

A large blue and red ship, the Magellan Explorer, is shown from a low angle, moving through the water. The ship's name 'MAGELLAN EXPLORER' is visible on its side. The background is a clear blue sky. The ship is partially obscured by a large teal graphic element that overlaps the right side of the image.

The use of alternative designs in encouraging innovation in ship design

Marintec, Shanghai, 2023

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First – Congratulations to SWS and CSSC 祝贺中船集团和外高桥造船



AGENDA



Prescriptive versus Performance
AD&A Regulations
Public Information
Breadth of Possibilities
Summary

Example of Prescriptive Standard



'All motor vehicle exhausts are to be fitted with a filtration unit of 120 mesh size or less'

This specifies the technical measure to be used

Compliance is easily checked

It may not be task or cost effective

No ownership of the objective by the car manufacturer



Example of Performance Standard



‘The level of particulates emitted from a motor vehicle engine should not exceed 1 ppm’

The performance standard to be achieved is clear

The manufacturer may use any solution in achieving the objective

The manufacturer has to own / understand the objective

Compliance with the standard is easily achieved by air sampling



Prescription vs Performance regulation



PRESCRIPTIVE Regulation

- Specific rules defining technical solutions
- Reactive - driven by accident history
- Regulators / Class actively involved in drafting

PERFORMANCE or GOAL oriented

- Regulators / Class define specific objective
- Nature of the technical solution is left to the operator
- Risk assessment fits well into this structure
- Potential for cost-benefit decision making

Issues identified



A designer wants to design a ship which is safe and meets the owner's requirements.

In some areas there are possibilities for giving the designer a flexibility to design the ship he wants to, and not to have to design the ship he's allowed to design.

SOLAS has identified 3 areas where this is possible and has created regulations to apply.

**SOLAS Ch. II-1 Reg 55 –Machinery Arrangements
Example – pumping arrangements**

**SOLAS Ch. II-2 Reg 17 _Fire Safety
-Example –Large Fire Zones**

**SOLAS Ch. III Reg. 38_Life Saving Appliances
-Example -Large Life Boats**

These are departures from the prescriptive rules, which are allowed in SOLAS, these are not “exemptions”

Design Example- Lifeboats

A designer designs a ship which needs Lifeboats for 470 people on each side of the ship.

SOLAS limits him to boats of 150 persons so 4 boats each side minimum.

This requires;

- 8 boats to supply and maintain
- 8 Davits to supply and maintain
- space for 8 boats
- 8 sets of falls and hooks to supply and maintain
- 8 Lifeboat crews to be trained

Using larger boats could half the number of boats, falls, crews and davits and could reduce the space needed for boats, increasing passenger space for cabins/shops etc.. So this could reduce costs and increase income.

Alternatives



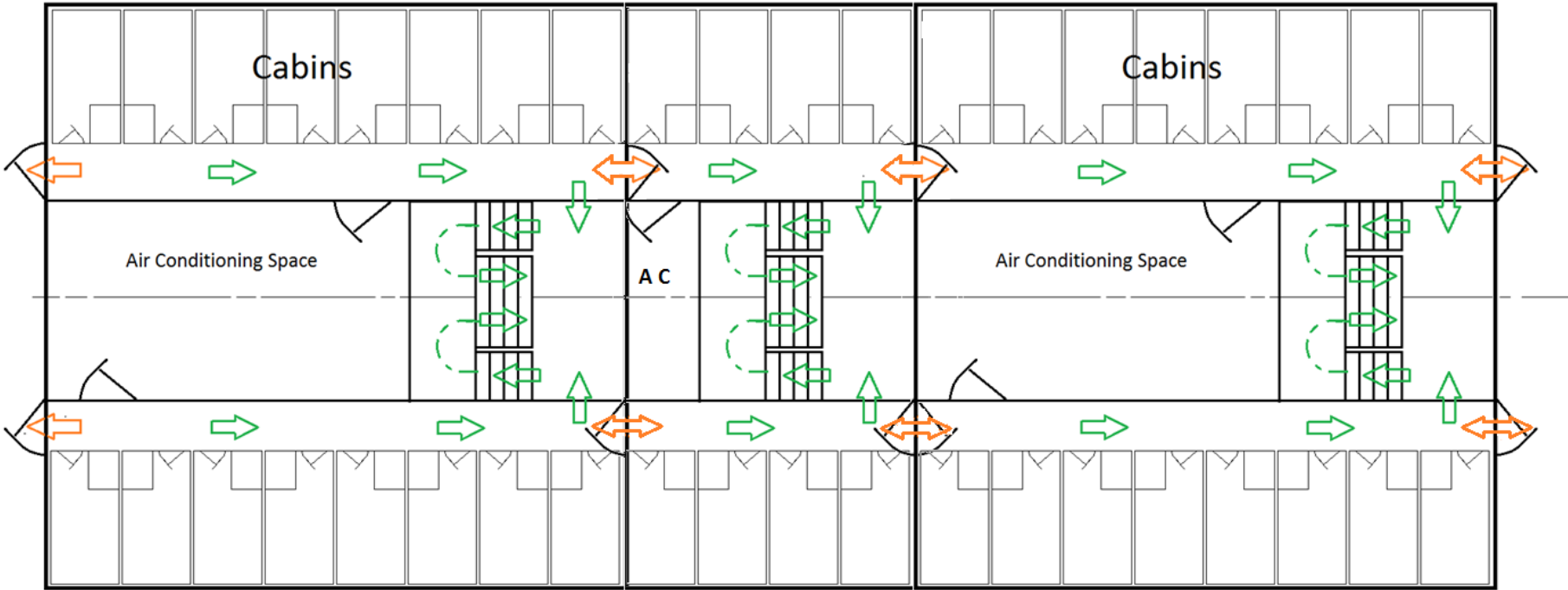
Ship with 8 Lifeboats



Ship with 4 Lifeboats



Main Fire Zones - Using prescriptive



- MFZ 2**
- 1 sprinkler zone
 - 1 Fire detection loop
 - 1 AC supply
 - 1 Lighting supply
 - 16 cabins

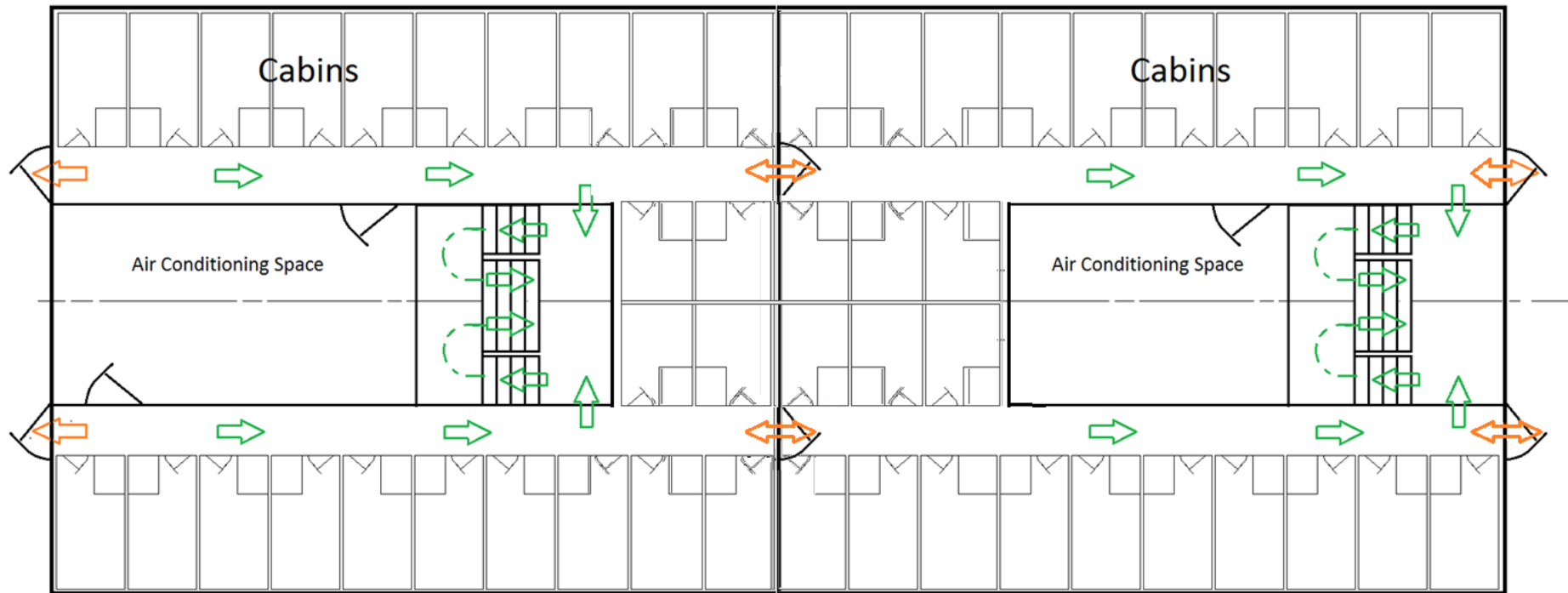
- MFZ 3**
- 1 sprinkler zone
 - 1 Fire detection loop
 - 1 AC supply
 - 1 Lighting supply
 - 8 cabins

- MFZ 4**
- 1 sprinkler zone
 - 1 Fire detection loop
 - 1 AC supply
 - 1 Lighting supply
 - 16 cabins



- 3 sprinkler zone
- 3 Fire detection loop
- 3 AC supply
- 3 Lighting supply
- 40 cabins

Main Fire Zones - Using AD&A



MFZ 2

- 1 sprinkler zone
- 1 Fire detection loop
- 1 AC supply
- 1 Lighting supply
- 24 cabins

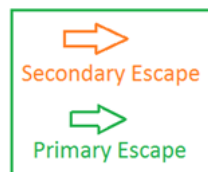
MFZ 3

- 1 sprinkler zone
- 1 Fire detection loop
- 1 AC supply
- 1 Lighting supply
- 26 cabins

TOTAL

- 2 sprinkler zone
- 2 Fire detection loop
- 2 AC supply
- 2 Lighting supply
- 50 cabins

If this was repeated over 5 decks of accommodation, the ship has 50 more cabins



A common approach to 3 Regulations

The methods for an Alternative Arrangement Acceptance is given in SOLAS and is consistent across the Fire, LSA and Engineering areas.

1 Purpose

2 General

3 Engineering analysis

4 Evaluation of the alternative design and arrangements

5 Exchange of information

6 Re-evaluation due to change of conditions

Example of where an LSA ADA affects Interior Arrangements



An evacuation analysis should be performed in order to verify total evacuation time of the ship within the limits as prescribed by SOLAS, including the verification of the boarding time of the lifeboats by tests as prescribed by SOLAS.



Public Information



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Search the world fleet of ships by IMO Number and look up company particulars by IMO Company Number.
- Maritime Security**
Information communicated under the provisions of SOLAS regulation XI-2/13 (SOLAS chapter X1-2 and the ISPS Code).
- Contact Points**
Contact lists of competent authorities and authorized organizations relating to IMO matters.
- Recognized Organizations**
Information submitted by Member States under MSC/Circ.1010-MEPC/Circ.382.
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Impressive reality check x International Maritime O x Surveys and Certification x

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Flag Administration: [All flag Administrations]

Ship name:

Ship IMO Number:

Text in title of reporting: (For reporting other than for a specific ship)

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Ref.	Flag Administration	Ship name	IMO Number	Title of reporting	Authority conferred by	Exempted from/equivalent to	Date of notification
XQ42923	Myanmar	KYAUK PYU	IMO 8902826		SOLAS regulation I/4(b)	SOLAS regulations III/32.3.2	2018-02-22
XQ42919	Myanmar	KENG TUNG	IMO 9158135		SOLAS regulation I/4(b)	SOLAS regulations III/32.3.2	2018-02-22
XQ42905	Myanmar	DAWEI	IMO 9158123		SOLAS regulation I/4(b)	SOLAS regulation III/32.3.2	2018-02-22
XQ42937	Myanmar	YAAN BYAE	IMO 9015797		SOLAS regulation I/4(b)	SOLAS regulations III/32.3.2	2018-02-22
XQ42969	Bolivia (Plurinational State of)	ATENEA	IMO 7119991		SOLAS CHAPTER III	REGULATION 32.3	2018-02-22
XQ42955	Seychelles	MALOYA	IMO 9128518		SOLAS Chapter V Regulation 3.2	Regulation 20.8.11 of SOLAS Chapter III	2018-02-22
XQ42941	Myanmar	MAAN AUNG	IMO 8920153		SOLAS regulation I/4(b)	SOLAS regulations III/32.3.2	2018-02-22
XQ42898	Vanuatu	GLOBAL DISCOVERY	IMO 9725691		CHAPTER III, REGULATION 20.8.1.1 and 20.9.1	CHAPTER III, REGULATION 20.8.1.1 and 20.9.1	2018-02-21
XQ42852	Antigua and Barbuda	PERLE	IMO 9119579		MLC	MLC Reg. A 3.1 No. 7(b)	2018-02-14
XQ42820	Bahamas	RANDGRID	IMO 9075345		SOLAS I, Reg.5(a)	SOLAS II-2, Reg.10.5.1.1 and SOLAS II-2, Reg.10.5.2.2.1	2018-02-08
XQ42781	Bahamas	NORWEGIAN BLISS III	IMO 9751511		LL Art 8(1)	Reg 23	2018-02-05
XQ42795	Bahamas	NORWEGIAN BLISS	IMO 9751509		LL Art 8(1)	Reg 23	2018-02-05
XQ42642	Bahrain	JANA 17	IMO 9746891		regulation III/2.1	regulation III/32.3	2018-02-04

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Examples from public records



REPORT ON THE APPROVAL OF ALTERNATIVE DESIGN AND ARRANGEMENTS FOR FIRE SAFETY

The Government of The Commonwealth of the Bahamas has approved on 22 March 2016 an alternative design and arrangement in accordance with provisions of regulation II-2/17.5 of the International Convention for Safety of Life at Sea (SOLAS), 1974, as amended, as described below:

Name of Ship	Koningsdam
Port of registry	Nassau
Ship Type	Passenger
IMO Number	9692557

1. Scope of the analysis or design, including the critical design assumptions and critical design features:

The analysis has been carried out in line with the contents of MSC.1/Circ.1319, Annex, and in particular Paragraph 4.1 where recommendations are made for evaluation of the fire performance and approval of fire doors exceeding 50% or more in surface area those which can be accommodated in the standard specimen size (e.g., 2,440 mm wide and 2,500 mm high), as specified in part 3 of the FTP Code, and it is indicated a full analysis based on SOLAS regulation II-2/17 should be performed to assess the safety of the vessel.

Name of ship:	Britannia
Port of registry:	Hamilton
Ship type:	Passenger
IMO number:	9614036

1. Scope of the analysis or design, including the critical design assumptions and critical design features:

The purpose of the analysis is to demonstrate that the arrangement of survival crafts (lifeboats) carried on the above vessel provides an equivalent level of safety to the prescriptive requirements of SOLAS chapter III.

The lifeboats, and the associated launching system, will be designed, constructed, tested and installed, in compliance with the applicable requirements of the International Life Saving Appliances (LSA) Code and of SOLAS.

The Analysis comprises of the following components:

- Comparative study to identify any deviation from the prescriptive requirements applicable to the lifeboat and davit launching system, as contained in the above mentioned IMO Codes and Conventions;
- Failure Mode Effect Analysis (FMEA) of the lifeboat and davit launching systems to identify and address any critical issue relevant to their safety and operability
- Evacuation embarkation analysis to verify the total evacuation time of the vessel within the time limits applicable to it, as referred to in IMO MSC.1/Circ. 1238,

2. Description of the alternative design and arrangements:

The vessel has 5 large openings in main fire bulkheads (MFB) and one large opening to stairway enclosures extending over two or more decks.

These openings are closed by large fire protection closures in the form of roller shutters and stack barriers. The roller shutters and the stack barriers are separating two public spaces or separating public spaces from stairways.

The fire protection closures are separating the following spaces:

- Position 1: Separating 'The Via' in MVZ 6 incl. its dome from the stairs in MVZ 5 (MFB separating Cat.8 from Cat.2 space)
- Position 2: Separating the stairs in MVZ 5 from the 'Royal Esplanade' in MVZ 5 (A-15 bulkhead separating Cat.2 from Cat.8/4 space)
- Position 3: Separating the 'Royal Esplanade' in MVZ 5 incl. its dome from the 'Royal Esplanade' in MVZ 4 (MFB separating two Cat.8/4 spaces)

Breadth of the flexibility



- ☐ Chapter II-2 - Construction - Fire protection, fire detection and fire extinction
 - ☐ Part A - General
 - Regulation 1 - Application footnote
 - Regulation 2 - Fire safety objectives and functional requirements
 - Regulation 3 - Definitions
 - ☐ Part B - Prevention of fire and explosion footnote
 - Regulation 4 - Probability of ignition
 - Regulation 5 - Fire growth potential
 - Regulation 6 - Smoke generation potential and toxicity
 - ☐ Part C - Suppression of fire
 - Regulation 7 - Detection and alarm
 - Regulation 8 - Control of smoke spread
 - Regulation 9 - Containment of fire
 - Regulation 10 - Fire fighting
 - Regulation 11 - Structural integrity
 - ☐ Part D - Escape
 - Regulation 12 - Notification of crew and passengers
 - Regulation 13 - Means of escape
 - ☐ Part E - Operational requirements
 - Regulation 14 - Operational readiness and maintenance
 - Regulation 15 - Instructions, on-board training and drills
 - Regulation 16 - Operations
 - ☐ Part F - Alternative design and arrangements
 - Regulation 17 - Alternative design and arrangements
 - ☐ Part G - Special requirements
 - Regulation 18 - Helicopter facilities
 - Regulation 19 - Carriage of dangerous goods footnote
 - Regulation 20 - Protection of vehicle, special category and ro-ro spaces
 - Regulation 20-1 - Requirements for vehicle carriers carrying motor vehicles with compressed hydrogen or natural gas in their tanks for their own propulsion as cargo
 - Regulation 21 - Casualty threshold, safe return to port and safe areas
 - Regulation 22 - Design criteria for systems to remain operational after a fire casualty
 - Regulation 23 - Safety centre on passenger ships

Alternative Designs and Arrangements Summary



Cost effective design

Design for unique applications

Formal method of incorporating novel designs

Greater understanding of loss potential

Allows designs to be assessed which are too complex to have relevant regulations applied

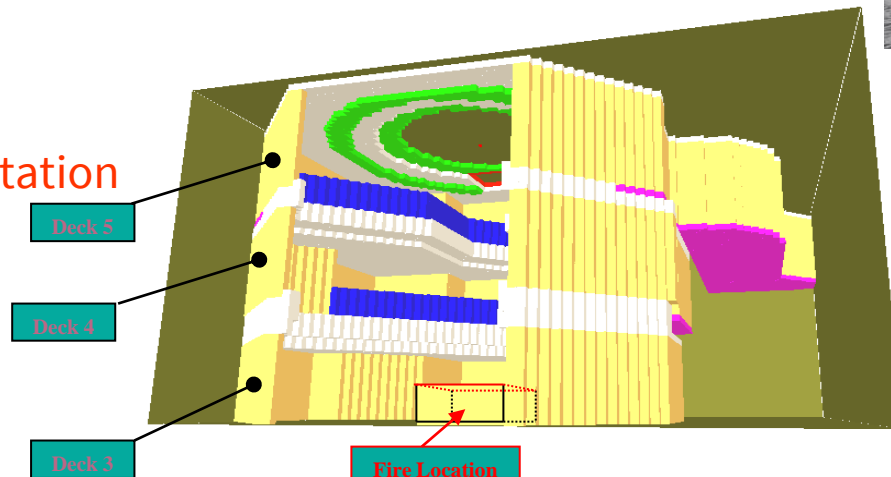
Conventional guidance can restrict design flexibility

Can address issues beyond life safety, e.g. protection of asset

Time

Cost

Greater documentation



By using Alternative Design and Arrangements the designer may be able to build what they want to build rather than the design the regulations allow them to.

灵活多样的船体设计和布置，能够为船东、船舶设计与建造方呈现真正符合其市场需求的方案，而不仅仅是为了迎合规范的要求。



Thank you