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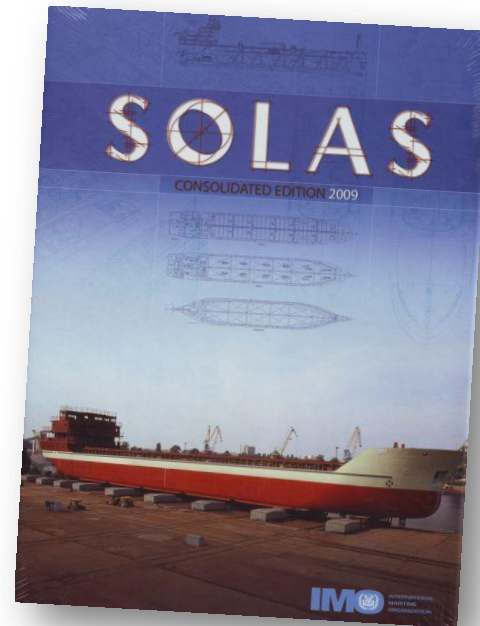
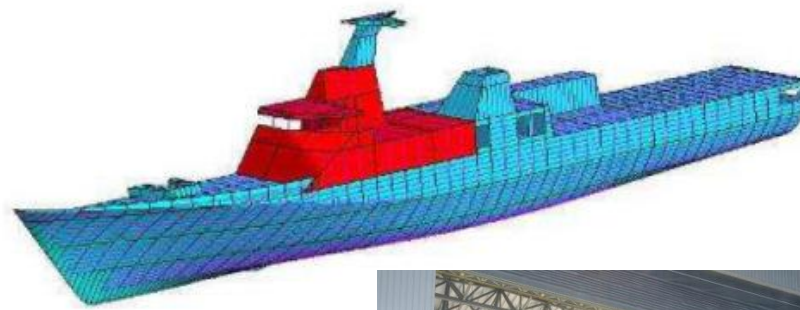
IMO FRP GUIDELINES STATUS

Franz Evegren

11 October 2017

RISE Research Institutes of Sweden

SAFETY AND TRANSPORT
Fire Research



Three are now one: RISE Research Institutes of ~~Sweden~~

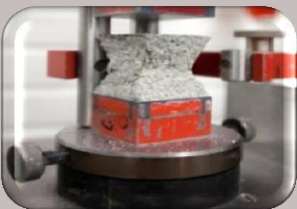
The RISE institutes Innventia, SP and Swedish ICT have merged in order to become a stronger research and innovation partner for businesses and society.



Facts about RISE

- 2 300 employees, 30 % PhD
- Turnover ~300 million Euro
- SME clients responsible for approx. 30 %
- RISE is owner/partner in 60 % of Sweden's test and demonstration facilities (several hundred), open for industry, SMEs, universities and institutes





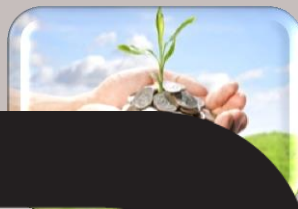
Concrete



Pharma



Pu



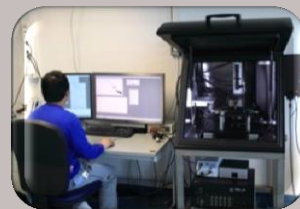
Bioecon



n



Water



Surfaces



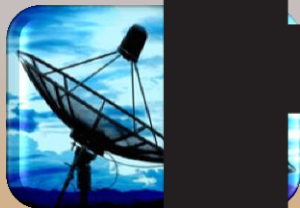
Pilot plant



Measurement



Fire



Rad



Wood



tics



ertification



Electronics



Chemistry



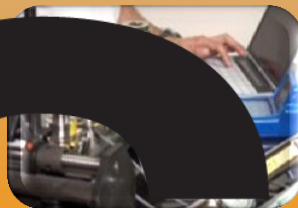
Agro



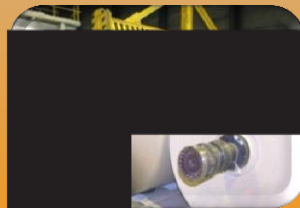
Mechanics



Glas



Calibration



Pulp



Paper



Energy



Big data



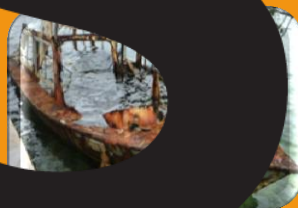
ICT



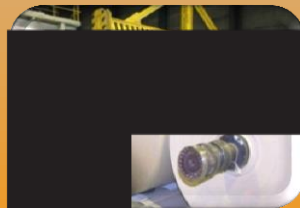
Food



Packaging



Corrosion



Safety



Air



Machine



Programming

Fire safety assessment of FRP composite structures

MSC 87 UK proposed the item and required guidance when FRP replaces steel
“Development of guidelines for use of Fibre Reinforced Plastic (FRP) within ship structures”

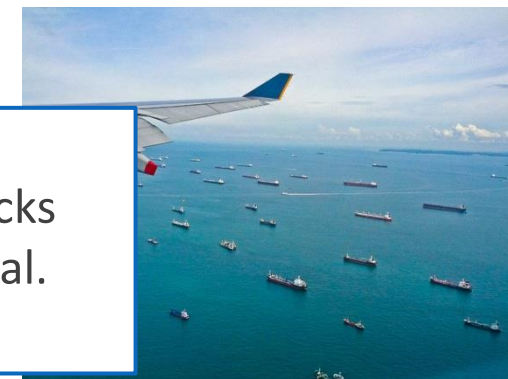
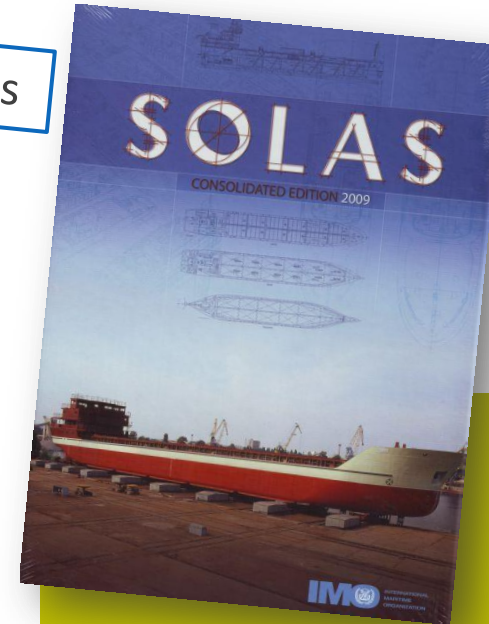
SOLAS (Safety Of Life At Sea) chapter II-2

SOLAS chapter I, Reg. 5 Equivalents

- Regulation 4 Probability of ignition
- Regulation 5 Fire growth potential
- Regulation 6 Smoke generation potential and toxicity
- Regulation 9 Containment of fire
- Regulation 10 Fire fighting
- Regulation 11 Structural integrity
- Regulation 13 Means of escape
- ...
- Regulation 17 Alternative design and arrangements

Reg. 9 prescribes main vertical and horizontal zones of A-class divisions
= steel or other equivalent material
= a non-combustible material which, by itself or down to insulation

Reg. 11 prescribes the hull, superstructures, structural bulkheads, decks and deckhouses to be constructed of steel or other equivalent material.



Guidelines for alternative design

SOLAS chapter II-2, Reg. 17 Alternative design and arrangements

Alternative solutions for fire safety are allowed if they can be shown to be at least as safe as a prescriptive design. Is shown through an analysis based on...

MSC/Circ.1002

Guidelines on Alternative Design and Arrangements for Fire Safety

MSC.1/Circ.1455

Guidelines for the approval of alternatives and equivalents as provided for in various IMO instruments

MSC.1/Circ. 1574

Guidelines for use of Fibre Reinforced Plastic (FRP) Elements within Ship: Fire Safety Issues



“Development of guidelines for use of Fibre Reinforced Plastic (FRP) within ship structures” (1/2)

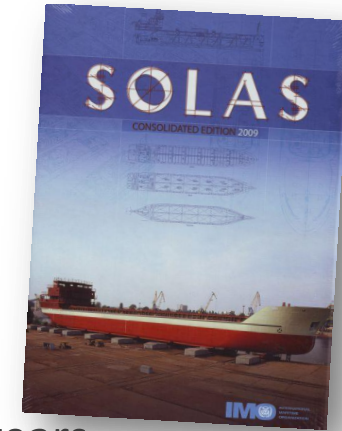
MSC 87 UK proposed the item and required guidance when FRP replaces steel

(2010)

MSC 98 “Interim Guidelines for use of FRP elements within ship structures: Fire Safety Issues”

What has happened?

- Agreement that approval of FRP elements is possible through SOLAS II-2/17, but some consider SOLAS I/5 a more suitable way (radio/radar, grounding...)
- The design SHALL MEET the fire safety objectives and functional requirements of SOLAS chapter II-2. (SOLAS II-2/5.1.3: The use of combustible materials shall be restricted.)
- Accepted as “interim” guidelines, meaning that they will be reviewed after four years in order to make any necessary amendments based on experience gained from using them.



“Development of guidelines for use of Fibre Reinforced Plastic (FRP) within ship structures” (2/2)

MSC 87 UK proposed the item and required guidance when FRP replaces steel

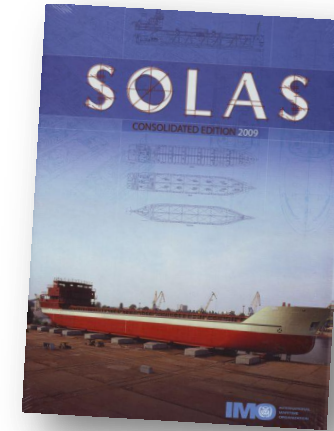
(2010)

MSC 98 “Interim Guidelines for use of FRP *elements* within ship structures: Fire Safety Issues”

What has happened?

- **Element:** “a structure which may be removed without compromising the safety of the ship”

“SOLAS was not developed with the concept of structural failure due to fire. Steel ships consist of welded steel boxes, unlike the columns and beams of buildings. Without the need to respond to casualties from a structural failure due to fire, IMO did not commit the effort to address the issue. Aluminum was permitted by requiring insulation without considering the issue of the overall structure. Had aluminum replaced steel as the primary material for large ships, IMO would have been forced to address structural failure of the ship. We opine that it is beyond the current experience of administrations to effectively evaluate whether a design had adequately avoided structural failure of the ship due to fire.” (USA)



“Development of guidelines for use of Fibre Reinforced Plastic (FRP) within ship structures” (2/2)

MSC 87 UK proposed the item and required guidance when FRP replaces steel

(2010)

MSC 98 “Interim Guidelines for use of FRP *elements* within ship structures: Fire Safety Issues”

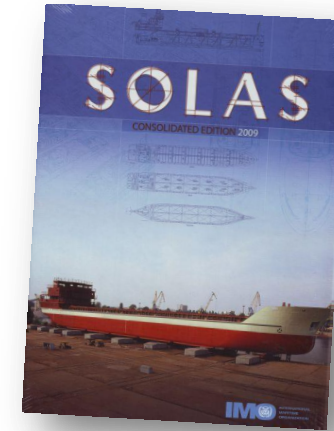
What has happened?

- **Element:** “a structure which may be removed without compromising the safety of the ship”

“do not fully address the risks of progressive structural collapse or global loss of structural integrity due to fire associated with a fully FRP composite ship or FRP composite structures contributing to global strength. Deviations from the guidelines should be identified and additional assessments be performed, as appropriate.”

“...may be categorized, for example, as:

1. integrated structures: elements integrated into the ship structure that do not contribute to global strength (e.g. pool, sliding roof, stage, tender platform, etc.); and
2. components: non-structural parts that are connected to the ship structure via mechanical or chemical joining methods (e.g. balcony, funnel, mast, gantry, flooring, etc.).”



Content of the IMO FRP guidelines, MSC.1/Circ.1574

Chapter 1: General

Chapter 2: Assessing fire safety of FRP composite structures

Chapter 3: Important factors to consider with regards to chapter II-2 regulations

Appendix A: Issues other than fire safety

Appendix B: FRP Composite Materials and Compositions used in Shipbuilding

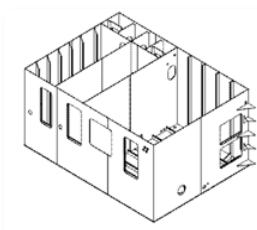
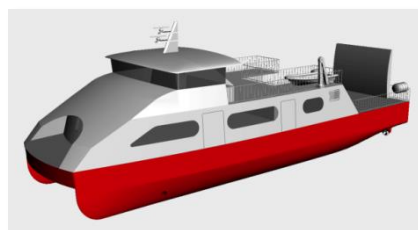
Appendix C: Recommendations regarding the assessment

Appendix D: Fire Testing of FRP Composite

Appendix E: Example of Assessment Procedure

Review after four years, to make amendments based on experience from application

**Approved examples are necessary
to release the industry**





THANK YOU

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