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REVIEW OF THE IGC CODE

Comments on the report of the Correspondence Group on Amendments to the IGF Code and Review of the IGC Code

Submitted by IACS

SUMMARY

Executive summary: This document provides comments on the report of the Correspondence Group on Amendments to the IGF Code and Review of the IGC Code presented in document CCC 10/4.

Strategic direction, if applicable: 1

Output: 1.17

Action to be taken: Paragraph 8

Related documents: CCC 9/10/2, CCC 9/14 and CCC 10/4

Introduction

1 This document is submitted in accordance with 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 document CCC 10/4.

2 IACS is grateful to the Coordinator and all the participants of the Correspondence Group on Amendments to the IGF Code and Review of the IGC Code for their active and constructive engagement. With a view to progressing the work on amendments to the IGC Code, IACS has identified a couple of issues requiring attention. In particular, IACS believes that the proposals of amendments to the IGC Code contained in annex 2 of the report of the Correspondence Group (CCC 10/4) should be modified to accurately reflect the intention of document CCC 9/10/2 (IACS), as well as the instructions of the Sub-Committee, as reported in document CCC 9/14.

Discussion

3 It is noted that the Correspondence Group is proposing to consolidate IACS unified interpretation GC8 (Rev.1 June 2016) into paragraphs 4.23.3.1.1 to 4.23.3.1.5 of the draft IGC Code amendments for finite element analysis and buckling assessment. However, proposals from IACS contained in sections D0, D1 and D2 of document CCC 9/10/2 aimed to revise the requirements of the IGC Code accordingly.

4 In this regard, the requirements of paragraphs 4.23.3.1.1 to 4.23.3.1.5 of the draft IGC Code amendments, originating from IACS unified interpretation GC8 (Rev.1 June 2016), as appearing in section 15 of annex 2 to the report of the Correspondence Group, should be deleted and paragraph 4.28.4.1.5 of the draft IGC Code, appearing in section 18 of annex 2 of the report of the Correspondence Group, should be modified as proposed in the annex to this document.

5 In that respect, IACS notes that the newly updated requirements for the finite element analysis and buckling assessment appearing in sections D0, D1 and D2 of document CCC 9/10/2 are already reflected in paragraphs 4.23.3.3, 4.28.4 and 4.28.5 of the draft IGC Code amendments, appearing in sections 16 and 18, respectively, of annex 2 of the report of the Correspondence Group.

6 Further, the Sub-Committee issued the following instructions in respect of section D3 of document CCC 9/10/2 (CCC 9/14, paragraphs 10.5 and 10.8):

"10.5 Subsequently, the Sub-Committee instructed the Working Group on Amendments to the IGF Code and Revision of the IGC Code (see paragraph 3.31) to further consider document CCC 9/10/2, except for the relevant proposal as set out in section D3, and advise the Sub-Committee on how best to proceed."; and

"10.8 The Sub-Committee instructed the Correspondence Group on Amendments to the IGF Code and Review of the IGC Code established under agenda item 3 (paragraph 3.36) to consider the proposals in sections B, C, D0, D1, D2, E and F of document CCC 9/10/2 and take action, as appropriate."

7 However, the proposals in section D3 of document CCC 9/10/2 are still included in paragraphs 4.23.4.2 to 4.23.4.4 of the draft IGC Code amendments contained in annex 2 to the report of the Correspondence Group. In this regard, IACS considers that those proposed paragraphs should be deleted in order to conform to the instructions of CCC 9.

Action requested of the Sub-Committee

8 The Sub-Committee is invited to consider the foregoing, the proposals in paragraphs 4 and 7 and in the annex to this document, and take action, as appropriate.

ANNEX

PROPOSED MODIFICATIONS

1 Paragraphs 4.23.3.1.1 to 4.23.3.1.5 of the draft IGC Code amendments appearing in section 15 of annex 2 of the report of the Correspondence Group are proposed to be deleted as follows:*

~~"4.23.3.1.1 The circumferential stresses at supports shall be calculated by a procedure acceptable to the Administration or Recognized Organization on its behalf, for a sufficient number of load cases."~~

~~"4.23.3.1.2 Permissible stresses in stiffening rings:
For horizontal cylindrical tanks made of carbon manganese steel supported in saddles, the equivalent stress in the stiffening rings shall not exceed the following values if calculated using finite element method:~~

~~$\sigma_b \leq \sigma_{all}$~~

~~where:~~

~~$\sigma_{all} = \min(0.57R_m; 0.85R_e)$~~

~~$\sigma_e = \sqrt{(\sigma_n + \sigma_b)^2 + 3\tau^2}$~~

~~σ_e = von Mises equivalent stress in N/mm²~~

~~σ_n = normal stress in N/mm² in the circumferential direction of the stiffening ring~~

~~σ_b = bending stress in N/mm² in the circumferential direction of the stiffening ring~~

~~τ = shear stress in N/mm² in the stiffening ring~~

~~R_m and R_e as defined in 4.18.1.3.~~

~~Equivalent stress values σ_e shall be calculated over the full extent of the stiffening ring by a procedure acceptable to the Administration or recognized organization on its behalf, for a sufficient number of load cases."~~

~~"4.23.3.1.3 The following assumption shall be made for the stiffening rings: the stiffening ring should be considered as a circumferential beam formed by web, face plate, doubler plate, if any, and associated shell plating.~~

~~The effective width of the associated plating shall be taken as:~~

~~.1 For cylindrical shells:~~

~~an effective width (mm) not greater than $0.78\sqrt{rt}$ on each side of the web. A doubler plate, if any, may be included within that distance.~~

~~where:~~

~~r = mean radius of the cylindrical shell (mm)~~

~~t = shell thickness (mm)~~

* Tracked changes to the draft text in annex 2 of document CCC 10/4 are indicated using "strikeout" for deleted text and "grey shading" to highlight all modifications and new insertions, including deleted text.

~~.2 For longitudinal bulkheads (in the case of lobe tanks):~~

~~the effective width shall be determined according to established standards. A value of $20tb$ on each side of the web may be taken as a guidance value.~~

~~where:~~

~~tb = bulkhead thickness (mm).~~

~~The stiffening ring shall be loaded with circumferential forces, on each side of the ring, due to the shear stress, determined by the bi-dimensional shear flow theory from the shear force of the tank." ["Notwithstanding, the tank shell and ring stiffeners including other solid structures may be modelled as a single element, applying the requirements of 4.23.3.1 of the Code"]~~

~~"4.23.3.1.4 For calculation of reaction forces at the supports, the following factors shall be taken into account:~~

~~.1 Elasticity of support material (intermediate layer of wood or similar material); and~~

~~.2 Change in contact surface between tank and support, and of the relevant reactions, due to thermal shrinkage of tank and elastic deformations of tank and support material.~~

~~The final distribution of the reaction forces at the supports shall not show any tensile forces."~~

~~"4.23.3.1.5 The buckling strength of the stiffening rings shall be examined as relevant."~~

2 Paragraph 4.28.4.1.5 of the draft IGC Code amendments appearing in section 18 of annex 2 to the report of the Correspondence Group is proposed to be amended as follows:

"4.28.4 Guidance to finite element analysis of type C tanks

"4.28.4.1 General

...

5. For calculation of reaction forces at the tank supports, ~~the requirements described in 4.23.3.1.4 apply.~~ the following factors shall be taken into account:

.1 elasticity of support material (intermediate layer of wood or similar material); and

.2 change in contact surface between tank and support, and of the relevant reactions, due to thermal shrinkage of tank and elastic deformations of tank and support material.

The final distribution of the reaction forces at the supports shall not show any tensile forces."