. Moreover, it would require a lot of heat absorption (and therefore time) to degrade foam insulation. The heat radiation to a foam insulated tank would heat up the cover and the insulation may degrade if the temperature increases above the melting point of the insulation (some hundred degrees Celsius). At the same time, the cooling effect of the stored liquid in the inner tank would absorb some of the heat.

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12 Detailed evaluations on this topic have been done within the scope of the SIGTTO working group on fires regarding Moss LNG carriers. Results have been presented in the SIGTTO report "Report on the Effects of Fire on LNG Carrier Containment Systems" and also at GASTECH 2009\*.

13 Though CESA agrees to the view expressed in CCC 8/3/2 paragraph 8 "*...that the purpose of regulation 11.3.3 of the IGF Code is to protect fuel tanks against fire in adjacent spaces...*", it does not agree with the assumption that the distance between the tank and the insulation has a relevant effect on fire protection.

14 The heat of a fire outside the hold space will, to a very large extent, come from heat radiation and not from heat convection. Physics dictates that distance has no effect on heat radiation. Therefore, it is not relevant if the distance to the insulation surface is 900 mm (in case the insulation is the reference point) or approximately 600 mm (in case the tank shell is the reference point). As a reference, foam insulation thickness can be assumed to be approximately 300 mm and vacuum space may be 200 to 300 mm.

15 The regulation for the distance between a type C tank and the hold space boundary in the IGF Code and IGC Code is related to the practical need to be able to perform inspection and maintenance. It is unrelated to fire protection.

16 It should be considered that distance requirements e.g. in paragraph 5.3 of the IGF Code and in paragraph 2.4 in IGC Code are also based on a reference point that if damaged, may compromise tank safety. This is the inner tank shell for type C foam insulated tanks, type A, type B tanks and the supporting structure for membrane tanks.

### **Proposal**

17 For the above reasons in paragraphs 6 to 16, the proposal in CCC 8/3/2 for new wording of part A-1 of the IGF Code should be rejected and the existing wording should be kept as is.

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

18 The Sub-Committee is invited to consider the proposal in paragraph 17 above, and take action as appropriate.

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\* Effects of Enveloping Pool Fires on LNG tank Containment Systems; Gerd-Michael Wuersig (Dr.-Ing.) GL, James Gaughan ABS, Benjamin Scholz GL, Lars Sannes Moss Maritime, Stephan Kabelac (Prof. Dr.-Ing.) IT, Alfred Leder (Prof. Dr.-Ing.) Ism