

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

SDC 11/11/4
22 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 CESA and SYBAss

SUMMARY

<i>Executive summary:</i>	This document comments on 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), provides further proposed amendments to the draft guidelines and highlights the application of heat deflection temperature (HDT), fire testing and conservative approach with HDT and measurement on fire-exposed side and finally, the comparison between FRP and aluminium.
<i>Strategic direction, if applicable:</i>	2
<i>Output:</i>	2.6
<i>Action to be taken:</i>	Paragraph 20
<i>Related document:</i>	SDC 11/11

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

Background

2 MSC 89 adopted the *Interim guidelines for use of Fibre Reinforced Plastic (FRP) elements within ship structures: Fire safety issues* (MSC.1/Circ.1574) (Interim guidelines), which now have been in use for seven years. Paragraph 5 of MSC.1/Circ.1574 states that the Interim guidelines should be reviewed four years after their approval in order to make any necessary amendments based on experience gained.

3 For that purpose, the output on the review of the Interim guidelines was kept on the post-biennial agenda and interested Member States and international organizations were invited to consider the need to review them and to submit any proposals to the SDC Sub-Committee.

4 In 2022, CESA submitted document SDC 9/15/2 proposing the review of the Interim guidelines with a view to widening the application of FRP beyond their current limitation as structures that may be removed without compromising the safety of the ship. Consequently, SDC 9 agreed to invite MSC to move the output "Guidelines for use of fibre-reinforced plastics (FRP) within ship structures" from its post-biennial agenda to the 2024-2025 biennial agenda of SDC, and to place it on the provisional agenda of SDC 10.

5 Subsequently, MSC 107 agreed to include the post-biennial output on the revision of the "Guidelines for use of fibre-reinforced plastics (FRP) within ship structures" in the provisional agenda of SDC 10 (MSC 107/20/Add.1, annex 41) and set the target completion year to 2025.

6 Furthermore, SDC 9 agreed that any work undertaken on the review of the Interim guidelines would need to take into account and address the concerns raised during the session regarding the potential challenges with using FRP, in particular concerning its recycling and its combustibility with respect to fire safety.

7 In 2023, Germany and CESA submitted document SDC 10/12 to propose a number of considerations for the review of the current Interim guidelines and timelines for the finalization of this review.

8 SDC 10 agreed to establish the Correspondence Group (CG) on the Revision of the Interim Guidelines for Use of Fibre-Reinforced Plastic (FRP) (MSC.1/Circ.1574) under the coordination of Sweden (SDC 10/17, paragraph 12.9). The report of the CG was submitted as document SDC 11/11.

General comments on the Correspondence Group report

9 The co-sponsors very much appreciate the organization of the CG, including the three virtual meetings, as well as the opportunity for all participants to engage, discuss and submit text proposals for the revision of the Interim guidelines.

10 The co-sponsors support, in general, the outcomes of the CG, and specifically the conclusion regarding the inclusion of load-bearing divisions and elements contributing to global strength, as part of the scope of the revision of MSC.1/Circ.1574. The co-sponsors also support establishing a working group during this session with the terms of reference as proposed by the CG.

11 All proposals made by the co-sponsors within the framework of the CG, as well as in this document and the attached/linked text proposal, are to be understood as initial proposals and additional contributions are welcome.

Scope of output 2.6 and terms of reference for Correspondence Group (recycling)

12 The CG spent a considerable amount of time discussing the scope of the revision of the Interim guidelines. In this respect, the co-sponsors support and emphasize paragraphs 12 and 13 of document SDC 11/11, concluding that as part of the scope of the revision of the Interim guidelines, load-bearing divisions and elements contributing to global strength should be covered.

13 The inclusion of the Life Cycle Assessment (LCA) approach of fibre-reinforced composites was rejected by the Group at this stage (paragraph 16 of SDC 11/11). However, the co-sponsors would like to point out that an exclusive focus on the recyclability of fibre-reinforced composites would disregard the major advantages that can arise from their use compared to other materials over the entire product life cycle of a ship, such as fuel savings through weight reduction. The co-sponsors, therefore, recommend including a consideration of the recyclability of the material as part of a holistic consideration of the advantages and disadvantages of using FRP materials for their entire life cycle.

Discussion

14 In addition to the text proposals for the revision of the Interim guidelines for use of Fibre-Reinforced Plastic (FRP) (MSC.1/Circ.1574), contained in the CG report (SDC 11/11), the co-sponsors suggest further text proposals for this revision. Some of the key proposals are highlighted further below and the draft updated text can be downloaded [here](#) (hereafter updated draft text). The co-sponsors suggest using this draft text as the basis for discussion, as it further builds upon the text submitted through the CG.

Heat deflection temperature

15 Within MSC.1/Circ.1574, references are made to different critical temperature points with regard to FRP material. The co-sponsors propose to harmonize these critical temperatures for the structural integrity of FRP material and apply the heat deflection temperature (HDT) as defined in ISO 75-3 "High-strength thermosetting laminates and long-fibre-reinforced plastics". ISO 75 specifies methods for the determination of the temperature of deflection under load (flexural stress under three-point loading) of, among others, fibre-reinforced plastics, providing an indication of the ability of the material to bear a given load at elevated temperatures.

Fire testing and conservative approach with HDT and measurement on fire-exposed side

16 In appendix D.7 of the updated draft text, the co-sponsors propose to carry out tests on combinations of material and insulation that lead to a failure of the test if a temperature greater than the HDT of the material is measured on the fire-exposed side between the insulation and FRP material during the standard fire test. A successful test would ensure that the material is sufficiently protected from heat generated by a fire and able to maintain its structural integrity for at least the duration of the standard fire test.

Comparison between FRP and aluminium

17 According to SOLAS, aluminium is considered a non-combustible material and therefore, equivalent to steel in terms of structural integrity with regard to fire. In this context, the co-sponsors would like to point out the following passages, which are already contained in the current Interim guidelines:

- .1 "aluminium was, according to regulations, considered as an alternative non-combustible material to steel. However, the relatively poor structural behaviour at elevated temperatures (aluminium does not burn but nevertheless melts in the non-combustibility test) highlighted the simplistic nature of the non-combustibility requirement. Aluminium structures were therefore generally required to be fitted with double sided insulation and were thereby considered equivalent to steel in this regard" (MSC.1/Circ.1574, appendix D.1, paragraph 3);

- .2 "a steel construction could still be load carrying for a long time after such temperatures are reached, whereas e.g. an aluminium construction would start to lose its structural strength at about 200°C. A steel construction is therefore allowed with insulation on one side of the division, whereas aluminium constructions must be insulated on both sides. The same would be true also for FRP composites." (MSC.1/Circ.1574, appendix B.3.1, paragraph 1); and
- .3 "it should be noted that this temperature of significant weight loss is significantly higher than the point at which aluminium is structurally useful. Therefore, FRP composites do not contribute to a fire until reaching a temperature beyond which a currently acceptable non-combustible material has ceased to either provide structural support or restrict the spread of fire" (MSC.1/Circ.1574, appendix B.2.1, paragraph 2).

18 Based on the approach to aluminium for the construction of SOLAS ships, the co-sponsors would like to propose that FRP may be used for all elements and structures of a ship if they are protected against heat and flames in the event of a fire in accordance with the criteria laid out in paragraph 15 above, so that they can pass the Standardized Fire Test according to SOLAS. In this case, the material can even be expected to have advantages over non-combustible but thermally highly conductive metallic materials with regard to containment of fire.

Proposal

19 The co-sponsors propose to take into consideration the information and proposals contained in this document, as well as the updated draft proposal available [here](#) when considering document SDC 11/11.

Action requested of the Sub-Committee

20 The Sub-Committee is invited to consider the information contained in this document and the proposals contained in the further updated draft guidelines available through the link provided in paragraph 14, as well as the proposals contained in paragraphs 9 to 19, and to take action, as appropriate.
