INTERNATIONAL MARITIME ORGANIZATION

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SUB-COMMITTEE ON SHIP DESIGN AND CONSTRUCTION
11th session
Agenda item 11

SDC 11/11/2
11 November 2024
Original: ENGLISH
Pre-session public release: ☒

GUIDELINES FOR USE OF FIBRE-REINFORCED PLASTICS (FRP) WITHIN SHIP STRUCTURES

Comments on document SDC 11/11

Submitted by IACS

SUMMARY

Executive summary:	This document provides initial comments on the DRAFT PROPOSAL linked to the report of the Correspondence Group on the Revision of the Interim guidelines for use of Fibre-Reinforced Plastic (FRP) (MSC.1/Circ.1574) (SDC 11/11) with respect to fire performance and fire testing of FRP composite structures.
Strategic direction, if applicable:	2
Output:	2.6
Action to be taken:	Paragraph 23
Related document:	SDC 11/11

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 comments on the DRAFT PROPOSAL linked to document SDC 11/11 (Sweden) containing the report of the Correspondence Group on the Revision of the Interim Guidelines for Use of Fibre-Reinforced Plastic (FRP) (MSC.1/Circ.1574).

Background

2 Paragraphs 19, 39 and 42 of the report of the Correspondence Group inform that the DRAFT PROPOSAL linked to document SDC 11/11 has not been considered by the Group, and paragraph 46.1 proposes to take into account the DRAFT PROPOSAL when finalizing the revision of the Interim Guidelines.

3 IACS appreciates the efforts made so far and acknowledges the complexity of the work under this output. IACS initial comments on the DRAFT PROPOSAL linked to the report in SDC 11/11 are provided as a basis for further development and refinement of the draft revised Interim Guidelines (MSC.1/Circ.1574).

Discussion

Scope of the output (title)

4 The title of the Interim Guidelines is suggested to be amended to cover the use of FRP within ship structures in general, i.e. with the suggestion to remove the terms "elements" and "fire safety issues".

5 IACS questions whether the amended title would also reflect a modification to the scope of the output. The current Guidelines address fire safety aspects of the FRP elements within ship structures.

Global strength (paragraph 1.2 of the annex)

6 The phrase "or FRP composite structures contributing to global strength" has been suggested to be removed from paragraph 1.2 of the Interim Guidelines.

7 IACS considers that the expression "FRP composite structures contributing to global strength" should be retained in paragraph 1.2 of the Interim Guidelines. IACS is not familiar with SOLAS steel ships with FRP composite structures contributing to global strength and is of the view that the statement should not be removed until appropriate experience has been gained.

Definition of "load-bearing element" (paragraph 1.4 of the annex)

8 A new definition of a load-bearing element is suggested in a new paragraph 1.4 of the Interim Guidelines.

9 IACS does not support the suggested new definition because there are load-bearing elements which can be removed without compromising the safety of the ship. The FRP composite elements should be listed in three categories corresponding to the different levels of requirements, in the following ascending order:

.1 elements which are not load bearing and are not contributing to global strength;

.2 elements which are load bearing and do not contribute to global strength; and

.3 elements which contribute to global strength.

Alternative design for assessment of FRP structures (paragraph 2.2 of the annex)

10 Paragraph 2.2 of the Interim Guidelines correctly points out the following:

> "…the use of FRP composites on SOLAS vessels is generally not allowed due to the prescriptive requirements on use of non-combustible materials. However, when design or arrangements deviate from the prescriptive requirements of SOLAS chapter II-2, review and approval can be carried out in accordance with SOLAS regulation II-2/17".

11 Non-combustible materials are defined by SOLAS regulation II-2/3.33 and tested according to annex 1 of part 1 of the 2010 FTP Code. IACS agrees that the application of SOLAS regulation II-2/17 on alternative design could be feasible for small FRP parts. For larger

structures, for example a ship superstructure, the application of SOLAS regulation II-2/17 on alternative design may, however, require unreasonable efforts (time/cost of engineering analysis, evaluation and approval) to document an equivalent level of safety. IACS considers that the inclusion of prescriptive measures in the revision of the Interim Guidelines may contribute to a more feasible alternative design process.

12 As per SOLAS regulation II-2/17, Administrations should communicate to IMO pertinent information concerning approved alternative designs and arrangements. In this respect, existing alternative designs relating to FRP structures submitted by Administrations may, if available, offer valuable insights for the development of such prescriptive measures.

Application of SOLAS chapter II-2 (paragraph 3.1 of the annex)

13 SOLAS regulation II-2/1 refers to the keel laying date as the basis for the application of SOLAS chapter II-2. IACS considers that the keel laying date may not be an appropriate term, or parameter, for the applications of provisions for FRP ship structures.

Smoke generation potential and toxicity (paragraph 3.6.3 of the annex)

14 Comment No.3 to regulation 6 in DRAFT PROPOSAL states that both SOLAS regulations II-2/5 and 6 manage smoke production.

15 IACS disagrees with this comment, as the objectives of SOLAS regulation II-2/5 (Fire growth potential) and SOLAS regulation II-2/6 (Smoke generation potential and toxicity) are different. SOLAS regulation II-2/5 concerns the contribution of combustible materials to the propagation of the fire, while SOLAS regulation II-2/6 concerns the smoke generated by the fire. The latter is only applicable to exposed surfaces of bulkheads, ceilings and primary deck coverings. FRP composites are typically not used as surface materials, making application of SOLAS regulation II-2/6 challenging.

Means of escape (paragraph 3.13.3 of the annex)

16 A sentence has been suggested to be added to comment No.3 to regulation 13, indicating that escape routes over composite decks may be safer than escape routes over steel decks.

17 IACS does not support the inclusion of the added sentence. The collapse of a composite deck could be sudden and fast, potentially creating a large passageway for smoke, depending on the nature of the joints of the composite deck. In contrast, a steel deck would have a more gradual collapse while maintaining better integrity in terms of smoke passage.

Fire testing of the FRP composite (appendix D)

18 A new part has been suggested to be added to appendix D to determine the structural resistance of the FRP elements within ship structures. The new part is intended to supplement part 11 of the 2010 FTP Code for FRP composite materials.

19 Tests in part 11 of the 2010 FTP Code are used to classify divisions, asserting that they will maintain their integrity for a minimum duration of 30 or 60 minutes. IACS is of the view that such criteria alone are not sufficient to determine an equivalent level of safety for FRP elements, when compared to the non-combustible constructions. The revised Interim Guidelines should provide guidance on how the FRP elements in ship structures, combined with additional fire safety systems, could be subject to a risk analysis to demonstrate an equivalent level of safety as compared to steel.

20 Currently, the draft revised Interim Guidelines do not consider the collapse of the composite materials (for example hull parts) in 60 minutes despite the application of water onto one side of the structure. A steel structure where water is being applied on the non-exposed fireside may sustain days of the fire raging on the other side. Therefore, in IACS opinion, the revised Interim Guidelines should introduce a significantly more stringent fire resistance test for the FRP composite structures contributing to the global strength. This is a crucial consideration in mitigating the risk of ships potentially sinking within 60 minutes under fire conditions.

21 The suggested additional fire tests appear to originate from the HSC Code and, therefore, IACS is of the view that these may not be representative of the general use of FRP elements in SOLAS ship structures. As an example, the suggested mounting of test specimens does not seem to represent the actual end-use conditions of FRP elements. Further, the suggested static loads appear very small and should be reviewed. It is important to note that the HSC Code assumes that the ship is stopped, that it is relatively small and further, that it is abandoned in a few minutes; all these are not typical design criteria under SOLAS.

Proposal

22 IACS proposes that the considerations in paragraphs 4 to 21 are taken into account when considering the DRAFT PROPOSAL linked to document SDC 11/11.

Action requested of the Sub-Committee

23 The Sub-Committee is invited to consider the foregoing, the proposal in paragraph 22 and to take action, as appropriate.