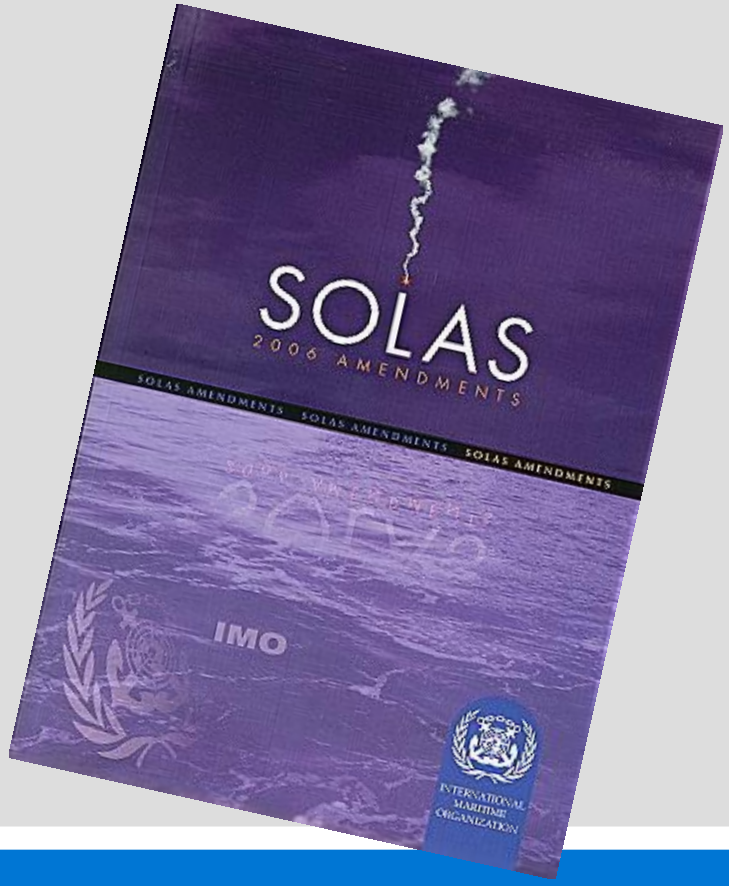
“Safe Return to Port” Requirements and Compliance



New IMO Requirements –
Safe Return to Port

LLOYD’S REGISTER EMEA

Lloyd's Register

Background

- In the beginning of 2000 the increasingly sizes of passenger ships and growing passenger numbers started to raise concerns of the affected levels of risk to these kind of ships.
- no doubt of these ships were being built, designed and operated in compliance with applicable IMO standards
- IMO launched a comprehensive proactive review of passenger ship safety - “Large Passenger Ship”
- Aiming at assessing the existing regulations were adequate and addresses all safety aspects of their operation – particular in emergency situations and where necessary to develop further safety requirements
- *“future large passenger ships should be designed for improved survivability, based on the time-honoured principle that* ***a ship is its own best lifeboat*** *”*
- “Large” dropped in 2004

30 years severe Cruise ship's fires resulting in abandonment, sinking or loss of propulsion steering and power

2009
- **Zenith (Pullmantur Cruises) not severe, just the latest**
- **Royal Princess (Princess Cruises) - in port, loss of propulsion**

2008
- ***Sea Wind* (Silja Cargo fleet) –passengers evacuated by helicopter**

2006
- **Calypso (Louis Cruise Lines) - ship towed to Southampton**

1999
- **Enchantment of the Seas (RCI) – loss of propulsion 60 miles from St. Thomas**
- **Sun Vista (Sun Cruises) - Sinks of the coast of Malaysia**

1998
- **Carnival Ecstasy - loss of power and steering**

1997
- **Vistaford (Cunard) – loss of propulsion and steering for two days before able to reinstate and return to port**
- **Romantica (New Paradise) – total loss**

1996
- **Golden Princess –loss of propulsion/steering**
- **Discovery I (Discovery Cruise Lines)**

1995
- **Celebration (Carnival) – ship adrift for two days**
- **Regency Star (Regency) - loss of propulsion/steering**

1994
- **Achille Lauro (MSC Starlauro) – sinks off the coast of Somalia**

1991
- **Starship Majestic (Walt Disney World) - loss of propulsion/steering**

1990
- **Regent Star (Regency) - grounding**
- **Crystal Harmony (Crystal) - ship adrift for three days**

1980
- **Prinsendam (HAL) – sinks 30 miles off Miami**

1979
- **Angelina Lauro (Starlauro) (galley fire) – sinks off Virgin Island st. Thomas**

Some comparisons of vessel sizes – delivered 1996

- Carnival Cruise Lines – Destiny Class
- MS Carnival Destiny
- Tonnage 101.353 GT
- Loa 272m
- Beam 35.6m
- Draft 8.2m
- 12 passenger decks
- Passengers - 2642
- Crew – 1040

- First passenger ship > 100.000 GT

Some comparisons of vessel sizes – delivered 1999-2003

- RCCL – Voyager Class
- MS Explorer of the Seas
- Tonnage 138.000 GT
- Loa 311m
- Beam 38.6m
- Draft 8.8m
- 15 passenger decks
- Passengers - 3114
- Crew – 1185

Some comparisons of vessel sizes – delivered 2004

- Cunard Lines
- RMS Queen Mary 2
- Tonnage 148.528 GT
- Loa 345m
- Beam 41m
- Draft 10.1m
- 13 passenger decks
- Passengers - 2620
- Crew – 1253

Some comparisons of vessel sizes – delivered 2008

- RCCL – Freedom Class
- MS Independence of the Seas
- Tonnage 154.407 GT
- Loa 339m
- Beam 38.6m
- Draft 8.8m
- 15 passenger decks
- Passengers - 4370
- Crew – 1360

Some comparisons of vessel sizes – delivered 2009

- Carnival Cruise Lines – Dream Class
- MS Carnival Dream
- Tonnage 130.000 GT
- Loa 306m
- Beam 37.2m
- 14 passenger decks
- Passengers - 3652
- Crew – 1369

Some comparisons of vessel sizes – delivery late 2009

- RCCL – Oasis Class
- MS Oasis of the Seas
- Tonnage 225.000 GT
- Displ. 100.000 tonnes
- Loa 360m
- Beam 47m
- Height 65m ab. Wl.
- Draft 9m
- 18 passenger decks
- Passengers - 5400 (double occupancy)
- Passengers - 7300 (incl.3rd and 4th)
- Crew – tbd

- Worlds largest (at time of build)

Application

- Amendments to SOLAS Ch. II–1 and Ch. II–2 finalised at the 82nd session of the IMO's Maritime Safety Committee in December 2006. Resolution MSC 216(82) Annex 2 & 3 (2006 amendments)
- New requirements are applicable to all passenger ships built on or after the 1st July 2010 having:

  Regulation II-2/21.1

  - a length of 120 m or more, or
  - three or more main vertical zones
- Note! Applicable also for ROPAX vessels as well!
- Horizontal fire zones (special category, Ro-Ro spaces) should not be included in the count
- Work ongoing at MSC, and SLF & FP subcommittees to develop:
  - Guidance notes
  - Stability criteria for return to port after a flooding casualty

Summary of the new requirements

- Casualty Threshold, Safe Area, Essential Services and Safe Return to Port concepts
- Orderly Evacuation and Abandonment after a casualty

New concepts introduced

- **Casualty Threshold (Reg. II-1/8-1 & II-2/21)**

  When damage does not exceed the casualty threshold, essential systems should remain operational and provide for systems to support safe area(s)

  Casualty thresholds are defined for:

  - Flooding

    -flooding of any single watertight compartment

    (*including compartments without boundary to the sea)*

  - Fire

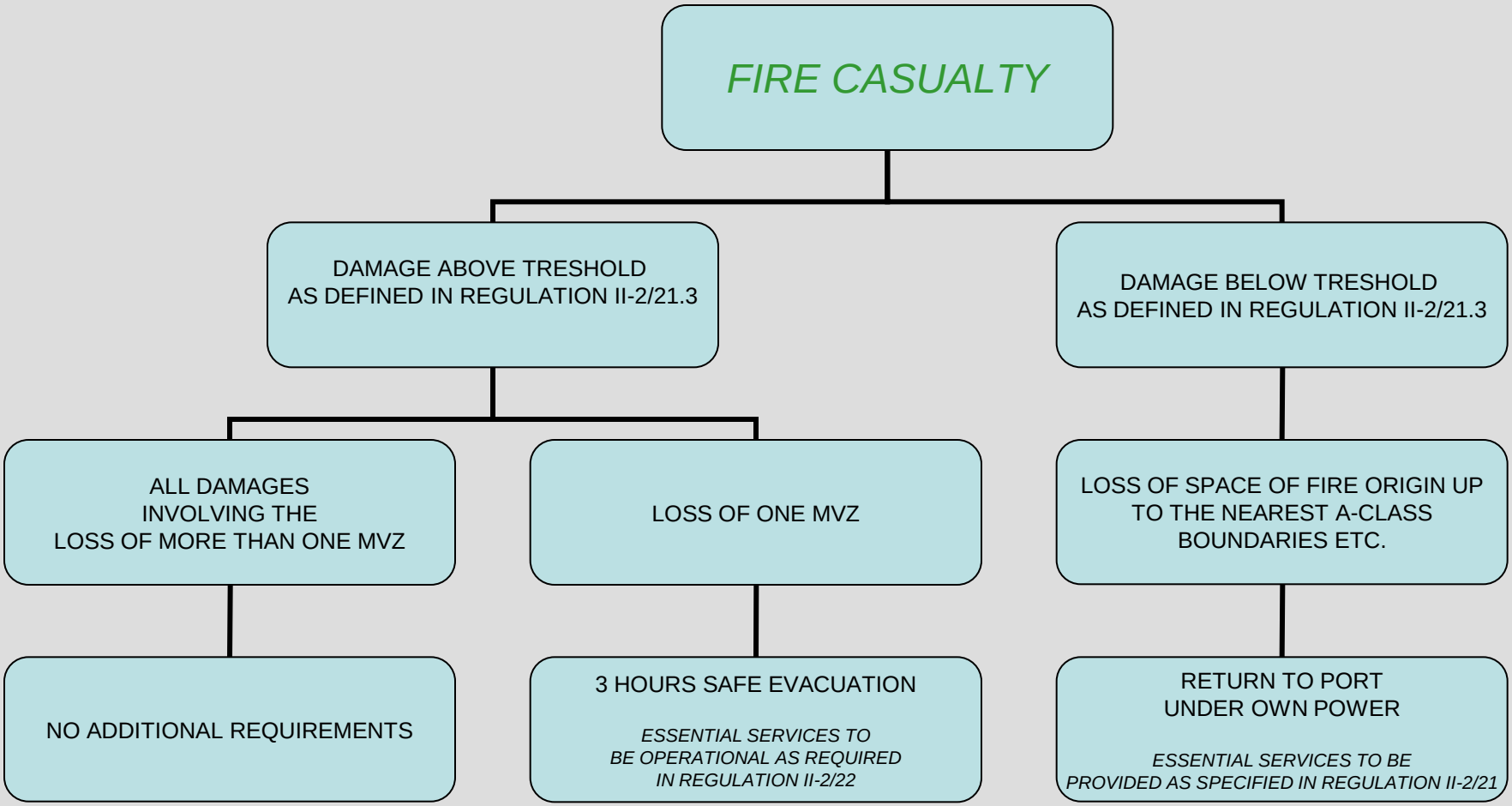
    -loss of space of origin up to the nearest “A” class boundaries *(if protected by a FFES)*

    -loss of space of origin and adjacent spaces up to the nearest ”A” class boundaries

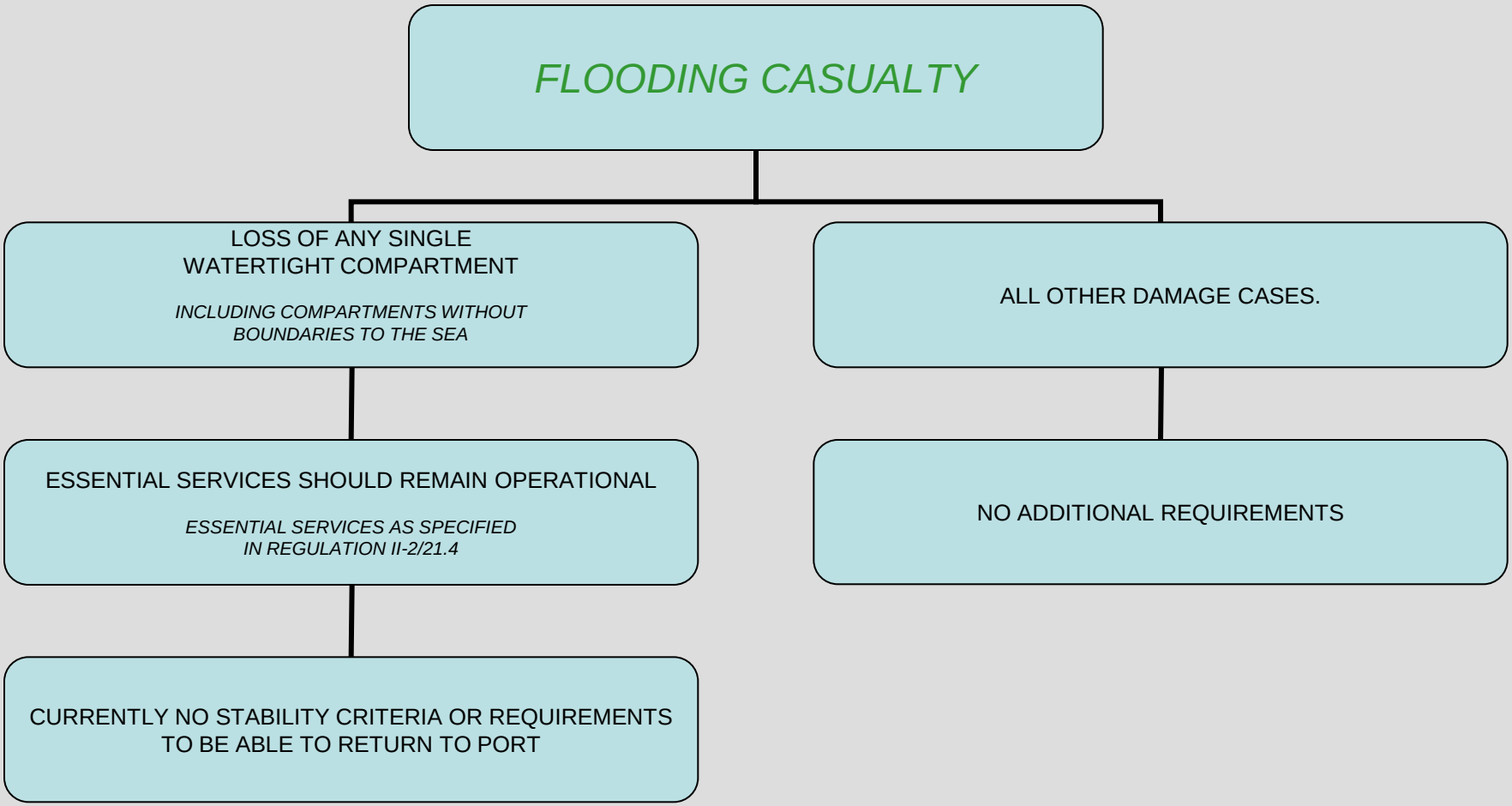
  <u>In case of fire only</u> (according to the present text of the regulations) the ship should be capable of returning to port using its own power, with all essential systems operational and while providing safe area(s).

  Presently there is no explicit requirement in II-1/8.1 flooding for the ship to be able to return to port.

Application of requirements



Application of requirements



New concepts introduced

- **Essential systems (MSC/Circ. 1214) [see also below]**
  - Propulsion systems and their necessary auxiliaries and control systems
  - Ship's electrical-generation systems and their auxiliaries vital to the vessel's survivability and safety
  - Steering systems and steering-control systems
  - Systems for fill, transfer and service of fuel oil
  - Internal and external communications systems
  - Fire main system
  - Fixed fire-extinguishing systems (gaseous and water)
  - Fire and smoke detection systems
  - Bilge and ballast systems
  - Navigation systems
  - Basic services to safe areas
  - Flooding detection system
  - Other systems vital to damage control

Basic Services to support Safe Areas

Black/grey water system
Potable Water system
Refrigeration system
Galley systems
HVAC system
Lighting
(etc)

New concepts introduced

- **Safe Area(s) (Reg. II-2/21)**

  Safe area in the context of a casualty is, from the perspective of habitability, any area(s) which is not flooded or which is outside the main vertical zone(s) in which a fire has occurred such that it can safely accommodate all persons onboard to protect them from hazards to life or health and provide them with basic services:

  - sanitation
  - water & food;
  - space for medical care;
  - shelter from the weather;
  - means of preventing heat stress and hypothermia;
  - light & ventilation

New concepts introduced

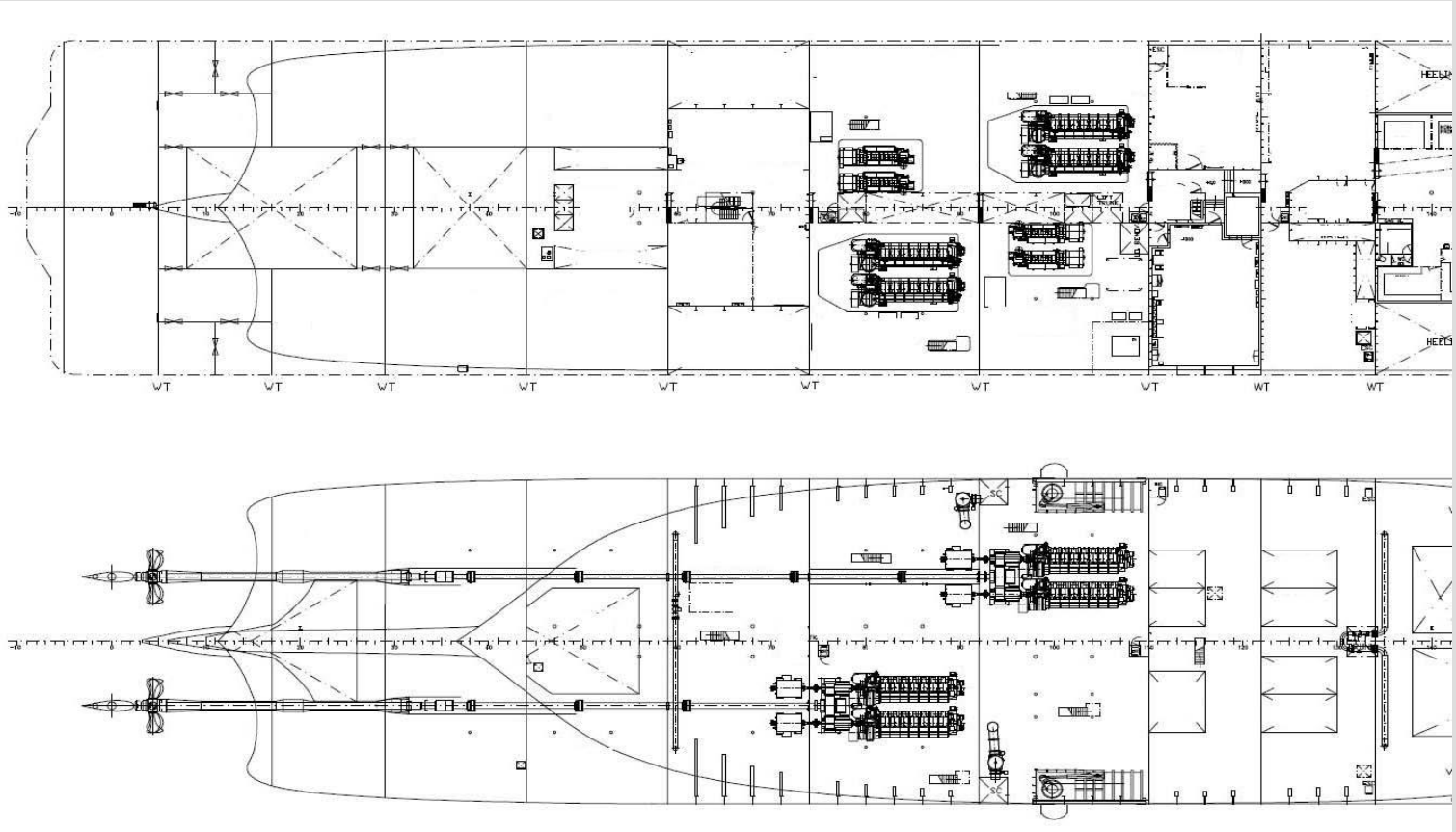
- **Orderly Evacuation and abandonment after a casualty (Reg. II-2/22)**
- In case any one main vertical zone is unserviceable due to fire, some systems shall remain operational for at least 3 h outside the unserviceable main vertical zone:
  - fire main
  - internal communications (in support of fire–fighting as required for passenger and crew notification and evacuation)
  - means of external communications
  - bilge systems for removal of fire–fighting water
  - lighting along escape routes, at assembly stations and at embarkation stations of life–saving appliances
  - guidance systems for evacuation shall be available.

•Achieving and verifying compliance with the new requirements

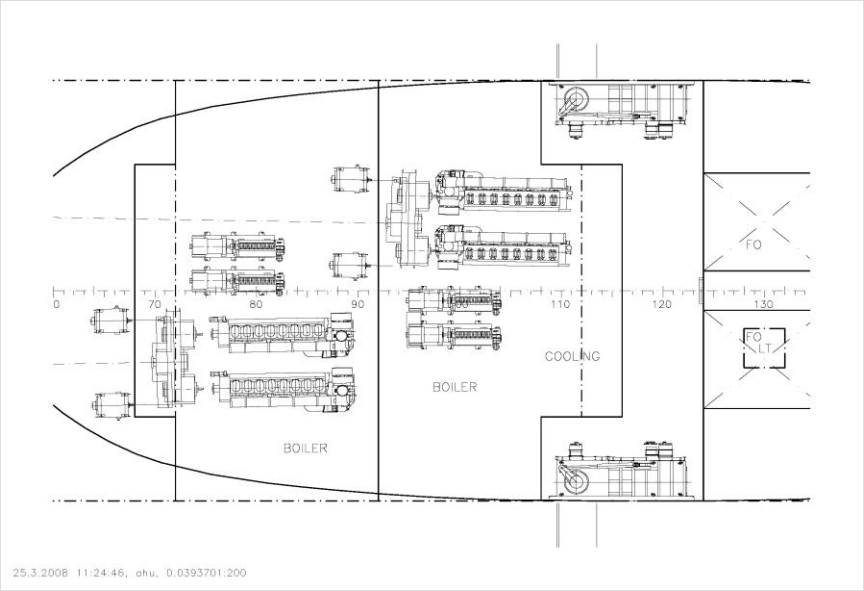
Applying SOLAS Ch II-2, Reg. 21 & 22

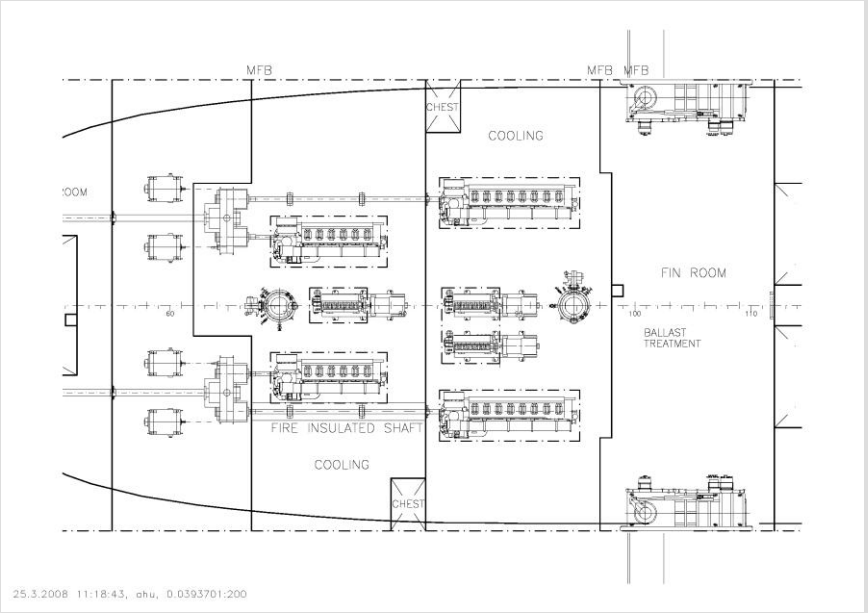
- A number of new concepts, introduced
- It is a performance requirement and contains an element of intentional ambiguity
- No reference to required prescriptive characteristics (e.g. speed, distance, power or capacities, neither in Regulation II-2/21 nor in the Performance standards in MSC/Circ.1214)

Concept – segregation of conventional diesel propulsion plant

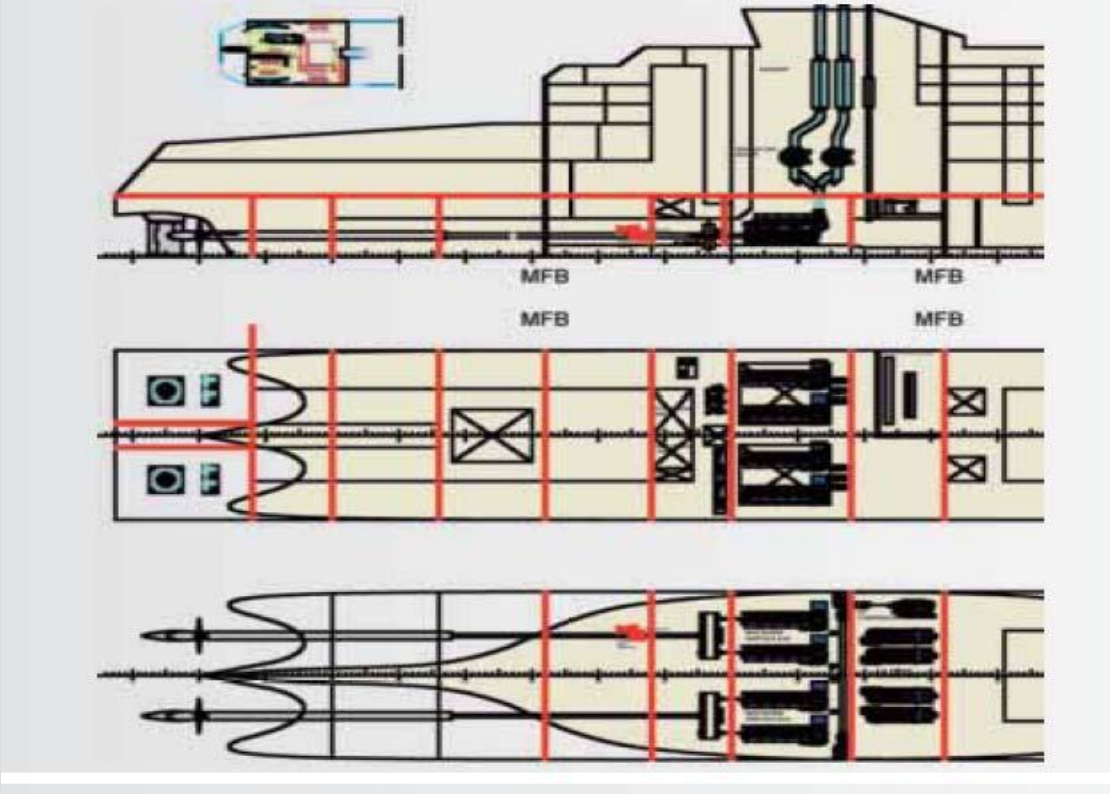


Concept – segregation of conventional diesel propulsion plant

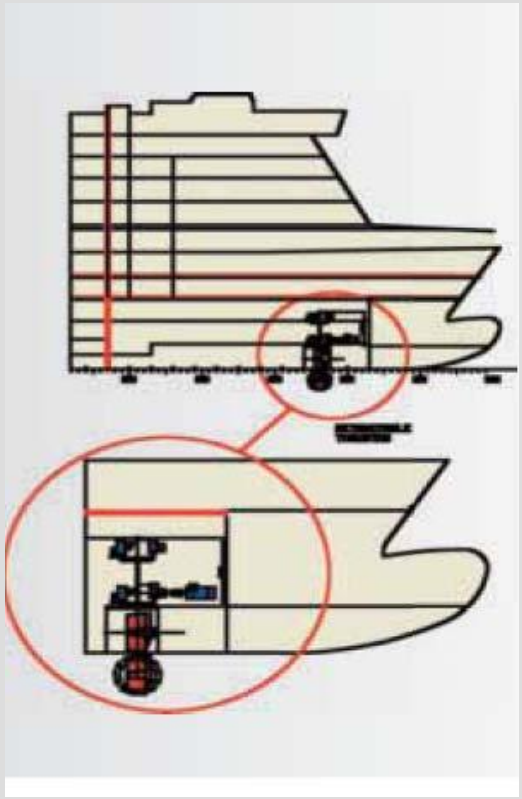




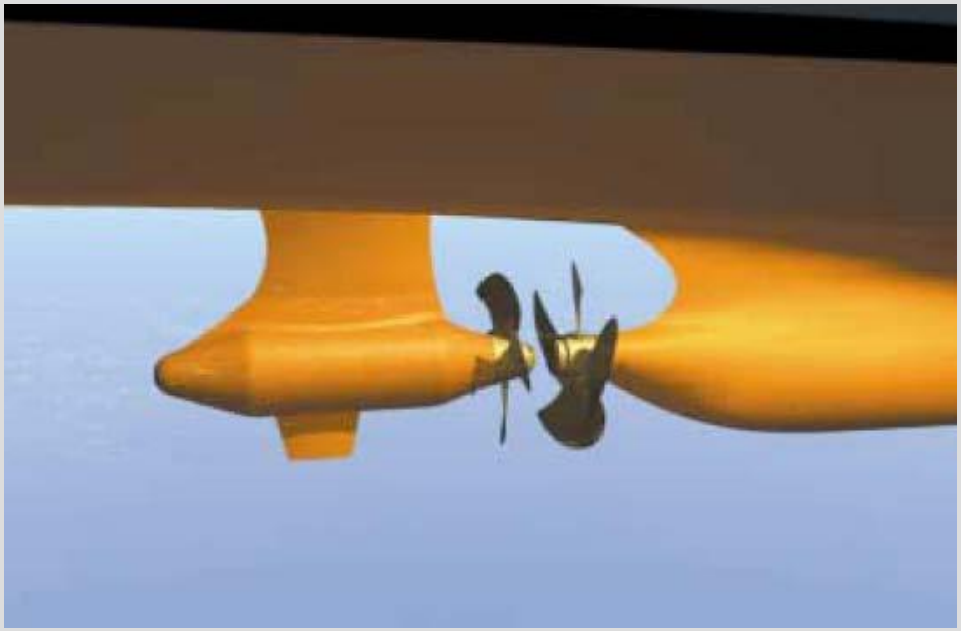
Concept - conventional diesel propulsion plant with PTI



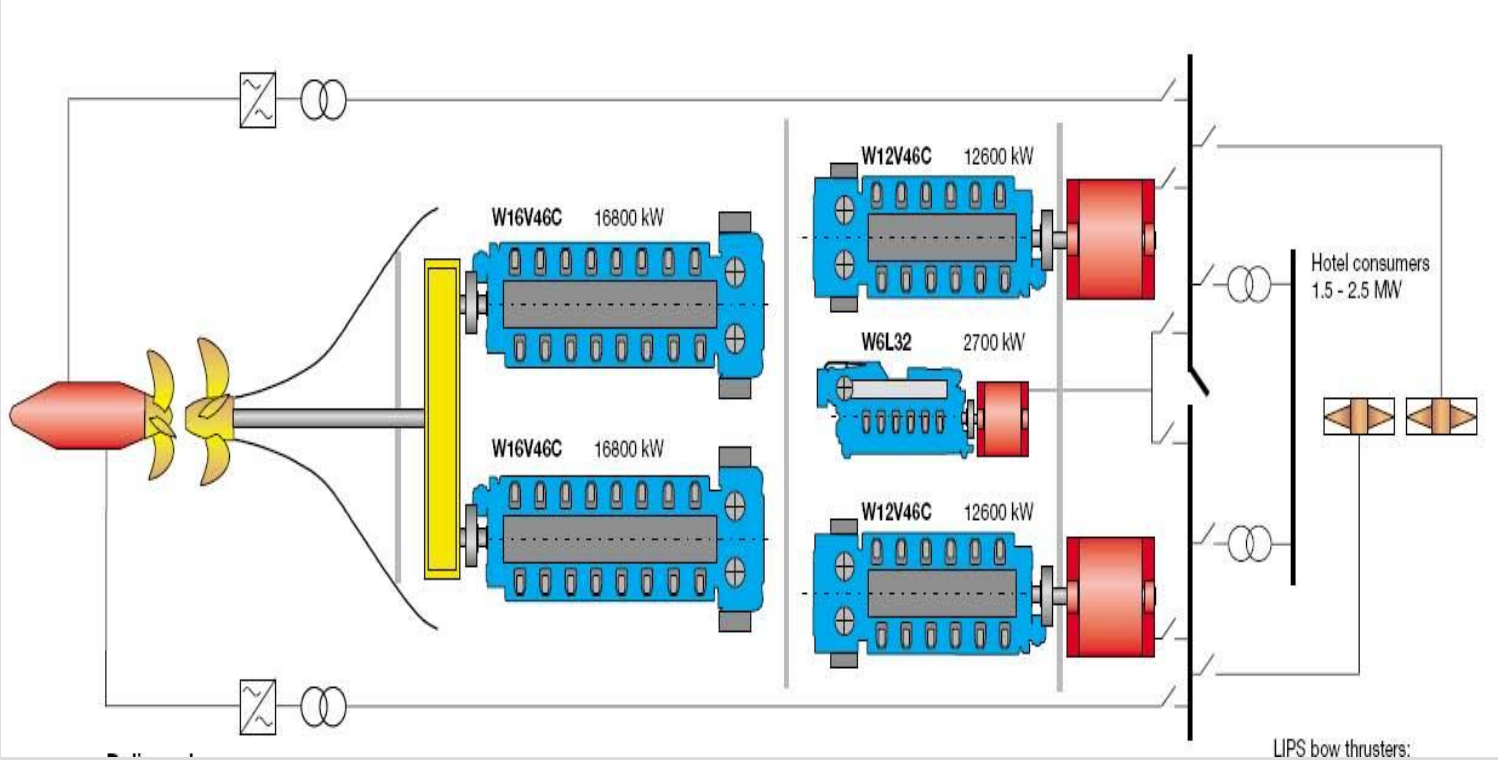
Concept – retractable thruster unit for ’take me home’



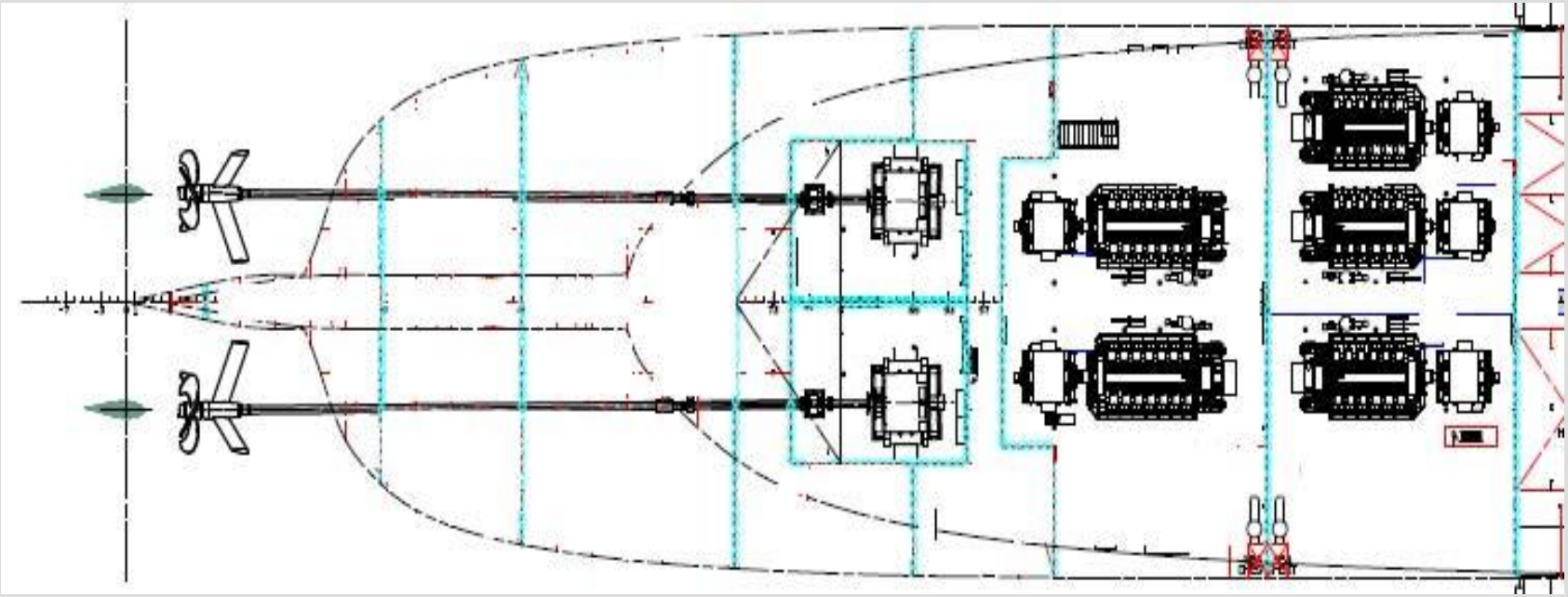
Concept – contra-rotating pod unit



Concept – contra-rotating pod unit



Concept - diesel electric propulsion plant



Applying SOLAS Ch II-2, Reg. 21 & 22

- **Two alternatives for appraisal:**
  - **Space by space**
    - Conventional, labour intensive
    - Difficult to design to
    - Large number of scenarios
    - Required detailed knowledge of location of equipment (including piping, cabling etc) and modelling
  - **System by system**
    - Clearer
    - Enhanced effects
    - Requires a holistic understanding of the ship's systems
    - Should include systems ancillary to essential services and auxiliary systems
    - Possible to do at an early stage in principle, but requires follow-up

Applying SOLAS Ch II-2, Reg 21

- **Essential systems to remain operational**

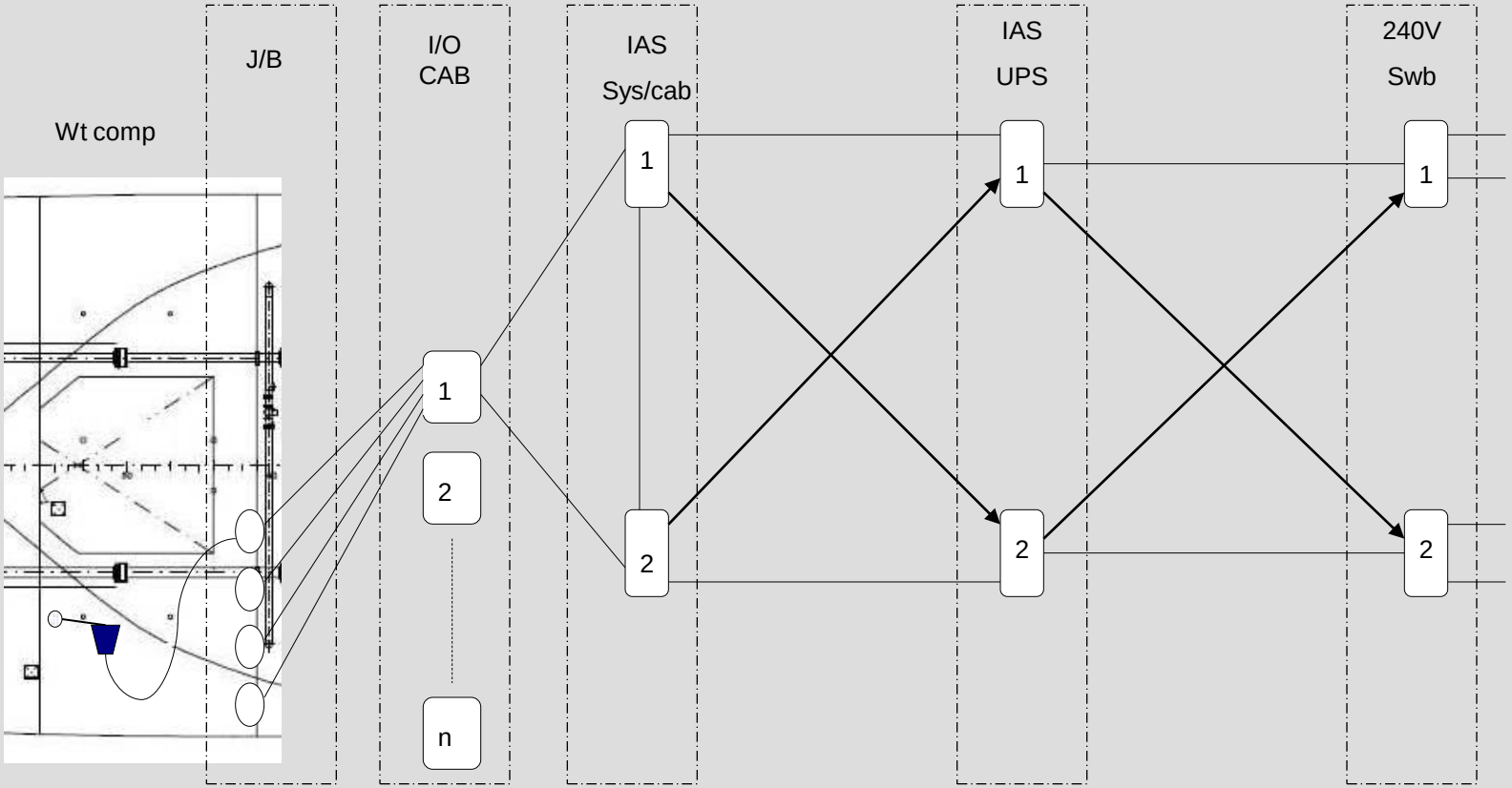
  - Propulsion
  - Steering
  - Fuel oil transfer
  - Safe area support

  Machinery systems: likely not having been designed to meet redundancy criteria

  - Communications
  - Fire & bilge systems
  - Fire safety
  - Damage control

  Safety systems: already achieving higher standards, likely to require less modifications

Example showing the complexity - flooding detection system



Some Possible Alternatives for Strategy

Different strategies may be followed in the design of the ship and in the design of the ship's systems to allow the ship to satisfy the requirements, after a fire or flooding casualty and to comply with the requirements. The chosen strategy is to form the basis for the preparation of all ship's operational procedures to be adopted by the crew in case of any such casualty. Different strategies may be adopted for different systems if necessary, however this can possibly create conflicts

- **Independent Strategy**
- **Duplication and segregation strategy**
- **Protection strategy**
- **Other strategies**

Some Possible Alternatives for Strategy

- ***Independent Strategy***: compliance is achieved with a completely independent equipment or component from the one used during normal operation (e.g. a propulsion thruster(s), stored food ratios and water, portable communication equipment etc):

Advantages

Reduces design concerns for redundancy

May simplify guidance

Disadvantages

Requires additional equipment which may not add value in normal operation

Maintenance issues

Some Possible Alternatives for Strategy

•***Duplication and segregation strategy***: compliance is achieved segregating components and equipment and duplicating runs of pipes and cables connecting them (e.g. separate engine rooms and switchboard rooms, separated potable water distribution and grey waters drainage, redundant public address system etc)

Advantages

Likely no additional equipment required, care should be taken in location and connection

May provide additional operational benefits

Disadvantages

Re-configuration of the system required after a casualty

Significant operational guidance.

Some Possible Alternatives for Strategy

- ***Protection strategy***: compliance is achieved maximising protection of system components, and using manual actions in case of a casualty (e.g. two screwshafts running through the same space, which should be treated as a void, and constructed and protected and maintained accordingly)

Advantages

May reduce installation

Disadvantages

May be difficult to demonstrate performance

Maintenance and accessibility issues likely

Significant operational guidance

Commonly used draft explanatory notes

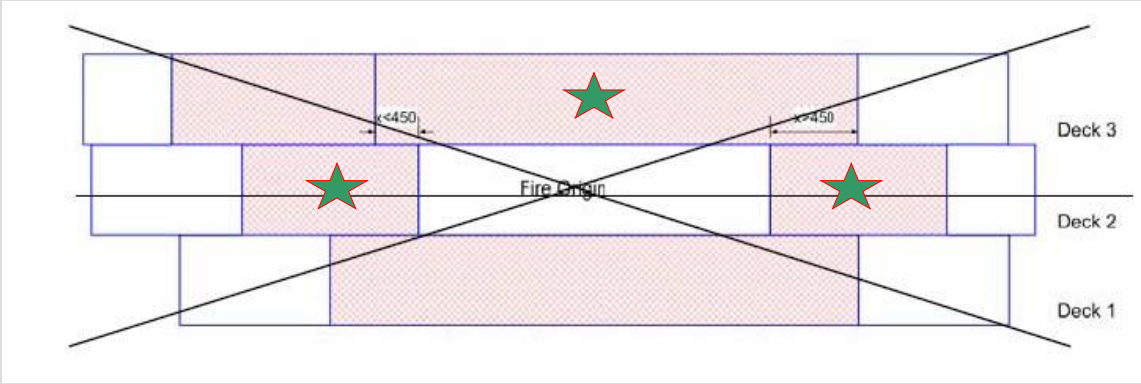
- Initial explanatory notes prepared by Classes; DNV, GL, RINA, BV and LR
- Italy and CLIA (Cruise Lines International Association), used these and made a submission to the IMO subcomittee on fire protection in October 2008;

  FP 53/18/1, 28th October 2008 ' Explanatory notes for the application of the safe return to port requirements
- The drafting group under IMO FP met in February 53td session

  FP 53/WP.7, 19th February 2009, Explanatory notes for the application of the safe return to port requirements
- Presently these draft interpretations are commonly accepted, however should be agreed with specific flag state for project purpose, until IMO decide to submit these to MSC and having been adopted.

Continued – explanatory notes

- II-2/21.3 – Casualty treshold
  - ’A’ class boundaries refers to both blkhd’s and decks
  - rating of ’A’ class boundaries does not affect the application of this regulation.
  - spaces extending vertical more than a single deck (stairwells, lift trunks and atriums) considered lost in their entirety unless subdivided
- II-2/21.3.2 –
  - spaces not protected by FFES, includes damage of spaces one deck upwards and adjacent spaces



Continued – explanatory notes

- II-2/21.3.2 –
  - spaces in which of origin of fire is negligible and not considered fire cases;
    - a) void spaces
    - b) trunks for pipes containing non-flammable liquids/cable trunk
    - c) C/D
    - d) tanks
    - e) chain lockers
    - f) independent ventilation trunks (except galley range and laundry or any other duct presenting a fire hazard)
    - g) vertical escape trunks
    - h) walk-in safes
    - i) store rooms for gaseous systems
    - j) store rooms dedicated for storage of non-flammable gases
    - k) busbars enclosed in 'A' class divisions
    - l) A-class enclosures space cat. (1), (2) or (4) only containing isolation valves or section valves
    - m) shaft tunnels with no fire load

Continued – explanatory notes

- II-1/8-1 –

  - spaces in which of origin of flooding is negligible and not considered watertight compartments of flooding cases;

    a) located at least B/10 inboard and at least B/20 from the bottom

    b) not crossed by seawater piping systems

    c) not containing drainage piping system collecting external waters

When crossed by piping systems other than above the impact of the available fluid quantity suscepticle to flood the compartment are to be assessed

Continued – explanatory notes

- II-2/21.4 – essential systems
  - wet steel pipes passing through (not serving) spaces affected by fire casualty considered to remain operational provided either;
    a) of substantial thickness (IACS UI LL36/rev. 1), or
    b) 'A-60' insulated
  - cabling complying with IEC TC18 considered intact when passing through spaces affected by flooding, provided no connections/joints
  - Fire resistant cables (IEC 60331-21, and -31, ref. IACS UR15) passing through spaces affected by a fire considered operational, provided no connections/joints
  - E/G can be used supporting SrtP function as long as its ability to provide services required is not impaired (including amount of fuel)

Continued – explanatory notes

- II-2/21.4.1 – Propulsion
  - fire casualties; ship being able to remain 6 knots while heading into Beaufort 8

    Evidence by model tank tests in sea keeping conditions including considerations of wind forces.

  - steel shaft line passing through a space may be considered operational if enclosed within a WT and 'A-0' class tunnel or alternatively-

    a) in flooding cases shown that it can operate under water

    b) in fire cases protected by a water-based fire-extinguishing system.

shafts passing through category A machinery spaces not to be considered operational

Continued – explanatory notes

- II-2/21.4.2 – steering systems and controls
  - in general, tunnel thrusters NOT accepted for emergency steering
  - local control of remaining steering system acceptable
  - Azimuth thrusters, pump jets, rudder propellers may be considered for emergency steering
- II-2/21.4.5 – internal communication systems
  - Portable systems acceptable, provided repeater systems remains operational and charging systems available in more than one MVZ
  - P/A & G/A integrated systems to remain operational in the MVZ safe areas not affected by the casualty
- II-2/21.4.6 – external communication systems
  - Portable systems acceptable, provided charging systems available in more than one MVZ
  - GMDSS or VHF marine and air band distress frequencies

Continued – explanatory notes

- II-2/21.4.8 – fixed fire extinguishing systems
  - CO2 systems to be either duplicated into two separate rooms or the quantity available to be able to protect largest and second largest space
  - Sprinkler systems accepted to be lost in spaces directly affected by fire casualty and those controlled under same section valve, provided each section serve a single deck area
  - loss of one pump unit/pump -> all sections to be fully protected with required flow and pressure each section
  - local application systems not required to remain operational unless part of a machinery space total flooding system
- II-2/21.4.9 – fire and smoke detection systems
  - accepted to be lost in spaces affected by fire and on same deck served by same section provided all other detctors remain operational on other decks served by same section.
- II-2/21.4.10 – Bilge and ballast systems
  - Electric power for bilge and ballast systems to be available in case of a casualty

Continued – explanatory notes

- II-2/21.5.1.1 – Safe areas
  - could be a number of spaces distributed onboard, preferably to be arranged in accommodation spaces
  - SrtP operations > 12h requires minimum space of 2m^2/person
- II-2/21.5.1.2 – basic services
  - to be determined for each listed basic services which fire casualty could affect the service and what measures to be taken.
- II-2/21.5.1.2.2.1 – sanitation
  - minimum one toilet per 50 persons or fraction thereof to be operational
  - grey/black water can be disposed to the sea (MARPOL)
- II-2/21.5.1.2.2.2 – water
  - minimum 3litre per person per day drinking water to be available
  - additional water for food preparation and hygiene may need be provided
- II-2/21.5.1.2.2.3 – food
  - can be any kind, including dry food, distributed as necessary
  - reference can be made to LSA Code IV, 4.4.8.12
- II-2/21.5.1.2.2.4 – Medical care
  - In addition to ships hospital one or more locations on the ship should be provided.
    a) different MVZ than hospital
    b) easily accessible, having emergency lighting and electrical power
- II-2/21.5.1.2.2.8 – ventilation
  - ventilation capacity of at least 4.5 m^3/h per person

Current ongoing developments

- Lloyd's Register very actively involved in the preparation of guidelines for the new regulations as well as the formulation of appropriate damage thresholds and stability criteria for safe return to port following flooding. IMO is working on the development of Unified Interpretations under a new Agenda item established at MSC84 and to be completed by the FP Sub-Committee in two sessions (beginning 2010).

For more information, please contact:

Passenger Safety, Fire and LSA
London Design Support Services
Lloyd's Register EMEA

Email: psg-stat@lr.org

LIFE MATTERS

The Lloyd's Register Group works to enhance safety and approve assets and systems at sea, on land and in the air – because life matters.