

January 2019 Edition

## Part B

Passenger Yacht Code  
(up to 36 passengers)



# Red Ensign Group Yacht Code



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## **PREAMBLE**

The Preamble is provided for explanatory purposes and is not part of the Code provisions.

This Code of Practice has been developed jointly by the United Kingdom, its relevant overseas territories and crown dependencies<sup>1</sup>, and international industry representatives. The Code prescribes standards of safety and pollution prevention which are appropriate to the size and type of yacht. The standards applied are either set by the relevant International Conventions or by equivalent standards where it is not reasonable or practicable for yachts to comply.

This Code is an equivalence under the provisions of Article 8 of the International Convention on Load Lines, 1966, Regulation I-5 of the International Convention on Safety of Life at Sea, and Article 9 of the International Convention on Standards of Training Certification and Watchkeeping for Seafarers 1978 as amended. Notification of equivalences can be found on the IMO website at <https://gisis.imo.org>.

The development of the Code is based on the consideration that full compliance with the provisions of the above mentioned Conventions is unreasonable and in some instances disproportionately onerous compared to the incremental increase in safety levels achieved for yachts. Yachts have a very different operating pattern when compared to a typical commercial ship which usually operate 24/7 on a tight schedule. The Code is intended to cater exclusively to the yachting sector of the market and it is not intended to apply to commercial cruise, excursion or ferry passenger (including passenger/cargo vessels) sectors of the industry. Yachts which comply with the Code do not have to comply with the requirements of the HSC Code.

During 2016 and 2017, the Red Ensign Group (REG) has been working alongside the Large Yacht industry to develop this 'REG Yacht Code'. This new Code consists of two parts; Part A, being an update to the existing Large Yacht Code (LY3), and Part B being an update to the Passenger Yacht Code 6<sup>th</sup> Edition (PYC). Although combined into a single new Code, the two Parts are still separate entities. However, where there are commonalities between the two new Parts, annexes have been produced which are applicable to both Parts A and B. The Scope of Parts A and B of the new Code have not been changed and are as follows:

- Part A applicable to yachts which are 24 metres and over in load line length, are in commercial use for sport or pleasure, do not carry cargo and do not carry more than 12 passengers;
- Part B applicable to pleasure yachts of any size, in private use or engaged in trade, which carry more than 12 but not more than 36 passengers and which do not carry cargo.
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<sup>1</sup> Crown Dependencies (Isle of Man, Guernsey and Jersey) and the UK Overseas Territories (Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Falkland Islands, Gibraltar, Montserrat, St Helena and the Turks & Caicos Islands)

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## **CHAPTER 1**

### **APPLICATION AND INTERPRETATION**

#### **1.1 Purpose**

- (1) *The purpose of Part B of the Red Ensign Group Yacht Code (“the Code”), is to provide design criteria, construction standards and other safety measures for yachts carrying no more than 36 passengers so as to minimise the risk to such yachts, persons onboard and the environment. The criteria are largely aligned to the Conventions and Instruments referred to in the preamble to the Code, but have been modified to create an equivalence where deemed appropriate to ensure their suitability for application to yachts.*

#### **1.2 Application**

- (1) *This Code applies only to pleasure yachts engaged on international voyages whilst carrying more than 12 but not more than 36 passengers with a maximum number of persons not more than 200 and which do not carry cargo.*
- (2) *Subject to 1.7(1), existing vessels may alternately elect to apply for certification in accordance with the Code, and the Code shall apply to such vessels in the same way as it applies to new vessels.*
- (3) *Subject to Section (4), all ships which undergo repairs, alterations, modifications and outfitting related thereto shall continue to comply with as a minimum the requirements previously applicable to these ships.*
- (4) *Any ship, whenever built, which is converted to a passenger yacht, or undergoes repairs, alterations and modifications which substantially alter the dimensions of the ship or the passenger accommodation spaces, or substantially increase the ship’s service life, shall be treated as a new passenger yacht constructed on the date on which such conversion, repairs, alterations or modifications commenced.*
- (5) *In the case of an existing vessel which does not comply fully with the Code safety standards but for which the Code standards are reasonable and practicable, the Administration shall give consideration to a proposal from the Company to phase in requirements within an agreed time scale not exceeding 18 months.*
- (6) *The table in Annex 1 sets out the general relationships between the type of pleasure yacht, its area of operation and the applicable standards with respect to Life Saving Appliances and stability.*

#### **1.3 Review of the Code**

- (1) *The content of the Code shall be reviewed by the REG annually to ascertain if amendments to it are required.*

**1.4 Amendments to International Conventions and related Instruments**

- (1) *Where the relevant provisions of SOLAS or ILLC apply in part but some provisions have been modified then the text of all of that Part of the Convention has been incorporated into the body text of the Code for consistency and ease of reference. To readily determine what is “new” drafting and what, in essence, are unmodified Convention provisions, then in the body text of the Code-*
  - (a) *modified or alternative provisions are shown, in italics; and*
  - (b) *unchanged Convention provisions are shown in plain text.*
- (2) *The wording of some of the unchanged Convention provisions has been adjusted, but the actual provisions remain unchanged and so the body text is in plain text.*

**1.5 International Conventions and related Instruments**

- (1) *Where the Code requires a yacht to comply with any of the provisions of an International Convention (or other related instrument), and the applied requirements are separated into different vessel types, a yacht shall comply with the applied requirements of the Convention that apply to a passenger ship. This is subject to any express provision to the contrary in the Code.*

**1.6 Area of Operation**

- (1) *In general, requirements given within the Code are based on unrestricted geographical operation outside Polar Regions, however, where considered appropriate, standards for vessels operating as PY-1 or PY-2 have been included.*
- (2) *Yachts which intend to operate in Polar Regions shall meet requirements of the Code, The IMO Polar Code (see Annex L) and those of a Recognised Organisation appropriate to the intended area of operation.*

**1.7 Editions of the Code**

- (1) *Vessels, the keels of which were laid or were at a similar stage of construction before the 1st January 2019 and which have and have been or are currently under survey to earlier Editions of the Passenger Yacht Code, shall continue to be considered under the standards in force at the time of initial survey with the exception of the following which shall comply with this edition of the Code by the first annual survey after 1<sup>st</sup> January 2019:*
  - (a) *Section 6.12 for Emergency training & drills;*
  - (b) *Section 7.17 for Emergency training & drills;*
  - (c) *Chapter 8 for Radiocommunications, safety of navigation, international safety management and maritime security;*
  - (d) *Chapter 9 for Accommodation and recreational facilities;*

- (e) *Chapter 10 for Requirements for vessels carrying more than 120 persons;*
  - (f) *Chapter 12 for protection of personnel;*
  - (g) *Chapter 13 for Ship-shore transfer of personnel;*
  - (h) *Chapter 14 for Manning, certification and hours of work;*
  - (i) *Chapter 16 for Operational readiness, maintenance and inspections;*
  - (j) *Chapter 17 for Medical care and carriage of medical stores;*
  - (k) *Chapter 18 for Application of International Conventions and national legislation;*
  - (l) *Chapter 19 for List of certificates to be issued;*
  - (m) *Chapter 20 for Survey, certification and accident investigation; and*
- (2) *Vessels, the keels of which were laid or were at a similar stage of construction on or after the 1st January 2019, shall comply with this edition of the code in its entirety.*

**1.8 Interpretation**

- (1) *Where a question of interpretation of any part of this Code arises, which cannot be resolved by a delegated authority and the Company for a vessel, a decision on the interpretation may be obtained on written application to the Administration.*

**1.9 Equivalent Arrangements**

- (2) *Proposals for the application of alternative standards considered to be at least equivalent to the requirements of the Code shall be submitted to the Administration for approval. Deviations from the requirements of the Code may be considered by the Administration, provided that the equivalence:*
- (a) *is based on the underlying Convention requirements;*
  - (b) *incorporates increased requirements to balance deficiencies and thereby provide an equivalent level of safety to the chapter concerned;*
  - (c) *meets the intent of the requirements concerned and the objectives of the chapter;*
  - (d) *incorporates any specific requirements in the chapter's 'Additional Equivalence Considerations' section; and*
  - (e) *where necessary;*
    - (i) *has successfully undergone testing to the satisfaction of the Administration; or*
    - (ii) *has successfully undergone, an engineering analysis, evaluation and approval by the Administration.*

**1.10 Alternative Design and Arrangements**

- (1) Purpose
  - (a) *The purpose of this Section is to provide a methodology for alternative design and arrangements which are limited by the extent to which International Conventions allow. Only chapters containing provisions for Alternative Design and Arrangements may utilise such provisions outlined in this section.*
- (2) General
  - (a) Design and arrangements may deviate from the requirements of Part B, provided that the alternative design and arrangements meet the intent of the requirements concerned, the chapter's objectives and functional requirements where provided, and provide an equivalent level of safety to the chapter concerned. Alternative design and arrangements shall be based on the underlying Convention requirements.
  - (b) When alternative design or arrangements deviate from the prescriptive requirements of Part B, an engineering analysis, evaluation and approval of the design and arrangements shall be carried out in accordance with this Section.
- (3) Engineering analysis
  - (a) *The engineering analysis shall be prepared and submitted to the Administration, based on the guidelines<sup>2</sup> and shall include, as a minimum, the elements listed under 'Engineering Analysis Elements' in the relevant chapter.*
- (4) Evaluation of the alternative design and arrangements
  - (a) The engineering analysis required in Section (3) shall be evaluated and approved by the Administration, taking into account the guidelines<sup>3</sup>
  - (b) A copy of the documentation, as approved by the Administration, indicating that the alternative design and arrangements comply with this regulation, shall be carried onboard the ship.
- (5) Exchange of information
  - (a) The Administration shall communicate to the IMO pertinent information concerning alternative design and arrangements approved by them for circulation to all Contracting Governments.
- (6) Re-evaluation due to change of conditions
  - (a) If the assumptions and operational restrictions that were stipulated in the alternative design and arrangements are changed, the engineering analysis shall be carried out under the changed condition and shall be approved by the Administration.

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<sup>2</sup> Refer to the Guidelines on alternative design and arrangements for SOLAS chapters II-1 and III (MSC.1/Circ.1212) & SOLAS Chapters II-2 (MSC.1/Circ.1002).

<sup>3</sup> Refer to the Guidelines on alternative design and arrangements for SOLAS chapters II-1 and III (MSC.1/Circ.1212) & SOLAS Chapters II-2 (MSC.1/Circ.1002).

**1.11 Exemptions**

- (1) Exemptions shall be granted only by the Administration.*
- (2) Applications for exemption shall be made to the Administration and be supported by justification for the exemption.*
- (3) The granting of exemptions shall be limited by the extent to which International Conventions allow and shall be regarded as exceptional.*

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## CHAPTER 2

### DEFINITIONS

#### 2.1 Definitions

- (1) *For the purpose of this Code, unless expressly provided otherwise, the terms used therein have the meanings defined in this section- (Note: where a definition is not contained within this Code, guidance shall be taken from definitions within the applicable International Conventions)-*
- (2) *Except where the context otherwise requires, throughout the Code the terms “yacht”, “ship” and “vessel” are synonymous.*
- (3) *The following definitions are applicable for this Part B of the Code:*

<i>“A” Class divisions”</i>	means those divisions formed by bulkheads and decks which comply with the following criteria: <ol style="list-style-type: none"><li>1. they are constructed of steel or other equivalent material;</li><li>2. they are suitably stiffened;</li><li>3. they are insulated with approved non-combustible materials such that the average temperature of the unexposed side will not rise more than 140°C above the original temperature, nor will the temperature, at any one point, including any joint, rise more than 180°C above the original temperature, within the time listed below:<ul style="list-style-type: none"><li>class "A-60" 60 min</li><li>class "A-30" 30 min</li><li>class "A-15" 15 min</li><li>class "A-0" 0 min</li></ul></li><li>4. they are constructed as to be capable of preventing the passage of smoke and flame to the end of the one-hour standard fire test; and</li><li>5. the Administration required a test of a prototype bulkhead or deck in accordance with the Fire Test Procedures Code to ensure that it meets the above requirements for integrity and temperature rise.</li></ol>
<i>“Accommodation spaces”</i>	means those spaces used for public spaces, corridors, lavatories, cabins, offices, hospitals, cinemas, game and hobby rooms, barber shops, pantries containing no cooking appliances and similar spaces.
<i>“Administration”</i>	with regard to this Code means the Government of the State whose flag the ship is entitled to fly, or a Recognised Organisation who has been delegated the responsibilities.
<i>“Aft terminal”</i>	means the aft limit of the subdivision length
<i>“Aft perpendicular”</i>	means the perpendicular taken at the after end of length (L)
<i>“Amidship”</i>	means at the middle of the length (L)
<i>“Anti-exposure suit”</i>	means a protective suit designed for use by rescue boat crews and marine evacuation system parties

“Approved”	in respect to materials or equipment means approved by the Administration or approved by an Administration or organisation which is formally recognised by the Administration.				
“Atrium”	means a public spaces within a single main vertical zone spanning three or more open decks;				
“Aviation Inspection Body”	means a body delegated the responsibility of inspecting helicopter landing areas by the Administration. The verification process shall include inspection, certification and, where necessary, the application of appropriate operational limitations.				
““B” class divisions”	<p>means those divisions, referred to as “B-15” or “B-0”, formed by bulkheads, decks, ceilings or linings which comply with the following criteria-</p> <ol style="list-style-type: none"><li>1. they are constructed of approved non-combustible materials and all materials used in the construction and erection of "B" class divisions are non-combustible.</li><li>2. they have an insulation value such that the average temperature of the unexposed side shall not rise more than 140°C above the original temperature, nor shall the temperature at any one point, including any joint, rise more than 225°C above the original temperature, within the time listed below-</li></ol> <table><tr><td>class "B-15"</td><td>15 min</td></tr><tr><td>class "B-0"</td><td>0 min</td></tr></table> <ol style="list-style-type: none"><li>3. they are so constructed as to be capable of preventing the passage of flame to the end of the first half hour of the standard fire test; and</li><li>4. the Administration has required a test of a prototype division in accordance with the Fire Test Procedures Code to ensure that it meets the above requirements for integrity and temperature rise</li></ol>	class "B-15"	15 min	class "B-0"	0 min
class "B-15"	15 min				
class "B-0"	0 min				
“Breadth” or “B”	means the maximum breadth of the ship, measured amidships to the moulded line of the frame in a ship with a metal shell and to the outer surface of the hull in a ship with a shell of any other material, unless expressly provided otherwise				
“Bulkhead deck”	means the uppermost deck up to which the transverse watertight bulkheads are carried				
“Buoyant lifeline”	means a line complying with the requirements of the LSA Code				
“Cabin balcony”	means an open deck space which is provided for the exclusive use of the occupants of a single cabin and has direct access from such a cabin				
““C” class division”	means divisions constructed of approved non-combustible materials. They need meet neither requirements relative to the passage of smoke and flame nor limitations relative to the temperature rise..				
“Cargo”	means an item(s) of value that is carried from one place and discharged at another place and for which either a charge or no charge is made and is not for use exclusively onboard the vessel.				
“Central control station”	<p>means a control station in which the following control and indicator functions are centralised-</p> <ol style="list-style-type: none"><li>(a) fixed fire detection and fire alarm systems;</li><li>(b) automatic sprinkler, fire detection and fire alarm systems;</li><li>(c) fire door indicator panels;</li><li>(d) fire door closure;</li><li>(e) watertight door indicator panels;</li><li>(f) watertight door closures;</li><li>(g) ventilation fans;</li><li>(h) general/fire alarms;</li><li>(i) communication systems including telephones; and</li></ol>				

	(j) microphones to public address systems
“Code”	means the Red Ensign Group Yacht Code Part B
“Combustible material”	means any material other than a non-combustible material
“Continuous “B” class ceilings or linings”	means those “B” class ceilings or linings which terminate at an “A” or “B” class division.
“Continuously manned central control station”	means a central control station which is continuously manned by a responsible member of the crew.
“COLREGs”	means the Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREG 72), as applicable for vessels the keels of which are laid on or after 1 <sup>st</sup> January 2019.
“Control stations”	means those spaces in which the ship's radio or main navigating equipment or the emergency source of power is located or where the fire recording or fire control equipment is centralised; spaces where the fire recording or fire control equipment is centralised are also considered to be a fire control station
“Company”	means the Owner of the ship or any other Organisation or person such as the Manager, or the Bareboat Charterer, who has assumed the responsibility for operation of the ship from the Shipowner and who on assuming such responsibility has agreed to take over all the duties and responsibilities imposed by the Code.
“Deadlight”	means a secondary watertight closure fitted to a glazed opening and which is fitted to the inside of the vessel
“Design Waterline”	Deepest loaded draught as per the all-seasons Load Line assigned to the vessel
“Design pressure”	means the hydrostatic pressure for which each structure or appliance assumed watertight in the intact and damage stability calculations is designed to withstand
“Draught” or (d)	means the vertical distance from the keel line at mid-length to the waterline in question
“Efficient”	in relation to a fitting, piece of equipment or material means that all reasonable and practicable measures have been taken to ensure that it is suitable for the purpose for which it is intended to be used.
“Embarkation ladder”	means the ladder provided at survival craft embarkation stations to permit safe access to survival craft after launching; complying with the requirements of the LSA Code
“Embarkation station”	means the place from which a survival craft is boarded. An embarkation station may also serve as a muster station, provided there is sufficient room, and the muster station activities can safely take place there.
“Emergency source of electrical power”	means the emergency source of electrical power required by SOLAS II-1/42.
“Emergency switchboard”	is a switchboard which in the event of failure of the main electrical power supply system is directly supplied by the emergency source of electrical power or the transitional source of emergency power and is intended to distribute electrical energy to the emergency services.
“Engaged in trade”	means, for the purposes of the Code, the carriage of passengers for reward or remuneration under a charter or hire agreement.
“EPIRB”	means a satellite emergency position-indicating radio beacon, being an earth station in the mobile-satellite service, the emissions of which are intended to facilitate search and rescue

operations, complying with performance standards adopted by the IMO contained in either Resolution A.810(19) or Resolution A.812(19) and Resolution A.662(16), or any Resolution amending or replacing these from time to time and which is considered by the Administration to be relevant, and is capable of:

- (a) floating free and automatically activating if the ship sinks;
- (b) being manually activated; and
- (c) being carried by one person.

<i>“Existing vessel”</i>	means any vessel, the keel of which was laid or was at a similar stage of construction prior to the 1st January 2019.
<i>“Fire damper”</i>	means a device installed in a ventilation duct, which under normal conditions remains open allowing flow in the duct, and is closed during a fire, preventing the flow in the duct to restrict the passage of fire. In using the above definition, the following terms may be associated: “automatic fire damper” is a fire damper that closes independently in response to exposure to fire products; “manual fire damper” is a fire damper that is intended to be opened or closed by the crew by hand at the damper itself; and “remotely operated fire damper” is a fire damper that is closed by the crew through a control located at a distance away from the controlled damper.
<i>“Fire Safety Systems Code”</i>	means the International Code for Fire Safety Systems as adopted by the Maritime Safety Committee of the IMO by resolution MSC.98 (73), as may be amended by the IMO.
<i>“Fire Test Procedures Code”</i>	means the International Code for Application of Fire Test Procedures as adopted by the Maritime Safety Committee of the IMO by resolution MSC.61(67), as may be amended by the IMO.
<i>“flashpoint”</i>	means the temperature in degrees Celsius (closed cup test) at which a product shall give off enough flammable vapour to be ignited, as determined by an approved flashpoint apparatus
<i>“Float-free launching”</i>	means that method of launching a survival craft whereby the craft is automatically released from a sinking ship and is ready for use
<i>“Forward perpendicular”</i>	means the perpendicular taken at the forward end of the length (L) such that the perpendicular coincides with the fore side of the stem on the waterline on which the length is measured
<i>“Forward terminal”</i>	means the forward limit of the subdivision length
<i>“Freeboard”</i>	has the meaning given in annex I of ICLL. The freeboard assigned is the distance measured vertically downwards amidships from the upper edge of the deck line to the upper edge of the related load line.
<i>“Freeboard deck”</i>	means, subject to paragraphs (a) to (d) below, the uppermost complete deck exposed to weather and sea, which has permanent means of closing all openings in the weather part thereof, and below which all openings in the sides of the ship are fitted with permanent means of watertight closing- (a) in a ship having a discontinuous freeboard deck, the lowest line of the exposed deck and the continuation of that line parallel to the upper part of the deck is taken as the freeboard deck; and (b) at the option of the Company and subject to the approval of the Administration, a lower deck may be designated as the freeboard deck provided it is a complete and permanent deck continuous in a fore and aft direction at least between the machinery space and peak bulkheads and continuous athwartships, provided that- (c) when this lower deck is stepped the lowest line of the deck and the continuation of that line parallel to the upper part of the deck is taken as the freeboard deck; (d) when a lower deck is designated as the freeboard deck, that part of the hull which

extends above the freeboard deck is treated as a superstructure so far as concerns the application of the conditions of assignment and the calculation of freeboard and it is from this deck that the freeboard is calculated.

- “Garage spaces” means those enclosed spaces above and below the bulkhead deck used for the storage of pleasure craft, vehicles, jet skis or any other such engine driven units and recreational dive systems
- “Garbage” means all kinds of victual, domestic and operational waste excluding fresh fish and parts thereof, generated during the normal operation of the vessel and liable to be disposed of continuously or periodically, except sewage originating from vessels.
- “General emergency alarm system” means the general emergency alarm system complying with the requirements of Chapter VII, 7.2.1 of the LSA Code;
- “Glazed Opening” means an opening in the hull, superstructure or deckhouse of a ship structure fitted with a transparent or translucent material.
- “Hazardous area” means those areas which may contain flammable or explosive gases, dusts or vapours, the use without proper consideration of machinery or electrical equipment may lead to fire hazard or explosion.
- “IMO High Speed Craft Code” means the International Code of Safety for High Speed Craft, 2000, adopted by the Maritime Safety Committee of the IMO by resolution MSC.97(73), as amended.
- “ICLL” means the International Convention on Load Lines, 1966, as amended, as applicable for vessels the keels of which are laid on or after 1<sup>st</sup> January 2019.
- “ILO” means the International Labour Organisation
- “Immersion suit” means a protective suit which reduces the body heat loss of a person wearing it in cold water complying with the requirements of the LSA Code
- “IMO” means the International Maritime Organisation, a specialised agency of the United Nations devoted to maritime affairs
- “Inflatable lifejacket” means a lifejacket complying with the requirements of the LSA Code
- “Intact Stability Code, 2008” means the International Code on Intact Stability, 2008 (2008 IS Code) As adopted by IMO Circular MSC.267(85). This revised Code includes a mandatory Part A and a recommendatory Part B. Also included in Part A are Severe Wind and Weather Rolling Criteria.
- “Keel line” means a line parallel to the slope of the keel passing amidships through-
- (a) the top of the keel at centreline or line of intersection of the inside of shell plating with the keel if a bar keel extends below that line, on a ship with a metal shell; or
  - (b) in wood and composite ships, the distance is measured from the lower edge of the keel rabbet and when the form at the lower part of the midship section is of a hollow character, or where thick garboards are fitted, the distance is measured from the point where the line of the flat of the bottom continued inward intersects the centreline amidships
- “L1” a virtual line drawn at a height of 2.5% of the breadth (B), or 500 mm, whichever is the greatest distance, above the design waterline
- “L2” a virtual line drawn at a height of  $h_{std} + 0.02L$  above the design waterline where 0.02L need not exceed 3m
- “L3” a virtual line drawn at a height of  $2 \times h_{std} + 0.02L$  above the design waterline where 0.02L need not exceed 3m

<i>“Level 1”</i>	The area between ‘L1’ and ‘L2’
<i>“Level 2”</i>	The area between ‘L2’ and ‘L3’
<i>“Landing Area”</i>	A generic term referring to any area primarily intended for the landing or take-off of aircraft.
<i>“Launching appliance (or arrangement)”</i>	means a provision complying with the requirements of the LSA Code for safely transferring a lifeboat, rescue boat, or liferaft respectively, from its stowed position to the water and recovery where applicable.
<i>“Length”</i>	means 96% of the total length on a waterline of a ship at 85% of the least moulded depth measured from the top of the keel, or the length from the fore-side of the stem to the axis of the rudder stock on that waterline, if that be greater. In ships designed with a rake of keel the waterline on which this is measured shall be parallel to the designed waterline.
<i>“Lightest seagoing condition”</i>	means the loading condition with the ship on even keel, with 10% stores and fuel remaining and with the full number of passengers and crew and their luggage
<i>“Lifeboat”</i>	means a lifeboat complying with the requirements of the LSA Code
<i>“Lifebuoy”</i>	means a lifebuoy complying with the requirements of the LSA Code.
<i>“Lifejacket”</i>	means a lifejacket complying with the requirements of the LSA Code.
<i>“Liferaft”</i>	means a liferaft complying with the requirements of the LSA Code.
<i>“Lightweight”</i>	means the displacement of a ship in tonnes without, fuel, lubricating oil, ballast water, fresh water and feedwater in tanks, consumable stores, and passengers and crew and their effects;
<i>“Line throwing appliance”</i>	means an appliance complying with the requirements of LSA Code.
<i>“Low-flashpoint fuel”</i>	means gaseous or liquid fuel having a flashpoint lower than otherwise permitted under SOLAS II-2/4.2.1.1
<i>“Low flame spread”</i>	means that the surface thus described shall adequately restrict the spread of flame, this being determined in accordance with the Fire Test Procedures Code.
<i>“LSA Code”</i>	means the International Life-Saving Appliance Code adopted by the Maritime Safety Committee of the IMO by resolution MSC.48(66), as it may be amended by the IMO
<i>“Machinery rooms”</i>	means spaces between the watertight boundaries of a room containing the main and auxiliary propulsion machinery, including boilers, generators and electric motors primarily intended for propulsion; provided that in the case of unusual arrangements, the Administration may define the limits of the machinery rooms
<i>“Machinery spaces”</i>	are all machinery spaces of category A and all other spaces containing propelling machinery, boilers, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air conditioning machinery, and similar spaces, and trunks to such spaces.
<i>“Machinery spaces of category A”</i>	means those spaces and trunks to such spaces which contain either- (a) internal combustion machinery used for main propulsion; (b) internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW; or (c) any oil-fired boiler or oil fuel unit, or any oil-fired equipment other than boilers, such as inert gas generators, incinerators, etc.

<i>“Main source of electrical power”</i>	is a source intended to supply electrical power to the main switchboard for distribution to all services necessary for maintaining the ship in normal operation and habitable condition.
<i>“Main switchboard”</i>	is a switchboard which is directly supplied by the main source of electrical power and is intended to distribute electrical energy to the ship's services.
<i>“Main vertical zone”</i>	means those sections into which the hull, superstructure and deckhouses are divided by “A” class divisions, the mean length of which on any deck does not normally exceed 40 metres.
<i>“Man-riding”</i>	means the use of a crane, lifting appliance or launching appliance with persons within the tender, rescue boat or other vehicle or platform during launch or recovery
<i>“Margin line”</i>	is a line drawn at least 76 millimetres below the upper surface of the bulkhead deck at side
<i>“Marine evacuation system”</i>	means an appliance complying with the requirements of the LSA Code, for the rapid transfer of persons from the embarkation deck of a ship to a floating survival craft;
<i>“MARPOL”</i>	means the International Convention for the Prevention of Pollution from Ships, 1973, as amended.
<i>“Master”</i>	includes every person (except a pilot) having command or charge of a ship and, in relation to a yacht, include the captain or skipper
<i>“Mid-length”</i>	means the mid-point of the subdivision length of the ship;
<i>“Major conversion”</i>	means a conversion of a vessel: (a) that substantially alters the dimensions of a vessel; (b) which changes the type of the vessel; (c) the intent of which in the opinion of the Administration is substantially to prolong its life; (d) which otherwise so alters the ship that, if it were a new vessel, it would become subject to relevant provisions of the present Code not applicable to it as an existing vessel.
<i>“Mile”</i>	means a nautical mile of 1852 metres.
<i>“MLC”</i>	means the International Labour Organisation’s Maritime Labour Convention 2006, as amended, as applicable for vessels the keels of which are laid on or after 1 <sup>st</sup> January 2019.
<i>“Moulded depth”</i>	means, subject to paragraphs (a) to (c) below, the vertical distance measured from the top of the keel to the top of the freeboard deck beam at side, provided that- (a) in wood and composite ships, the distance is measured from the lower edge of the keel rabbet and where the form at the lower part of the midship section is of a hollow character, or where thick garboards are fitted, the distance is measured from the point where the line of the flat of the bottom continued inwards cuts the side of the keel; (b) in ships having rounded gunwales, the moulded depth shall be measured to the point of intersection of the moulded lines of the deck and side shell plating, the lines extending as though the gunwale were of angular design; and (c) where the freeboard deck is stepped and the raised part of the deck extends over the point at which the moulded depth shall be determined, the moulded depth shall be measured to a line of reference extending from the lower part of the deck along a line parallel with the raised part
<i>“Muster station”</i>	means an area where passengers and crew can be gathered in the event of an emergency, given instructions and prepared to abandon the craft, if necessary.
<i>“Non-combustible material”</i>	means a material which neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750°C, this being determined in accordance with the Fire Test Procedures Code.

<i>"Motor vessel"</i>	means a vessel which is described in the register and on the certificate of registry as such, and which has a sole means of propulsion either one or more power units.
<i>"Multihull vessel"</i>	means any vessel which in any normally achievable operating trim or heel angle, has a rigid hull structure which penetrates the surface of the sea over more than one separate or discrete area.
<i>"New vessel"</i>	means a vessel, to which this Code applies, the keel of which was laid or was at a similar stage of construction on or after the 1st January 2019.
<i>"Not readily ignitable"</i>	means that the surface thus described shall not continue to burn for more than 20 seconds after removal of a suitable impinging test flame.
<i>"Occasional Worker"</i>	As defined in Annex E
<i>"Officer"</i>	"Officer" means <ol style="list-style-type: none"><li>any seafarer who is required to be qualified under the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended (STCW); or</li><li>any other seafarer considered by the Company to be an officer.</li></ol>
<i>"Oil fuel unit"</i>	means the equipment used for the preparation of oil fuel for delivery to an oil-fired boiler, or equipment used for the preparation for delivery of heated oil to an internal combustion engine, and includes any oil pressure pumps, filters and heaters dealing with oil at a pressure of more than 0.18 N/mm <sup>2</sup>
<i>"Over-side Working Systems"</i>	means the securing, anchoring or track and rail systems used to access external portions of the vessel for maintenance and wash down. This can include but not limited to track and car systems or static harness points
<i>"Partial subdivision draft" or "(dp)"</i>	means the light service draft plus 60% of the difference between the light service draft and the Design Waterline draft
<i>"Passenger"</i>	As defined in Annex E
<i>"Passenger ship"</i>	means a ship carrying more than 12 passengers
<i>"Passenger spaces"</i>	means those spaces which are provided for the accommodation and use of passengers, excluding baggage store, provision and mail rooms and for the purposes of purposes of sections 4.26(3) and 4.27(5), spaces provided below the margin line for the accommodation and use of the crew shall be regarded as passenger spaces
<i>"Passenger yacht"</i>	means a yacht engaged in trade carrying more than 12 but not more than 36 passengers
<i>"Passenger Yacht 1"</i>	means a passenger yacht engaged on a prescribed international voyage;
<i>"Passenger Yacht 2"</i>	means a passenger yacht engaged on voyages in wind and weather conditions not exceeding Wind Scale 6 and Sea State 5 on the Beaufort scale and during which the ship is- <ol style="list-style-type: none"><li>not more than 20 nautical miles from land; and</li><li>not more than 60 nautical miles from a port or place in which the passengers and crew could be placed in safety</li></ol>
<i>"Permeability or "(μ)"</i>	of a space means the proportion of the immersed volume of that space which can be occupied by water
<i>"Person"</i>	means a person over the age of one year.
<i>"Pleasure vessel"</i>	shall have the meaning assigned to the term as defined in the national legislation of the

REG Member State implementing the provisions of the Code

<i>“Position 1”</i>	means upon freeboard decks and raised quarterdecks, or other exposed decks <sup>4</sup> lower than one standard height of superstructure above the freeboard deck, and upon exposed decks situated forward of a point located a quarter of the ship’s length from the forward perpendicular that are located lower than two standard heights of superstructure above the freeboard deck.
<i>“Position 2”</i>	means upon exposed decks situated abaft a quarter of the ship’s length from the forward perpendicular and located at least one standard height of superstructure above the freeboard deck and lower than two standard heights of superstructure above the freeboard deck. Upon exposed decks situated forward of a point located a quarter of the ship’s length from the forward perpendicular and located at least two standard heights of superstructure above the freeboard deck and lower than three standard heights of superstructure above the freeboard deck.
<i>“Positive stability”</i>	means the ability of a ship to return to its original position after the removal of a heeling moment
<i>“Prescribed international voyage”</i>	means an international voyage during the course of which a ship is not more than 200 nautical miles from a port or place in which the passengers and crew could be placed in safety and within a geographical area which limits the length of the voyage to a maximum of 1000 nautical miles from the initial point of departure, as specified in any Certificate issued in accordance with the Code with respect to the ship
<i>“Prescriptive requirements”</i>	means the construction characteristics, limiting dimensions or fire safety systems specified in this Code or in applicable International Conventions or national laws and regulations
<i>“Public spaces”</i>	means those portions of the accommodation which are used for halls, dining rooms, lounges and includes similar permanently enclosed spaces
<i>“Radar transponder”</i>	means a radar transponder for use in survival craft to facilitate location of survival craft in search and rescue operations.
<i>“Recess”</i>	means an indentation or depression in a deck and which is surrounded by the deck and has no boundary common with the shell of the vessel.
<i>“Recognised Organisation or “RO””</i>	means a Classification Society or other body which has been authorised by the Administration under a written agreement to undertake statutory surveys and issue statutory Certificates on the Administration’s behalf
<i>“Recovery time for a rescue boat”</i>	means the time required to raise the boat to a position where persons onboard can disembark to the deck of the ship and includes the time required to make preparations for recovery onboard the rescue boat such as passing and securing a painter, connecting the rescue boat to the launching appliance, and the time to raise the rescue boat provided that recovery time does not include the time needed to lower the launching appliance into position to recover the rescue boat.
<i>“Recreational Diving System”</i>	means any system or equipment using, creating or storing compressed gas of any type to aid or facilitate recreational underwater activities.
<i>“Recreational Fire Appliances”</i>	means heating or cooking appliances with open flames such as fireplaces, charcoal galley ovens, barbecues, spit roasts and fire pits.
<i>“REG”</i>	Means The Red Ensign Group comprising of the United Kingdom, Crown Dependencies (Isle of Man, Guernsey and Jersey) and UK Overseas Territories (Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Falkland Islands, Gibraltar, Montserrat, St Helena

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<sup>4</sup> “Exposed decks” include top decks of superstructures, deckhouses, companionways and other similar deck structures.

and the Turks & Caicos Islands) which operate shipping registers.

“Rescue boat”	means a boat complying with the requirements of LSA Code and designed to rescue persons in distress and for marshalling liferafts.
“Retro-reflective material”	means a material which reflects in the opposite direction a beam of light directed on it.
“Rocket parachute flare”	means a pyrotechnic signal complying with the requirements of LSA Code.
“Safe haven”	means a harbour or shelter of any kind which affords entry, subject to prudence in the weather conditions prevailing, and protection from the force of the weather.
“Sailing vessel”	means a vessel designed to carry sail, whether as a sole means of propulsion or as a supplementary means.
“Sauna”	means a hot room with temperatures normally varying between 80°C and 120°C where the heat is provided by a hot surface (e.g., by an electrically heated oven) and may include the space where the oven is located and adjacent bathrooms
“Seafarer”	includes every person (except Occasional Workers and pilots) employed or engaged in any capacity onboard a ship
“Sea area A1”	means an area within the radiotelephone coverage of at least one VHF coast station in which continuous DSC alerting is available
“Sea area A2”	means an area, excluding sea area A1, within the radiotelephone coverage of at least one MF coast station in which continuous DCS alerting is available
“Sea area A3”	means an area, excluding sea areas A1 and A2, within the coverage of an INMARSAT geostationary satellite in which continuous alerting is available.
“Sea area A4”	means an area outside sea area A1, A2 and A3.
“Self-activating smoke signal”	means a signal complying with the requirements of the LSA Code.
“Self-igniting light”	means a light complying with the requirements of the LSA Code.
“Service spaces”	means those spaces used for galleys, pantries containing cooking appliances, lockers, store-rooms, workshops other than those forming part of the machinery spaces, and similar spaces and trunks to such spaces
“Ships constructed”	means ships the keels of which are laid or which are at a similar stage of construction
“Short Range Yacht”	means a vessel under 500GT, the keel of which was laid or was at a similar stage of construction prior to the 1st August 2005, or a vessel constructed on or after that date under 300GT: restricted to operating in forecast or actual wind of a maximum Beaufort Force 4, for a motor yacht, and Beaufort Force 6 for a sailing yacht within 60 nautical miles of a safe haven. (The Administration may permit operation on specified routes up to 90 nautical miles from a safe haven as appropriate).
“Similar stage of construction”	means at a stage which:  (a) construction identifiable with a specific vessel begins; and (b) assembly of that vessel, comprising at least 50 tonnes or 1% of the estimated mass of all structural material has commenced; or (c) In the case of vessels constructed of FRP or GRP this shall be considered as the date when more than 5% of the hull resin and reinforcement has been laid.

<i>“Smoke damper”</i>	means a device installed in a ventilation duct, which under normal conditions remains open allowing flow in the duct, and is closed during a fire, preventing the flow in the duct to restrict the passage of smoke and hot gases. A smoke damper is not expected to contribute to the integrity of a fire rated division penetrated by a ventilation duct. In using the above definition the following terms may be associated: “automatic smoke damper” is a smoke damper that closes independently in response to exposure to smoke or hot gases; “manual smoke damper” is a smoke damper intended to be opened or closed by the crew by hand at the damper itself; and “remotely operated smoke damper” is a smoke damper that is closed by the crew through a control located at a distance away from the controlled damper.
<i>“Sprinkler”</i>	means a fixed pressure water-spraying fire-extinguishing system complying with the provisions of the Fire Safety Systems Code.
<i>“SOLAS”</i>	means the International Convention for the Safety of Life at Sea, 1974 as amended, as applicable for vessels the keels of which are laid on or after 1 <sup>st</sup> January 2019.
<i>“SOLAS 90”</i>	means the International Convention for the Safety of Life at Sea, 1974 as amended by the IMO October 1988 amendments, which were adopted by resolution MSC.12(56) and entered into force on 29 April 1990.
<i>“SOLAS A pack”</i>	means a liferaft emergency pack complying with the requirements of LSA Code
<i>“SOLAS B pack”</i>	means a liferaft emergency pack complying with the requirements of LSA Code
<i>“Standard fire test”</i>	means a test in which specimens of the relevant bulkheads, decks or other constructions are exposed in a test furnace by a specified test method in accordance with the Fire Test Procedures Code
<i>“Standard Superstructure Height <math>h_{std}</math>”</i>	means standard superstructure height which shall be taken as- (a) 1.8 metres for vessels up to 75 metres in length; (b) 2.3 metres for vessels of 125 metres or more in length; and (c) superstructure heights for vessels of intermediate lengths shall be obtained by interpolation
<i>“STCW”</i>	means the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended, as applicable for vessels the keels of which are laid on or after 1 <sup>st</sup> January 2019.
<i>“Steel or other equivalent material”</i>	means any non-combustible material which, by itself or due to insulation provided, has structural and integrity properties equivalent to steel at the end of the applicable exposure to the standard fire test (e.g., aluminium alloy with appropriate insulation)
<i>“Storm Covers”</i>	means a portable protective closure fitted to a glazed opening and which is fitted to the outside (weatherside) of the vessel. Also known as a Storm Shutter.
<i>“Sub-division length or (L<sub>s</sub>)”</i>	of a ship means the greatest projected moulded length of that part of the ship at or below deck or decks limiting the vertical extent of flooding with the ship at the Design Waterline draft
<i>“Submersible Craft”</i>	means any description of manned mobile submersible apparatus which is designed to maintain some or all of its occupants at or near atmospheric pressure including free, self-propelled, tethered, towed or bottom contact propelled apparatus and atmospheric diving suits.
<i>“Superstructure”</i>	means a decked structure on the freeboard deck, extending from side to side of the ship or with the side plating not being inboard of the shell plating more than 4% of the breadth (B)
<i>“Survival craft”</i>	means a craft capable of sustaining the lives of persons in distress from the time of

	abandoning the ship, including Liferafts, MES & Lifeboats
<i>“Training manual”</i>	with regard to life-saving appliances means a manual complying with the requirements of SOLAS III/Part B – Life Saving Appliances and Arrangements, Regulation 35.
<i>“Trim”</i>	means the difference between the draft forward and the draft aft, where the drafts are measured at the forward and aft terminals respectively, disregarding any rake of keel
<i>“Two-way VHF radiotelephone set”</i>	means a portable or a fixed VHF installation for survival craft complying with the performance standards adopted by the IMO contained in A.762(18) or any Resolution amending or replacing it which is considered by the Administration to be relevant from time to time.
<i>“Voyage”</i>	includes an excursion
<i>“Watertight”</i>	means having scantlings and arrangements capable of preventing the passage of water in any direction under the head of water likely to occur in intact and damaged conditions and in the damaged condition the head of water shall be considered in the worst situation at equilibrium, including intermediate stages of flooding;
<i>“Weather deck”</i>	means a deck which is completely exposed to the weather from above and from at least two sides
<i>“Weathertight”</i>	means that in any sea conditions water shall not penetrate into the ship.
<i>“Well”</i>	means any area on the deck exposed to the weather, where water may be entrapped and includes deck areas bounded on two or more sides by deck structures.
<i>“Wheelhouse”</i>	means the control position occupied by the officer of the watch who is responsible for the safe navigation of the vessel.
<i>“Window”</i>	means a ship's window, being any window, regardless of shape, suitable for installation aboard ships.

## **CHAPTER 3**

### **LOAD LINES**

#### **3.1 *Strength and Construction of Ship***

- (1) The Administration shall satisfy itself that the general structural strength of the ship is adequate for the draft corresponding to the freeboard assigned.
- (2) In addition to the requirements contained elsewhere in this Code, a ship to which the Code applies shall be designed, constructed, maintained and assigned a Class Notation as a passenger ship in compliance with the structural, mechanical and electrical requirements of a Recognised Organisation
- (3) Ships to which this Code applies shall comply with an intact stability standard acceptable to the Administration.
- (4) All vessels shall be assigned a freeboard in accordance with the requirements of the ILLC.
- (5) *A weather deck shall be fitted throughout the length of the vessel and be of adequate strength to withstand the sea and weather conditions likely to be encountered.*

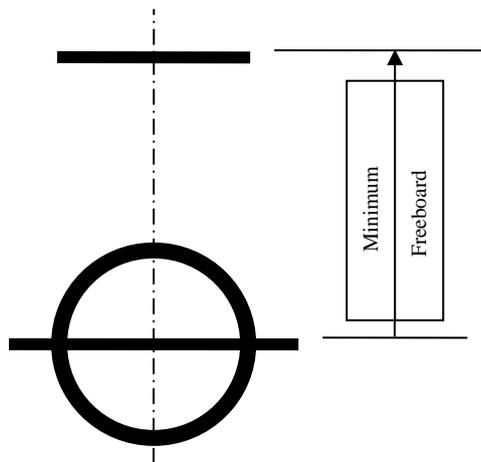
#### **3.2 *Application***

- (1) Subject to meeting the requirements of section 3.16 (Protection of the Crew), relaxations from these requirements may be granted to a ship to which a greater than minimum freeboard is assigned on condition that the Administration is satisfied with the safety conditions provided.
- (2) Where the assigned summer freeboard is increased such that the resulting draft is not more than that corresponding to a minimum summer freeboard for the same ship, but with an assumed freeboard deck located a distance below the actual freeboard deck at least equal to the standard superstructure height, the conditions of assignment in accordance with the ILLC, as applicable, to the actual freeboard deck may be as required for a superstructure deck.

#### **3.3 *Subdivision and Load Line Mark***

- (1) *The line which indicates the subdivision and load line assigned in accordance with Chapter 4 and this Chapter shall be the horizontal line which passes through the centre of the ring shown in figure 3.1. (See also section 4.20 of Chapter 4 of the Code)*

Figure 3.1 - Illustration of minimum freeboard mark and not the actual markings required



*Note: Distance measured from the top edge of the deck line to the top edge of the line bisecting the ring.*

- (2) The Subdivision and load line mark shall consist of a ring 300 millimetres in outside diameter and 25 millimetres wide which is intersected by a horizontal line 450 millimetres in length and 25 millimetres in breadth, the upper edge of which passes through the centre of the ring; the centre of the ring shall be placed amidships and at a distance measured vertically below the upper edge of the deck line equal to the assigned freeboard measured vertically below the upper edge of the deck as illustrated in Figure 3.1.
- (3) *Subject to Sections (4) and (5), the deck line is a horizontal line 300 millimetres in length and 25 millimetres in breadth which shall be marked amidships on each side of the ship with its upper edge normally passing through the point where the continuation outwards of the upper surface of the freeboard deck intersects the outer surface of the shell, provided that the deck line may be placed with reference to another fixed point on the ship on condition that the freeboard is correspondingly corrected;*
- (4) *Where the upper edge of the deck line coincides with a readily identifiable structural feature such as the actual deck at the side amidships, that structural feature may be utilised as the deck line providing it is clearly identified as such in the International Load Line Certificate;*
- (5) *Any other readily identifiable line or structure at the side amidships above or below the deck line position may be similarly utilised as the deck line providing it is clearly identified as such in the International Load Line Certificate and the freeboard is correspondingly corrected.*
- (6) The location of the reference point and the identification of the freeboard deck shall in all cases be indicated on the International Load Line Certificate.

- (7) In no case shall any subdivision load line mark be placed above the deepest load line in salt water as determined by the strength of the ship or this Chapter.
- (8) *The ring, lines and letters shall-*
  - (a) *be painted or otherwise permanently affixed to the hull;*
  - (b) *be of a contrasting colour to the hull; and*
  - (c) *where the marks are bonded to the hull provision shall be made to replace the marks, in the event of bond line failure, with the vessel afloat.*
- (9) The subdivision and load line assigned and marked shall be recorded in the Passenger Yacht Safety Certificate.
- (10) A ship shall in no case be so loaded that when it is in salt water the subdivision and load line mark is submerged.
- (11) *In applying this section due regard shall also be had to the requirement for draft marks as set out in section 4.29(17).*

**3.4 Mark of Assigning Authority**

- (1) The mark of the Authority by whom the load lines are assigned may be indicated alongside the load line ring above the horizontal line which passes through the centre of the ring, or above and below it and the mark shall consist of not more than four initials to identify the Authority's name, each measuring approximately 115 millimetres in height and 75 millimetres in width.
- (2) The International Load Line Certificate shall not be delivered to the ship until the officer or surveyor acting under the provisions of Article 13 of the ILLC has certified that the marks are correctly and permanently indicated on the ship's sides.

**3.5 Doors and Openings above the Weather Deck**

- (1) All access openings in bulkheads at ends of enclosed superstructures shall be fitted with weathertight doors of steel or other equivalent material, permanently and strongly attached to the bulkhead, and framed, stiffened and fitted so that the whole structure is of equivalent strength to the un-pierced bulkhead; the means for securing these doors weathertight shall consist of gaskets and clamping devices or other equivalent means which shall be permanently attached to the bulkhead or to the doors themselves, and the doors shall be so arranged that they can be operated from both sides of the bulkhead.
- (2) Unless otherwise permitted by the Administration, doors shall be hinged at the forward edge and open outwards to provide additional security against the impact of the sea; *alternative closing arrangements shall be considered providing it can be demonstrated that the efficiency of the closing arrangements and their ability to prevent the ingress of water shall not impair the safety of the vessel.*

- (3) Except as otherwise provided in this Chapter, the height of sills of access openings in bulkheads at ends of enclosed superstructures shall be at least 380 millimetres above the deck.
- (4) Portable sills shall generally be avoided provided that where the fitting of a sill in accordance with Section (3) proves impracticable, portable sills may be fitted on the following conditions-
  - (a) they shall be installed before the ship leaves port; and
  - (b) they shall be gasketed and fastened by closely spaced through bolts or other equivalent arrangement.
- (5) Where the requirements of section 3.2(2) are applicable further reductions in sill heights may be permitted provided that the Administration is satisfied that the safety of the ship is not impaired in any sea conditions and the safety of the ship shall be assumed not to be impaired if the vessel can comply with the enhanced survivability standard as defined in section 4.30 with the watertight compartment to which the door leads flooded.
- (6) Machinery space openings in Position 1 or 2 shall be properly framed and efficiently enclosed by steel or equivalent casings of ample strength and where machinery casings are not protected by other structures, their strength and protection arrangements shall be specially considered.
- (7) Access openings in the casings referred to in Section (6)-
  - (a) shall be fitted with doors complying with the requirements of Section (1), the sills of which shall be at least 600 millimetres above the deck if in Position 1, and at least 380 millimetres above the deck if in Position 2;
  - (b) other openings in such casings shall be fitted with equivalent covers, permanently attached in their proper positions; and
  - (c) *where the provision of fixed sills as required in this section proves impracticable, consideration may be given to the provision of portable sills, subject to the requirements of Section (4).*
- (8) Coamings of any fiddley, funnel or machinery space ventilator in an exposed position on the freeboard deck or superstructure deck shall be as high above the deck as reasonable and practicable provided that, subject to section 3.5(9), ventilators necessary to continuously supply the machinery space shall have coamings of sufficient height to comply with section 3.9(5), without having to fit weathertight closing appliances.
- (9) Where due to size of vessel or nature of the design compliance with the coaming heights required by Section (8) for ventilators necessary to continuously supply the machinery space proves impracticable, reduced coaming heights may be accepted subject to the following:
  - (a) *the ventilators are:*

- (i) *fitted with louvres and other such devices to prevent water ingress; and*
  - (ii) *provided with permanently attached closing appliances.*
- (b) *the ventilators and supply system is so designed to ensure that an adequate uninterrupted supply of ventilation can be maintained with the weather side closed off.*
- (c) *the vessel can comply with the enhanced survivability standard as specified in section 4(30), with the machinery space flooded.*
- (10) Fiddle openings shall be fitted with strong covers of steel or other equivalent material permanently attached in their proper positions and capable of being secured weathertight.

**3.6 Shell Openings Below the bulkhead Deck**

- (1) *Garages and other compartment(s) below the bulkhead deck, provided for recreational, storing or other purposes (for Pilot Doors, see also Annex K) to do with the business of the vessel and having access openings in the hull, shall be bounded by watertight divisions without any opening (i.e. doors, manholes, ventilation ducts or any other opening) up to 600mm above the deck, other than sliding watertight doors complying with Chapter 4.*
- (2) Access openings in the sides of ships below the freeboard deck shall be fitted with doors so designed as to ensure the same watertightness and structural integrity as the surrounding shell plating and
- (a) unless otherwise approved by the Administration, these openings shall open outwards; and
  - (b) the number of such openings shall be the minimum compatible with the design and proper working of the ship.
- (3) Unless otherwise permitted by the Administration, the lower edge of openings referred to in Section (2) shall not be below a line drawn parallel to the freeboard deck at side, which is at its lowest point at least 230 millimetres above the waterline corresponding to the deepest permitted operational draft.
- (4) *Where a shell door provided in accordance with the provisions of this section cannot be tested watertight under a head of water in accordance with section 4.12(1) then the requirements applicable to flush hatches in section 3.7(4) shall apply.*
- (5) *Means shall be provided to prevent the unauthorised use of the doors locally through provision of secondary or remote control at a continuously manned station, through an interlock, dual control process or procedure.*
- (6) *Critical equipment such as for the system for securing of the hull opening and any provided in accordance with Chapter 14, shall have a Liquid ingress protection of level*

5 (e.g. IP 65) in accordance with the International Protection Marking, IEC standard 60529 or equivalent.

**3.7 Hatchways and Coamings**

- (1) All hatchways in Positions 1 and 2 shall-
  - (a) be fitted with hatch covers of steel or other equivalent material;
  - (b) have hatch covers which shall be weathertight and fitted with gaskets and clamping devices;
  - (c) have means for securing and maintaining weathertightness which shall be to the satisfaction of the Administration;
  - (d) have arrangements which ensure that the weathertightness can be maintained in any sea conditions, and for this purpose tests for weathertightness shall be required at the initial survey and may be required at renewal and annual surveys or at more frequent intervals; and
  - (e) shall be so designed to comply with strength and securing requirements as defined in Regulation 16 of the ILLC.
- (2) The coamings of hatchways shall be of substantial construction in accordance with their position, and their height above the deck shall be at least as follows-
  - (f) 600 millimetres if in Position 1; and
  - (g) 450 millimetres if in Position 2.
- (3) In the case of hatchways which comply with regulation 16 of the ILLC, the height of these coamings may be reduced, or the coamings omitted entirely, on condition that the Administration is satisfied that the safety of the ship is not thereby impaired in any sea conditions.
- (4) *Where flush deck hatches or hatches without any coamings are provided the arrangements shall comply with the following functional requirements-*
  - (a) *the hatch cover shall be watertight and meet the strength requirements of Regulation 16 of the ILLC;*
  - (b) *the local deck strength shall be locally increased to avoid deformation;*
  - (c) *the hatch shall be closed at sea and marked accordingly and shall be provided with open/close indication at the navigating position;*
  - (d) *the means of securing shall be designed so as to maintain watertight integrity;*
  - (e) *the space to which the hatch leads shall be provided with low and high level bilge alarms; and*
  - (f) *the vessel can comply with the enhanced survivability standard as defined in Section 4.30 with the watertight compartment to which the hatch leads flooded.*

- (g) *where the hatch is provided for infrequent or emergency use only and is not used when at sea, Section (f) need not be complied with*
- (5) *Hatches which are designated for escape purposes shall comply with the following requirements:*
  - (a) *they shall be provided with covers which can be opened from either side and in the direction of escape they are able to be opened without a key;*
  - (b) *all handles on the inside shall be non removable; and*
  - (c) *an escape hatch shall be readily identified and easy and safe to use, having due regard to its position.*

**3.8 Miscellaneous Openings in Freeboard and Superstructure Decks**

- (1) *Openings in freeboard and superstructure decks shall be designed to comply with Regulation 18 of the ILLC.*
- (2) *Where compliance with Section (1) proves impracticable alternative arrangements for closure and coaming heights may be considered subject to the vessel being able to comply with the enhanced survivability standard in section 4.30 with the watertight compartment to which the opening leads flooded.*

**3.9 Ventilators**

- (1) Ventilators in Position 1 and Position 2 to spaces below the freeboard deck or decks of enclosed superstructures shall be of substantial construction of steel or equivalent material and-
  - (a) ventilators in Position 1 shall have coamings of a height of at least 900 millimetres above the deck;
  - (b) ventilators in Position 2 shall have coamings of a height of at least 760 millimetres above the deck; and
  - (c) where the coaming of any ventilator exceeds 900 millimetres in height it shall be specially supported.
- (2) Ventilator openings shall be provided with weathertight closing appliances of steel or equivalent or have equivalent means of preventing ingress of water and the means of closing shall-
  - (a) in ships of less than 100 metres in length, be permanently attached to each of the ventilators; and
  - (b) in ships of 100 metres or more in length, if not permanently attached to the ventilator the means of closing shall conveniently stowed near the ventilators to which they shall be fitted.
- (3) Where due to ship design and arrangements compliance with Sections (1) and (2) is not practicable, lesser heights for ventilator coamings, fitted with weathertight closing

appliances, may be permitted by the Administration in combination with other suitable arrangements to ensure an uninterrupted, adequate supply of ventilation to the spaces.

- (4) In exposed locations, the height of coamings shall be increased as required to the satisfaction of the Administration.
- (5) Subject to the meeting the requirements for fire protection contained in Chapter 6, ventilators-
  - (a) in Position 1, the coamings of which extend to more than 4.5 metres above the deck; and
  - (b) in Position 2, the coamings of which extend to more than 2.3 metres above the deck, need not be fitted with closing arrangements unless specifically required by the Administration.
- (6) *Permanently attached means of weathertight closure required by (2) and (3) may be omitted if it can be shown that the open end of a ventilator is afforded adequate protection by other structure(s) which shall prevent the ingress of water<sup>5</sup>.*

### **3.10 Air Pipes**

- (1) Subject to the provisions of section 4.19(3), where air pipes to ballast and other tanks extend above the freeboard or superstructure decks, the exposed parts of the pipes shall be of substantial construction and the height of the air pipe from the deck to the point where water may have access to the space below shall be at least 760 millimetres on the freeboard deck and 450 millimetres on the superstructure deck.
- (2) Where these heights may interfere with the working of the ship, a lower height may be approved, provided that the Administration is satisfied that the closing arrangements and other circumstances justify a lower height.
- (3) Air pipes shall be provided with automatic closing devices.
- (4) In applying this section due regard shall be had to section 4.19(3) of the Code.

### **3.11 Scuppers, Inlets and Discharges**

- (1) Subject to Section (2), scuppers, inlets and discharges are to comply with the requirements of the ILLC and with section 4.16 of the Code.
- (2) *Where the provision of an automatic non return valve for an underwater exhaust is impracticable, this may be omitted subject to the following requirements-*
  - (a) *the discharge pipe shall be-*

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<sup>5</sup> Weathertightness tested in accordance with Section 8.1.1 of ISO 14884:2015 or IACS UR S14 - Testing Procedures of Watertight Compartments, Section 4.4.3.

- (i) *of substantial thickness as defined in Recognised Organisation Rules; and in no case shall the thickness of the pipe be less than that required for the shell plating in this location; and*
- (ii) *provided with a positive means of closure, fitted as close to the shell outlet as practicable and operable from an accessible location above the bulkhead deck,*
- (b) *the substantial thickness portion of the discharge shall extend from the shell outlet to a height of not less than 1000 millimetres above the deepest waterline from the valve location;*
- (c) *the positive means of closure required in Section 3.11(2)(a)(ii) shall be designed and installed so as to be readily accessible for routine inspection and maintenance. and*
- (d) *low and high level bilge alarms shall be fitted in way of the exhaust discharge to provide early warning of water ingress into the hull.*

### **3.12 Glazed Openings**

#### *General*

- (1) Glazed openings & Skylights shall:
  - (a) be made from toughened safety glass. In case of chemically toughened glass, it shall be qualified by testing in accordance with EN 1288-3, based on the requirements given in ISO 11336-1. Regular inspections of the glazed openings, with particular reference to the surface condition, shall form part of the operational procedures and annual surveys;
  - (b) not be fitted in such a position that their sills are below a line drawn parallel to the freeboard deck at side and having its lowest point 2.5% of the breadth (B), or 500 millimetres, whichever is the greatest distance, above the design waterline;
  - (c) be attached to the ship in such a manner, that they are capable of fulfilling their role in the application of ICLL requirements;
  - (d) follow the requirements of Chapter 8 where they are for glazed openings in the navigating position;
  - (e) not be fitted in the hull in the way of the machinery space; and
  - (f) be of the non-readily opening type which shall be securely closed when the vessel is in navigation and indication provided on the bridge that they are closed.
- (2) When glazed openings are fitted by bonding the following provisions shall be observed:
  - (a) proposals shall include measures to ensure the integrity of the bond line taking into account environmental and ageing effects;

- (b) arrangements shall be such that glazed openings and doors cannot fall from their mounting should the bond line fail or due to the effects of fire when required to be fire rated; and
- (3) Where glazed openings protect buoyant volumes, they shall be designed using the pressure heads derived from a recognised International Standard such as ISO 5780 or ISO 11336-1.
- (4) Where glazed openings with an area exceeding 0.16 m<sup>2</sup> are fitted in the buoyant part of the hull within Level 1, the vessel shall meet the enhanced survivability standard as set out in Chapter 4 of the Code, with the watertight compartment behind the glazed opening assumed flooded and in all such cases the arrangements shall comply with all other applicable provisions of this section.
- (5) Where glazed openings do not protect buoyant volumes, they shall be designed using the pressure heads rules of a Recognised Organisation or a recognised International Standard such as ISO 11336-1.

*Deadlights*

- (6) Glazed openings within the buoyant part of the hull shall be provided with deadlights so arranged that they can be easily and effectively closed and secured watertight.
- (7) Deadlights may be portable provided these are stored in an easily accessible location and are readily mountable in a seaway. Instructions to the Master as to when deadlights shall be applied to portlights shall be provided.

*Storm Covers*

- (8) Storm covers shall be required in the following locations, where deadlights are not already required by Section (6):
  - (a) glazed openings in the front and sides of Level 1;
  - (b) glazed openings in the front of Level 2; and
  - (c) where storm covers are interchangeable between port and starboard, a minimum of 50% of each size shall be provided;
- (9) Where required by Section (8), if the glazed openings meet an enhanced structural standard, in accordance with Recognised Organisation rules, a recognized International Standard, or a factor of 1.5 applied to the design pressure of the glazed opening, then storm covers are not required.
- (10) A- and B-Class cabin bulkheads and doors are accepted in place of deadlights or storm covers fitted to glazed openings in the following locations:
  - (a) in Levels 1 and 2 when above the buoyant part of the hull and separating side glazed openings from a direct access leading below; and

- (b) in Level 2 when considered buoyant in the stability calculations.

*Skylights*

- (11) Fixed or opening skylights shall-
  - (a) have a glazing thickness appropriate to their size and position as required for glazed openings;
  - (b) be provided with protection from mechanical damage to the skylight load-bearing glazing in any position;
  - (c) except where the arrangements comply with (12), when fitted in Level 1 or 2, be provided with deadlights or storm covers that can be easily and safely mounted in a seaway; and
  - (d) if designated for escape purposes, be provided with a means of opening from either side of the skylight provided that in the direction of escape they are able to be opened without a key.
- (12) the Administration may permit the storm covers specified in Sections (11)(c) to be omitted provided the glazing meets Section (9)

*Strength*

- (13) Glazed openings, together with their frames, deadlights and storm covers, if fitted, shall meet an appropriate national or international standard or the rules regarding side scuttles and windows of a Recognised Organisation<sup>6</sup>.
- (14) Where the glazing material, glazing thickness, or fixing of the glazed opening do not meet the requirements of a recognised standard<sup>7</sup> they may be tested<sup>8</sup>, to the satisfaction of the Administration, in accordance with the following provisions:
  - (a) the glazed opening shall be tested to a minimum test pressure of 4 times the required design pressure derived from an appropriate national or international standard, provided that as a minimum, the calculated thicknesses shall meet the Recognised Organisation requirements; and
  - (b) the testing shall be witnessed by an Recognised Organisation.

**3.13** *Garbage Chutes etc.*

- (1) Where a garbage chute is fitted two gate valves controlled from the working deck of the chute instead of the non-return valve with a positive means of closing from a position above the freeboard deck are acceptable provided they comply with the following requirements-

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<sup>6</sup> For illustration purposes see the requirements set out in Part 4, Chapter 2 Section 11.3 of Lloyd's Registers Rules and Regulations for the Classification of Ships.

<sup>7</sup> For example ISO 11336-1 Large yachts – Strength, weathertightness and watertightness of glazed openings

<sup>8</sup> For example hydrostatic testing of the windows and frames or ISO 11336-1 Large yachts – Strength, weathertightness and watertightness of glazed openings

- (a) the lower gate valve shall be controlled from a position above the freeboard deck and an interlock system between the two valves shall be arranged;
  - (b) subject to Section (c), the inboard end shall be located above the waterline formed by an 8.5° heel to port or starboard at a draft corresponding to the lowest operational freeboard, but not less than 1,000 millimetres above that waterline;
  - (c) where the inboard end exceeds 0.01L above the waterline defined in Section (b), valve control from the freeboard deck is not required, provided the inboard gate valve is always accessible under service conditions; and
  - (d) alternatively, the upper and lower gate valves may be replaced by a hinged weathertight cover at the inboard end of the chute together with a discharge flap, arranged with an interlock so that the discharge flap cannot be operated until the hopper cover is closed.
- (2) The entire chute, including the cover, shall be constructed of material of substantial thickness.
- (3) The controls for the gate valves and/or hinged covers shall be clearly marked: "Keep closed when not in use".
- (4) Where the inboard end of the chute is below the freeboard deck then-
- (a) the inboard end hinged cover/valve shall be watertight;
  - (b) the valve shall be a screw-down non-return valve fitted in an easily accessible position above the deepest load line; and
  - (c) The screw-down non-return valve shall be controlled from a position above the bulkhead deck and provided with open/closed indicators and the valve control shall be clearly marked: "Keep closed when not in use".

### **3.14 Spurling Pipes and Cable Lockers**

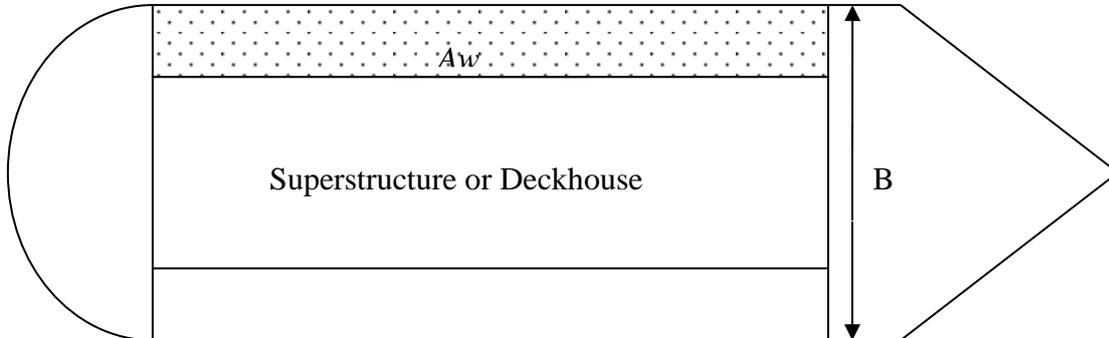
- (1) Spurling pipes and cable lockers shall be watertight up to the deck exposed to weather.
- (2) Where means of access are provided, they shall be closed by a substantial cover and secured by closely spaced bolts.
- (3) Spurling pipes through which anchor cables are led shall be provided with permanently attached closing appliances to minimise water ingress.

### **3.15 Freeing Ports and Recesses**

#### *Freeing Ports*

- (1) *The standards for water freeing arrangements shall comply with the ILLC as far as it is reasonable and practicable to do so on any weather decks in the forward quarter, and up to position 2 elsewhere and in any case the intention shall be to achieve a standard of safety which is at least equivalent to the standard of the ILLC to the satisfaction of the Administration given the design and use of the vessel.*

- (2) Where a well is created on each side of the vessel between a superstructure or deckhouse, and the bulwark in way of that superstructure or deck house, the following formula may be used, in accordance with Figure 3.2, to determine the required freeing port areas on each side of the vessel for the well concerned-



**Figure 3.2**

$$FP_{REQ} = \frac{0.28 \times A_w}{B}$$

Where-  $FP_{REQ}$  = Required Minimum Freeing Port Area;  
 $A_w$  = Area of well in way of superstructure; and  
 $B$  = Maximum beam at deck in way of the well.

- (3) In individual cases, when the Administration considers that the requirements of the ILLC with respect to freeing port areas cannot be met, the Administration may consider and approve alternative arrangements to achieve adequate safety standards which may take account of a reduced permeability and volume of a well.
- (4) For a Passenger Yacht 2 (PY-2) the requirement for the minimum freeing port area for a forward or after well as determined in accordance with Section (2) may be reduced by a form factor equal to the ratio of  $\frac{AW}{LW \times BW}$  where-

$AW$  = Actual area of the well;

$LW$  = Overall length of the well;

$BW$  = Maximum breadth of the well; and

Dimensions are measured at half the height of the bulwark above the deck of the well,

provided that

- (a) the maximum reduction shall not exceed 50%;
- (b) the stability requirements for the yacht are maintained with all the wells flooded to any level up to the height of the bulwark; and
- (c) the freeing port area provided is sufficient to allow the well to drain in less than three minutes.

*Recesses*

- (5) Any recess in the weather deck shall be of weathertight construction and shall be self draining under all normal conditions of heel and trim of the vessel; a swimming pool or spa bath, open to the elements, shall be treated as a recess.
- (6) *The means of drainage provided shall be capable of efficient operation when the vessel is heeled to an angle of 10°.*
- (7) *The drainage arrangements shall have the capability of draining the recess (when fully charged with water) within 3 minutes when the vessel is upright and at the load line draft and means shall be provided to prevent the backflow of sea water into the recess.*
- (8) *Where it is not practical to provide drainage which meets the requirements of Sections (6) and (7), alternative safety measures may be proposed for approval by the Administration, provided that where the above requirements for quick drainage cannot be met, the effect on intact and damage stability shall be considered taking into account the mass of water and its free surface effect.*

**3.16 Protection of the Crew**

- (1) The deckhouses used for the accommodation of the crew shall be constructed to an acceptable level of strength.
- (2) Guard rails or bulwarks shall be fitted around all exposed decks and the height of the bulwarks or guard rails shall be at least 1 metre from the deck, provided that where this height would interfere with the normal operation of the ship, a lesser height may be approved provided that the Administration is satisfied that adequate protection is provided;
- (3) Guard rails fitted on superstructure and freeboard decks shall have at least three courses such that the opening below the lowest course of the guard rails shall not exceed 230 millimetres and the other courses shall be not more than 380 millimetres apart;
- (4) In the case of ships with rounded gunwales the guard rail supports shall be placed on the flat of the deck.
- (5) In other locations, guardrails with at least two courses shall be fitted.
- (6) Guard rails shall comply with the vessel's Recognised Organisation construction requirements or the following provisions-
  - (a) fixed, removable or hinged stanchions shall be fitted about 1.5 metres apart and removable or hinged stanchions shall be capable of being locked in the upright position;
  - (b) at least every third stanchion shall be supported by a bracket or stay;
  - (c) where necessary for the normal operation of the ship, steel wire ropes may be accepted in lieu of guard rails and such wires shall be made taut by means of turnbuckles; and

- (d) where necessary for the normal operation of the ship, chains fitted between two fixed stanchions and/or bulwarks are acceptable in lieu of guard rails.
- (e) *a combination of bulwarks and guardrails shall be permitted providing that bulwarks comply with applicable freeing port area requirements.*
- (7) Satisfactory means for safe passage (in the form of guard rails, lifelines, gangways or underdeck passages, etc.) shall be provided for the protection of the crew in getting to and from their quarters, the machinery space and any other spaces used in the essential operation of the ship.
- (8) *Where the function of the vessel would be impeded by the provision of bulwarks and/or guard rails complying with Sections (2) to (6), alternative proposals detailed to provide equivalent safety for persons on deck shall be submitted to the Administration for approval where recognised national or international standards may be accepted as equivalence.*
- (9) *The structural strength of any bulwarks or guardrails shall comply with the requirements of a Recognised Organisation or recognised international standard as appropriate to the vessel and its areas of operation.*

### **3.17 Reduced Sill Heights and Coaming**

(summary of requirements from earlier sections)

- (1) *A reduction in door sill height is allowed to the satisfaction of the Administration in accordance with section 3.5(5), provided that the vessel has increased freeboard in accordance section 3.2(2), and can comply with the enhanced survivability standard as defined in section 4.30, with the watertight compartment to which the door leads flooded in accordance with 3.17(4).*
- (2) *Flush hatches are allowed in accordance with section 3.7(4), including, but not limited to, that the vessel can comply with the enhanced survivability standard as defined in Section 4.30, with the watertight compartment to which the hatch leads flooded in accordance with 3.17(4).*
- (3) *Miscellaneous Openings in Freeboard and Superstructure Decks may have reduced coamings considered in accordance with section 3.8(2) subject to the vessel being able to comply with the enhanced survivability standard in section 4.30, with the watertight compartment to which the opening leads flooded in accordance with 3.17(4).*
- (4) *Where compliance with the enhanced survivability standard in section 4.30, with the watertight compartment to which the opening leads flooded is required, the compartment supplied by the opening shall be assumed to be flooded to the outside waterline. With the compartment flooded the vessel shall be shown to meet the criteria set out in Section 4.30.*

### **3.18 Additional Equivalence Considerations**

- (1) *Openings to be kept closed at sea*

- (2) *Enhanced Bilge Pumping capacity and additional bilge alarms*
- (3) *Compliance with enhanced stability if not already a requirement (see Section 4.30)*
- (4) *Provision of dorade boxes or baffle systems to prevent direct ingress of water*
- (5) *Alternative ventilation for use in bad weather*
- (6) *Consideration of downflooding angle and reduced risk of green sea loads, i.e. protected position*
- (7) *Enhanced survey inspection regime*
- (8) *Operational Limitations*
- (9) *Consideration shall be given to the provision of operational instructions to the Master as to when deadlights shall be applied to portlights.*

## **CHAPTER 4**

### **CONSTRUCTION, SUBDIVISION AND STABILITY**

#### **PART I - GENERAL**

##### **4.1 Strength of Ship and Subdivision - General**

- (1) *The Administration shall satisfy itself that the general structural strength of the ship is adequate for the draft corresponding to the freeboard assigned.*
- (2) *The ship shall in any case be constructed in accordance with the requirements of Chapter 3 (Load Lines) and it shall comply with the Intact Stability Code 2008 or with intact stability standards acceptable to the Administration.*
- (3) *Ships shall be as efficiently subdivided as is possible having regard to the nature of the service for which they are intended and the degree of subdivision shall vary with the subdivision length ( $L_s$ ) of the ship and with the service, in such manner that the highest degree of subdivision corresponds with the ships of greatest subdivision length ( $L_s$ ), primarily engaged in the carriage of passengers.*
- (4) *Where it is proposed to fit decks, inner skins or longitudinal bulkheads of sufficient tightness to seriously restrict the flow of water, the Administration shall be satisfied that proper consideration is given to beneficial or adverse effects of such structures in the calculations.*
- (5) *The Table in Annex 1 summarises the stability provisions applicable to the various categories of Passenger Yacht.*

##### **4.2 Application of SOLAS Provisions – General**

- (1) *Except where provided otherwise in this Chapter, all new vessels to which this Code applies shall be required to meet the applicable requirements of SOLAS II-1.*
- (2) *The damage stability requirements in SOLAS II-1, Parts B-1 through B-4 of those amendments shall apply to all ships, provided that for vessels up to 80m L (i.e. Load Line length), the Administration may permit the use of SOLAS 90 Deterministic methodology, in lieu of sections 4.5 and 4.6, in accordance with Part VI of this Chapter.*
- (3) *For ships of 1,600 gross tonnage and above, SOLAS II-1 Part A-1 Regulation 3-12 on the protection against noise and the Code on noise levels onboard ships, adopted by the Maritime Safety Committee by resolution MSC.337(91), as may be amended by the IMO shall apply. For the purpose of this section, although the Code on noise levels onboard ships is treated as a mandatory instrument, recommendatory parts as specified in chapter I of the Code shall be treated as non-mandatory.*

## **PART II**

### **STABILITY**

#### **4.3 Intact Stability and Information<sup>9</sup>**

- (1) Every ship to which this Code applies shall be inclined upon its completion and the elements of its stability determined.
- (2) Where any alterations are made to a ship so as to materially affect the stability information supplied to the master-
  - (a) amended stability information shall be provided;
  - (b) if necessary the ship shall be re-inclined; and
  - (c) the ship shall be re-inclined if anticipated deviations exceed one of the values specified in Section (3)(b).
- (3) At periodical intervals not exceeding five years-
  - (a) a lightweight survey shall be carried out on all passenger ships to verify any changes in lightship displacement and longitudinal centre of gravity; and
  - (b) the ship shall be re-inclined whenever, in comparison with the approved stability information, a deviation from the lightship displacement exceeding 2% or a deviation of the longitudinal centre of gravity exceeding 1% of  $L_s$  is found or anticipated<sup>10</sup>.
- (4) *In applying this section due regard shall be given to the Intact Stability Code 2008 as defined in Chapter 2 of this Code.*

#### **4.4 Stability Information to be supplied to the Master<sup>11</sup>**

- (1) The master shall be supplied with such stability information satisfactory to the Administration as is necessary to enable him by rapid and simple processes to obtain accurate guidance as to the stability of the ship under varying conditions of service and a copy of the stability information shall be furnished to the Administration.
- (2) Information shall be provided to the master-
  - (a) in a form that is approved by the Administration or a Recognised Organisation; and

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<sup>9</sup> Refer to the Code on Intact Stability for All Types of Ships covered by IMO Instruments, adopted by the IMO by MSC.267(85)

<sup>10</sup> Refer to IMO Circular MSC/Circ.1158 Stability information for passenger ships and cargo ships - Lightweight check

<sup>11</sup> Refer also to the Guidelines for the preparation of intact stability information (MSC/Circ.456) and the revised guidance to the master for avoiding dangerous situations in following and quartering seas (MSC.1/Circ.1228)

- (b) such information, and loading information also related to ship strength when required under Section (1), shall be carried onboard at all times together with evidence that the information has been approved by the Administration.
- (3) The information shall include-
  - (a) curves or tables of minimum operational metacentric height (*GM*) versus draught which assures compliance with the relevant intact and damage stability requirements, alternatively corresponding curves or tables of the maximum allowable vertical centre of gravity (*KG*) versus draught, or with the equivalents of either of these curves;
  - (b) instructions concerning the operation of cross-flooding arrangements; and
  - (c) all other data and aids which might be necessary to maintain the required intact stability and stability after damage.
- (4) The stability information shall show the influence of various trims in cases where the operational trim range exceeds +/- 0.5% of  $L_s$ .
- (5) For ships which have to fulfil the stability requirements of Part II of this Chapter, information referred to in Section (2) is determined from considerations related to the subdivision index, in the following manner-
  - (a) minimum required *GM* (or maximum permissible vertical position of centre of gravity *KG*) for the three draughts  $d_s$ ,  $d_p$  and  $d_l$  are equal to the *GM* (or *KG* values) of corresponding loading cases used for the calculation of survival factor  $s_i$ ;
  - (b) for intermediate draughts, values to be used shall be obtained by linear interpolation applied to the *GM* value only between the deepest subdivision draught and the partial subdivision draught and between the partial load line and the light service draught respectively. Intact stability criteria shall also be taken into account by retaining for each draft the maximum among minimum required *GM* values or the minimum of maximum permissible *KG* values for both criteria; and
  - (c) if the subdivision index is calculated for different trims, several required *GM* curves shall be established in the same way.
- (6) When curves or tables of minimum operational metacentric height (*GM*) versus draught are not appropriate, the master shall ensure that the operating condition does not deviate from a studied loading condition, or verify by calculation that the stability criteria are satisfied for this loading condition.
- (7) In applying this section due regard shall be had to the Intact Stability Code as defined in Chapter 2 of this Code.

#### **4.5 Required Subdivision Index R<sup>12</sup>**

- (1) The subdivision of a ship is considered sufficient if the attained subdivision index A, determined in accordance with section 4.6, is not less than the required subdivision index

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<sup>12</sup> The Maritime Safety Committee, in adopting the regulations contained in parts B to B-4 of SOLAS, as amended, invited Administrations to note that the regulations shall be applied in conjunction with the explanatory notes developed by the IMO as set out in Resolution MSC.281(85) in order to ensure their uniform application.

R calculated in accordance with this regulation and if, in addition, the partial indices  $A_s$ ,  $A_p$  and  $A_i$  are not less than 0.9R for passenger ships.

- (2) For all passenger ships to which the damage stability requirements of this Chapter apply, the degree of subdivision to be provided shall be determined by the required subdivision index  $R$ , as follows-

$$R = 1 - \frac{5,000}{L_s + 2.5N + 15,225}$$

where:

$$N = N_1 + 2N_2;$$

$N_1$  = number of persons for whom lifeboats are provided<sup>13</sup>; and

$N_2$  = number of persons (including officers and crew) the ship is permitted to carry in excess of  $N_1$ .

- (3) Where the conditions of service are such that compliance with Section (2) on the basis of  $N = N_1 + 2N_2$  is impracticable and where the Administration considers that a suitably reduced degree of hazard exists<sup>14</sup>, a lesser value of  $N$  may be taken but in no case shall the value be less than  $N = N_1 + N_2$ .

#### 4.6 Attained Subdivision Index A

- (1) The attained subdivision index  $A$  is obtained by the summation of the partial indices  $A_s$ ,  $A_p$  and  $A_i$ , (weighted as shown) calculated for the draughts  $d_s$ ,  $d_p$  and  $d_i$  defined in Chapter 2 in accordance with the following formula-

$$A = 0.4A_s + 0.4A_p + 0.2A_i$$

- (2) Each partial index is a summation of contributions from all damage cases taken in consideration, using the following formula-

$$A = \sum p_i s_i$$

where-

$i$  represents each compartment or group of compartments under consideration;

$p_i$  accounts for the probability that only the compartment or group of compartments under consideration may be flooded, disregarding any horizontal subdivision, as defined in section 4.7; and

$s_i$  accounts for the probability of survival after flooding the compartment or group of compartments under consideration, and includes the effect of any horizontal subdivision, as defined in section 4.8.

- (3) In the calculation of  $A$ -

<sup>13</sup> Where enhanced survivability is relied upon,  $N_1$  shall be deemed to include all persons onboard.

<sup>14</sup> Regarding the term "reduced degree of hazard", the following interpretation shall be applied in accordance with Regulation 6.2.4 of the above mentioned Resolution MSC.281(85)-

"A lesser value of  $N$ , but in no case less than  $N = N_1 + N_2$ , may be allowed at the discretion of the Administration for passenger ships, which, in the course of their voyages, do not proceed more than 20 miles from the nearest land."

- (a) the level trim shall be used for the deepest subdivision draught and the partial subdivision draught;
  - (b) the actual service trim shall be used for the light service draught; and
  - (c) if in any service condition, the trim variation in comparison with the calculated trim is greater than 0.5% of  $L_s$ , one or more additional calculations of  $A$  shall be submitted for the same draughts but different trims so that, for all service conditions, the difference in trim in comparison with the reference trim used for one calculation shall be less than 0.5% of  $L_s$ .
- (4) When determining the positive righting lever ( $GZ$ ) of the residual stability curve, the displacement used shall be that of the intact condition; that is, the constant displacement method of calculation shall be used.
- (5) The summation indicated by the above formula shall be taken over the ship's subdivision length ( $L_s$ ) for all cases of flooding in which a single compartment or two or more adjacent compartments are involved. In the case of unsymmetrical arrangements, the calculated  $A$  value shall be the mean value obtained from calculations involving both sides; alternatively, it shall be taken as that corresponding to the side which evidently gives the least favourable result.
- (6) Wherever wing compartments are fitted-
- (a) contribution to the summation indicated by the formula shall be taken for all cases of flooding in which wing compartments are involved;
  - (b) additionally, cases of simultaneous flooding of a wing compartment or group of compartments and the adjacent inboard compartment or group of compartments, but excluding damage of transverse extent greater than one half of the ship breadth  $B$ , may be added; and
  - (c) for the purpose of this regulation, transverse extent is measured inboard from ship's side, at right angle to the centreline at the level of the deepest subdivision draught.
- (7) In the flooding calculations carried out according to the regulations-
- (a) only one breach of the hull and only one free surface need to be assumed; and
  - (b) the assumed vertical extent of damage is to extend from the baseline upwards to any watertight horizontal subdivision above the waterline or higher.
- provided however, if a lesser extent of damage shall give a more severe result, such extent shall be assumed.
- (8) If pipes, ducts or tunnels are situated within the assumed extent of damage, arrangements shall be made to ensure that progressive flooding cannot thereby extend to compartments other than those assumed flooded. However, the Administration may permit minor progressive flooding if it is demonstrated that its effects can be easily controlled and the safety of the ship is not impaired.

**4.7 Calculation of the Factor  $p_i$**

- (1) The factor  $p_i$  for a compartment or group of compartments shall be calculated in accordance with this section using the following notations-

$j$  = the aftmost damage zone number involved in the damage starting with No.1 at the stern;

$n$  = the number of adjacent damage zones involved in the damage;

$k$  = is the number of a particular longitudinal bulkhead as barrier for transverse penetration in a damage zone counted from shell towards the centre line; the shell has  $k = 0$ ;

$x1$  = the distance from the aft terminal of  $L_s$  to the aft end of the zone in question;

$x2$  = the distance from the aft terminal of  $L_s$  to the forward end of the zone in question;

$b$  = the mean transverse distance in metres measured at right angles to the centreline at the deepest subdivision load line between the shell and an assumed vertical plane extended between the longitudinal limits used in calculating the factor  $p_i$  and which is a tangent to, or common with, all or part of the outermost portion of the longitudinal bulkhead under consideration; this vertical plane shall be so orientated that the mean transverse distance to the shell is a maximum, but not more than twice the least distance between the plane and the shell; if the upper part of a longitudinal bulkhead is below the deepest subdivision load line the vertical plane used for determination of  $b$  is assumed to extend upwards to the deepest subdivision waterline; in any case,  $b$  is not to be taken greater than  $B/2$ .

If the damage involves a single zone only:

$$p_i = p(x1_j, x2_j) \cdot [r(x1_j, x2_j, b_k) - r(x1_j, x2_j, b_{k-1})]$$

If the damage involves two adjacent zones:

$$p_i = p(x1_j, x2_{j+1}) \cdot [r(x1_j, x2_{j+1}, b_k) - r(x1_j, x2_{j+1}, b_{k-1})] \\ - p(x1_j, x2_j) \cdot [r(x1_j, x2_j, b_k) - r(x1_j, x2_j, b_{k-1})] \\ - p(x1_{j+1}, x2_{j+1}) \cdot [r(x1_{j+1}, x2_{j+1}, b_k) - r(x1_{j+1}, x2_{j+1}, b_{k-1})]$$

If the damage involves three or more adjacent zones:

$$p_i = p(x1_j, x2_{j+n-1}) \cdot [r(x1_j, x2_{j+n-1}, b_k) - r(x1_j, x2_{j+n-1}, b_{k-1})] \\ - p(x1_j, x2_{j+n-2}) \cdot [r(x1_j, x2_{j+n-2}, b_k) - r(x1_j, x2_{j+n-2}, b_{k-1})] \\ - p(x1_{j+1}, x2_{j+n-1}) \cdot [r(x1_{j+1}, x2_{j+n-1}, b_k) - r(x1_{j+1}, x2_{j+n-1}, b_{k-1})] \\ + p(x1_{j+1}, x2_{j+n-2}) \cdot [r(x1_{j+1}, x2_{j+n-2}, b_k) - r(x1_{j+1}, x2_{j+n-2}, b_{k-1})]$$

and where  $r(x1, x2, b_0) = 0$

(2) The factor  $p(x1, x2)$  shall be calculated according to the following formulae-

Overall normalised max damage length:  $J_{max} = 10/33$

Knuckle point in the distribution:  $J_{kn} = 5/33$

Cumulative probability at  $J_{kn}$ :  $p_k = 11/12$

Maximum absolute damage length:  $l_{max} = 60$  metres

Length where normalised distribution ends:  $L^* = 260$  metres

Probability density at  $J = 0$ :

$$b_0 = 2 \left( \frac{p_k}{J_{kn}} - \frac{1 - p_k}{J_{max} - J_{kn}} \right)$$

When  $L_s \leq L^*$ :

$$J_m = \min \left\{ J_{max}, \frac{l_{max}}{L_s} \right\}$$

$$J_k = \frac{J_m}{2} + \frac{1 - \sqrt{1 + (1 - 2p_k)b_0J_m + \frac{1}{4}b_0^2J_m^2}}{b_0}$$

$$b_{12} = b_0$$

When  $L_s > L^*$ :

$$J_m^* = \min \left\{ J_{max}, \frac{l_{max}}{L^*} \right\}$$

$$J_k^* = \frac{J_m^*}{2} + \frac{1 - \sqrt{1 + (1 - 2p_k)b_0J_m^* + \frac{1}{4}b_0^2J_m^{*2}}}{b_0}$$

$$J_m = \frac{J_m^* \cdot L^*}{L_s}$$

$$J_k = \frac{J_k^* \cdot L^*}{L_s}$$

$$b_{12} = 2 \left( \frac{p_k}{J_k} - \frac{1 - p_k}{J_m - J_k} \right)$$

$$b_{11} = 4 \frac{1 - p_k}{(J_m - J_k)J_k} - 2 \frac{p_k}{J_k^2}$$

$$b_{21} = -2 \frac{1 - p_k}{(J_m - J_k)^2}$$

$$b_{22} = -b_{21}J_m$$

The non-dimensional damage length:

$$J = \frac{(x_2 - x_1)}{L_s}$$

The normalised length of a compartment or group of compartments  $J_n$  shall be taken as the lesser of  $J$  and  $J_m$

- (3) Where neither limit of the compartment or group of compartments under consideration coincides with the aft or forward terminals-

$J \leq J_k$ :

$$p(x_1, x_2) = p_1 = \frac{1}{6}J^2(b_{11}J + 3b_{12})$$

$J > J_k$ :

$$p(x1, x2) = p_2 = -\frac{1}{3}b_{11}J_k^3 + \frac{1}{2}(b_{11}J - b_{12})J_k^2 + b_{12}JJ_k - \frac{1}{3}b_{21}(J_n^3 - J_k^3) + \frac{1}{2}(b_{21}J - b_{22})(J_n^2 - J_k^2) + b_{22}J(J_n - J_k)$$

- (4) Where the aft limit of the compartment or group of compartments under consideration coincides with the aft terminal or the forward limit of the compartment or group of compartments under consideration coincides with the forward terminal-

$$J \leq J_k:$$

$$p(x1, x2) = \frac{1}{2}(p_1 + J)$$

$$J > J_k:$$

$$p(x1, x2) = \frac{1}{2}(p_2 + J)$$

- (5) Where the compartment or groups of compartments considered extends over the entire subdivision length ( $L_s$ )-

$$p(x1, x2) = 1$$

- (6) The factor  $r(x1, x2, b)$  shall be determined by the following formulae-

$$r(x1, x2, b) = 1 - (1 - C) \cdot \left[ 1 - \frac{G}{p(x1, x2)} \right]$$

where-

$$C = 12 \cdot J_b \cdot (-45 \cdot J_b + 4); \text{ and}$$

$$J_b = \frac{b}{15 \cdot B}$$

- (7) Where the compartment or groups of compartments considered extends over the entire subdivision length ( $L_s$ )-

$$G = G_1 = \frac{1}{2}b_{11}J_b^2 + b_{12}J_b$$

- (8) Where neither limits of the compartment or group of compartments under consideration coincides with the aft or forward terminals-

$$G = G_2 = -\frac{1}{3}b_{11}J_0^3 + \frac{1}{2}(b_{11}J - b_{12})J_0^2 + b_{12}JJ_0$$

where-

$$J_0 = \min(J, J_b)$$

- (9) Where the aft limit of the compartment or group of compartments under consideration coincides with the aft terminal or the forward limit of the compartment or group of compartments under consideration coincides with the forward terminal-

$$G = \frac{1}{2}(G_2 + G_1 \cdot J)$$

#### 4.8 Calculation of the Factor $s_i$

- (1) The factor  $s_i$  shall be determined for each case of assumed flooding, involving a compartment or group of compartments, in accordance with the following notations and the provisions in this section, where-

$\theta_e$  is the equilibrium heel angle in any stage of flooding, in degrees;

$\theta_v$  is the angle, in any stage of flooding, where the righting lever becomes negative, or the angle at which an opening incapable of being closed weathertight becomes submerged;

$GZ_{max}$  is the maximum positive righting lever, in metres, up to the angle  $\theta_v$ ;

*Range* is the range of positive righting levers, in degrees, measured from the angle  $\theta_e$ ; the positive range shall be taken up to the angle  $\theta_v$ ;

*Flooding stage* is any discrete step during the flooding process, including the stage before equalisation (if any) until final equilibrium has been reached.

- (2) The factor  $s_i$  for any damage case at any initial loading condition,  $d_i$ , shall be obtained from the formula-

$$s_i = \text{minimum} \{ s_{\text{intermediate},i} \text{ Or } s_{\text{final},i} \cdot s_{\text{mom},i} \}$$

where-

$s_{\text{intermediate},i}$  is the probability to survive all intermediate flooding stages until the final equilibrium stage, and is calculated in accordance with Section (3);

$s_{\text{final},i}$  is the probability to survive in the final equilibrium stage of flooding, calculated in accordance with Section (4); and

$s_{\text{mom},i}$  is the probability to survive heeling moments, and is calculated in accordance with Section (5).

- (3) The factor  $s_{\text{intermediate},i}$  shall be taken as the least of the  $s$ -factors obtained from all flooding stages including the stage before equalisation, if any, and shall be calculated as follows-

$$s_{\text{intermediate},i} = \left[ \frac{GZ_{max}}{0.05} \cdot \frac{Range}{7} \right]^{\frac{1}{4}}$$

where-

$GZ_{max}$  is not to be taken as more than 0.05 metres and *Range* as not more than 7°;

$s_{\text{intermediate}} = 0$ , if the intermediate heel angle exceeds 15°; and

the time for equalisation shall not exceed 10 minutes where cross-flooding fittings are required.

- (4) The factor  $s_{\text{final},i}$  shall be obtained from the formula-

$$S_{final_i} = K \cdot \left[ \frac{GZ_{max}}{0.12} \cdot \frac{Range}{16} \right]^{\frac{1}{4}}$$

where:

$GZ_{max}$  is not to be taken as more than 0.12 metres;

$Range$  is not to be taken as more than 16°;

$K = 1$  if  $\theta_e \leq \theta_{min}$

$K = 0$  if  $\theta_e \geq \theta_{max}$

$K = \sqrt{\frac{\theta_{max} - \theta_e}{\theta_{max} - \theta_{min}}}$  otherwise,

and where:

$\theta_{min}$  is 7° for passenger ships; and

$\theta_{max}$  is 15° for passenger ships.

- (5) The factor  $s_{mom,i}$  shall be calculated at the final equilibrium from the formula-

$$S_{mom,i} = \frac{(GZ_{max} - 0.04) \cdot Displacement}{M_{heel}}$$

where:

$Displacement$  is the intact displacement at the subdivision draught;

$M_{heel}$  is the maximum assumed heeling moment as calculated in accordance with Section 4.1; and

$S_{mom,i} \leq 1$ .

- (6) The heeling moment  $M_{heel}$  shall be calculated as follows-

$$M_{heel} = \text{maximum}\{M_{passenger} \text{ or } M_{wind} \text{ or } M_{survival craft}\}$$

- (7)  $M_{passenger}$  is the maximum assumed heeling moment resulting from movement of passengers, and shall be obtained as follows-

- (a) by the formula

$$M_{passenger} = (0.075 \cdot N_p) \cdot (0.45 \cdot B) \text{ (tm)}$$

where-

$N_p$  is the maximum number of passengers permitted to be onboard in the service condition corresponding to the deepest subdivision draught under consideration; and

$B$  is the beam of the ship.

- (b) alternatively, the heeling moment may be calculated assuming the passengers are distributed with 4 persons per square metre on available deck areas towards one side of the ship on the decks where muster stations are located and in such a way that they produce the most adverse heeling moment and in doing so, a weight of 75 kg per passenger shall be assumed.

- (8)  $M_{wind}$  is the maximum assumed wind force acting in a damage situation calculated in accordance with the following formula-

$$M_{wind} = (P \cdot A \cdot Z) / 9,806 \text{ (tm)}$$

where:

$P = 120 \text{ N/m}^2$ ;

$A$  = projected lateral area above waterline;

$Z$  = distance from centre of lateral projected area above waterline to  $T/2$ ; and

$T$  = ship's draught,  $d_i$ .

- (9)  $M_{Survivalcraft}$  is the maximum assumed heeling moment due to the launching of all fully loaded davit-launched survival craft on one side of the ship and it shall be calculated using the following assumptions-
- (a) all lifeboats and rescue boats fitted on the side to which the ship has heeled after having sustained damage shall be assumed to be swung out fully loaded and ready for lowering;
  - (b) for lifeboats which are arranged to be launched fully loaded from the stowed position, the maximum heeling moment during launching shall be taken;
  - (c) a fully loaded davit-launched liferaft attached to each davit on the side to which the ship has heeled after having sustained damage shall be assumed to be swung out ready for lowering;
  - (d) persons not in the life-saving appliances which are swung out shall not provide either additional heeling or righting moment; and
  - (e) life-saving appliances on the side of the ship opposite to the side to which the ship has heeled shall be assumed to be in a stowed position.
- (10) Unsymmetrical flooding shall be kept to a minimum consistent with the efficient arrangements in accordance with the following provisions-
- (a) where it is necessary to correct large angles of heel, the means adopted shall, where practicable, be self-acting, but in any case where controls to equalisation devices are provided they shall be operable from above the bulkhead deck;
  - (b) these fittings together with their controls shall be acceptable to the Administration<sup>15</sup> and suitable information concerning the use of equalisation devices shall be supplied to the master of the ship;
  - (c) tanks and compartments taking part in such equalisation shall be fitted with air pipes or equivalent means of sufficient cross-section to ensure that the flow of water into the equalisation compartments is not delayed.
- (11) In all cases,  $s_i$  shall be taken as zero in those cases where the final waterline, taking into account sinkage, heel and trim, immerses-
- (a) the lower edge of openings through which progressive flooding may take place and such flooding is not accounted for in the calculation of factor  $s_i$ ; such openings shall include air-pipes, ventilators and openings which are closed by means of weathertight doors or hatch covers; and
  - (b) any part of the bulkhead deck in passenger ships considered a horizontal evacuation route for compliance with Chapter II-2 of SOLAS.
- (12) The factor  $s_i$  shall be taken as zero if, taking into account sinkage, heel and trim, any of the following occur in any intermediate stage or in the final stage of flooding-
- (a) immersion of any vertical escape hatch in the bulkhead deck intended for compliance with Chapter II-2 of SOLAS;
  - (b) any controls intended for the operation of watertight doors, equalisation devices, valves on piping or on ventilation ducts intended to maintain the integrity of watertight bulkheads from above the bulkhead deck become inaccessible or inoperable; and

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<sup>15</sup> Reference is made to the Recommendation on a standard method for evaluating cross-flooding arrangements in passenger ships, adopted by the IMO by Resolution MSC.245(83), as may be amended.

- (c) immersion of any part of piping or ventilation ducts carried through a watertight boundary that is located within any compartment included in damage cases contributing to the attained index  $A$ , if not fitted with watertight means of closure at each boundary,

provided however that where compartments assumed flooded due to progressive flooding are taken into account in the damage stability calculations multiple values of  $s_{\text{intermediate},i}$  may be calculated assuming equalisation in additional flooding phases.

- (13) Except as provided in section 4.8(12)(a), openings closed by means of watertight manhole covers and flush scuttles, small watertight hatch covers, remotely operated sliding watertight doors, side scuttles of the non-opening type as well as watertight access doors and hatch covers required to be kept closed at sea need not be considered.
- (14) Where horizontal watertight boundaries are fitted above the waterline under consideration the  $s$ -value calculated for the lower compartment or group of compartments shall be obtained by multiplying the value as determined in section 4.8(2) by the reduction factor  $v_m$  according to section 4.8(15), which represents the probability that the spaces above the horizontal subdivision shall not be flooded.
- (15) The factor  $v_m$  shall be obtained from the formula-

$$v_m = v(H_{j, n, m}, d) - v(H_{j, n, m-1}, d)$$

where-

$H_{j, n, m}$  is the least height above the baseline, in metres, within the longitudinal range of  $x_{1(j)} \dots x_{2(j+n-1)}$  of the  $m^{\text{th}}$  horizontal boundary which is assumed to limit the vertical extent of flooding for the damaged compartments under consideration;

$H_{j, n, m-1}$  is the least height above the baseline, in metres, within the longitudinal range of  $x_{1(j)} \dots x_{2(j+n-1)}$  of the  $(m-1)^{\text{th}}$  horizontal boundary which is assumed to limit the vertical extent of flooding for the damaged compartments under consideration;

$j$  signifies the aft terminal of the damaged compartments under consideration;

$m$  represents each horizontal boundary counted upwards from the waterline under consideration;

$d$  is the draft in question as defined in Chapter 2; and

$x_1$  and  $x_2$  represent the terminals of the compartment or group of compartments considered in section 4.7.

- (16) The factors  $v(H_{j, n, m}, d)$  and  $v(H_{j, n, m-1}, d)$  shall be obtained from the formulae-

$$v(H, d) = 0.8 \frac{(H-d)}{7.8}, \text{ if } (H_m - d) \text{ is less than, or equal to } 7.8 \text{ metres;}$$

$$v(H, d) = 0.8 + 0.2 \left[ \frac{(H-d)-7.8}{4.7} \right] \text{ in all other cases,}$$

where-

$v(H_{j, n, m}, d)$  shall be taken as 1, if  $H_m$  coincides with the uppermost watertight boundary of the ship within the range  $(x_{1(j)} \dots x_{2(j+n-1)})$  and

$v(H_j, n, 0, d)$  shall be taken as 0;

and in no case is  $v_m$  to be taken as less than zero or more than 1.

- (17) In general, each contribution  $dA$  to the index  $A$  in the case of horizontal subdivisions is obtained from the formula-

$$dA = p_i \cdot [v_1 \cdot s_{\min 1} + (v_2 - v_1) \cdot s_{\min 2} + \dots + (1 - v_{m-1}) \cdot s_{\min m}]$$

where

$v_m$  the  $v$ -value calculated in accordance with section 4.7(15);

$s_{\min}$  the least  $s$ -factor for all combinations of damages obtained when the assumed damage extends from the assumed damage height  $H_m$  downwards.

#### 4.9 Permeability

- (1) For the purpose of the subdivision and damage stability calculations of the regulations, the permeability of each compartment or part of a compartment shall be as follows-

SPACE	PERMEABILITY
Appropriated to stores.	0.60
Occupied by accommodation.	0.95
Occupied by machinery.	0.85
Void spaces.	0.95
<i>Spaces similar to dry cargo spaces such as storage spaces and the like.</i>	0.95
Intended for liquid.	0.0 or 0.95 (Whichever results in the more severe requirement)

- (2) Other figures for permeability may be used if substantiated by calculations.

#### 4.10 Requirements Concerning Passenger Ship Stability

- (1) A passenger ship intended to carry 36 or more persons shall be capable of withstanding damage along the side shell to an extent specified in Section (2) and compliance with this section shall be achieved by demonstrating that  $s_i$ , as defined in section 4.8(2), is not less than 0.9 for the three loading conditions on which is based the calculation of the subdivision index.
- (2) The damage extent to be assumed when demonstrating compliance with section 4.10(1), shall be dependent on both  $N$  and  $L_s$ , as defined in Chapter 2 and Section 4.5(2) respectively, such that-
- (a) the vertical extent of damage is to extend from the ship's moulded baseline to a position up to 12.5 metres above the position of the deepest subdivision draft as

defined in Chapter 2 unless a lesser vertical extent of damage were to give a lower value of  $s_v$ , in which case this reduced extent shall be used;

- (b) where 400 or more persons shall be carried, a damage length of  $0.03L_s$  but not less than 3 metres shall be assumed at any position along the side shell, in conjunction with a penetration inboard of  $0.1B$  but not less than 0.75 m measured inboard from the ship side, at right angles to the centreline at the level of the deepest subdivision draught;
- (c) where less than 400 persons are carried, damage length shall be assumed at any position along the shell side between transverse watertight bulkheads provided that the distance between two adjacent transverse watertight bulkheads is not less than the assumed damage length; if the distance between adjacent transverse watertight bulkheads is less than the assumed damage length, only one of these bulkheads shall be considered effective for the purpose of demonstrating compliance with section 4.10(1);
- (d) where 36 persons are carried, a damage length of  $0.015L_s$  but not less than 3 metres shall be assumed, in conjunction with a penetration inboard of  $0.05B$  but not less than 0.75 metres; and
- (e) where more than 36, but fewer than 400 persons are carried the values of damage length and penetration inboard, used in the determination of the assumed extent of damage, shall be obtained by linear interpolation between the values of damage length and penetration which apply for ships carrying 36 persons and 400 persons as specified in sections 4.10(2)(d) and 4.10(2)(b).

## PART III

### SUBDIVISION, WATERTIGHT AND WEATHERTIGHT INTEGRITY

#### 4.11 Double Bottoms

- (1) *Subject to Sections (a) to (c), a double bottom shall be fitted extending from the collision bulkhead to the afterpeak bulkhead, as far as this is practicable and compatible with the design and proper working of the ship-*
- (a) *in ships of 50 metres and upwards but less than 61 m in length a double bottom shall be fitted at least from the machinery space to the forepeak bulkhead, or as near thereto as practicable;*
  - (b) *in ships of 61 metres and upwards but less than 76 m in length a double bottom shall be fitted at least outside the machinery space, and shall extend to the fore and after peak bulkheads, or as near thereto as practicable;*
  - (c) *subject to Section (c), in ships of 76 metres in length and upwards, a double bottom shall be fitted amidships, and shall extend to the fore and after peak bulkheads, or as near thereto as practicable; and*
  - (d) *for vessels assessed in accordance with the probabilistic means in accordance with Parts B-1 through B-4 of SOLAS, where it is deemed that the installation of a double bottom is impracticable in accordance with Section (c), the vessel shall be able to demonstrate compliance with the enhanced survivability criteria defined in section 4.30 of the Code, following the occurrence of bottom damage in the area concerned.*
- (2) Where a double bottom is required to be fitted the inner bottom shall be continued out to the ship's sides in such a manner as to protect the bottom to the turn of the bilge; such protection shall be deemed satisfactory if the inner bottom is not lower at any part than a plane parallel with the keel line and which is located not less than a vertical distance  $h$  measured from the keel line, as calculated by the formula-
- $$h = B/20,$$
- provided that in no case is the value of  $h$  to be less than 760 millimetres and need not be taken as more than 2,000 millimetres.
- (3) Small wells constructed in the double bottom in connection with drainage arrangements of storage spaces, etc., shall not extend downward more than necessary, provided that-
- (a) a well extending to the outer bottom is, however, permitted at the after end of the shaft tunnel;
  - (b) other wells (e.g., for lubricating oil under main engines) may be permitted by the Administration if satisfied that the arrangements give protection equivalent to that afforded by a double bottom complying with this regulation; and
  - (c) in no case shall the vertical distance from the bottom of such a well to a plane coinciding with the keel line be less than 500 millimetres.

- (4) A double bottom need not be fitted in way of watertight tanks, including dry tanks of moderate size, provided the safety of the ship is not impaired in the event of bottom or side damage.
- (5) Any part of a passenger ship that is not fitted with a double bottom in accordance with Sections (1) or (4) shall be capable of withstanding bottom damages, as specified in section 4.11(7), in that part of the ship.
- (6) In the case of unusual bottom arrangements in a passenger ship it shall be demonstrated that the ship is capable of withstanding bottom damages as specified in section 4.11(7).
- (7) Compliance with Sections (5) or (6) shall be achieved by demonstrating that  $s_i$ , when calculated in accordance with section 4.8 is not less than 1 for all service conditions when subject to a bottom damage assumed at any position along the ship's bottom in accordance with the following conditions and with an extent specified in Section (2) for the affected part of the ship-
  - (a) Flooding of such spaces shall not render emergency power and lighting, internal communication, signals or other emergency devices inoperable in other parts of the ship.
  - (b) Assumed extent of damage shall be as follows-

<b>Extent</b>	<b>For 0.3 L from the forward perpendicular of the ship</b>	<b>Any other part of the ship</b>
Longitudinal extent	$1/3 L^{2/3}$ or 14.5 metres, whichever is less	$1/3 L^{2/3}$ or 14.5 metres, whichever is less
Transverse extent	$B/6$ or 10 metres, whichever is less	$B/6$ or 5 metres, whichever is less
Vertical extent, measured from the keel line	$B/20$ or 2 metres, whichever is less	$B/20$ or 2 metres, whichever is less

- (c) If any damage of a lesser extent than the maximum damage specified in section 4.11(7)(b) would result in a more severe condition, such damage shall be considered.
- (8) In case of large lower compartments in passenger ships-
  - (a) the Administration may require an increased double bottom height of not more than  $B/10$  or 3 metres, whichever is less, measured from the keel line;
  - (b) alternatively, bottom damages may be calculated for these areas, in accordance with Section (7), but assuming an increased vertical extent.

**4.12 Construction of Watertight Bulkheads**

- (1) Each watertight subdivision bulkhead, whether transverse or longitudinal, shall be constructed having scantlings as specified in Chapter 2, in the definition for "watertight", and in all cases, watertight subdivision bulkheads shall be capable of supporting at least the pressure due to a head of water up to the bulkhead deck.
- (2) Steps and recesses in watertight bulkheads shall be as strong as the bulkhead at the place where each occurs.

**4.13 Initial Testing of Watertight Bulkheads, etc.**

- (1) Testing of watertight spaces not intended to hold by filling them with water is not compulsory but where such testing is not carried out-
  - (a) a hose test shall be carried out where practicable;
  - (b) this test shall be carried out in the most advanced stage of the fitting out of the ship;
  - (c) where a hose test is not practicable because of possible damage to machinery, electrical equipment insulation or outfitting items, it may be replaced by a careful visual examination of welded connections, supported where deemed necessary by means such as a dye penetrant test or an ultrasonic leak test or an equivalent test; and
  - (d) in any case a thorough inspection of the watertight bulkheads shall be carried out.
- (2) The forepeak, double bottom (including duct keels) and inner skins shall be tested with water to a head corresponding to the requirements of section 4.12(1).
- (3) Tanks which are intended to hold liquids, and which form part of the watertight subdivision of the ship, shall be tested for tightness and structural strength with water to a head corresponding to its design pressure and the water head is in no case to be less than the top of the air pipes or to a level of 2.4 metres above the top of the tank, whichever is the greater.
- (4) The tests referred to in Sections (2) and (3) are for the purpose of ensuring that the subdivision structural arrangements are watertight and are not to be regarded as a test of the fitness of any compartment for the storage of oil fuel or for other special purposes for which a test of a superior character may be required depending on the height to which the liquid has access in the tank or its connections.

**4.14 Peak and Machinery Space Bulkheads, Shaft Tunnels, etc.**

- (1) A collision bulkhead shall be fitted which shall be watertight up to the bulkhead deck and this bulkhead shall be located at a distance from the forward perpendicular of not less than  $0.05L$  or 10 metres, whichever is the less, and, except as may be permitted by the Administration, not more than  $0.08L$  or  $0.05L + 3$  metres, whichever is the greater.
- (2) Where any part of the ship below the waterline extends forward of the forward perpendicular, e.g., a bulbous bow, the distances stipulated in Section (1) shall be measured from a point either-
  - (a) at the mid-length of such extension;
  - (b) at a distance  $0.015L$  forward of the forward perpendicular; or
  - (c) at a distance 3 metres forward of the forward perpendicular,whichever gives the smallest measurement.
- (3) The bulkhead may have steps or recesses provided they are within the limits prescribed in Sections (1) or (2).
- (4) No doors, manholes, access openings, ventilation ducts or any other openings shall be fitted in the collision bulkhead below the bulkhead deck.

- (5) The collision bulkhead shall comply with the following provisions-
- (a) except as provided in Section (b), the collision bulkhead may be pierced below the bulkhead deck by not more than one pipe for dealing with fluid in the forepeak tank, provided that the pipe is fitted with a screw-down valve capable of being operated from above the bulkhead deck, the valve chest being secured inside the forepeak to the collision bulkhead, provided that-
    - (i) the Administration may, however, authorise the fitting of this valve on the after side of the collision bulkhead where that the valve is readily accessible under all service conditions and the space in which it is located is not a storage space;
    - (ii) all valves shall be of steel, bronze or other approved ductile material; and
    - (iii) valves of ordinary cast iron or similar material are not acceptable.
  - (b) If the forepeak is divided to hold two different kinds of liquids the Administration may allow the collision bulkhead to be pierced below the bulkhead deck by two pipes, each of which is fitted as required by Section (a), provided the Administration is satisfied that there is no practical alternative to the fitting of such a second pipe and that, having regard to the additional subdivision provided in the forepeak, the safety of the ship is maintained.
- (6) Where a long forward superstructure is fitted-
- (a) the collision bulkhead shall be extended weathertight to the deck next above the bulkhead deck;
  - (b) the extension need not be fitted directly above the bulkhead below provided it is located within the limits prescribed in Section (1) or (2) and that the part of the deck which forms the step is made effectively weathertight; and
- (7) The number of openings in the extension of the collision bulkhead above the freeboard deck shall be restricted to the minimum compatible with the design and normal operation of the ship and all such openings shall be capable of being closed weathertight.
- (8) Bulkheads shall be fitted separating the machinery space accommodation spaces forward and aft and made watertight up to the bulkhead deck and in passenger ships an afterpeak bulkhead shall also be fitted and made watertight up to the bulkhead deck, provided that the afterpeak bulkhead may, however, be stepped below the bulkhead deck, providing the degree of safety of the ship as regards subdivision is not thereby diminished.
- (9) In all cases stern tubes shall be enclosed in watertight spaces of moderate volume and the stern gland shall be situated in a watertight shaft tunnel or other watertight space separate from the stern tube compartment and of such volume that, if flooded by leakage through the stern gland, the bulkhead deck shall not be immersed.

**4.15 *Openings in Watertight Bulkheads below the Bulkhead Deck***

- (1) The number of openings in watertight bulkheads shall be reduced to the minimum compatible with the design and proper working of the ship, satisfactory means shall be provided for closing these openings.

- (2) Watertight bulkhead integrity shall be maintained in accordance with the following provisions-
- (a) where pipes, scuppers, electric cables, etc., are carried through watertight bulkheads, arrangements shall be made to ensure the watertight integrity of the bulkheads;
  - (b) valves not forming part of a piping system shall not be permitted in watertight bulkheads; and
  - (c) lead or other heat sensitive materials shall not be used in systems which penetrate watertight bulkheads, where deterioration of such systems in the event of fire would impair the watertight integrity of the bulkheads.
- (3) *No doors, manholes, or access openings are permitted in watertight transverse bulkheads dividing a storage space from an adjoining storage space, except as provided in section 4.15(9).*
- (4) Subject to section 4.15(10)-
- (a) not more than one door, apart from the doors to shaft tunnels, may be fitted in each watertight bulkhead *per deck* within spaces containing the main and auxiliary propulsion machinery including boilers serving the needs of propulsion;
  - (b) where two or more shafts are fitted, the tunnels shall be connected by an intercommunicating passage;
  - (c) there shall be only one door between the machinery space and the tunnel spaces where two shafts are fitted and only two doors where there are more than two shafts;
  - (d) all these doors shall be of the sliding type and shall be so located as to have their sills as high as practicable; and
  - (e) the hand gear for operating these doors from above the bulkhead deck shall be situated outside the spaces containing the machinery.
- (5) Watertight doors shall comply with the following general provisions-
- (a) watertight doors, except as provided in section 4.15(9), shall be power-operated sliding doors complying with the requirements of section 4.15(7) capable of being closed simultaneously from the central operating console at the navigation bridge in not more than 60 seconds with the ship in the upright position; and
  - (b) the means of operation whether by power or by hand of any power-operated sliding watertight door shall be capable of closing the door with the ship listed to 15° either way and consideration shall also be given to the forces which may act on either side of the door as may be experienced when water is flowing through the opening applying a static head equivalent to a water height of at least 1 metre above the sill on the centreline of the door;
  - (c) watertight doors and their controls, including hydraulic piping and electric cables shall comply with the following provisions
    - (i) the controls shall be kept as close as practicable to the bulkhead in which the doors are fitted, in order to minimise the likelihood of them being involved in any damage which the ship may sustain; and
    - (ii) the positioning of watertight doors and their controls shall be such that if the ship sustains damage within one fifth of the breadth of the ship, as defined in Chapter 2 such distance being measured at right angles to the centreline at the level of the deepest subdivision draught,

the operation of the watertight doors clear of the damaged portion of the ship is not impaired.

- (6) All power-operated sliding watertight doors shall-
- (a) be provided with means of indication which shall show at all remote operating positions whether the doors are open or closed; and
  - (b) have their remote operating positions only at the navigation bridge as required by section 4.15(7)(a)(v) and at the location where hand operation above the bulkhead deck is required by section 4.15(7)(a)(iv).
- (7) Watertight doors shall comply with the following provisions-
- (a) Each power-operated sliding watertight door shall-
    - (i) have a vertical or horizontal motion;
    - (ii) subject to section 4.15(10), be normally limited to a maximum clear opening width of 1.2 metres; provided that the Administration may permit larger doors only to the extent considered necessary for the effective operation of the ship provided that other safety measures, including the following, are taken into consideration-
      - (ba) special consideration shall be given to the strength of the door and its closing appliances in order to prevent leakages; and
      - (bb) the door shall be located inboard the damage zone *B/5*;
    - (iii) be fitted with the necessary equipment to open and close the door using electric power, hydraulic power, or any other form of power that is acceptable to the Administration;
    - (iv) be provided with an individual hand-operated mechanism such that it shall be possible to open and close the door by hand at the door itself from either side, and in addition, close the door from an accessible position above the bulkhead deck with an all round crank motion or some other movement providing the same degree of safety acceptable to the Administration and the direction of rotation or other movement shall be clearly indicated at all operating positions; the time necessary for the complete closure of the door, when operating by hand gear, shall not exceed 90 seconds with the ship in the upright position;
    - (v) be provided with controls for opening and closing the door by power from both sides of the door and also for closing the door by power from the central operating console at the navigation bridge;
    - (vi) be provided with an audible alarm in accordance with the following provisions-
      - (ba) it shall be distinct from any other alarm in the area;
      - (bb) it shall sound whenever the door is closed remotely by power and shall sound for at least 5 seconds but no more than 10 seconds before the door begins to move and shall continue sounding until the door is completely closed; provided that in the case of remote hand operation it is sufficient for the audible alarm to sound only when the door is moving; and
      - (bc) additionally, in passenger areas and areas of high ambient noise the Administration may require the audible alarm to be supplemented by an intermittent visual signal at the door;

- (vii) have an approximately uniform rate of closure under power and the closure time, from the time the door begins to move to the time it reaches the completely closed position shall in no case be less than 20 seconds or more than 40 seconds with the ship in the upright position;
- (b) The electrical power required for-
  - (i) power-operated sliding watertight doors shall be supplied from the emergency switchboard either directly or by a dedicated distribution board situated above the bulkhead deck;
  - (ii) the associated control, indication and alarm circuits shall be supplied from the emergency switchboard either directly or by a dedicated distribution board situated above the bulkhead deck and be capable of being automatically supplied by the transitional source of emergency electrical power required by Regulation 42 of Chapter II-1 D of SOLAS, in accordance with Chapter 5 of this Code, in the event of failure of either the main or emergency source of electrical power.
  - (iii) board situated above the bulkhead deck and be capable of being automatically supplied by the transitional source of emergency electrical power required by Regulation 42 of Chapter II-1 D of SOLAS, in accordance with Chapter 5 of this Code, in the event of failure of either the main or emergency source of electrical power.
- (c) Power-operated sliding watertight doors shall have either-
  - (i) a centralised hydraulic system complying with the following provisions-
    - (ba)* two independent power sources each consisting of a motor and pump capable of simultaneously closing all doors;
    - (bb)* having, for the whole installation, hydraulic accumulators of sufficient capacity to operate all the doors at least three times, i.e. closed-open-closed, against an adverse list of 15°;
    - (bc)* the operating cycle referred to in Section *(bb)* above shall be capable of being carried out when the accumulator is at the pump cut-in pressure;
    - (bd)* the fluid used in the system shall be chosen considering the temperatures liable to be encountered by the installation during its service;
    - (be)* the power operating system shall be designed to minimise the possibility of having a single failure in the hydraulic piping adversely affect the operation of more than one door;
    - (bf)* the hydraulic system shall be provided with a low-level alarm for hydraulic fluid reservoirs serving the power-operated system and a low gas pressure alarm or other effective means of monitoring loss of stored energy in hydraulic accumulators; and
    - (bg)* the alarm referred to in Section *(bf)* above shall be audible and visual and shall be situated on the central operating console at the navigation bridge;

**OR**

- (ii) an independent hydraulic system for each door complying with the following provisions-
  - (ba)* each power source shall consist of a motor and pump capable of opening and closing the door;

- (bb)* in addition, there shall be a hydraulic accumulator of sufficient capacity to operate the door at least three times, i.e. closed-open-closed, against an adverse list of 15° and this operating cycle shall be capable of being carried out when the accumulator is at the pump cut-in pressure;
- (bc)* the fluid used shall be chosen considering the temperatures liable to be encountered by the installation during its service;
- (bd)* a low gas pressure group alarm or other effective means of monitoring loss of stored energy in hydraulic accumulators shall be provided at the central operating console on the navigation bridge; and
- (be)* loss of stored energy indication at each local operating position shall also be provided;

**OR**

- (iii) an independent electrical system and motor for each door complying with the following provisions-
  - (ba)* each power source shall consist of a motor capable of opening and closing the door;
  - (bb)* the power source shall be capable of being automatically supplied by the transitional source of emergency electrical power as required by Regulation 42 of Chapter II-1 D of SOLAS, in accordance with Chapter 5 of this Code, in the event of failure of either the main or emergency source of electrical power and with sufficient capacity to operate the door at least three times, i.e. closed-open-closed, against an adverse list of 15°,
- (iv) For the systems specified in sections 4.15(7)(c)(i), 4.15(7)(c)(ii) and 4.15(7)(c)(iii), provision shall be made as follows-
  - (ba)* power systems for power-operated watertight sliding doors shall be separate from any other power system; and
  - (bb)* a single failure in the electric or hydraulic power-operated systems excluding the hydraulic actuator shall not prevent the hand operation of any door.
- (d) control handles shall be provided at each side of the bulkhead at a minimum height of 1.6 metres above the floor and shall be so arranged as to enable persons passing through the doorway to hold both handles in the open position without being able to set the power closing mechanism in operation accidentally and the direction of movement of the handles in opening and closing the door shall be in the direction of door movement and shall be clearly indicated
- (e) as far as practicable, electrical equipment and components for watertight doors shall be situated above the bulkhead deck and outside hazardous areas and spaces.
- (f) the enclosures of electrical components necessarily situated below the bulkhead deck shall provide suitable protection against the ingress of water<sup>16</sup>.

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<sup>16</sup> Refer to the following publication IEC 60529-(2003)-

- (a) electrical motors, associated circuits and control components; protected to IPX 7 standard;
- (b) door position indicators and associated circuit components; protected to IPX 8 standard; and
- (c) door movement warning signals; protected to IPX 6 standard.

- (g) electric power, control, indication and alarm circuits shall be protected against fault in such a way that a failure in one door circuit shall not cause a failure in any other door circuit. Short circuits or other faults in the alarm or indicator circuits of a door shall not result in a loss of power operation of that door and arrangements shall be such that leakage of water into the electrical equipment located below the bulkhead deck shall not cause the door to open.
- (h) the power operating or control system of a power-operated sliding watertight door shall comply with the following provisions-
  - (i) a single electrical failure in the power operating or control system of a power-operated sliding watertight door shall not result in a closed door opening;
  - (ii) the availability of the power supply shall be continuously monitored at a point in the electrical circuit as near as practicable to each of the motors required by section 4.15(7); and
  - (iii) the loss of any such power supply shall activate an audible and visual alarm at the central operating console at the navigation bridge.
- (8) The central operating console at the navigation bridge shall comply with the following provisions-
  - (a) it shall have a "master mode" switch with two modes of control as follows-
    - (i) a "local control" mode which shall allow any door to be locally opened and locally closed after use without automatic closure; and
    - (ii) a "doors closed" mode which shall automatically close any door that is open;
  - (b) the "doors closed" mode shall automatically close any door that is open and permit doors to be opened locally and shall automatically re-close the doors upon release of the local control mechanism.
  - (c) the "master mode" switch shall normally be in the "local control" mode.
  - (d) the "doors closed" mode shall only be used in an emergency or for testing purposes; and
  - (e) special consideration shall be given to the reliability of the "master mode" switch.
  - (f) the console shall be-
    - (i) be provided with a diagram showing the location of each door, with visual indicators to show whether each door is open or closed;
    - (ii) be fitted with a red light indicating that a door is fully open and a green light indicating that door is fully closed and when a door is closed remotely the red indicating light shall indicate the intermediate position by flashing,
  - (g) the indicating circuit shall be independent of the control circuit for each door; and
  - (h) it shall not be possible to remotely open any door from the central operating console.

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Other arrangements for the enclosures of electrical components may be fitted provided the Administration is satisfied that an equivalent protection is achieved. The water pressure IPX 8 shall be based on the pressure that may occur at the location of the component during flooding for a period of 36 hours.

- (9) *If the Administration is satisfied that the fitting of watertight doors in watertight bulkheads dividing storage between deck spaces is essential then such doors, of satisfactory construction, may be fitted in accordance with the following provisions-*
- (a) such doors may be hinged, rolling or sliding doors but shall not be remotely controlled;
  - (b) they shall be fitted at the highest level and as far from the shell plating as practicable, but in no case shall the outboard vertical edges be situated at a distance from the shell plating which is less than one fifth of the breadth of the ship, as defined in Chapter 2, such distance being measured at right angles to the centreline at the level of the deepest subdivision draught;
  - (c) should any such doors be accessible during the voyage, they shall be fitted with a device which prevents unauthorised opening; and
  - (d) when it is proposed to fit such doors, the number and arrangements shall receive the special consideration of the Administration.
- (10) Portable plates on bulkheads shall not be permitted except in machinery spaces and where they are permitted shall be subject to the following conditions-
- (a) the Administration may permit not more than one power-operated sliding watertight door in each watertight bulkhead *per deck* larger than those specified in section 4.15(7)(a)(ii) to be substituted for these portable plates, provided these doors are intended to remain closed during navigation except in case of urgent necessity at the discretion of the master; and
  - (b) such doors need not meet the requirements of section 4.15(7)(a)(iv) regarding complete closure by hand-operated gear in 90 seconds.
- (11) Where trunkways or tunnels for access from crew accommodation to other spaces, for piping, or for any other purpose are carried through watertight bulkheads, they shall comply with the following provisions-
- (a) they shall be watertight and in accordance with the requirements of section 4.18;
  - (b) the access to at least one end of each such tunnel or trunkway, if used as a passage at sea, shall be through a trunk extending watertight to a height sufficient to permit access above the bulkhead deck;
  - (c) the access to the other end of the trunkway or tunnel may be through a watertight door of the type required by its location in the ship;
  - (d) such trunkways or tunnels shall not extend through the first subdivision bulkhead abaft the collision bulkhead;
  - (e) where it is proposed to fit tunnels piercing watertight bulkheads, these shall receive the special consideration of the Administration; and
  - (f) where trunkways in connection with refrigerated spaces and ventilation or forced draught trunks are carried through more than one watertight bulkhead, the means of closure at such openings shall be operated by power and be capable of being closed from a central position situated above the bulkhead deck.

**4.16 Openings in the Shell Plating below the Bulkhead Deck**

- (1) The number of openings in the shell plating shall be reduced to the minimum compatible with the design and proper working of the ship.

- (2) The arrangement and efficiency of the means for closing any opening in the shell plating shall be consistent with its intended purpose and the position in which it is fitted and generally to the satisfaction of the Administration.
- (3) Subject to the requirements of Chapter 3, no sidescuttle or window shall be fitted in such a position that its sill is below a line drawn parallel to the freeboard deck at side and having its lowest point 2.5% of the breadth of the ship above the deepest subdivision load line, or 500 millimetres, whichever is the greater.
- (4) *Notwithstanding the requirements of section 3.12 all sidescuttles, the sills of which are below the bulkhead deck, as permitted by Section (3) shall be such of construction, and subject to strict procedures, as shall effectively prevent any person opening them without the sanction of the master.*
- (5) The number of scuppers, sanitary discharges and other similar openings in the shell plating shall be reduced to the minimum either by making each discharge serve for as many as possible of the sanitary and other pipes, or in any other satisfactory manner.
- (6) All inlets and discharges in the shell plating shall be fitted with efficient and accessible arrangements for preventing the accidental admission of water into the ship.
- (7) Subject to the requirements of the ILLC, and except as provided in Section (9), each separate discharge led through the shell plating from spaces below the margin line shall comply with the following provisions-
  - (a) the discharge shall be provided with either one automatic non-return valve fitted with a positive means of closing it from above the bulkhead deck or with two automatic non-return valves without positive means of closing, provided that the inboard valve is situated above the deepest subdivision load line and is always accessible for examination under service conditions; and
  - (b) where a valve with positive means of closing is fitted, the operating position above the bulkhead deck shall always be readily accessible and means shall be provided for indicating whether the valve is open or closed.
- (8) The requirements of the ILLC shall apply to discharges led through the shell plating from spaces above the margin line.
- (9) *Machinery room main and auxiliary sea inlets and discharges in connection with the operation of machinery shall be fitted with readily accessible valves between the pipes and the shell plating or between the pipes and fabricated boxes attached to the shell plating and the valves shall be provided with indicators showing whether they are open or closed: the location of the controls of such valves shall be so sited as to allow adequate time for operation in case of influx of water to the space, having regard to the time likely to be required in order to reach and operate such controls. If the level to which the space could become flooded with the ship in the fully loaded condition so requires, arrangements shall be made to operate the controls from a position above such level: provided that in continuously Manned Machinery Spaces the valves may be controlled locally but they shall also be provided with indicators showing whether they are open or closed.*
- (10) All shell fittings, valves and pipes required by this Chapter shall comply with the following provisions-
  - (a) shell fittings and valves shall be of steel, bronze or other approved ductile material;

- (b) valves of ordinary cast iron or similar material are not acceptable;
  - (c) pipes shall be of steel or other equivalent material to the satisfaction of the Administration.
- (11) *Ports fitted below the margin line shall be of sufficient strength and shall be effectively closed and secured watertight before the ship leaves port, and shall be kept closed during navigation.*
- (12) Such ports shall in no case be so fitted as to have their lowest point below the deepest subdivision load line.
- (13) *The inboard opening of each ash-chute, rubbish-chute, etc., shall be fitted with an efficient cover.*
- (14) If the inboard opening is situated below the margin line, the cover shall be watertight, and in addition an automatic non-return valve shall be fitted in the chute in an easily accessible position above the deepest subdivision load line and when the chute is not in use both the cover and the valve shall be kept closed and secured.
- (15) *Underwater lights and associated penetrations fitted in the hull shall be approved by the Recognised Organisation.*
- (16) *In applying this section due regard shall also be had to section 2.13 of the Code.*

**4.17 Construction and Initial Testing of Watertight Doors, Sidescuttles, etc.**

- (1) In all ships-
- (a) the design, materials and construction of all watertight doors, sidescuttles, gangway and stores loading ports, valves, pipes, and rubbish-chutes referred to in these regulations shall be to the satisfaction of the Administration;
  - (b) such valves, doors and mechanisms shall be suitably marked to ensure that they may be properly used to provide maximum safety; and
  - (c) the frames of vertical watertight doors shall have no groove at the bottom in which dirt might lodge and prevent the door closing properly.
- (2) In all ships-
- (a) watertight doors shall be tested by water pressure to a head of water they might sustain in a final or intermediate stage of flooding;
  - (b) where testing of individual doors is not carried out because of possible damage to insulation or outfitting items, testing of individual doors may be replaced by a prototype pressure test of each type and size of door with a test pressure corresponding at least to the head required for the intended location provided that-
    - (i) the prototype test shall be carried out before the door is fitted;
    - (ii) the installation method and procedure for fitting the door onboard shall correspond to that of the prototype test; and
    - (iii) when fitted onboard, each door shall be checked for proper seating between the bulkhead, the frame and the door.

**4.18 Construction and Initial Testing of Watertight Decks, Trunks, etc.**

- (1) Watertight decks, trunks, tunnels, duct keels and ventilators shall-
  - (a) *be of the same strength as watertight bulkheads at corresponding levels and the means used for making them watertight, and the arrangements adopted for closing openings in them, shall be to the satisfaction of the Administration and in all cases, shall be provided with open/close indication at the navigating position;*
  - (b) watertight ventilators and trunks shall be carried at least up to the bulkhead deck;
- (2) where a ventilation trunk passing through a structure penetrates the bulkhead deck, the trunk shall be capable of withstanding the water pressure that may be present within the trunk, after having taken into account the maximum heel angle allowable during intermediate stages of flooding, in accordance with section 4.8.
- (3) after completion, a hose or flooding test shall be applied to watertight decks and a hose test to watertight trunks, tunnels and ventilators.

**4.19 Internal Watertight Integrity above the Bulkhead Deck**

- (1) The Administration may require that all reasonable and practicable measures shall be taken to limit the entry and spread of water above the bulkhead deck in accordance with the following provisions-
  - (a) such measures may include partial bulkheads or webs;
  - (b) when partial watertight bulkheads and webs are fitted on the bulkhead deck, above or in the immediate vicinity of watertight bulkheads, they shall have watertight shell and bulkhead deck connections so as to restrict the flow of water along the deck when the ship is in a heeled damaged condition;
  - (c) where the partial watertight bulkhead does not line up with the bulkhead below, the bulkhead deck between shall be made effectively watertight; and
  - (d) where openings, pipes, scuppers, electric cables etc. are carried through the partial watertight bulkheads or decks within the immersed part of the bulkhead deck, arrangements shall be made to ensure the watertight integrity of the structure above the bulkhead deck<sup>17</sup>.
- (2) All openings in the exposed weather deck shall have coamings of ample height and strength and shall be provided with efficient means for expeditiously closing them weathertight. Freeing ports, open rails and scuppers shall be fitted as necessary for rapidly clearing the weather deck of water under all weather conditions.
- (3) The open end of air pipes terminating within a superstructure shall-
  - (a) be at least 1 metre above the waterline when the ship heels to an angle of 15°, or the maximum angle of heel during intermediate stages of flooding, as determined by direct calculation, whichever is the greater;

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<sup>17</sup> Refer to the Guidance notes on the integrity of flooding boundaries above the bulkhead deck of passenger ships for proper application of regulations II-1/8 and 20, paragraph 1, of SOLAS, as amended (MSC/Circ.541, as may be amended).

- (b) alternatively, air pipes from tanks other than oil tanks may discharge through the side of the superstructure; and
  - (c) the provisions of this paragraph are without prejudice to the provisions of the ILLC.
- (4) Sidescuttles, gangway, stores loading and fuelling ports and other means for closing openings in the shell plating above the bulkhead deck shall be of efficient design and construction and of sufficient strength having regard to the spaces in which they are fitted and their positions relative to the deepest subdivision draught.
- (5) *In applying the provisions of this section due regard shall be had to section 3.12.*

## **PART IV**

### **SUBDIVISION LOAD LINE ASSIGNMENT**

#### **4.20**    *Assigning, Marking and Recording of Subdivision Load Lines*

- (1) In order that the required degree of subdivision shall be maintained a load line corresponding to the approved subdivision draught shall be assigned and marked on the ship's sides;
- (2) Subject to Section (3), the subdivision load lines assigned and marked shall be recorded in the Passenger Ship Safety Certificate, and shall be distinguished by the notation P1 for the principal passenger service configuration, and P2, P3, etc., for the alternative configurations and the principal passenger configuration shall be taken as the mode of operation in which the required subdivision index R shall have the highest value.
- (3) *Where assessed using the deterministic means in accordance with Part VI of this Chapter, the subdivision load lines assigned and marked shall be recorded in the Passenger Ship Safety Certificate and shall be distinguished by the notation C.1 for the principal passenger condition and C.2, C.3, etc., for the alternative conditions.*
- (4) The freeboard corresponding to each of these load lines shall be measured at the same position and from the same deck line as the freeboards determined in accordance with the ILLC. (See also section 3.3 and 3.4 of Chapter 3 of the Code.)
- (5) The freeboard corresponding to each approved subdivision load line and the service configuration, for which it is approved, shall be clearly indicated on the Passenger Ship Safety Certificate.
- (6) In no case shall any subdivision load line mark be placed above the deepest load line in salt water as determined by the strength of the ship or the ILLC.
- (7) Whatever may be the position of the subdivision load line marks, a ship shall in no case be loaded so as to submerge the load line mark appropriate to the season and locality as determined in accordance with the ILLC.
- (8) A ship shall in no case be so loaded that when it is in salt water the subdivision load line mark appropriate to the particular voyage and service configuration is submerged.

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## **PART V**

### **STABILITY MANAGEMENT**

#### **4.21 *Damage Control Information***<sup>18</sup>

- (1) There shall be permanently exhibited, or readily available on the navigation bridge, for the guidance of the officer in charge of the ship-
  - (a) plans showing clearly for each deck and storage space the boundaries of the watertight compartments, the openings therein with the means of closure and position of any controls thereof, and the arrangements for the correction of any list due to flooding;
  - (b) booklets containing the aforementioned information shall be made available to the officers of the ship.
- (2) Watertight doors in passenger ships permitted to remain open during navigation shall be clearly indicated in the ship's stability information.
- (3) General precautions to be included shall consist of a listing of equipment, conditions, and operational procedures, considered by the Administration to be necessary to maintain watertight integrity under normal ship operations.
- (4) Specific precautions to be included shall consist of a listing of elements (i.e. closures, security of stores, sounding of alarms, etc.) considered by the Administration to be vital to the survival of the ship, passengers and crew.
- (5) In case of ships to which damage stability requirements of Part II of this Chapter apply, damage stability information shall provide the master with a simple and easily understandable way of assessing the ship's survivability in all damage cases involving a compartment or group of compartments.

#### **4.22 *Loading of Passenger Ships***

- (1) On completion of loading of the ship-
  - (a) the master shall, prior to the ship's departure, determine the ship's trim and stability and also ascertain and record that the ship is in compliance with stability criteria in relevant regulations; and
  - (b) the determination of the ship's stability shall always be made by calculation provided that the Administration may accept the use of an electronic loading and stability computer or equivalent means for this purpose.
- (2) Water ballast shall not in general be carried in tanks intended for oil fuel provided that in ships in which it is not practicable to avoid putting water in oil fuel tanks, oily-water separating equipment to the satisfaction of the Administration shall be fitted, or other

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<sup>18</sup> Refer to the Guidelines for damage control plans contained in MSC.1/Circular.1245 - Guidelines for Damage Control Plans and Information to the Master (as may be amended from time to time)

alternative means, such as discharge to shore facilities, acceptable to the Administration shall be provided for disposing of the oily-water ballast.

- (3) The provisions of this section are without prejudice to the provisions of MARPOL.

**4.23 Periodical Operation and Inspection of Watertight doors, etc.**

- (1) Drills for the operating of watertight doors, sidescuttles, valves and closing mechanisms of scuppers, ash-chutes and rubbish-chutes shall take place weekly. In ships in which the voyage exceeds one week in duration a complete drill shall be held before leaving port, and others thereafter at least once a week during the voyage.
- (2) All watertight doors, both hinged and power operated, in watertight bulkheads, in use at sea, shall be operated daily.
- (3) The watertight doors and all mechanisms and indicators connected therewith, all valves, the closing of which is necessary to make a compartment watertight, and all valves the operation of which is necessary for damage control cross connections shall be periodically inspected at sea at least once a week.
- (4) A record of all drills and inspections required by this Section shall be entered in the log-book with an explicit record of any defects which may be disclosed.

**4.24 Prevention and Control of Water Ingress, etc.**

- (1) All watertight doors shall be kept closed during navigation provided that-
- (a) they may be opened during navigation as specified in Sections (3) and (4);
  - (b) watertight doors of a width of more than 1.2 metres in machinery spaces as permitted by section 4.15 (10) may only be opened in the circumstances detailed in that regulation; and
  - (c) any door which is opened in accordance with this paragraph shall be ready to be immediately closed.
- (2) Watertight doors located below the bulkhead deck having a maximum clear opening width of more than 1.2 metres shall be kept closed when the ship is at sea, except for limited periods when absolutely necessary as determined by the Administration.
- (3) A watertight door may be opened during navigation to permit the passage of passengers or crew, or when work in the immediate vicinity of the door necessitates it being opened provided that the door shall be immediately closed when transit through the door is complete or when the task which necessitated it being open is finished.
- (4) Certain watertight doors may be permitted to remain open during navigation under the following conditions-
- (a) only if considered absolutely necessary; that is, being open is determined essential to the safe and effective operation of the ship's machinery or to permit passengers normally unrestricted access throughout the passenger area;
  - (b) such determination shall be made by the Administration only after careful consideration of the impact on ship operations and survivability; and

- (c) a watertight door permitted to remain thus open shall be clearly indicated in the ship's stability information and shall always be ready to be immediately closed.
- (5) Portable plates on bulkheads and power-operated sliding doors permitted in machinery spaces in accordance with section 4.15(10) shall be subject to the following provisions-
  - (a) portable plates shall always be in place before the ship leaves port, and shall not be removed during navigation except in case of urgent necessity at the discretion of the master;
  - (b) the necessary precautions shall be taken in replacing portable plates to ensure that the joints are watertight; and
  - (c) power-operated sliding watertight doors permitted in machinery spaces shall be closed before the ship leaves port and shall remain closed during navigation except in case of urgent necessity at the discretion of the master.
- (6) Watertight doors fitted in watertight bulkheads dividing storage between deck spaces in accordance with section 4.15(9) shall be closed before the voyage commences and shall be kept closed during navigation; the time of opening such doors in port and of closing them before the ship leaves port shall be entered in the Official Log Book Part 2.
- (7) Gangway, stores and fueling ports fitted below the bulkhead deck shall be effectively closed and secured watertight before the ship leaves port, and shall be kept closed during navigation.
- (8) The following doors, located above the bulkhead deck, shall be closed and locked before the ship proceeds on any voyage and shall remain closed and locked until the ship is at its next berth-
  - (a) doors in the shell or the boundaries of enclosed superstructures;
  - (b) *garage doors fitted in positions as indicated in Section (a) above;*
  - (c) doors in the collision bulkhead; and
  - (d) other shell openings forming an alternative closure to those defined in the above Sections (a) to (c) inclusive.
- (9) *Notwithstanding the requirements of Sections 8(a) and (d) above, the Administration may authorise that particular doors can be opened at the discretion of the master, if necessary for the operation of the ship or the embarking and disembarking of passengers and appropriate recreational activities when the ship is at safe anchorage and provided that the safety of the ship is not impaired.*
- (10) The master shall ensure that an effective system of supervision and reporting of the closing and opening of the doors referred to in Section (8) is implemented.
- (11) The master shall ensure, before the ship proceeds on any voyage, that an entry in the log-book is made of the time of the last closing of the doors specified in Section (13) and the time of any opening of particular doors in accordance with Section (14).
- (12) Hinged doors, portable plates, sidescuttles, gangway, stores loading and bunkering ports and other openings, which are required by this Section to be kept closed during navigation, shall be closed before the ship leaves port and the time of closing and the time of opening (where permissible under the Code) shall be recorded in such log-book as may be prescribed by the Administration.

- (13) Where in a between-decks, the sills of any of the sidescuttles referred to in section 4.16(4) are below a line drawn parallel to the bulkhead deck at side and having its lowest point 1.4 metres plus 2.5% of the breadth of the ship above the water when the ship departs from any port-
- (a) all the sidescuttles in that between-decks shall be closed watertight and locked before the ship leaves port;
  - (b) they shall not be opened before the ship arrives at the next port;
  - (c) in the application of this paragraph the appropriate allowance for fresh water may be made when applicable;
  - (d) the time of opening such sidescuttles in port and of closing and locking them before the ship leaves port shall be entered in such log-book as may be prescribed by the Administration; and
  - (e) for any ship that has one or more sidescuttles so placed that the requirements of this Section would apply when it was floating at its deepest subdivision draught, the Administration may indicate the limiting mean draught at which these sidescuttles shall have their sills above the line drawn parallel to the bulkhead deck at side, and having its lowest point 1.4 metres plus 2.5% of the breadth of the ship above the waterline corresponding to the limiting mean draft, and at which it shall therefore be permissible to depart from port without previously closing and locking them and to open them at sea on the responsibility of the master during the voyage to the next port; in tropical zones as defined in the ILLC, this limiting draught may be increased by 0.3 metres.
- (14) Sidescuttles and their deadlights which shall not be accessible during navigation shall be closed and secured before the ship leaves port.
- (15) *If stores are carried in spaces fitted with sidescuttles then those sidescuttles and their deadlights shall be closed watertight and locked before the stores are shipped and such closing and locking shall be recorded in such log-book as may be prescribed by the Administration.*
- (16) When a rubbish-chute, etc., is not in use, both the cover and the valve required by section 4.16(10)(b) shall be kept closed and secured.

## **PART VI**

### **ALTERNATIVE SUBDIVISION AND STABILITY STANDARDS FOR PASSENGER YACHTS NOT EXCEEDING 80 METRES IN LENGTH (L) WHERE COMPLIANCE WITH REGULATION 6 AND 7 OF SOLAS II-1 PART B-1 PROVES IMPRACTICABLE**

*In order to use this Part of the Code, compliance with regulation 6 and 7 of SOLAS II-1 Part B-1 shall be confirmed to be impracticable for the vessel arrangement due to its size. This shall be in the form of a statement from the Naval Architect following consideration that SOLAS II-1 PART B-1 was not developed for vessels of this size.*

#### **4.25 Floodable Length**

- (1) The floodable length at any point shall be determined by a method of calculation which takes into consideration the form, draught and other characteristics of the ship in question.*
- (2) In a ship with a continuous bulkhead deck, the floodable length at a given point is the maximum portion of the length of the ship, having its centre at the point in question, which can be flooded under the definite assumptions set forth in section 4.26 without the ship being submerged beyond the margin line.*
- (3) In the case of a ship not having a continuous bulkhead deck, the floodable length at any point may be determined to an assumed continuous margin line which at no point is less than 76 millimetres below the top of the deck (at side) to which the bulkheads concerned and the shell are carried watertight.*
- (4) Where a portion of an assumed margin line is appreciably below the deck to which bulkheads are carried, the Administration may permit a limited relaxation in the watertightness of those portions of the bulkheads which are above the margin line and immediately under the higher deck.*

#### **4.26 Permeability**

- (1) The definite assumptions referred to in section 4.25 relate to the permeability of the spaces below the margin line.*
- (2) In determining the floodable length, a uniform average permeability shall be used throughout the whole length of each of the following portions of the ship below the margin line-*
  - (a) the machinery room;*
  - (b) the portion forward of the machinery room; and*
  - (c) the portion abaft the machinery room.*
- (3) The uniform average permeability throughout the machinery room shall be determined from the formula-*

$$85 + 10 \frac{a - c}{v}$$

where-

*a* = the volume of the passenger spaces;

*c* = the volume of between-deck spaces below the margin line within the limits of the machinery room which are appropriated to stores; and

*v* = the whole volume of the machinery room below the margin line.

- (4) Where it is shown to the satisfaction of the Administration that the average permeability as determined by detailed calculation is less than that given by the formula, the detailed calculated value may be used and for the purpose of such calculation, the permeability of passenger spaces shall be taken as 95, that of all store spaces as 60, and that of double bottom, oil fuel and other tanks at such value as may be approved in each case.

- (5) Except as provided in Section (6), the uniform average permeability throughout the portion of the ship forward of or abaft the machinery room shall be determined from the formula-

$$63 + 35 \frac{a}{v}$$

where-

*a* = the volume of the passenger spaces, as defined in which are situated below the margin line, forward of or abaft the machinery room; and

*v* = the whole volume of the portion of the ship below the margin line forward of or abaft the machinery room.

- (6) In the case of unusual arrangements the Administration may allow, or require, a detailed calculation of average permeability for the portions forward of or abaft the machinery room and for the purpose of such calculation, the permeability of passenger spaces shall be taken as 95, that of spaces containing machinery as 85, that of all store spaces as 60, and that of double bottom, oil fuel and other tanks at such value as may be approved in each case.

- (7) Where a between-deck compartment between two watertight transverse bulkheads contains any passenger or crew space, the whole of that compartment, less any space completely enclosed within permanent steel bulkheads and appropriated to other purposes, shall be regarded as passenger space.

## 4.27 Permissible Length of Compartments

### General

- (1) Ships shall be as efficiently subdivided as is possible having regard to the nature of the service for which they are intended and the degree of subdivision shall vary with the length of the ship and with the service, in such manner that the highest degree of subdivision corresponds with the ships of greatest length, primarily engaged in the carriage of passengers.

### Factor of subdivision

- (2) The maximum permissible length of a compartment having its centre at any point in the ship's length is obtained from the floodable length by multiplying the latter by an appropriate factor called the factor of subdivision.

(3) *The factor of subdivision shall depend on the length of the ship, and for a given length shall vary according to the nature of the service for which the ship is intended and it shall decrease in a regular and continuous manner-*

- (a) *as the length of the ship increases, and*
- (b) *from a factor A, to a factor B.*

(4) *The variations of the factors A and B shall be expressed by the following formulae (1) and (2) where L is the length of the ship as defined in Chapter 2-*

$$A = \frac{58.2}{L-60} + 0.18 \text{ (Where } L = 131 \text{ metres and above)} \quad (1)$$

$$B = \frac{30.3}{L-42} + 0.18 \text{ (Where } L = 79 \text{ metres and above)} \quad (2)$$

*Criterion of Service*

(5) *For a ship of given length the appropriate factor of subdivision shall be determined by the criterion of service numeral (hereinafter called the criterion numeral) as given by the following formulae (3) and (4) where-*

*C<sub>s</sub> = the criterion numeral;*

*L = the length of the ship (metres), as defined in Chapter 2;*

*M = the volume of the machinery room (cubic metres), as defined in Chapter 2, with the addition thereto of the volume of any permanent oil fuel bunkers which may be situated above the inner bottom and forward of or abaft the machinery room;*

*P = the whole volume of the passenger spaces below the margin line (cubic metres), as defined in Chapter 2;*

*V = the whole volume of the ship below the margin line (cubic metres); and*

$$P_1 = KN$$

*where:*

*N = the number of passengers for which the ship shall be certified, and*

$$K = 0.056L.$$

*when P<sub>1</sub> is greater than P-*

$$C_s = 72 \frac{M+2P_1}{V+P_1-P} \quad (3)$$

*in other cases-*

$$C_s = 72 \frac{M+2P}{V} \quad (4)$$

(6) *Where the value of KN is greater than the sum of P and the whole volume of the actual passenger spaces above the margin line, the figure to be taken as P<sub>1</sub> is that sum or two-thirds KN, whichever is the greater.*

(7) *For ships not having a continuous bulkhead deck the volumes shall be taken up to the actual margin lines used in determining the floodable lengths.*

*Rules for Subdivision of Ships other than those covered by Section (14) (Special Subdivision Standards)*

- (8) *The subdivision abaft the forepeak of ships of 131 metres in length and upwards having a criterion numeral of 23 or less shall be governed by the factor A given by formula (1); of those having a criterion numeral of 123 or more by the factor B given by formula (2); and of those having a criterion numeral between 23 and 123 by the factor F obtained by linear interpolation between the factors A and B, using the formula-*

$$F = A - \frac{(A-B)(C_s-23)}{100} \quad (5)$$

- (9) *Nevertheless, where the criterion numeral is equal to 45 or more and simultaneously the computed factor of subdivision as given by formula (5) is 0.65 or less, but more than 0.5, the subdivision abaft the forepeak shall be governed by the factor 0.5.*
- (10) *Where the factor F is less than 0.4 and it is shown to the satisfaction of the Administration to be impracticable to comply with the factor F in a machinery compartment of the ship, the subdivision of such compartment may be governed by an increased factor, which, however, shall not exceed 0.4.*

- (11) *The subdivision abaft the forepeak of ships of less than 131 metres but not less than 79 metres in length having a criterion numeral equal to S, where-*

$$S = \frac{3.574 - 25L}{13}$$

*shall be governed by the factor unity; of those having a criterion numeral of 123 or more by the factor B given by the formula (2); of those having a criterion numeral between S and 123 by the factor F obtained by linear interpolation between unity and the factor B using the formula-*

$$F = 1 - \frac{(1-B)(C_s-S)}{123-S} \quad (6)$$

- (12) *The subdivision abaft the forepeak of ships of less than 131 metres but not less than 79 metres in length and having a criterion numeral less than S, and of ships of less than 79 metres in length shall be governed by the factor unity, unless, in either case, it is shown to the satisfaction of the Administration to be impracticable to comply with this factor in any part of the ship, in which case the Administration may allow such relaxation as may appear to be justified, having regard to all the circumstances.*
- (13) *The provisions of Section (12) shall apply also to ships of whatever length, which are certified to carry a number of passengers exceeding 12 but not exceeding:*

$$\frac{L^2}{650} \text{ or } 36, \text{ whichever is less.}$$

*Special Subdivision Standards for Ships complying with Section 7.21(2)*

- (14) *In the case of ships complying with section 7.21(2) the subdivision abaft the forepeak shall be governed by a factor of 0.5 or by the factor determined according to Sections (5) to (13), if less than 0.5.*
- (15) *In the case of such ships of less than 91.5 metres in length, if the Administration is satisfied that compliance with such factor would be impracticable in a compartment, it may allow the length of that compartment to be governed by a higher factor provided the factor used is the lowest that is practicable and reasonable in the circumstances.*
- (16) *The special provisions regarding permeability given in section 4.26(2) shall be employed when calculating the floodable length curves.*

- (17) *Where the Administration is satisfied that, having regard to the nature and conditions of the intended voyages, compliance with the other provisions of this Chapter and Chapters 6 and 7 is sufficient, the requirements of section 4.27(16) need not be complied with.*

**4.28 Special Requirements concerning Subdivision**

- (1) *Where in a portion or portions of a ship the watertight bulkheads are carried to a higher deck than in the remainder of the ship and it is desired to take advantage of this higher extension of the bulkheads in calculating the floodable length, separate margin lines may be used for each such portion of the ship provided that-*
- (a) *the sides of the ship are extended throughout the ship's length to the deck corresponding to the upper margin line and all openings in the shell plating below this deck throughout the length of the ship are treated as being below a margin line, for the purposes of paragraph; and*
  - (b) *the two compartments adjacent to the "step" in the bulkhead deck are each within the permissible length corresponding to their respective margin lines, and, in addition, their combined length does not exceed twice the permissible length based on the lower margin line.*
- (2) *A compartment may exceed the permissible length determined in accordance with section 4.27 provided the combined length of each pair of adjacent compartments to which the compartment in question is common does not exceed either the floodable length or twice the permissible length, whichever is the less.*
- (3) *If one of the two adjacent compartments is situated inside the machinery room, and the second is situated outside the machinery room, and the average permeability of the portion of the ship in which the second is situated differs from that of the machinery room, the combined length of the two compartments shall be adjusted to the mean average permeability of the two portions of the ship in which the compartments are situated.*
- (4) *Where the two adjacent compartments have different factors of subdivision, the combined length of the two compartments shall be determined proportionately.*
- (5) *In ships of 100 metres in length and upwards, one of the main transverse bulkheads abaft the forepeak shall be fitted at a distance from the forward perpendicular which is not greater than the permissible length.*
- (6) *A main transverse bulkhead may be recessed provided that all parts of the recess lie inboard of vertical surfaces on both sides of the ship, situated at a distance from the shell plating equal to one fifth the breadth of the ship, as defined in Chapter 2, and measured at right angles to the centreline at the level of the deepest subdivision load line. Any part of a recess which lies outside these limits shall be dealt with as a step in accordance with Section (7).*
- (7) *A main transverse bulkhead may be stepped provided that it meets one of the following conditions-*
- (a) *the combined length of the two compartments, separated by the bulkhead in question, does not exceed either 90% of the floodable length or twice the permissible length, except that, in ships having a factor of subdivision greater than 0.9, the combined length of the two compartments in question shall not exceed the permissible length;*

- (b) *additional subdivision is provided in way of the step to maintain the same measure of safety as that secured by a plane bulkhead; and*
  - (c) *the compartment over which the step extends does not exceed the permissible length corresponding to a margin line taken 76 millimetres below the step.*
- (8) *Where a main transverse bulkhead is recessed or stepped, an equivalent plane bulkhead shall be used in determining the subdivision.*
- (9) *If the distance between two adjacent main transverse bulkheads, or their equivalent plane bulkheads, or the distance between the transverse planes passing through the nearest stepped portions of the bulkheads, is less than 3 metres plus 3% of the length of the ship, or 11 metres, whichever is the less, only one of these bulkheads shall be regarded as forming part of the subdivision of the ship in accordance with the provisions of section 4.27.*
- (10) *Where a main transverse watertight compartment contains local subdivision and it can be shown to the satisfaction of the Administration that, after any assumed side damage extending over a length of 3 metres plus 3% of the length of the ship, or 11 metres, whichever is the less, the whole volume of the main compartment shall not be flooded, a proportionate allowance may be made in the permissible length otherwise required for such compartment and in such a case the volume of effective buoyancy assumed on the undamaged side shall not be greater than that assumed on the damaged side.*
- (11) *Where the required factor of subdivision is 0.5 or less, the combined length of any two adjacent compartments shall not exceed the floodable length.*

**4.29 Stability in Damaged Condition**

- (1) *Sufficient intact stability shall be provided in all service conditions so as to enable the ship to withstand the final stage of flooding of any one main compartment which is required to be within the floodable length.*
- (2) *Where two adjacent main compartments are separated by a bulkhead which is stepped under the conditions of section 4.28(7)(b) the intact stability shall be adequate to withstand the flooding of those two adjacent main compartments.*
- (3) *Where the required factor of subdivision is 0.5 or less but more than 0.33 intact stability shall be adequate to withstand the flooding of any two adjacent main compartments.*
- (4) *Where the required factor of subdivision is 0.33 or less the intact stability shall be adequate to withstand the flooding of any three adjacent main compartments.*
- (5) *The requirements of Sections (1) to (4) shall be determined by calculations which are in accordance with Sections (11), (12) and (14) respectively and which take into consideration the proportions and design characteristics of the ship and the arrangement and configuration of the damaged compartments and in making these calculations the ship shall be assumed in the worst anticipated service condition as regards stability.*
- (6) *Where it is proposed to fit decks, inner skins or longitudinal bulkheads of sufficient tightness to seriously restrict the flow of water, the Administration shall be satisfied that proper consideration is given to such restrictions in the calculations.*

- (7) *The stability required in the final condition after damage, and after equalization where provided, shall be such that the positive residual righting lever curve shall have a minimum range of 15° beyond the angle of equilibrium provided that this range may be reduced to a minimum of 10°, in the case where the area under the righting lever curve is that specified in Section (8), increased by the ratio-*

$$15/\text{range}$$

*where the range is expressed in degrees.*

- (8) *The area under the righting lever curve shall be at least 0.015 metre-radians, measured from the angle of equilibrium to the lesser of-*

- (a) *the angle at which progressive flooding occurs; or*
- (b) *22° (measured from the upright) in the case of one-compartment flooding, or 27° (measured from the upright) in the case of the simultaneous flooding of two or more adjacent compartments.*

- (9) *A residual righting lever shall be obtained within the range of positive stability, taking into account the greatest of the following heeling moments-*

- (a) *the crowding of all passengers towards one side;*
- (b) *the launching of all fully loaded davit-launched survival craft on one side; and*
- (c) *due to wind pressure,*

*as calculated by the formula-*

$$GZ \text{ (in metres)} = (\text{Heeling moment/Displacement}) + 0.04,$$

*provided that in no case is the righting lever to be less than 0.1 metres.*

- (10) *For the purpose of calculating the heeling moments in Section (9), the following assumptions shall be made-*

- (a) *moments due to crowding of passengers allowing-*

- (i) *four persons per square metre;*
- (ii) *a mass of 75 kg for each passenger,*

*and passengers shall be distributed on available deck areas towards one side of the ship on the decks where muster stations are located and in such a way that they produce the most adverse heeling moment;*

- (b) *moments due to launching of all fully loaded davit-launched survival craft on one side under the following conditions;*

- (i) *all lifeboats and rescue boats fitted on the side to which the ship has heeled after having sustained damage shall be assumed to be swung out fully loaded and ready for lowering;*
- (ii) *for lifeboats which are arranged to be launched fully loaded from the stowed position, the maximum heeling moment during launching shall be taken;*
- (iii) *a fully loaded davit-launched liferaft attached to each davit on the side to which the ship has heeled after having sustained damage shall be assumed to be swung out ready for lowering;*
- (iv) *persons not in the life-saving appliances which are swung out shall not provide either additional heeling or righting moment; and*

- (v) *life-saving appliances on the side of the ship opposite to the side to which the ship has heeled shall be assumed to be in a stowed position;*
  - (c) *moments due to wind pressure where-*
    - (i) *a wind pressure of 120 N/m<sup>2</sup> to be applied;*
    - (ii) *the area applicable shall be the projected lateral area of the ship above the waterline corresponding to the intact condition; and*
    - (iii) *the moment arm shall be the vertical distance from a point at one half of the mean draught corresponding to the intact condition to the centre of gravity of the lateral area;*
  - (d) *in intermediate stages of flooding, the maximum righting lever shall be at least 0.05 metres and the range of positive righting levers shall be at least 7° provided that in all cases, only one breach in the hull and only one free surface need be assumed.*
- (11) *For the purpose of making damage stability calculations the volume and surface permeabilities shall be in general as follows-*

Spaces	Permeability
<i>Appropriated to stores</i>	<i>60</i>
<i>Occupied by accommodation</i>	<i>95</i>
<i>Occupied by machinery</i>	<i>85</i>
<i>Intended for liquids</i>	<i>0 or 95 (whichever results in the more severe requirements)</i>

*provided that higher surface permeabilities shall be assumed in respect of spaces which, in the vicinity of the damage waterplane, contain no substantial quantity of accommodation or machinery and spaces which are not generally occupied by any substantial quantity of stores.*

- (12) *The assumed extent of damage shall be as follows-*
- (a) *in the longitudinal extent, 3 metres plus 3% of the length (L) of the ship, or 11 metres, whichever is the less, provided that where the required factor of subdivision is 0.33 or less the assumed longitudinal extent of damage shall be increased as necessary so as to include any two consecutive main transverse watertight bulkheads;*
  - (b) *in the transverse extent (measured inboard from the ship's side, at right angles to the centreline at the level of the deepest subdivision load line) a distance of one fifth of the breadth of the ship, as defined in Chapter 2; and*
  - (c) *in the vertical extent: from the base line upwards without limit;*
- provided that if any damage of lesser extent than that indicated in this paragraph would result in a more severe condition regarding heel or loss of metacentric height, such damage shall be assumed in the calculations.*
- (13) *The following provisions apply with respect to unsymmetrical flooding-*
- (a) *Such flooding shall be kept to a minimum consistent with efficient arrangements;*

- (b) *where it is necessary to correct large angles of heel, the means adopted shall, where practicable, be self-acting, but in any case where controls to cross-flooding fittings are provided they shall be operable from above the bulkhead deck;*
  - (c) *the cross-flooding fittings, together with their controls, shall be acceptable to the Administration;*
  - (d) *the maximum angle of heel after flooding but before equalisation shall not exceed 15°;*
  - (e) *where cross-flooding fittings are required the time for equalisation shall not exceed 15 minutes; and*
  - (f) *suitable information concerning the use of cross-flooding fittings shall be supplied to the master of the ship<sup>19</sup>.*
- (14) *The final conditions of the ship after damage and, in the case of unsymmetrical flooding, after equalization measures have been taken shall be as follows-*
- (a) *in the case of symmetrical flooding there shall be a positive residual metacentric height of at least 50 millimetres as calculated by the constant displacement method;*
  - (b) *in the case of unsymmetrical flooding, the angle of heel for one-compartment flooding shall not exceed 7° and for the simultaneous flooding of two or more adjacent compartments, a heel of 12° may be permitted by the Administration; and*
  - (c) *in no case shall the margin line be submerged in the final stage of flooding and if it is considered that the margin line may become submerged during an intermediate stage of flooding, the Administration may require such investigations and arrangements as it considers necessary for the safety of the ship.*
- (15) *The master of the ship shall be supplied with the data necessary to maintain sufficient intact stability under service conditions to enable the ship to withstand the critical damage and in the case of ships requiring cross-flooding the master of the ship shall be informed of the conditions of stability on which the calculations of heel are based and be warned that excessive heeling might result should the ship sustain damage when in a less favourable condition.*
- (16) *The data referred to in Section (15) to enable the master to maintain sufficient intact stability shall include information which indicates the maximum permissible height of the ship's centre of gravity above keel (KG), or alternatively the minimum permissible metacentric height (GM), for a range of draughts or displacements sufficient to include all service conditions and the information shall show the influence of various trims taking into account the operational limits*
- (17) *Datum draught marks shall be provided at the bow and stern, port and starboard, in accordance with the following provisions-*
- (a) *they shall be adequate for assessing the condition and trim of the vessel;*
  - (b) *the draught marks may be single datum lines;*
  - (c) *the marks shall be permanent and easily read but need not be of contrasting colour to the hull;*

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<sup>19</sup> Refer to the Recommendation on a standard method for establishing compliance with the requirements for cross-flooding arrangements in passenger ships adopted by the IMO by resolution A.266(VIII).

- (d) *the marks need not indicate more than one draught at each position and shall be above, but within 1000 millimetres, of the deepest load waterline; and*
- (e) *in the case where the draught marks are not located where they are easily readable or operational constraints for a particular trade make it difficult to read the draft marks, then the ship shall also be fitted with a reliable draught indicating system by which the bow and stern draughts can be determined.*
- (18) *The draught to which marks relate shall be indicated either above the mark on the hull and/or in the stability information booklet for the vessel and the position of the marks shall be verified at initial placement by the Administration or the vessel's Assigning Authority.*
- (19) *Where a reliable draught indicating system is fitted as required by Section (17) consideration shall be given to dispensing with the provision of draught marks.*
- (20) *On completion of loading of the ship and prior to its departure, the master shall determine the ship's trim and stability and also ascertain and record that the ship is in compliance with the approved stability criteria and the determination of the ship's stability shall always be made by calculation, provided that the Administration may accept the use of an electronic loading and stability computer or equivalent means for this purpose.*
- (21) *No relaxation from the requirements for damage stability may be considered by the Administration unless it is shown that the intact metacentric height in any service condition necessary to meet these requirements is excessive for the service intended.*
- (22) *Relaxations from the requirements for damage stability shall be permitted only in exceptional cases and subject to the condition that the Administration shall be satisfied that the proportions, arrangements and other characteristics of the ship are the most favourable to stability after damage which can practically and reasonably be adopted in the particular circumstances.*

## PART VII

### ADDITIONAL PROVISIONS FOR VESSELS PERMITTED TO CARRY DAVIT LAUNCHED LIFERAFTS AND MARINE EVACUATION SYSTEMS IN LIEU OF LIFEBOATS

#### 4.30 *Enhanced Survivability*

- (1) *In addition to meeting the requirements of SOLAS II-1 Part B-1 Regulation 6 and 7 and the requirements of Part II or of Part VI of this Chapter, as appropriate, the following additional requirements shall be met in all loading conditions following the flooding of any two adjacent compartments-*
- (a) *Except where Section 4.30(1)(b) applies, in the final stage of flooding and also after equalisation measures, if any have been taken shall be as follows-*
    - (i) *the residual stability shall be such that any angle of equilibrium does not exceed 7° from the upright, the resulting righting lever (GZ) curve has a range to down-flooding of at least 7° beyond any angle of equilibrium; and*
    - (ii) *the residual stability shall be such that the vessel has a positive GZ of not less than 0.05 metres and a GM of not less than 0.05 metres; and*
    - (iii) *the margin line shall not be immersed in the final stage of flooding except where (b) is complied with,*
  - (b) *the Administration may permit the margin line to be immersed in the final stage of flooding provided that the following conditions are satisfied-*
    - (i) *with the exception of Section 4.30(1)(a)(iii), all other provisions of this section are complied with in full;*
    - (ii) *no progressive flooding can occur;*
    - (iii) *no escape routes, muster stations or survival craft locations are immersed;*
    - (iv) *all essential services, such as survival craft launching appliances, emergency generators, bilge systems, firefighting systems and communications are available at all stages of flooding; and*
    - (v) *no controls intended for the operation of watertight doors, equalisation devices, or valves on piping or on ventilation ducts intended to maintain the integrity of watertight bulkheads from above the bulkhead deck, become inaccessible or inoperable,*
  - (c) *in intermediate stages of flooding the angle of heel shall not exceed 20° and the maximum GZ shall be at least 0.03 metres and the range of positive righting levers shall be at least 5° and progressive flooding is not to take place within this positive range; and*
  - (d) *for the purposes of this section damage shall be assumed to occur anywhere in the length of the vessel.*
- (2) *The assumed extent of damage shall be as follows-*

- (a) *in the longitudinal extent, 3 metres plus 3% of the length (L) of the ship but need not exceed 10% of length, or 11 metres, whichever is the less, provided that where the required factor of subdivision is 0.33 or less the assumed longitudinal extent of damage shall be increased as necessary so as to include any two consecutive main transverse watertight bulkheads;*
- (b) *in the transverse extent (measured inboard from the ship's side, at right angles to the centreline at the level of the deepest subdivision load line) a distance of one fifth of the breadth of the ship, as defined in Chapter 2; and*
- (c) *in the vertical extent: from the base line upwards without limit,*

*provided that if any damage of lesser extent than that indicated in this paragraph would result in a more severe condition regarding heel or loss of metacentric height, such damage shall be assumed in the calculations.*

**4.31 Maximum Floodable Length for vessels of 80 metres in length and over**

- (1) *Vessels to which this section applies, over 80 metres in length, and assessed in accordance SOLAS II-1 Part B-1 Regulation 6 and 7, shall additionally meet the requirements for floodable length as defined in Section 4.25 of the Code.*

## **PART VIII**

### **ADDITIONAL EQUIVALENCE CONSIDERATIONS**

#### **4.32**    *Additional Equivalence Considerations*

- (1)    *None*

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## **CHAPTER 5**

### **MACHINERY AND ELECTRICAL INSTALLATIONS AND UNATTENDED MACHINERY SPACES**

#### **5.1 *Machinery Installations***

- (1) Every ship to which this Code applies shall also comply with the applicable requirements of SOLAS Chapter II-1, Part C, with respect to machinery installations.
- (2) Where gas turbines are fitted, attention shall be paid to the guidance contained within the IMO High-speed Craft Code, and installation shall be to the satisfaction of the Administration.
- (3) Vessels with garage spaces shall have the space's drainage or bilge system sized to remove no less than 125% of the combined capacity of both the water-spraying system pumps and the required number of fire hose nozzles, taking into account the guidelines developed by the IMO<sup>20</sup>. The drainage system valves shall be operable from outside the protected space at a position in the vicinity of the extinguishing system controls. If this is not possible, the adverse effect upon stability of the added weight and free surface of water shall be taken into account to the extent deemed necessary by the Administration. Such information shall be included in the stability book.

#### **5.2 *Electrical Installations***

- (1) Every ship to which this Code applies shall also comply with the applicable requirements of SOLAS Chapter II-1, Part D, with respect to electrical installations.
- (2) *Where batteries are used for propulsion and/or electric power supply purpose during ship operations, The design and operation of the battery system shall consider the guidelines provided in Annex A*

#### **5.3 *Periodically Unattended Machinery Spaces***

- (1) *Whilst nothing in this Code precludes ships to which the Code applies from being optionally compliant with the requirements for periodically Unmanned Machinery Spaces (UMS), such a ship shall not operate in this mode whilst in service as a Code vessel, provided that when on transitional voyages without passengers such ships may operate in the UMS mode subject to the approval of the Administration.*
- (2) Every ship to which this Code applies and which complies with the periodically unattended machinery space standards in accordance with Section (1) also comply with the applicable requirements of Chapter II-1, Part E of SOLAS, with respect to electrical installations.

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<sup>20</sup> Refer to the Guidelines for drainage systems in closed vehicle and ro-ro spaces and special category spaces, to be developed by the IMO.

**5.4 Additional Equivalence Considerations**

- (1) *None*

**5.5 Alternative Design and Arrangements**

- (1) *Vessels may follow Section 1.10 on Alternative Design and Arrangements for this chapter as allowed by SOLAS II-1 Regulation 55.*
- (2) The engineering analysis required by 1.10(3) shall be prepared and submitted to the Administration, based on the guidelines<sup>21</sup> and shall include, as a minimum, the following engineering analysis elements:
- (a) determination of the ship type, machinery, electrical installations and space(s) concerned;
  - (b) identification of the prescriptive requirement(s) with which the machinery and electrical installations will not comply;
  - (c) identification of the reason the proposed design will not meet the prescriptive requirements supported by compliance with other recognized engineering or industry standards;
  - (d) determination of the performance criteria for the ship, machinery, electrical installation or the space(s) concerned addressed by the relevant prescriptive requirement(s):
    - (i) performance criteria shall provide a level of safety not inferior to the relevant prescriptive requirements contained in SOLAS II-1 parts C, D and E; and
    - (ii) performance criteria shall be quantifiable and measurable;
  - (e) detailed description of the alternative design and arrangements, including a list of the assumptions used in the design and any proposed operational restrictions or conditions;
  - (f) technical justification demonstrating that the alternative design and arrangements meet the safety performance criteria; and
  - (g) risk assessment based on identification of the potential faults and hazards associated with the proposal.

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<sup>21</sup> Refer to the Guidelines on alternative design and arrangements for SOLAS chapters II-1 and III (MSC.1/Circ.1212).

## **CHAPTER 6**

### **FIRE PROTECTION, DETECTION AND EXTINCTION**

#### **6.1 Fire Safety Objectives and Functional Requirements**

##### *Fire Safety Objectives*

- (1) The fire safety objectives of this Chapter are to-
  - (a) prevent the occurrence of fire and explosion;
  - (b) reduce the risk to life caused by fire;
  - (c) reduce the risk of damage caused by fire to the ship and the environment;
  - (d) contain, control and suppress fire and explosion in the compartment of origin; and
  - (e) provide adequate and readily accessible means of escape for passengers and crew.

##### *Functional Requirements*

- (2) In order to achieve the fire safety objectives set out in Section (1), the following functional requirements are embodied in the paragraphs of this Chapter as appropriate-
  - (a) division of the ship into main vertical and horizontal zones by thermal and structural boundaries;
  - (b) separation of accommodation spaces from the remainder of the ship by thermal and structural boundaries;
  - (c) restricted use of combustible materials;
  - (d) detection of any fire in the zone of origin;
  - (e) containment and extinction of any fire in the space of origin;
  - (f) protection of means of escape and access for firefighting; and
  - (g) ready availability of fire-extinguishing appliances.

##### *Achievement of the Fire Safety Objectives*

- (3) The fire safety objectives set out in Section (1) shall be achieved by ensuring compliance with the prescriptive requirements specified in this Chapter, or by alternative design and arrangements which comply with section 6.14 and a ship shall be considered to meet the functional requirements set out in Section (2) and to achieve the fire safety objectives set out in Section (1) when either-
  - (a) the ship's design and arrangements, as a whole, comply with the relevant prescriptive requirements in this Chapter;
  - (b) the ship's design and arrangements, as a whole, have been reviewed and approved in accordance with section 6.14; or
  - (c) part(s) of the ship's design and arrangements have been reviewed and approved in accordance with section 6.14 and the remaining parts of the ship comply with the relevant prescriptive requirements in this Chapter.

**6.2 Probability of Ignition**

*Purpose*

- (1) The purpose of this paragraph is to prevent the ignition of combustible materials or flammable liquids. For this purpose, the following functional requirements shall be met-
  - (a) means shall be provided to control leaks of flammable liquids;
  - (b) means shall be provided to limit the accumulation of flammable vapours;
  - (c) the ignitability of combustible materials shall be restricted;
  - (d) ignition sources shall be restricted; and
  - (e) ignition sources shall be separated from combustible materials and flammable liquids.

*Arrangements for Oil Fuel, Lubrication Oil, other Flammable Oils and Gaseous Fuels*

- (2) The following limitations shall apply to the use of oil as fuel-
  - (a) except as otherwise permitted by this paragraph, no oil fuel with a flashpoint of less than 60°C shall be used;
  - (b) in emergency generators, oil fuel with a flashpoint of not less than 43°C may be used;
  - (c) the use of oil fuel having a flashpoint of less than 60°C but not less than 43°C may be permitted (e.g. for feeding the emergency fire pump's engines and the auxiliary machines which are not located in the machinery spaces of category A subject to the following-
    - (i) fuel oil tanks except those arranged in double bottom compartments shall be located outside of machinery spaces of category A;
    - (ii) provisions for the measurement of oil temperature are provided on the suction pipe of the oil fuel pump;
    - (iii) stop valves and/or cocks are provided on the inlet side and outlet side of the oil fuel strainers; and
    - (iv) pipe joints of welded construction or of circular cone type or spherical type union joint are applied as much as possible.
- (3) In a ship in which oil fuel is used, the arrangements for the storage, distribution and utilization of the oil fuel shall be such as to ensure the safety of the ship and persons onboard and shall at least comply with Sections (4) through (22) inclusive.
- (4) As far as practicable, parts of the oil fuel system containing heated oil under pressure exceeding 0.18 N/mm<sup>2</sup> shall not be placed in a concealed position such that defects and leakage cannot readily be observed and the machinery spaces in way of such parts of the oil fuel system shall be adequately illuminated.
- (5) The ventilation of machinery spaces shall be sufficient under normal conditions to prevent accumulation of oil vapour.
- (6) Fuel oil, lubrication oil and other flammable oils shall not be carried in forepeak tanks.
- (7) The following provisions shall apply to the structure and location of oil fuel tanks-

- (a) as far as practicable, oil fuel tanks shall be part of the ship's structure and shall be located outside machinery spaces of category A;
  - (b) where oil fuel tanks, other than double bottom tanks, are necessarily located adjacent to or within machinery spaces of category A, at least one of their vertical sides shall be contiguous to the machinery space boundaries, and shall preferably have a common boundary with the double bottom tanks, and the area of the tank boundary common with the machinery spaces shall be kept to a minimum; and
  - (c) where tanks are situated within the boundaries of machinery spaces of category A they shall not contain oil fuel having a flashpoint of less than 60°C. The use of free-standing oil fuel tanks shall be prohibited in category A machinery spaces.
- (8) No oil fuel tank shall be situated where spillage or leakage therefrom can constitute a fire or explosion hazard by falling on heated surfaces.
- (9) Oil fuel pipes, which, if damaged, would allow oil to escape from a storage, settling or daily service tank having a capacity of 500 litres and above situated above the double bottom, shall be provided with a remote means of closing as follows-
- (a) subject to Section (b) the tank shall be fitted with a cock or valve directly on the tank capable of being closed from a safe position outside the space concerned in the event of a fire occurring in the space in which such tanks are situated;
  - (b) in the special case of deep tanks situated in any shaft or pipe tunnel or similar space, whilst valves on the tank shall be fitted, control in the event of fire may be effected by means of an additional valve on the pipe or pipes outside the tunnel or similar space, provided that if such an additional valve is fitted in the machinery space, it shall be operated from a position outside that space;
  - (c) the controls for remote operation of the valve for the emergency generator fuel tank shall be in a separate location from the controls for remote operation of other valves for tanks located in machinery spaces.
- (10) Safe and efficient means of ascertaining the amount of oil fuel contained in any oil fuel tank shall be provided.
- (11) Where sounding pipes are used-
- (a) they shall not terminate in any space where the risk of ignition of spillage from the sounding pipe might arise and in particular, they shall not terminate in passenger or crew spaces; and
  - (b) as a general rule they shall not terminate in machinery spaces provided that where the Administration considers that this requirement is impracticable, it may permit termination of sounding pipes in machinery spaces on condition that all of the following requirements are met-
    - (i) an oil-level gauge is provided meeting the requirements of Section (12);
    - (ii) the sounding pipes terminate in locations remote from ignition hazards unless precautions are taken, such as the fitting of effective screens, to prevent the oil fuel in the case of spillage through the terminations of the sounding pipes from coming into contact with a source of ignition;
    - (iii) the terminations of the sounding pipes are fitted with self-closing blanking devices and with a small-diameter self-closing control cock

- located below the blanking device for the purpose of ascertaining, before the blanking device is opened, that oil fuel is not present; and
- (iv) provisions are made so as to ensure that any spillage of oil fuel through the control cock involves no ignition hazard.
- (12) Other oil-level gauges may be used in place of sounding pipes provided such gauges shall not require penetration below the top of the tank and their failure or overfilling of the tanks shall not permit release of fuel.
- (13) The means prescribed in Section (12) which are acceptable to the Administration shall be maintained in the proper condition to ensure their continued accurate functioning in service.
- (14) Provisions shall be made to-
- (a) prevent overpressure in any oil tank or in any part of the oil fuel system, including the filling pipes served by pumps onboard; and
  - (b) to ensure that air and overflow pipes and relief valves shall discharge to a position where there is no risk of fire or explosion from the emergence of oils and vapour and such pipes shall not lead into crew, machinery, passenger or similar spaces.
- (15) Oil fuel pipes and their valves and fittings shall conform to the following requirements-
- (a) they shall be of steel or other approved material provided that, subject to Section (b), restricted use of flexible pipes shall be permissible in positions where the Administration is satisfied that they are necessary;
  - (b) flexible pipes permitted under Section (a), and their end attachments, shall be of approved fire-resisting materials of adequate strength and shall be constructed to the satisfaction of the Administration; and
  - (c) where valves fitted to oil fuel tanks are subject to static pressure, steel or spheroidal-graphite cast iron may be accepted provided that ordinary cast iron valves may be used in piping systems where the design pressure is lower than 7 bar and the design temperature is below 60°C.
- (16) External high-pressure fuel delivery lines between the high-pressure fuel pumps and fuel injectors shall be protected with a jacketed piping system which-
- (a) shall incorporate an outer pipe into which the high-pressure fuel pipe is placed, forming a permanent assembly;
  - (b) shall be capable of containing fuel from a high-pressure line failure; and
  - (c) shall include a means for collection of leakages and be provided with an alarm in case of a fuel line failure.
- (17) Oil fuel lines shall-
- (a) not be located immediately above or near units of high temperature, including boilers, steam pipelines, exhaust manifolds, silencers or other equipment required to be protected by Sections (21) and (22);
  - (b) as far as practicable, be arranged so as to be far apart from hot surfaces, electrical installations or other sources of ignition;
  - (c) be screened or otherwise suitably protected to avoid oil spray or oil leakage onto the sources of ignition; and

- (d) be arranged such that the number of joints in such piping systems shall be kept to a minimum.
- (18) Components of a diesel engine fuel system shall be designed considering the maximum peak pressure which shall be experienced in service, including any high-pressure pulses which are generated and transmitted back into the fuel supply and spill lines by the action of fuel injection pumps and connections within the fuel supply and spill lines shall be constructed having regard to their ability to prevent pressurized oil fuel leaks while in service and after maintenance.
- (19) In multi-engine installations which are supplied from the same fuel source, means of isolating the fuel supply and spill piping to individual engines shall be provided and such means of isolation shall not affect the operation of the other engines and shall be operable from a position not rendered inaccessible by a fire on any of the engines.
- (20) Where the Administration may permit the conveying of oil and combustible liquids through accommodation and service spaces, the pipes conveying oil or combustible liquids shall be of a material approved by the Administration having regard to the fire risk.
- (21) Surfaces with temperatures above 220°C which may be impinged as a result of a fuel system failure shall be properly insulated.
- (22) Precautions shall be taken to prevent any oil that may escape under pressure from any pump, filter or heater from coming into contact with heated surfaces.
- (23) The arrangements for the storage, distribution and utilisation of oil used in pressure lubrication systems shall be such as to ensure the safety of the ship and persons onboard and the arrangements made in machinery spaces of category A, and whenever practicable in other machinery spaces, shall at least comply with the provisions of Sections (7) to (10), (14), (15), (17), (21) and (22), provided that-
  - (a) this does not preclude the use of sight-flow glasses in lubricating systems provided that they are shown by testing to have a suitable degree of fire resistance; and
  - (b) sounding pipes may be authorised in machinery spaces and the requirements of Sections (11)(b)(i) and (11)(b)(iii) need not be applied provided that that the sounding pipes are fitted with appropriate means of closure.
- (24) The provisions of Section (9) shall also apply to lubricating oil tanks having a capacity of 500 litres or more, storage tanks on which valves are closed during the normal operation mode of the ship, or where it is determined that an unintended operation of a quick-closing valve on the oil lubricating tank would endanger the safe operation of the main propulsion and essential auxiliary machinery.
- (25) The arrangements for the storage, distribution and utilisation of other flammable oils employed under pressure in power transmission systems, control and activating systems and heating systems shall-
  - (a) be such as to ensure the safety of the ship and persons onboard;
  - (b) shall be fitted with suitable oil collecting arrangements for leaks below hydraulic valves and cylinders;

- (c) where means of ignition are present, at least comply with the provisions of Sections (8), (10), (13), (21), and (22), and with the provisions of Sections (14) and (15) in respect of strength and construction.
- (26) *The arrangements for the storage, distribution and utilisation of fuels having a flashpoint of less than 60°C for use in vehicles and pleasure craft shall be such as to ensure the safety of the ship and persons onboard and such arrangements shall at least comply with the provisions of Section 5 of Annex H.*
- (27) In addition to the requirements of Sections (2) to (4), the oil fuel and lubricating oil systems in a periodically unattended machinery space shall comply with the following-
  - (a) where daily service oil fuel tanks are filled automatically, or by remote control, means shall be provided to prevent overflow spillages. Other equipment which treats flammable liquids automatically (e.g., oil fuel purifiers) which, whenever practicable, shall be installed in a special space reserved for purifiers and their heaters, shall have arrangements to prevent overflow spillages; and
  - (b) where daily service oil fuel tanks or settling tanks are fitted with heating arrangements, a high temperature alarm shall be provided if the flashpoint of the oil fuel can be exceeded.
- (28) *Where gaseous fuel is used for domestic purposes, the arrangements for the storage, distribution and utilisation of the fuel shall be such that, having regard to the hazards of fire and explosion which the use of the fuel may entail, the safety of the ship and the persons onboard is preserved and the installation shall be in accordance with recognised national or international standards acceptable to the Administration.*
- (29) *Storage lockers for gas cylinders shall be provided with-*
  - (a) *effective ventilation;*
  - (b) *an outward-opening door accessible directly to the open deck;*
  - (c) *gas-tight boundaries, including doors and other means of closing any openings therein, which form boundaries between such lockers and adjoining spaces; and*
  - (d) *equipment and fittings which shall be certified as safe for the environment in which they are being used,*
- (30) *Spaces using gaseous fuel for heating, cooking or other purposes shall be provided with an effective power ventilation system which shall be in operation at all times when gas is being used in such spaces and means shall be provided on the navigation bridge to indicate any loss of the required ventilating capacity.*

*Miscellaneous Items of Ignition Sources and Ignitability*

- (31) Electric radiators, if used, shall be fixed in position and so constructed as to reduce fire risks to a minimum and no such radiators shall be fitted with an element so exposed that clothing, curtains, or other similar materials can be scorched or set on fire by heat from the element.
- (32) *Waste receptacles shall be constructed of non-combustible materials with no openings in the sides or bottom subject to the following-*
  - (a) *plastic bins in galleys are for food waste only and shall be clearly marked in accordance with vessels Garbage Management Plan;*

- (b) *plastic bins in galleys used for Glass and Tins only shall be suitably marked in accordance with the Garbage Management Plan and kept clear from any heat source; and*
  - (c) *fire retardant fibreglass bins are acceptable for general waste around the ship provided they are fitted with metal liners.*
- (33) In spaces where penetration of oil products is possible, the surface of insulation shall be impervious to oil or oil vapours.
- (34) *Notwithstanding 6.4(4) and (5) primary deck coverings, if applied within accommodation and service spaces, control stations, and cabin balconies shall be of approved material which shall not readily ignite, this being determined in accordance with the Fire Test Procedures Code.*

### **6.3 Fire Growth Potential**

#### *Purpose*

- (1) The purpose of this paragraph is to limit the fire growth potential in every space of the ship and for this purpose, the following functional requirements shall be met-
- (a) means of control for the air supply to the space shall be provided;
  - (b) means of control for flammable liquids in the space shall be provided; and
  - (c) the use of combustible materials shall be restricted.

#### *Control of Air Supply and Flammable Liquid to the Space*

- (2) The main inlets and outlets of all ventilation systems shall be capable of being closed from outside the spaces being ventilated and the means of closing shall be easily accessible as well as prominently and permanently marked and shall indicate whether the shut-off is open or closed.
- (3) Power ventilation of accommodation spaces, service spaces, control stations and machinery spaces shall be capable of being stopped from an easily accessible position outside the space being served and this position shall not be readily cut off in the event of a fire in the spaces served.
- (4) Means of control shall be provided for opening and closure of skylights, closure of openings in funnels which normally allow exhaust ventilation and closure of ventilator dampers.
- (5) Means of control shall be provided for stopping ventilating fans in accordance with the following provisions-
- (a) controls provided for the power ventilation serving machinery spaces shall be grouped so as to be operable from two positions, one of which shall be outside such spaces; and
  - (b) the means provided for stopping the power ventilation of the machinery spaces shall be entirely separate from the means provided for stopping ventilation of other spaces.

- (6) Means of control shall be provided for stopping forced and induced draught fans, oil fuel transfer pumps, oil fuel unit pumps, lubricating oil service pumps, thermal oil circulating pumps and oil separators (purifiers) provided that Sections (7) and (8) need not apply to oily water separators.
- (7) The controls required in Sections (4) to (6) and in Section 6.2(9) shall be located outside the space served so they shall not be cut off in the event of fire in that space.
- (8) The controls required in Sections (4) to (7) and in sections 6.6(5) and 6.6(6) and the controls for any required fire-extinguishing system shall be situated at one control position or grouped in as few positions as possible to the satisfaction of the Administration and such positions shall have a safe access from the open deck.

*Additional Requirements for Means of Control in Periodically Unattended Machinery Spaces*

- (9) For periodically unattended machinery spaces, the Administration shall give special consideration to maintaining the fire integrity of the machinery spaces, the location and centralisation of the fire-extinguishing system controls, the required shutdown arrangements (e.g., ventilation, fuel pumps, etc.) and any additional fire-extinguishing appliances and other fire-fighting equipment and breathing apparatus that may be required and these requirements shall be at least equivalent to those of machinery spaces normally attended. *(Note section 5.3(1) which prohibits unattended machinery spaces operations on Code vessels subject to the approval of the Administration)*

*Use of Non-Combustible Materials*

- (10) Insulating materials in spaces, other than in mail rooms, baggage rooms and refrigerated compartments of service spaces, shall be non-combustible provided that vapour barriers and adhesives used in conjunction with insulation, as well as the insulation of pipe fittings for cold service systems, need not be of non-combustible materials, but they shall be kept to the minimum quantity practicable and their exposed surfaces shall have low flame-spread characteristics.
- (11) All linings, grounds, draught stops and ceilings used internally or on open decks, bulkheads and overhangs shall be of non-combustible material except in saunas or refrigerated compartments of service spaces; partial bulkheads or decks used to subdivide a space for utility or artistic treatment shall also be of non-combustible materials.
- (12) Open decks, bulkheads and divisions of "A", "B" or "C" class in accommodation, service spaces and cabin balconies which are faced with combustible materials, facings, mouldings, decorations and veneers shall comply with the provisions of Sections (13) to (15) and section 6.4, provided that natural hard wood decking, traditional wooden benches, wooden linings on bulkheads and ceilings are permitted in open decks and saunas and such materials need not be subject to the calculations prescribed in Sections (13) and (14): *provided that where it is possible to readily direct a jet of water, for firefighting purposes, on to an open deck or cabin balcony from the deck immediately above, or adjacent, the restrictions on materials used bulkheads and divisions on such an open deck or balcony may be relaxed, except for open decks and cabin balconies adjacent to life saving appliances, as referred to in section 6.3(23), where an evaluation of the fire risk<sup>22</sup> shall be conducted and mitigation measures put in place to the satisfaction of the Administration; see also Sections (14), (15), (17), (19) and (20).*

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<sup>22</sup> Refer to MSC.1/Circ.1274 - Guidelines for Evaluation of Fire Risk of External Areas on Passenger Ships

- (13) Combustible materials used on the surfaces and linings specified in Section (12), except for open decks, shall have a calorific value<sup>23</sup> not exceeding 45 MJ/m<sup>2</sup> of the area for the thickness used; provided that the requirements of this paragraph are not applicable to the surfaces of furniture fixed to linings or bulkheads.
- (14) *Subject to Section (15), furniture and furnishings on open decks shall comply with Regulation 5.3.4 of Chapter II-2 of SOLAS unless such open decks are protected by a fixed pressure water-spraying and fixed fire detection system and alarm system.*
- (15) *Except for open decks adjacent to life saving appliances, as referred to in section 6.3(23), the furniture and furnishings on the open decks referred to in Section (14) need not comply with Regulation 5.3.4 of Chapter II-2 of SOLAS provided it is possible to readily direct a jet of water, for firefighting purposes, on to such a deck from the deck immediately above or adjacent.*
- (16) Where combustible materials are used in the vessel interior in accordance with Section (12), they shall comply with the following requirements-
- (a) the total volume of combustible facings, mouldings, decorations and veneers in accommodation and service spaces shall not exceed a volume equivalent to 2.5 millimetres veneer on the combined area of the walls and ceiling linings. Furniture fixed to linings, bulkheads or decks need not be included in the calculation of the total volume of combustible materials; and
  - (b) in the case of ships fitted with an automatic sprinkler system complying with the provisions of the Fire Safety Systems Code, the above volume may include some combustible material used for erection of "C" class divisions.
- (17) The following surfaces shall have low flame-spread characteristics in accordance with the Fire Test Procedures Code-
- (a) exposed surfaces in corridors and stairway enclosures and of bulkhead and ceiling linings in accommodation and service spaces (except saunas) and control stations;
  - (b) surfaces and grounds in concealed or inaccessible spaces in accommodation and service spaces and control stations; and
  - (c) exposed surfaces of cabin balconies except for natural hardwood decking systems: provided that this section need not apply where it is possible to readily direct a jet of water, for firefighting purposes, on to such a balcony from the deck immediately above or adjacent, and the balcony is not adjacent to life saving appliances;
- (18) *the Administration may relax the provisions of 6.3(17) in areas appropriated for the use of the owner and passengers, other than in relation to escape routes, stairway enclosures and corridors, provided that-*
- (a) *such owner and passenger spaces within such areas are individually bounded by divisions with fire integrity in accordance with Tables 6.1 and 6.2;*
  - (b) *the spaces are fitted with a fully addressable fire detection system and a fixed firefighting system complying with the relevant provision of the Fire Safety Systems Code;*

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<sup>23</sup> Refer to the recommendations published by the International Organization for Standardization, in particular publication ISO 1716:2002, *Determination of calorific potential*.

- (c) *in all cases the Administration is consulted, either directly or through the vessel's Recognised Organisation and a detailed proposal with respect to the material to be used and its intended location is submitted as part of the consultation process;*
- (19) *In applying the provisions of Section (18), the overall fire, smoke and toxicity characteristics of the materials to be used may be taken into account as part of the overall assessment.*
- (20) Furniture within stairway enclosures shall be subject to the following provisions-
- (a) furniture in stairway enclosures shall-
    - (i) be fixed and limited to no more than six seats on each deck in each stairway enclosure;
    - (ii) be of restricted fire risk determined in accordance with the Fire Test Procedures Code; and
    - (iii) not restrict the passenger escape route;
    - (iv) provided that Administration may permit additional seating in the main reception area within a stairway enclosure if it is fixed, non-combustible and does not restrict the passenger escape route.
  - (b) furniture shall not be permitted in passenger and crew corridors and stairs forming escape routes in cabin areas, provided that-
    - (i) lockers of non-combustible material, providing storage for non-hazardous safety equipment required by this Chapter; and
    - (ii) drinking water dispensers, ice cube machines, decorative flower or plant arrangements, statues or other objects of art such as paintings and tapestries;may be permitted in corridors and stairways where these are fixed and do not restrict the width of the escape routes.
- (21) *Subject to Section (22), furniture and furnishings on cabin balconies shall comply with section 6.7(1)(d)(i),(ii), (iii), (vi) and (vii) unless such balconies are protected by a fixed pressure water-spraying and fixed fire detection and fire alarm systems complying with SOLAS Chapter II-2, Part C, regulations 7.10 and 10.6.1.3.*
- (22) *Except for open decks adjacent to life saving appliances, as referred to in section 6.3(23), the furniture and furnishings on the cabin balconies referred to in Section (19) need not comply with Regulation 5.3.4 of Chapter II-2 of SOLAS provided it is possible to readily direct a jet of water, for fire-fighting purposes, on to such a deck from the deck immediately above or adjacent.*
- (23) *Furniture and furnishings on open decks adjacent to survival craft, rescue boats and their respective launching and embarkation stations, shall have their fire risk evaluated<sup>24</sup> and mitigation measures put in place to the satisfaction of the Administration. The following are considered as providing suitable mitigating measures to give a level of risk to be accepted:*
- (a) *The furniture and furnishings shall be of a restricted fire risk in accordance with SOLAS II-2 Regulation 3.40*

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<sup>24</sup> Refer to MSC.1/Circ.1274 - Guidelines for Evaluation of Fire Risk of External Areas on Passenger Ships

- (b) *Use of upholstered furniture in accordance with Fire Test Procedures Code Part 8;*
- (c) *Local portable firefighting appliances for Class A fires;*
- (d) *Fixed fire detection and firefighting systems suitable for open decks;*
- (e) *Restricted use of non fixed furnishing; and*
- (f) *Furniture not to be immediately adjacent to or proving storage for the Life-saving appliances.*

#### **6.4 Smoke Generation Potential and Toxicity**

##### *Purpose*

- (1) The purpose of this paragraph is to reduce the hazard to life from smoke and toxic products generated during a fire in spaces where persons normally work or live by limiting the quantity of smoke and toxic products released from combustible materials, including surface finishes, during a fire.

##### *Paints, Varnishes and other Finishes*

- (2) Paints, varnishes and other finishes used on exposed interior surfaces shall not be capable of producing excessive quantities of smoke and toxic products, this being determined in accordance with the Fire Test Procedures Code.
- (3) Paints, varnishes and other finishes used on exposed surfaces of cabin balconies, excluding natural hard wood decking systems, shall not be capable of producing excessive quantities of smoke and toxic products, this being determined in accordance with the Fire Test Procedures Code.

##### *Primary Deck Coverings*

- (4) *Notwithstanding 6.2(34), primary deck coverings, if applied within accommodation and service spaces, control stations and on open decks shall be of approved material which shall not give rise to smoke or toxic or explosive hazards at elevated temperatures, this being determined in accordance with the Fire Test Procedures Code.*
- (5) Notwithstanding 6.2(34) primary deck coverings on cabin balconies shall not give rise to smoke, toxic or explosive hazards at elevated temperatures, this being determined in accordance with the Fire Test Procedures Code.

#### **6.5 Detection and Alarm**

##### *Purpose*

- (1) The purpose of this paragraph is to detect a fire in the space of origin and to provide for alarm for safe escape and fire-fighting activity and for this purpose, the following functional requirements shall be met-
  - (a) fixed fire detection and fire alarm system installations shall be suitable for the nature of the space, fire growth potential and potential generation of smoke and gases;

- (b) manually operated call points shall be placed effectively to ensure a readily accessible means of notification; and
- (c) *fixed fire detection and fire alarm system installations shall be capable of remotely and individually identifying each detector and manually operated call point.*

*General Requirements*

- (1) A fixed fire detection and fire alarm system shall be provided in accordance with the provisions of this paragraph.
- (2) A fixed fire detection and fire alarm system and a sample extraction smoke detection system required in this paragraph and other paragraphs in this part shall be of an approved type and comply with the Fire Safety Systems Code.
- (3) Where a fixed fire detection and fire alarm system is required for the protection of spaces other than those specified in Section (9), at least one detector complying with the Fire Safety Systems Code shall be installed in each such space.

*Initial and Periodical Tests*

- (4) The function of fixed fire detection and fire alarm systems required by the relevant requirements of this Chapter shall be tested under varying conditions of ventilation after installation.
- (5) The function of fixed fire detection and fire alarm systems shall be periodically tested to the satisfaction of the Administration by means of equipment producing hot air at the appropriate temperature, or smoke or aerosol particles having the appropriate range of density or particle size, or other phenomena associated with incipient fires to which the detector is designed to respond.

*Protection of Machinery Spaces*

- (6) A fixed fire detection and fire alarm system shall be installed in-
  - (d) periodically unattended machinery spaces; and
  - (e) machinery spaces where-
    - (i) the installation of automatic and remote control systems and equipment has been approved in lieu of continuous manning of the space; and
    - (ii) the main propulsion and associated machinery, including the main sources of electrical power, are provided with various degrees of automatic or remote control and are under continuous manned supervision from a control room.
- (7) The fixed fire detection and fire alarm system required in Section (1) shall-
  - (a) be so designed and the detectors so positioned as to detect rapidly the onset of fire in any part of those spaces and under any normal conditions of operation of the machinery and variations of ventilation as required by the possible range of ambient temperatures;
  - (b) detection systems using only thermal detectors shall not be permitted except in spaces of restricted height and where their use is appropriate;

- (c) the detection system shall initiate local and remote audible and visual alarms distinct in both respects from the alarms of any other system not indicating fire, in sufficient places to ensure that the alarms are heard and observed on the navigation bridge or continuously manned central control station and by a responsible engineer officer.

*Protection of Accommodation and Service Spaces and Control Stations*

- (8) Smoke detectors shall be installed in all cabins, stairways, corridors and escape routes within accommodation spaces as provided in Section (10); consideration shall also be given to the installation of special purpose smoke detectors within ventilation ducting.
- (9) *There shall be installed in every ship throughout each separate zone, whether vertical or horizontal, in all accommodation and service spaces and, where it is considered necessary by the Administration, in control stations, except spaces which afford no substantial fire risk such as void spaces and sanitary spaces, an automatic sprinkler, a fire detection and fire alarm system of an approved type complying with the relevant requirements of the Fire Safety Systems Code and with the provisions of Section (16) and so installed and arranged as to protect such spaces.*
- (10) *The construction of ceilings and bulkheads shall be such that it shall be possible, without impairing the efficiency of the fire protection to detect any smoke originating in concealed and inaccessible places (requiring tools to access), except where in the opinion of the Administration there is no risk of fire originating in such places due to there being no ignition sources.*
- (11) *Manually operated call points complying with the Fire Safety Systems Code shall be installed throughout the accommodation spaces, service spaces, control stations and external deck areas such that*
  - (a) *one manually operated call point shall be located at each exit;*
  - (b) *manually operated call points shall be readily accessible in the corridors of each deck such that no part of the corridor is more than 20 metres from such a point; and*
  - (c) *manually operated call points shall be located on external decks where a source of ignition or fire risk is identified beneath an overhanging structure.*

*Fire Alarm Signaling Systems*<sup>25</sup>

- (12) *Ships shall at all times when at sea, or in port (except when out of service), be so manned or equipped as to ensure that any initial fire alarm is immediately received by a responsible member of the crew either:*
  - (a) *on the bridge; or*
  - (b) *at the continuously manned control station should this station be in a location other than on the bridge; and*
  - (c) *when more than 12 passengers are carried the navigation bridge shall be manned at all times.*

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<sup>25</sup> Refer to the Code on Alerts and Indicators adopted by the IMO by Resolution A.1021(26).

- (13) The control panel of fixed fire detection and fire alarm systems shall be designed on the fail-safe principle (e.g., an open detector circuit shall cause an alarm condition).
- (14) *The fire detection and fire alarms system required by Section (10) shall comply with the following requirements-*
- (a) *it shall be centralised in a continuously manned central control station, which may be the navigation bridge;*
  - (b) *in addition, controls for fire pumps and emergency fire pumps, remote closing of the watertight and semi-watertight doors, fire doors, release of smoke from machinery spaces and shutting down the ventilation fans shall be centralised in the same location as that referred to in Section (a) above;*
  - (c) *the ventilation fans shall be capable of reactivation by the crew at the continuously manned control station;*
  - (d) *the control panels in the central control station shall be capable of indicating open or closed positions of watertight and semi-watertight doors, fire doors if required under 6.7(35), on or off status of the detectors, manual call points, alarms and fans;*
  - (e) *the control panel shall be continuously powered and shall have an automatic change-over to standby power supply in case of loss of normal power supply; and*
  - (f) *the control panel shall be powered from the main source of electrical power and the emergency source of electrical power.*
- (15) A special alarm, operated from the navigation bridge and fire control station, shall be fitted to summon the crew and this alarm may be part of the ship's general emergency alarm system and shall be capable of being sounded independently of the alarm to the passenger spaces.
- (16) A fixed fire detection and fire alarm system complying with the provisions of the Fire Safety Systems Code shall be installed on cabin balconies of ships to which SOLAS Chapter II-2, Part B, regulation 5.3.4 applies, when furniture and furnishings on such balconies are not as defined in Section 6.7(1)(d)(i), (ii), (iii), (vi) and (vii).

## **6.6 Control of Smoke Spread**

### *Purpose*

- (1) The purpose of this part is to control the spread of smoke in order to minimise the hazards from smoke by providing means for controlling smoke in atriums, control stations, machinery spaces and concealed spaces.

### *Protection of Control Stations outside Machinery Spaces*

- (2) Practicable measures shall be taken for control stations outside machinery spaces in order to ensure that ventilation, visibility and freedom from smoke are maintained within them so that, in the event of fire, the machinery and equipment contained therein may be supervised and continue to function effectively, such measures to include the provision of alternative and separate means of air supply arranged so that the air inlets of the two sources of supply shall be so disposed that the risk of both inlets drawing in smoke simultaneously is minimized; provided that, at the discretion of the Administration, such

requirements need not apply to control stations situated on, and opening onto, an open deck or where local closing arrangements would be equally effective.

- (3) *The ventilation system serving safety centres may be derived from the ventilation system serving the navigation bridge, unless located in an adjacent main vertical zone.*

*Release of Smoke from Machinery Spaces*

- (4) The provisions of Sections (5), (6) and (7) shall apply to machinery spaces of category A and, where the Administration considers it desirable, to other machinery spaces.
- (5) Means of control shall be provided for permitting the release of smoke, in the event of fire, from the space to be protected and, subject to the provisions of section 6.7(50), the normal ventilation systems may be acceptable for this purpose.
- (6) Means of control shall be provided for permitting the release of smoke and such controls shall be located outside the space served so that, in the event of fire in that space, they shall not be cut off.
- (7) The controls required by Section (5) shall be situated at one control position or grouped in as few positions as possible to the satisfaction of the Administration and such positions shall have a safe access from the open deck.

*Draught Stops*

- (8) Air spaces enclosed behind ceilings, panelling or linings shall be divided by close-fitting draught stops spaced not more than 14 metres apart. In the vertical direction, such enclosed air spaces, including those behind linings of stairways, trunks, etc., shall be closed at each deck.

*Smoke Extraction Systems in Atriums*

- (9) Atriums shall be equipped with a smoke extraction system, having fans sized such that that the entire volume within the space can be exhausted in 10 minutes or less, and which shall be activated by the required smoke detection system and be capable of manual control.

**6.7 Containment of Fire**

*Purpose*

- (1) The purpose of this part is to contain a fire in the space of origin by meeting the following functional requirements-
- (a) the ship shall be subdivided by thermal and structural boundaries;
  - (b) thermal insulation of boundaries shall have due regard to the fire risk of the space and adjacent spaces;
  - (c) the fire integrity of the divisions shall be maintained at openings and penetrations; and

*Thermal and Structural Subdivision*

- (2) Ships shall be subdivided into spaces by thermal and structural divisions having regard to the fire risks of the spaces.

*Main Vertical Zones and Horizontal Zones*

- (3) The hull, superstructure and deckhouses in way of accommodation and service spaces shall be subdivided into main vertical zones by "A" class divisions and these divisions shall have insulation values in accordance with Tables 6.1 and 6.2.
- (4) The main vertical zones shall comply with the following provisions-
- (a) the bulkheads forming the boundaries of the main vertical zones above the bulkhead deck shall as far as practicable, be in line with watertight subdivision bulkheads situated immediately below the bulkhead deck;
  - (b) the length and width of main vertical zones may be extended to a maximum of 48 metres in order to bring the ends of main vertical zones to coincide with watertight subdivision bulkheads or in order to accommodate a large public space extending for the whole length of the main vertical zone provided that the total area of the main vertical zone is not greater than 1,600 m<sup>2</sup> on any deck;
  - (c) the length or width of a main vertical zone shall be the maximum distance between the furthestmost points of the bulkheads bounding it; and
  - (d) main vertical zones may be stepped or may consist of one or more horizontal zones where it is impracticable from structural or design considerations to achieve compliance otherwise; in all cases however the Administration shall be satisfied that an equivalent level of safety and protection is achieved.
- (5) Bulkheads forming the boundaries of main vertical zones shall extend from deck to deck and to the shell or other boundaries.
- (6) Where a main vertical zone is subdivided by horizontal "A" class divisions into horizontal zones for the purpose of providing an appropriate barrier between a zone with sprinklers and a zone without sprinklers, the divisions shall extend between adjacent main vertical zone bulkheads and to the shell or exterior boundaries of the ship and shall be insulated in accordance with the fire insulation and integrity values given in Table 6.2.

*Bulkheads within a Main Vertical Zone*

- (7) *Bulkheads within accommodation and service spaces shall meet the requirements of Sections (a) to (d) as appropriate taking into consideration guidelines developed by the IMO<sup>26</sup>.*
- (a) Subject to Sections (a) and (b), bulkheads within accommodation and service spaces which are not required to be "A" class divisions shall be at least "B" class or "C" class divisions as prescribed in Tables 6.1 and 6.2; in addition, corridor bulkheads, where not required to be "A" class, shall be "B" class divisions which shall extend from deck to deck;

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<sup>26</sup> Refer to the Guidelines on fire safety construction in accommodation areas (MSC/Circ.917) for passenger ships carrying <36 passengers.

- (b) where continuous "B" class ceilings or linings are fitted on both sides of the bulkhead, the portion of the bulkhead behind the continuous ceiling or lining shall be of material which, in thickness and composition, is acceptable in the construction of "B" class divisions, but which shall be required to meet "B" class integrity standards only in so far as is reasonable and practicable in the opinion of the Administration;
  - (c) where, as shall normally be the case, the ship is protected by an automatic sprinkler system complying with the provisions of the Fire Safety Systems Code, the corridor bulkheads may terminate at a ceiling in the corridor provided such bulkheads and ceilings are of "B" class standard in compliance with Sections (10) and (11): provided that all doors and frames in such bulkheads shall be of non-combustible materials and shall have the same fire integrity as the bulkhead in which they are fitted.
  - (d) *where "C" class divisions between similar purposed spaces are provided (sleeping/washing/dressing), these divisions do not need to be continuous and the group of spaces may be considered as one.*
- (8) Bulkheads required to be "B" class divisions, except corridor bulkheads as prescribed in Section 6.9(2), shall extend from deck to deck and to the shell or other boundaries; provided that where a continuous "B" class ceiling or lining is fitted on both sides of a bulkhead which is at least of the same fire resistance as the adjoining bulkhead, the bulkhead may terminate at the continuous ceiling or lining.

*Fire Integrity of Bulkheads and Decks*

- (9) In addition to complying with the specific provisions for fire integrity of bulkheads and decks, the minimum fire integrity of bulkheads and decks shall be as prescribed in Tables 6.1 and 6.2.
- (10) The following requirements shall govern application of the Tables-
- (a) Tables 6.1 and 6.2 shall apply respectively to the bulkheads and decks separating adjacent spaces;
  - (b) For determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces-
    - (i) such spaces are classified according to their fire risk as shown in Sections *(ba)* to *(bk)* below;
    - (ii) where the contents and use of a space are such that there is a doubt as to its classification for the purpose of this paragraph, or where it is possible to assign two or more classifications to a space, it shall be treated as a space within the relevant category having the most stringent boundary requirements;
    - (iii) smaller, enclosed rooms within a space that have less than 30% communicating openings to that space are considered separate spaces;
    - (iv) the fire integrity of the boundary bulkheads and decks of such smaller rooms shall be as prescribed in Tables 6.1 and 6.2;
    - (v) the title of each category is intended to be typical rather than restrictive; and
    - (vi) the number in parentheses following each category refers to the applicable column or row in the Tables,

- (ba)** control stations (1):  
spaces containing emergency sources of power and lighting; wheelhouse and chartroom; spaces containing the ship's radio equipment; fire control stations; control room for propulsion machinery when located outside the machinery space; spaces containing centralised fire alarm equipment;
  - (bb)** corridors (2):  
passenger and crew corridors and lobbies;
  - (bc)** accommodation spaces (3):  
spaces as defined in Chapter 2 excluding corridors;
  - (bd)** stairways (4):  
interior stairways; lifts; totally enclosed emergency escape trunks and escalators (other than those wholly contained within the machinery spaces) and enclosures thereto (in this connection, a stairway which is enclosed only at one level shall be regarded as part of the space from which it is not separated by a fire door);
  - (be)** service spaces (low risk) (5):  
lockers and store-rooms not having provisions for the storage of flammable liquids and having areas less than 4m<sup>2</sup>, drying rooms and laundries and spaces containing marine evacuation systems;
  - (bf)** machinery spaces of Category A (6):  
spaces as defined in Chapter 2;
  - (bg)** other machinery spaces (7):  
electrical equipment rooms (auto-telephone exchange, air-conditioning duct spaces); spaces as defined in Chapter 2 excluding machinery spaces of category A;
  - (bh)** service spaces (high risk) (9):  
galleys; pantries containing cooking appliances; paint lockers; lockers and store-rooms having areas of 4m<sup>2</sup> or more; spaces for the storage of flammable liquids; saunas and workshops other than those forming part of the machinery spaces;
  - (bi)** open decks (10):  
open deck spaces and enclosed promenades having little or no fire risk; enclosed promenades shall have no significant fire risk, meaning that furnishing shall be restricted to deck furniture; in addition, such spaces shall be naturally ventilated by permanent openings; air spaces (the space outside superstructures and deckhouses); and
  - (bj)** garage spaces (11):  
spaces as defined in Chapter 2.
- (11) In determining the applicable fire integrity standard of a boundary between two spaces within a main vertical zone or horizontal zone which is not protected by an automatic sprinkler system complying with the provisions of the Fire Safety Systems Code or between such zones neither of which is so protected, the higher of the two values given in the tables shall apply.

- (12) In determining the applicable fire integrity standard of a boundary between two spaces within a main vertical zone or horizontal zone which is protected by an automatic sprinkler system complying with the provisions of the Fire Safety Systems Code or between such zones both of which are so protected, the lesser of the two values given in the tables shall apply and where a zone with sprinklers and a zone without sprinklers meet within accommodation and service spaces, the higher of the two values given in the tables shall apply to the division between the zones.
- (13) Continuous "B" class ceilings or linings, in association with the relevant decks or bulkheads, may be accepted as contributing, wholly or in part, to the required insulation and integrity of a division.
- (14) External boundaries which are required in Section 6.9(2) to be of steel or other equivalent material may be pierced for the fitting of windows and sidescuttles provided that there is no requirement for such boundaries to have "A" class integrity. Similarly, in such boundaries which are not required to have "A" class integrity, doors may be constructed of materials which are to the satisfaction of the Administration.

*Construction and Arrangement of Saunas*

- (15) The perimeter of the sauna shall be of "A" class boundaries and may include changing rooms, showers and toilets and the sauna shall be insulated to "A-60" standard against other spaces except those inside of the perimeter of the sauna and spaces of category (5), (7) and (10).
- (16) Bathrooms with direct access to saunas may be considered as part of them. In such cases, the door between sauna and the bathroom need not comply with fire safety requirements.
- (17) The traditional wooden lining on the bulkheads and ceiling are permitted in the sauna provided that-
  - (a) the ceiling above the oven shall be lined with a non-combustible plate with an air gap of at least 30 millimetres; and
  - (b) the distance from the hot surfaces to combustible materials shall be at least 500 millimetres or the combustible materials shall be protected (e.g., non-combustible plate with an air gap of at least 30 millimetres).
- (18) The traditional wooden benches are permitted to be used in the sauna.
- (19) The sauna door shall open outwards by pushing.
- (20) Electrically heated ovens shall be provided with a timer.

*Protection of Stairways and Lifts in Accommodation Area*

- (21) Stairways shall be within enclosures formed of "A" class divisions, with positive means of closure at all openings, except that-
  - (a) a stairway connecting only two decks need not be enclosed, provided the integrity of the deck is maintained by proper bulkheads or self-closing doors in one 'tween-deck space; when a stairway is closed in one 'tween-deck space, the stairway enclosure shall be protected in accordance with Table 6.2; and

- (b) Stairways may be fitted in the open in a public space, provided they lie wholly within the public space.
- (22) Lift trunks shall be so fitted as to prevent the passage of smoke and flame from one deck to another and shall be provided with means of closing so as to permit the control of draught and smoke.
- (23) Machinery for lifts located within stairway enclosures shall be arranged in a separate room, surrounded by steel boundaries, provided that small passages for lift cables are permitted.
- (24) Lifts which open into spaces other than corridors, public spaces, special category spaces, stairways and external areas shall not open into stairways included in the means of escape.
- (25) Non-load bearing partial bulkheads which separate adjacent cabin balconies shall be capable of being opened by the crew from each side for the purpose of fighting fires.

*Protection of Atriums:*

- (26) Atriums shall be within enclosures formed of "A" class divisions having a fire rating determined in accordance with Table 6.1.
- (27) Decks separating spaces within atriums shall have a fire rating determined in accordance with Table 6.2.

Table 6.1 - Fire Integrity of Bulkheads separating Adjacent Spaces

SPACES	SOLAS REF. No.		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)	(11)
	▼	▶										
Control stations	(1)		A-0 <sup>c</sup>	A-0	A-60	A-0	A-15	A-60	A-15	A-60	*	A-60
Corridors	(2)			C <sup>e</sup>	B-0 <sup>e</sup>	A-0 <sup>a</sup> B-0 <sup>e</sup>	B-0 <sup>e</sup>	A-60	A-0	A-15 A-0 <sup>d</sup>	*	A-30
Accommodation spaces	(3)				C <sup>e</sup>	A-0 <sup>a</sup> B-0 <sup>e</sup>	B-0 <sup>e</sup>	A-60	A-0	A-15 A-0 <sup>d</sup>	*	A-30 A-0 <sup>d</sup>
Stairways	(4)					A-0 <sup>a</sup> B-0 <sup>e</sup>	A-0 <sup>a</sup> B-0 <sup>e</sup>	A-60	A-0	A-15 A-0 <sup>d</sup>	*	A-30
Service spaces (low risk)	(5)						C <sup>e</sup>	A-60	A-0	A-0	*	A-0
Machinery spaces of Category A	(6)							*	A-0	A-60	*	A-60
Other machinery spaces	(7)								A-0 <sup>b</sup>	A-0	*	A-0
Service spaces (high risk)	(9)									A-0 <sup>b</sup>	*	A-30
Open decks	(10)										*	A-0
Garage spaces	(11)											A-30

Table 6.2 - Fire Integrity of Decks separating Adjacent Spaces

SPACES BELOW ▼	SPACES ABOVE ▶	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)	(11)
Control stations	(1)	A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0	*	A-60
Corridors	(2)	A-0	*	*	A-0	*	A-60	A-0	A-0	*	A-30
Accommodation spaces	(3)	A-60	A-0	*	A-0	*	A-60	A-0	A-0	*	A-30 A-0 <sup>d</sup>
Stairways	(4)	A-0	A-0	A-0	*	A-0	A-60	A-0	A-0	*	A-30
Service spaces (low risk)	(5)	A-15	A-0	A-0	A-0	*	A-60	A-0	A-0	*	A-0
Machinery spaces of Category A	(6)	A-60	A-60	A-60	A-60	A-60	*	A-60 <sup>f</sup>	A-60	*	A-60
Other machinery spaces	(7)	A-15	A-0	A-0	A-0	A-0	A-0	*	A-0	*	A-0
Service spaces (high risk)	(9)	A-60	A-30 A-0 <sup>d</sup>	A-30 A-0 <sup>d</sup>	A-30 A-0 <sup>d</sup>	A-0	A-60	A-0	A-0	*	A-30
Open decks	(10)	*	*	*	*	*	*	*	*	---	A-0
Garage spaces	(11)	A-60	A-30	A-30 A-0 <sup>d</sup>	A-30	A-0	A-60	A-0	A-30	A-0	A-30

**Notes: To be applied to both tables 6.1 and 6.2 as appropriate**

(For clarification as to which applies, see Sections (7) and (8) and Sections (21) and (24))

<sup>a</sup> For clarification as to which applies, see Sections 6.7(7) and (8) and 6.7(21) to (25)

<sup>b</sup> Where spaces are of the same numerical category and superscript "b" appears, a bulkhead or deck of the rating shown in the tables is only required when the adjacent spaces are for a different purpose (e.g., in category (9)). A galley next to a galley does not require a bulkhead, but a galley next to a paint room requires an "A-0" bulkhead.

<sup>c</sup> Bulkheads separating the wheelhouse and chartroom from each other may have a "B-0" rating. No fire rating is required for those partitions separating the navigation bridge and the safety centre when the latter is within the navigation bridge.

<sup>d</sup> See Sections (11) and (12).

<sup>e</sup> For the application of Section (3), "B-0" and "C", where appearing in Table 6.1, shall be read as "A-0".

<sup>f</sup> Fire insulation need not be fitted if the machinery space in category (7), in the opinion of the Administration, has little or no fire risk.

\* Where an asterisk appears in the Tables it indicates that-

- (a) the division is required to be of steel or other equivalent material, but is not required to be of "A" class; however, where a deck, except in a category (10) space, is penetrated for the passage of electric cables, pipes and vent ducts, such penetrations shall be made tight to prevent the passage of flame and smoke;
- (b) divisions between control stations (emergency generators) and open decks may have air intake openings without means for closure; unless a fixed gas fire-extinguishing system is fitted *in the control station*;
- (c) for the application of Section 6.7(3), in Table 6.2, "A" class divisions shall be read as "A-0", except for category (10); and
- (d) for windows and doors, Section 6.7(46) shall apply;

*Penetrations in Fire-Resisting Divisions and Prevention of Heat Transmission*

- (28) Where "A" class divisions are penetrated, such penetrations shall comply with the following provisions-
- (a) subject to the provisions of Section (36), the penetrations shall be tested in accordance with the Fire Test Procedures Code;
  - (b) in the case of ventilation ducts, Sections (56) and (68) shall apply;
  - (c) where a pipe penetration is made of steel or equivalent material having a thickness of 3 millimetres or greater and a length of not less than 900 millimetres (preferably 450 millimetres on each side of the division), and there are no openings, testing is not required but such penetrations shall be suitably insulated by extension of the insulation at the same level of the division being penetrated.
- (29) Where "B" class divisions are penetrated for the passage of electric cables, pipes, trunks, ducts, etc., or for the fitting of ventilation terminals, lighting fixtures and similar devices, such penetrations shall comply with the following provisions-
- (a) subject to the provisions of Section (69), arrangements shall be made to ensure that the fire resistance is not impaired;
  - (b) pipes other than steel or copper that shall be protected by either-
    - (i) a fire-tested penetration device suitable for the fire resistance of the division pierced and the type of pipe used; or
    - (ii) a steel sleeve, having a thickness of not less than 1.8 millimetres and a length of not less than 900 millimetres for pipe diameters of 150 millimetres or more and not less than 600 millimetres for pipe diameters of less than 150 millimetres (preferably equally divided to each side of the division). The pipe shall be connected to the ends of the sleeve by flanges or couplings; or the clearance between the sleeve and the pipe shall not exceed 2.5 millimetres; or any clearance between pipe and sleeve shall be made tight by means of non-combustible or other suitable material.
- (30) Uninsulated metallic pipes penetrating "A" or "B" class divisions shall be of materials having a melting temperature which exceeds 950°C for "A-0" and 850°C for "B-0" class divisions.
- (31) In approving structural fire protection details, the Administration shall have regard to the risk of heat transmission at intersections and terminal points of required thermal barriers. The insulation of a deck or bulkhead shall be carried past the penetration, intersection or terminal point for a distance of at least 450 millimetres in the case of steel and aluminium structures. If a space is divided with a deck or a bulkhead of "A" class standard having insulation of different values, the insulation with the higher value shall continue on the deck or bulkhead with the insulation of the lesser value for a distance of at least 450 millimetres.

*Protection of Openings in Fire-Resisting Divisions*

- (32) Openings shall be provided with permanently attached means of closing which shall be at least as effective for resisting fires as the divisions in which they are fitted.

- (33) The construction of doors and door frames in "A" class divisions, with the means of securing them when closed, shall comply with the following provisions-
- (a) the construction shall provide resistance to fire as well as to the passage of smoke and flame equivalent to that of the bulkheads in which the doors are situated, this being determined in accordance with the Fire Test Procedures Code;
  - (b) doors and door frames shall be constructed of steel or other equivalent material (for glass doors refer to 3.12(2(d)));
  - (c) steel watertight doors need not be insulated;
  - (d) doors approved without the sill being part of the frame, shall be installed such that the gap under the door does not exceed 12 millimetres;
  - (e) a non-combustible sill shall be installed under the door such that floor coverings do not extend beneath the closed door.
- (34) It shall be possible for each door to be opened and closed from each side of the bulkhead by one person only.
- (35) Fire doors in main vertical zone bulkheads, galley boundaries and stairway enclosures other than power-operated watertight doors and those which are normally locked shall satisfy the following requirements:
- (a) the doors shall be self-closing and be capable of closing with an angle of inclination of up to 3.5° opposing closure;
  - (b) the approximate time of closure for hinged fire doors shall be no more than 40 seconds and no less than 10 seconds from the beginning of their movement with the ship in upright position. The approximate uniform rate of closure for sliding doors shall be of no more than 0.2 m/s and no less than 0.1 m/s with the ship in upright position;
  - (c) the doors, except those for emergency escape trunks, shall be capable of remote release from the continuously manned central control station, either simultaneously or in groups, and shall be capable of release also individually from a position at both sides of the door. Release switches shall have an on-off function to prevent automatic resetting of the system;
  - (d) hold-back hooks not subject to central control station release are prohibited;
  - (e) a door closed remotely from the central control station shall be capable of being re-opened from both sides of the door by local control. After such local opening, the door shall automatically close again;
  - (f) indication shall be provided at the fire door indicator panel in the continuously manned central control station whether each door is closed;
  - (g) the release mechanism shall be so designed that the door shall automatically close in the event of disruption of the control system or central power supply;
  - (h) local power accumulators for power-operated doors shall be provided in the immediate vicinity of the doors to enable the doors to be operated at least ten times (fully opened and closed) after disruption of the control system or central power supply using the local controls;
  - (i) disruption of the control system or central power supply at one door shall not impair the safe functioning of the other doors;

- (j) remote-released sliding or power-operated doors shall be equipped with an alarm that sounds at least 5 seconds but no more than 10 seconds, after the door is released from the central control station and before the door begins to move and continues sounding until the door is completely closed;
  - (k) a door designed to re-open upon contacting an object in its path shall re-open not more than 1 metre from the point of contact;
  - (l) double-leaf doors equipped with a latch necessary for their fire integrity shall have a latch that is automatically activated by the operation of the doors when released by the system;
  - (m) the components of the local control system shall be accessible for maintenance and adjusting;
  - (n) power-operated doors shall be provided with a control system of an approved type which shall be able to operate in case of fire and be in accordance with the Fire Test Procedures Code. This system shall satisfy the following requirements-
    - (i) the control system shall be able to operate the door at the temperature of at least 200°C for at least 60 min, served by the power supply;
    - (ii) the power for all other doors not subject to fire shall not be impaired; and
    - (iii) at temperatures exceeding 200°C, the control system shall be automatically isolated from the power supply and shall be capable of keeping the door closed up to at least 945°C.
- (36) Where a space is protected by an automatic sprinkler fire detection and fire alarm system complying with the provisions of the Fire Safety Systems Code or fitted with a continuous "B" class ceiling, openings in decks not forming steps in main vertical zones nor bounding horizontal zones shall be closed reasonably tight and such decks shall meet the "A" class integrity requirements in so far as is reasonable and practicable in the opinion of the Administration.
- (37) The requirements for "A" class integrity of the outer boundaries of a ship shall not apply to-
- (a) glass partitions, windows and sidescuttles, provided that there is no requirement for such boundaries to have "A" class integrity in Section (46);
  - (b) exterior doors, except for those in superstructures and deckhouses facing life-saving appliances, embarkation and external assembly station areas, external stairs and open decks used for escape routes; and
  - (c) *stairway enclosure doors, glass doors and windows*
- (38) Except for watertight doors, weathertight doors, semi-watertight doors, doors leading to the open deck and doors which need to be reasonably gastight, all "A" class doors located in stairways, public spaces and main vertical zone bulkheads in escape routes shall be equipped with a self-closing hose port, the material, construction and fire resistance of which shall be equivalent to the door into which it is fitted, and the port shall be a 150 millimetres square clear opening with the door closed and shall be inset into the lower edge of the door, opposite the door hinges or, in the case of sliding doors, nearest the opening.
- (39) Ventilation ducts passing through main vertical zone divisions shall be kept to a minimum and where it is necessary that a such a duct passes through a main vertical zone division, a

fail-safe automatic closing fire damper shall be fitted adjacent to the division complying with the following provisions-

- (a) the damper shall be capable of being manually closed from each side of the division;
- (b) the operating position of the damper shall be readily accessible and be marked in red light-reflecting colour;
- (c) the duct between the division and the damper shall be of steel or other equivalent material and, if necessary, insulated to comply with the requirements of Section (28); and
- (d) the damper shall be fitted on at least one side of the division with a visible indicator showing whether the damper is in the open position.

*Openings in "B" Class Divisions*

- (40) Doors and door frames in "B" class divisions and means of securing them shall provide a method of closure which shall have resistance to fire equivalent to that of the divisions, this being determined in accordance with the Fire Test Procedures Code provided that that ventilation openings may be permitted in the lower portion of such doors as follows-
  - (a) where such opening is in or under a door the total net area of any such opening or openings shall not exceed 0.05 m<sup>2</sup>;
  - (b) alternatively, a non-combustible air balance duct routed between the cabin and the corridor, and located below the sanitary unit, is permitted where the cross-sectional area of the duct does not exceed 0.05m<sup>2</sup>;
  - (c) all ventilation openings shall be fitted with a grill made of non-combustible material;
  - (d) doors shall be non-combustible; and
  - (e) doors approved without the sill being part of the frame, shall be installed such that the gap under the door does not exceed 25 millimetres.
- (41) Cabin doors in "B" class divisions shall be of a self-closing type. Hold-back hooks are not permitted. *Other "B" Class doors may have holdbacks that are released remotely at the bridge and in the event of main power failure. Such doors with holdbacks shall have indication provided at the fire door indicator panel in the continuously manned central control station showing whether each door is closed.*
- (42) The requirements for "B" class integrity of the outer boundaries of a ship shall not apply to glass partitions, windows and sidescuttles. Similarly, the requirements for "B" class integrity shall not apply to exterior doors in superstructures and deckhouses. The Administration may permit the use of combustible materials in doors separating cabins from the individual interior sanitary spaces such as showers.
- (43) The following provisions apply to openings in "B" Class Divisions-
  - (a) openings in decks not forming steps in main vertical zones nor bounding horizontal zones shall be closed reasonably tight and such decks shall meet the "B" class integrity requirements in so far as is reasonable and practicable in the opinion of the Administration; and

- (b) openings in corridor bulkheads of "B" class materials shall be protected in accordance with the provisions of Sections (8) and (9).

*Windows, Sidescuttles Weathertight and Watertight Doors*

- (44) Windows and sidescuttles in bulkheads within accommodation and service spaces and control stations other than those to which the provisions of Sections (35) and (40) apply shall be so constructed as to preserve the integrity requirements of the type of bulkheads in which they are fitted, this being determined in accordance with the Fire Test Procedures Code.
- (45) "A" class windows and sidescuttles in bulkheads separating accommodation and service spaces and control stations from weather shall be constructed with frames of steel or other suitable material and the glass shall be mechanically retained.
- (46) windows and doors (except those leading from stairways), facing survival craft and escape slide, embarkation areas and windows situated below such areas shall have fire integrity at least equal to "A-0" class.
- (47) *Steel sliding watertight doors need not be insulated.*

*Protection of Openings in Machinery Spaces Boundaries*

- (48) The provision of Sections (49) to (54) shall apply to machinery spaces of category A and, where the Administration considers it desirable, to other machinery spaces.
- (49) The number of skylights, doors, ventilators, openings in funnels to permit exhaust ventilation and other openings to machinery spaces shall be reduced to a minimum consistent with the needs of ventilation and the proper and safe working of the ship.
- (50) Skylights shall be of steel and shall not contain glass panels.
- (51) Means of control shall be provided for closing power-operated doors or actuating release mechanisms on doors other than power-operated watertight doors and such controls shall be located outside the space served so that they shall not be cut off in the event of fire in that place.
- (52) The means of control required in Section (51) shall be situated at one control position or grouped in as few positions as possible to the satisfaction of the Administration and such positions shall have safe access from the open deck.
- (53) Doors, other than power-operated watertight doors, shall be so arranged that positive closure is assured in case of fire in the space by power-operated closing arrangements or by the provision of self-closing doors capable of closing against an inclination of 3.5° opposing closure, and having a fail-safe hold-back arrangement; provided with a remotely operated release device; provided that doors for emergency escape trunks need not be fitted with a fail-safe hold-back facility and a remotely operated release device.
- (54) Windows shall not be fitted in machinery space boundaries. However, this does not preclude the use of glass in control rooms within the machinery spaces.

Ventilation Systems

- (55) Ventilation ducts, including single and double wall ducts, shall be of steel or equivalent material except flexible bellows of short length not exceeding 600 millimetres used for connecting fans to the ducting in air-conditioning rooms. Unless expressly provided otherwise in Section (60), any other material used in the construction of ducts, including insulation, shall also be non-combustible. However, short ducts, not generally exceeding 2 metres in length and with a free cross-sectional area<sup>27</sup> not exceeding 0.02 m<sup>2</sup>, need not be of steel or equivalent material, subject to the following conditions:
- (a) the ducts shall be made of non-combustible material, which may be faced internally and externally with membranes having low flame-spread characteristics and, in each case, a calorific value<sup>28</sup> not exceeding 45 MJ/m<sup>2</sup> of their surface area for the thickness used;
  - (b) the ducts are only used at the end of the ventilation device; and
  - (c) the ducts are not situated less than 600 millimetres, measured along the duct, from an opening in an "A" or "B" class division, including continuous "B" class ceiling.
- (56) The following arrangements shall be tested in accordance with the Fire Test Procedures Code-
- (a) fire dampers, including their relevant means of operation; and
  - (b) duct penetrations through "A" class divisions. However, the test is not required where steel sleeves are directly joined to ventilation ducts by means of riveted or screwed flanges or by welding.
- (57) Fire dampers shall be easily accessible. Where they are placed behind ceilings or linings, these ceilings or linings shall be provided with an inspection hatch on which the identification number of the fire damper is marked. The fire damper identification number shall also be marked on any remote controls provided.
- (58) Ventilation ducts shall be provided with hatches for inspection and cleaning. The hatches shall be located near the fire dampers.
- (59) The main inlets and outlets of ventilation systems shall be capable of being closed from outside the spaces being ventilated. The means of closing shall be easily accessible as well as prominently and permanently marked and shall indicate the operating position of the closing device.
- (60) Combustible gaskets in flanged ventilation duct connections are not permitted within 600 millimetres of openings in "A" or "B" class divisions and in ducts required to be of "A" class construction.
- (61) Ventilation openings or air balance ducts between two enclosed spaces shall not be provided except as permitted by Section (40).

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<sup>27</sup> The term *free cross-sectional area* means, even in the case of a pre-insulated duct, the area calculated on the basis of the inner dimensions of the duct itself and not the insulation.

<sup>28</sup> Refer to the recommendations published by the International Organization for Standardization, in particular publication ISO 1716:2002, Reaction to the fire tests for building products – Determination of the heat of combustion.

- (62) The ventilation systems for machinery spaces of category A, *garage* spaces and galleys shall, in general, be separated from each other and from the ventilation systems serving other spaces. However, the galley ventilation systems need not be completely separated from other ventilation systems, but may be served by separate ducts from a ventilation unit serving other spaces. In such a case, an automatic fire damper shall be fitted in the galley ventilation duct near the ventilation unit.
- (63) Ducts provided for the ventilation of machinery spaces of category A, galleys and *garage* spaces shall not pass through accommodation spaces, service spaces, or control stations unless they comply with Section (65).
- (64) Ducts provided for the ventilation of accommodation spaces, service spaces or control stations shall not pass through machinery spaces of category A, galleys and *garage* spaces, unless they comply with Section (65).
- (65) As permitted by Sections (63) and (64) ducts shall be either:
- (a) constructed of steel having a thickness of at least 3 millimetres for ducts with a free cross-sectional area of less than 0.075 m<sup>2</sup>, at least 4 millimetres for ducts with a free cross-sectional area of between 0.075 m<sup>2</sup> and 0.45 m<sup>2</sup>, and at least 5 millimetres for ducts with a free cross-sectional area of over 0.45 m<sup>2</sup>;
  - (b) suitably supported and stiffened;
  - (c) fitted with automatic fire dampers close to the boundaries penetrated; and
  - (d) insulated to "A-60" class standard from the boundaries of the spaces they serve to a point at least 5 m beyond each fire damper;
- or
- (e) constructed of steel in accordance with Sections (a) and (b); and
  - (f) insulated to "A-60" class standard throughout the spaces they pass through, except for ducts that pass through the following spaces;
    - (i) Sanitary and similar spaces such as;
      - (ba) communal sanitary facilities, showers, baths, water closets, etc.
      - (bb) small laundry rooms.
      - (bc) indoor swimming pool area.
      - (bd) isolated pantries containing no cooking appliances in accommodation spaces.
      - (be) private sanitary facilities shall be considered a portion of the space in which they are located.
    - (ii) Tanks, voids and auxiliary machinery spaces having little or no fire risk such as;
      - (ba) water tanks forming part of the ship's structure.
      - (bb) voids and cofferdams.

- (bc) auxiliary machinery space which do not contain machinery having a pressure lubrication system and where storage of combustibles is prohibited, such as:
  - (bd) ventilation and air-conditioning rooms;
  - (be) windlass room;
  - (bf) steering gear room;
  - (bg) stabilizer equipment room;
  - (bh) electrical propulsion motor room;
  - (bi) rooms containing section switchboards and purely electrical equipment other than oil-filled electrical transformers (above 10 kVA);
  - (bj) shaft alleys and pipe tunnels;
  - (bk) spaces for pumps and refrigeration machinery (not handling or using flammable liquids).
  - (bl) closed trunks serving the spaces listed above.
  - (bm) other closed trunks such as pipe and cable trunks.
  
- (66) For the purposes of Sections (65)(d) and (65)(f), ducts shall be insulated over their entire cross-sectional external surface. Ducts that are outside but adjacent to the specified space, and share one or more surfaces with it, shall be considered to pass through the specified space, and shall be insulated over the surface they share with the space for a distance of 450 millimetres past the duct<sup>29</sup>.
  
- (67) Where it is necessary that a ventilation duct passes through a main vertical zone division, an automatic fire damper shall be fitted adjacent to the division. The damper shall also be capable of being manually closed from each side of the division. The control location shall be readily accessible and be clearly and prominently marked. The duct between the division and the damper shall be constructed of steel in accordance with Sections (65)(a) and (65)(b) and insulated to at least the same fire integrity as the division penetrated. The damper shall be fitted on at least one side of the division with a visible indicator showing the operating position of the damper.
  
- (68) Ducts passing through "A" class divisions shall meet the following requirements:
  - (b) where a thin plated duct with a free cross sectional area equal to, or less than, 0.02 m<sup>2</sup> passes through "A" class divisions, the opening shall be fitted with a steel sheet sleeve having a thickness of at least 3 millimetres and a length of at least 200 millimetres, divided preferably into 100 millimetres on each side of a bulkhead or, in the case of a deck, wholly laid on the lower side of the decks penetrated;
  - (c) where ventilation ducts with a free cross-sectional area exceeding 0.02 m<sup>2</sup>, but not more than 0.075 m<sup>2</sup>, pass through "A" class divisions, the openings shall be lined with steel sheet sleeves. The ducts and sleeves shall have a thickness of at least 3 millimetres and a length of at least 900 millimetres. When passing through bulkheads, this length shall be divided preferably into 450 millimetres on each side of the bulkhead. These ducts, or sleeves lining such ducts, shall be provided

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<sup>29</sup> Sketches of such arrangements are contained in the Unified Interpretations of SOLAS chapter II-2 (MSC.1/Circ.1276).

with fire insulation. The insulation shall have at least the same fire integrity as the division through which the duct passes; and

- (d) automatic fire dampers shall be fitted in all ducts with a free cross-sectional area exceeding 0.075 m<sup>2</sup> that pass through "A" class divisions. Each damper shall be fitted close to the division penetrated and the duct between the damper and the division penetrated shall be constructed of steel in accordance with Sections (65)(a) and (65)(b). The fire damper shall operate automatically, but shall also be capable of being closed manually from both sides of the division. The damper shall be fitted with a visible indicator which shows the operating position of the damper. Fire dampers are not required, however, where ducts pass through spaces surrounded by "A" class divisions, without serving those spaces, provided those ducts have the same fire integrity as the divisions which they penetrate. A duct of cross-sectional area exceeding 0.075 m<sup>2</sup> shall not be divided into smaller ducts at the penetration of an "A" class division and then recombined into the original duct once through the division to avoid installing the damper required by this provision.
- (69) Ventilation ducts with a free cross-sectional area exceeding 0.02 m<sup>2</sup> passing through "B" class bulkheads shall be lined with steel sheet sleeves of 900 millimetres in length, divided preferably into 450 millimetres on each side of the bulkheads unless the duct is of steel for this length.
- (70) All fire dampers shall be capable of manual operation. The dampers shall have a direct mechanical means of release or, alternatively, be closed by electrical, hydraulic, or pneumatic operation. All dampers shall be manually operable from both sides of the division. Automatic fire dampers, including those capable of remote operation, shall have a failsafe mechanism that shall close the damper in a fire even upon loss of electrical power or hydraulic or pneumatic pressure loss. Remotely operated fire dampers shall be capable of being reopened manually at the damper.
- (71) When passing through accommodation spaces or spaces containing combustible materials, the exhaust ducts from galley ranges shall be constructed in accordance with Sections (65)(a) and (65)(b). Each exhaust duct shall be fitted with:
- (a) a grease trap readily removable for cleaning;
  - (b) an automatically and remotely operated fire damper located in the lower end of the duct at the junction between the duct and the galley range hood and, in addition, a remotely operated fire damper in the upper end of the duct close to the outlet of the duct;
  - (c) arrangements, operable from within the galley, for shutting off the exhaust and supply fans; and
  - (d) fixed means for extinguishing a fire within the duct<sup>30</sup>.
- (72) Exhaust ducts from laundries shall be fitted with:

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<sup>30</sup> Refer to the recommendations published by the International Organization for Standardization, in particular publication ISO 15371:2009, Ships and marine technology – Fire-extinguishing systems for protection of galley cooking equipment.

- (a) filters readily removable for cleaning purposes;
- (b) a fire damper located in the lower end of the duct which is automatically and remotely operated;
- (c) remote-control arrangements for shutting off the exhaust fans and supply fans from within the space and for operating the fire damper mentioned in (b); and
- (d) suitably located hatches for inspection and cleaning.

*Construction and Arrangement of Steam Room*

- (73) Construction and Arrangement of Steam Rooms shall meet the following requirements:
- (a) The perimeter of the steam room may include changing rooms, showers and toilets.
  - (b) Bathrooms with direct access to suite may be considered as part of it. In such cases, the door between suite and the bathroom need not comply with fire safety requirements.
  - (c) If a steam generator of more than 5 kW is contained within the perimeter, the suite boundary shall be constructed to an A-0 standard. If a steam generator of more than 5 kW is not contained within the perimeter the steam generator shall be protected by A-0 standard divisions, and pipes leading to the discharge nozzles shall be lagged.
  - (d) All spaces within the perimeter shall be protected by a fire detection and alarm system.

*Construction and Arrangement of Cinemas and Projector Rooms*

- (74) Construction and arrangement of cinemas and projector rooms shall meet the following requirements:
- (a) have their category of space agreed with the Administration given the varied technical options for these spaces;
  - (b) in deciding the category of space, consideration shall be given to the generation of heat and the grouping of large quantities of electrical items;
  - (c) the perimeter of the cinema or projector rooms may include reception areas and toilets;

**6.8 Fire Fighting**

*Purpose*

- (1) The purpose of this paragraph is to suppress and swiftly extinguish a fire in the space of origin by meeting the following functional requirements-

- (a) fixed fire-extinguishing systems shall be installed, having due regard to the fire growth potential of the protected spaces; and
- (b) fire-extinguishing appliances shall be readily available.

*Water Supply Systems*

- (2) Ships shall be provided with fire pumps, fire mains, hydrants and hoses complying with the applicable requirements of this paragraph.
- (3) Fire mains and hydrants shall comply with the following provisions-
  - (a) materials readily rendered ineffective by heat shall not be used for fire mains and hydrants unless adequately protected;
  - (b) the fire main pipes and hydrants shall be so placed that the fire hoses may be easily coupled to them;
  - (c) the arrangement of pipes and hydrants shall be such as to avoid the possibility of freezing;
  - (d) suitable drainage provisions shall be provided for fire main piping; and
  - (e) isolation valves shall be installed for all open deck fire main branches used for purposes other than fire fighting.
- (4) The arrangements for the ready availability of water supply shall be-
  - (a) ships of 1,000GT and above such that at least one effective jet of water is immediately available from any hydrant in an interior location and so as to ensure the continuation of the output of water by the automatic starting of one required fire pump;
  - (b) ships of less than 1,000GT by automatic start of at least one fire pump or by remote starting from the navigation bridge of at least one fire pump. If the pump starts automatically or if the bottom valve cannot be opened from where the pump is remotely started, the bottom valve shall always be kept open; and
  - (c) if fitted with periodically unattended machinery space the Administration shall determine provisions for fixed water fire-extinguishing arrangements for such spaces equivalent to those required for normally attended machinery spaces.
- (5) The diameter of the fire main and water service pipes shall be sufficient for the effective distribution of the maximum required discharge from two fire pumps operating simultaneously.
- (6) Isolating valves, emergency fire pumps and their associated arrangements shall comply with the following provisions-
  - (a) isolating valves which separate the section of the fire main within the machinery space containing the main fire pump or pumps from the rest of the fire main shall be fitted in an easily accessible and tenable position outside the machinery spaces;
  - (b) the fire main shall be so arranged that when the isolating valves are shut all the hydrants on the ship, except those in the machinery space referred to above, can be supplied with water by another fire pump or an emergency fire pump;
  - (c) subject to Section (d), the emergency fire pump, its seawater inlet, and suction and delivery pipes and isolating valves shall be located outside the machinery space;

- (d) if the arrangement referred to in Section (c) cannot be complied with, the sea-chest may be fitted in the machinery space if the valve is remotely controlled from a position in the same compartment as the emergency fire pump and the suction pipe is as short as practicable; and
- (e) short lengths of suction or discharge piping may penetrate the machinery space, provided such pipes-
  - (i) are enclosed in a substantial steel casing or are insulated to "A-60" class standards;
  - (ii) have substantial wall thickness, but in no case less than 11 millimetres; and
  - (iii) shall be welded except for the flanged connection to the sea inlet valve.
- (7) A valve shall be fitted to serve each fire hydrant so that any fire hose may be removed while the fire pumps are in operation.
- (8) Relief valves shall be provided in conjunction with fire pumps if the pumps are capable of developing a pressure exceeding the design pressure of the water service pipes, hydrants and hoses. These valves shall be so placed and adjusted as to prevent excessive pressure in any part of the fire main system.
- (9) The number and position of hydrants shall be such that at least two jets of water not emanating from the same hydrant, one of which shall be from a single length of hose, may reach any part of the ship normally accessible, when the ship is being navigated, to the passengers or crew.
- (10) In addition to the requirements in Section (9), ships shall comply with the following-
  - (a) in the accommodation, service and machinery spaces, the number and position of hydrants shall be such that the requirements of Section (9) may be complied with when all watertight doors and all doors in main vertical zone bulkheads are closed; and
  - (b) where access is provided to a machinery space of category A at a low level from an adjacent shaft tunnel, two hydrants shall be provided external to, but near the entrance to, that machinery space. Where such access is provided from other spaces, in one of those spaces two hydrants shall be provided near the entrance to the machinery space of category A. Such provision need not be made where the tunnel or adjacent spaces are not part of the escape route.
- (11) With the two pumps simultaneously delivering water through the nozzles specified in Section (22), with the quantity of water as specified in Section (5), through any adjacent hydrants, the following minimum pressures shall be maintained at all hydrants-

Gross Tonnage	Minimum Pressure
4000 and upwards	0.40 N/mm <sup>2</sup>
Less than 4000	0.30 N/mm <sup>2</sup>

provided that the maximum pressure at any hydrant shall not exceed that at which the effective control of a fire hose can be demonstrated.

- (12) Ships of 500GT and above shall be provided with at least one international shore connection complying with the Fire Safety Systems Code.

(13) Facilities shall be available enabling such a connection to be used on either side of the ship.

(14) *Sanitary, ballast, bilge or general service pumps may be accepted as fire pumps, provided that they are not normally used for pumping oil.*

(15) Ships shall be provided with independently driven fire pumps as follows:

Gross Tonnage	No. of Pumps
4000 and upwards	At least three
Less than 4000	At least two

(16) The arrangement of sea connections, fire pumps and their sources of power shall be as to ensure that:

- (a) in ships of 1,000GT and above, in the event of a fire in any one compartment, all the fire pumps shall not be put out of action; and
- (b) in ships of less than 1,000GT and above, if a fire in any one compartment could put all the pumps out of action, there shall be an alternative means consisting of an emergency fire pump complying with the provisions of the Fire Safety Systems Code with its source of power and sea connection located outside the space where the main fire pumps or their sources of power are located.

(17) The space containing the emergency fire pump shall not be contiguous to the boundaries of machinery spaces of category A or those spaces containing main fire pumps; provided that where this is not practicable, the common bulkhead between the two spaces shall be insulated to a standard of structural fire protection equivalent to that required for a control station.

(18) No direct access shall be permitted between the machinery space and the space containing the emergency fire pump and its source of power, provided that-

- (a) when this is impracticable, the Administration may accept an arrangement where the access is by means of an airlock with the door of the machinery space being of "A-60" class standard and the other door being at least steel, both reasonably gastight, self-closing and without any hold-back arrangements;
- (b) alternatively, the access may be through a watertight door capable of being operated from a space remote from the machinery space and the space containing the emergency fire pump and unlikely to be cut off in the event of fire in those spaces; and
- (c) a second means of access to the space containing the emergency fire pump and its source of power shall be provided.

(19) Ventilation arrangements to the space containing the independent source of power for the emergency fire pump shall be such as to preclude, as far as practicable, the possibility of smoke from a machinery space fire entering or being drawn into that space.

(20) The required fire pumps shall be capable of delivering for fire-fighting purposes a quantity of water not less than two thirds of the quantity required to be dealt with by the bilge pumps when employed for bilge pumping at the pressure specified in Section (11).

(21) Each of the required fire pumps shall-

- (a) have a capacity not less than 80% of the total required capacity divided by the minimum number of required fire pumps, but in any case not less than 25 m<sup>3</sup>/h and each such pump shall in any event be capable of delivering at least the two required jets of water;
  - (b) be capable of supplying the fire main system under the required conditions,  
and where more pumps than the minimum of required pumps are installed, such additional pumps shall have a capacity of at least 25m<sup>3</sup>/h and shall be capable of delivering at least the two jets of water required in Section (9).
- (22) Fire hoses shall-
- (a) be of non-perishable material approved by the Administration;
  - (b) be sufficient in length to project a jet of water to any of the spaces in which they may be required to be used;
  - (c) each be provided with a nozzle and the necessary couplings;
  - (d) where specified in this Chapter as "fire hoses", be kept ready for use in conspicuous positions near the water service hydrants or connections, together with any necessary fittings and tools; and
  - (e) have a length of at least 10 metres, but not more than-
    - (i) 15 metres in machinery spaces; and
    - (ii) 20 metres in other spaces and open decks.
- (23) Unless one hose and nozzle is provided for each hydrant in the ship, there shall be complete interchangeability of hose couplings and nozzles.
- (24) Ships shall be provided with fire pumps, fire mains, hydrants and hoses complying with the applicable requirements of this section.
- (25) There shall be at least one fire hose for each of the hydrants required by Sections (9) and (10) and these hoses shall be used only for the purposes of extinguishing fires or testing the fire-extinguishing apparatus at fire drills and surveys.
- (26) Standard nozzle sizes shall be 12 millimetres, 16 millimetres and 19 millimetres or as near thereto as possible provided that larger diameter nozzles may be permitted at the discretion of the Administration.
- (27) For accommodation and service spaces, a nozzle size greater than 12 millimetres need not be used.
- (28) For machinery spaces and exterior locations, the nozzle size shall be such as to obtain the maximum discharge possible from two jets at the pressure prescribed in Section (11) from the smallest pump, provided that a nozzle size greater than 19 millimetres need not be used.
- (29) Nozzles shall be of an approved dual-purpose type (i.e. spray/jet type) incorporating a shutoff.

*Portable fire extinguishers*

- (30) Portable fire extinguishers shall comply with the requirements of the Fire Safety Systems Code.
- (31) Accommodation spaces, service spaces and control stations shall be provided with portable fire extinguishers of appropriate types and in sufficient number to the satisfaction of the Administration; ships of 1,000GT and above shall carry at least five portable fire extinguishers.
- (32) One of the portable fire extinguishers intended for use in any space shall be stowed near the entrance to that space.
- (33) Carbon dioxide fire extinguishers shall not be placed in accommodation spaces. In control stations and other spaces containing electrical or electronic equipment or appliances necessary for the safety of the ship, fire extinguishers shall be provided whose extinguishing media are neither electrically conductive nor harmful to the equipment and appliances.
- (34) Fire extinguishers shall be situated ready for use at easily visible places, which can be reached quickly and easily at any time in the event of a fire, and in such a way that their serviceability is not impaired by the weather, vibration or other external factors and portable fire extinguishers shall be provided with devices which indicate whether they have been used.
- (35) Spare charges shall be provided for 100% of the first ten extinguishers and 50% of the remaining fire extinguishers capable of being recharged onboard provided that not more than sixty total spare charges are required; instructions for recharging shall be carried onboard.
- (36) For fire extinguishers which cannot be recharged onboard, additional portable fire extinguishers of the same quantity, type, capacity and number as determined in Section (35) above shall be provided in lieu of spare charges.

*Fixed fire-extinguishing systems*

- (37) A fixed fire-extinguishing system required by Section (44) below may be any of the following systems-
  - (a) a fixed gas fire-extinguishing system complying with the provisions of the Fire Safety Systems Code;
  - (b) a fixed high-expansion foam fire-extinguishing system complying with the provisions of the Fire Safety Systems Code; and
  - (c) a fixed pressure water-spraying fire-extinguishing system complying with the provisions of the Fire Safety Systems Code.
- (38) Where a fixed fire-extinguishing system not required by this Chapter is installed, it shall meet the requirements of the relevant requirements of this Chapter and the Fire Safety Systems Code.
- (39) Fire-extinguishing systems using Halon 1211, 1301, and 2402 and perfluorocarbons shall be prohibited.

- (40) In general, the Administration shall not permit the use of steam as a fire-extinguishing medium in fixed fire-extinguishing systems.
- (41) Where a fixed gas fire-extinguishing system is used, openings which may admit air to, or allow gas to escape from, a protected space shall be capable of being closed from outside the protected space.
- (42) When the fire-extinguishing medium is stored outside a protected space the storage shall comply with the following provisions<sup>31</sup>-
- (a) the medium shall be stored in a room which is located behind the forward collision bulkhead, and is used for no other purposes;
  - (b) any entrance to such a storage room shall preferably be from the open deck and shall be independent of the protected space;
  - (c) where the storage space is located below deck, it shall be located no more than one deck below the open deck and shall be directly accessible by a stairway or ladder from the open deck;
  - (d) spaces which are located below deck or spaces where access from the open deck is not provided shall be fitted with a mechanical ventilation system designed to take exhaust air from the bottom of the space and shall be sized to provide at least 6 air changes per hour;
  - (e) access doors shall open outwards, and bulkheads and decks, including doors and other means of closing any opening therein, which form the boundaries between such rooms and adjacent enclosed spaces shall be gastight; and
  - (f) for the purpose of the application of tables 6.1 and 6.2, such storage rooms shall be treated as control stations.
- (43) Pumps, other than those serving the fire main, required for the provision of water for fire-extinguishing systems required by this Chapter, their sources of power and their controls shall be installed outside the space or spaces protected by such systems and shall be so arranged that a fire in the space or spaces protected shall not put any such system out of action.

*Fire-Extinguishing Arrangements in Machinery Spaces*

- (44) Machinery spaces of category A shall be provided with any one of the fixed fire-extinguishing systems in Section (37) and in each case, if the engine-room and boiler room are not entirely separate, or if fuel oil can drain from the boiler room into the engine-room, the combined engine and boiler rooms shall be considered as one compartment.
- (45) There shall be provided in each Machinery space of category A-
- (a) at least one portable foam applicator unit complying with the provisions of the Fire Safety Systems Code;
  - (b) approved fire extinguishers, each of at least 45 litre capacity or equivalent, sufficient in number to enable foam or its equivalent to be directed onto any part of the fuel and lubricating oil pressure systems, gearing and other fire hazards;
  - (c) in addition, there shall be provided a sufficient number of portable foam extinguishers or equivalent which shall be so located that no point in the space is

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<sup>31</sup> See also interpretation of SOLAS II-2 Regulation 10.4.3 in MSC/Circ.1120

more than 10 metres walking distance from an extinguisher provided that there are at least two such extinguishers in each space.

- (46) Where, in the opinion of the Administration, a fire hazard exists in any machinery space for which no specific provisions for fire-extinguishing appliances are prescribed there shall be provided in, or adjacent to, that space such a number of approved portable fire extinguishers or other means of fire extinction as the Administration may deem sufficient.
- (47) Subject to Section (48), machinery spaces of category A of any size<sup>32</sup> shall, in addition to the fixed fire-extinguishing system required in Section (44), be protected by an approved type of fixed water-based or equivalent local application fire-extinguishing system, based on the guidelines developed by the IMO<sup>33</sup> and in the case of periodically unattended machinery spaces, the fire-extinguishing system shall have both automatic and manual release capabilities; in the case of continuously manned machinery spaces, the fire-extinguishing system is only required to have a manual release capability.
- (48) *The Administration may dispense with the requirement for a local application fire-extinguishing system as required in Section (47) in machinery spaces of category A of less than 500m<sup>3</sup> volume, taking due cognizance of the type of machinery installed in such space.*
- (49) Fixed local application fire-extinguishing systems are to protect areas such as the following without the necessity of engine shutdown, personnel evacuation, or sealing of the spaces:
- (a) the fire hazard portions of internal combustion machinery;
  - (b) boiler fronts;
  - (c) the fire hazard portions of incinerators; and
  - (d) purifiers for heated fuel oil.
- (50) Activation of any local application system shall comply with the following provisions-
- (a) activation shall give a visual and distinct audible alarm in the protected space and at continuously manned stations;
  - (b) the alarm shall indicate the specific system activated; and
  - (c) the system alarm requirements described within this Section are in addition to, and not a substitute for, the detection and fire alarm system required elsewhere in this Chapter.

*Fire-Extinguishing Arrangements in Control Stations, Accommodation and Service Spaces*

- (51) *An automatic sprinkler or water spray system shall be installed as required by section 6.5(10).*
- (52) *A fixed pressure water-spraying fire-extinguishing system complying with the provisions of the Fire Safety Systems Code shall be installed on cabin balconies of ships to which 6.3(18) applies; where furniture and furnishings on such balconies are not as defined in Section 6.7(1)(d)(i), (ii), (iii), (vi) and (vii): provided that this section need not apply where it is possible to readily direct a jet of water, for firefighting purposes, on to such a balcony*

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<sup>32</sup> Under SOLAS, this provision applies only to machinery spaces of Category A above 500m<sup>2</sup> in volume.

<sup>33</sup> Refer to the Guidelines for the approval of fixed water-based local application fire fighting systems for use in Category A machinery spaces (MSC/Circ.913).

*from the deck immediately above or adjacent and where such balcony is not adjacent to life saving appliances.*

- (53) *Paint lockers shall be protected by either-*
- (a) a carbon dioxide system, designed to give a minimum volume of free gas equal to 40% of the gross volume of the protected space;
  - (b) a dry powder system, designed for at least 0.5 kg powder/m<sup>3</sup>;
  - (c) a water spraying or sprinkler system, designed for 5 l/m<sup>2</sup> min. Water spraying systems may be connected to the fire main of the ship; or
  - (d) a system providing equivalent protection, as determined by the Administration.
- and in all cases, the system shall be operable from outside the protected space.
- (54) Flammable liquid lockers shall be protected by an appropriate fire-extinguishing arrangement approved by the Administration.
- (55) For lockers of a deck area of less than 4m<sup>2</sup>, which do not give access to accommodation spaces, a portable carbon dioxide fire extinguisher sized to provide a minimum volume of free gas equal to 40% of the gross volume of the space may be accepted in lieu of a fixed system provided that-
- (a) a discharge port shall be arranged in the locker to allow the discharge of the extinguisher without having to enter into the protected space;
  - (b) the required portable fire extinguisher shall be stowed adjacent to the port; and
  - (c) alternatively, a port or hose connection may be provided to facilitate the use of fire main water.
- (56) Deep-fat cooking equipment installed in enclosed spaces or on open decks shall be fitted with the following-
- (a) an automatic or manual fire-extinguishing system tested to an international standard acceptable to the IMO<sup>34</sup>;
  - (b) a primary and backup thermostat with an alarm to alert the operator in the event of failure of either thermostat;
  - (c) arrangements for automatically shutting off the electrical power upon activation of the fire-extinguishing system;
  - (d) an alarm for indicating operation of the fire-extinguishing system in the galley where the equipment is installed; and
  - (e) controls for manual operation of the fire-extinguishing system which are clearly labelled for ready use by the crew.

*Fire-Fighter's Outfits*

- (57) Types of fire-fighter's outfits-
- (a) Fire-fighter's outfits shall comply with the Fire Safety Systems Code; and

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<sup>34</sup> Refer to the recommendations by the International Organization for Standardization, in particular publication ISO 15371:2009, "Fire-extinguishing systems for protection of galley cooking equipment"

- (b) Self-contained compressed air breathing apparatus of fire-fighter's outfits shall comply with paragraph 2.1.2.2 of chapter 3 of the Fire Safety Systems Code by 1 July 2019.
  
- (58) Ships shall carry-
  - (a) at least two fire-fighter's outfits;
  - (b) additionally, for every 80 metres, or part thereof, of the aggregate of the lengths of all passenger spaces and service spaces on the deck which carries such spaces or, if there is more than one such deck, on the deck which has the largest aggregate of such length:
    - (i) two fire-fighter's outfits; and
    - (ii) two sets of personal equipment, each set comprising the items stipulated in the Fire Safety Systems Code.
  
- (59) The fire-fighter's outfits or sets of personal equipment shall be kept ready for use in an easily accessible location that is permanently and clearly marked and, where more than one fire-fighter's outfit or more than one set of personal equipment is carried, they shall be stored in widely separated positions.
  
- (60) The Administration may require additional sets of personal equipment and breathing apparatus, having due regard to the size and layout of the ship.
  
- (61) Two spare charges shall be provided for each required breathing apparatus. Ships that are equipped with suitably located means for fully recharging the air cylinders free from contamination need carry only one spare charge for each required apparatus.
  
- (62) A minimum of two two-way portable radiotelephone apparatus for each fire party for fire-fighter's communication shall be carried onboard. Those two-way portable radiotelephone apparatus shall be of an explosion-proof type or intrinsically safe.

## **6.9 Structural Integrity**

### *Purpose*

- (2) The purpose of this paragraph is to maintain structural integrity of the ship, preventing partial or whole collapse of the ship structures due to strength deterioration by heat. For this purpose, materials used in the ships' structure shall ensure that the structural integrity is not degraded due to fire.

### *Material of Hull, Superstructures, Structural Bulkheads, Decks and Deckhouses*

- (3) The hull, superstructures, structural bulkheads, decks and deckhouses shall be constructed of steel or other equivalent material and for the purpose of applying the definition of steel or other equivalent material the "applicable fire exposure" shall be according to the integrity and insulation standards given in Tables 6.1 and 6.2; for example, where divisions such as decks or sides and ends of deckhouses are permitted to have "B-0" fire integrity, the "applicable fire exposure" shall be half an hour.

### *Structure of Aluminium Alloy*

- (4) Unless otherwise specified in Section (2), in cases where any part of the structure is of aluminium alloy, the following shall apply-
- (a) the insulation of aluminium alloy components of "A" or "B" class divisions, except structure which, in the opinion of the Administration, is non-load-bearing, shall be such that the temperature of the structural core does not rise more than 200°C above the ambient temperature at any time during the applicable fire exposure to the standard fire test; and
  - (b) special attention shall be given to the insulation of aluminium alloy components of columns, stanchions and other structural members required to support lifeboat and liferaft stowage, launching and embarkation areas, and "A" and "B" class divisions to ensure-
    - (iii) that for such members supporting lifeboat and liferaft areas and "A" class divisions, the temperature rise limitation specified in Section (a) above shall apply at the end of one hour; and
    - (iv) that for such members required to support "B" class divisions, the temperature rise limitation specified in the said Section (a) shall apply at the end of half an hour.

*Machinery Spaces of Category A*

- (5) Subject to Section (5), the boundaries of all machinery spaces of category A, including crowns and casings, shall be of steel construction and shall be insulated as required by Tables 6.1 and 6.2 as appropriate.
- (6) The Administration may permit the boundaries of Category A machinery spaces, including crowns and casings, to be constructed of aluminium provided that-
- (a) the space is provided with an equivalent water-mist fire-extinguishing system complying with MSC/Circ.1165<sup>35</sup> that shall provide total flooding of the space in the event of a fire in that space; and
  - (b) the space is provided with a fixed local application fire-extinguishing system of the water-mist type in accordance with MSC/Circ.913<sup>36</sup>, MSC/Circ.1082<sup>37</sup> and MSC.1/Circ.1276<sup>38</sup>, applicable to machinery spaces of any size; and
  - (c) the space and the divisions forming the crowns and casings shall be constructed and insulated to "A-60" class standard on both sides as demonstrated by a fire test conducted in accordance with the relevant provisions of the Fire Test Procedures Code; and
  - (d) where the hull forms part of the boundary of the machinery space then the internal surface of the hull shall be insulated in accordance with Section(c) down to at least 450millimetres below the line of the lightest sea-going draft.
- (7) The floor plating of normal passageways in machinery spaces of Category A shall be constructed of steel.

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<sup>35</sup> Revised Guidelines for the approval of Equivalent Water-Based Fire Extinguishing Systems for Machinery Spaces and Cargo Pump-Rooms, as further amended by MSC.1/Circ.1237.

<sup>36</sup> Guidelines for the Approval of Fixed Water-Based Local Application Fire-Fighting Systems for use in Category A Machinery Spaces.

<sup>37</sup> Unified Interpretations of the Guidelines for Approval of Fixed Water-Based Local Application Fire-Fighting Systems (MSC/Circ.913).

<sup>38</sup> Unified Interpretations of SOLAS Chapter II-2.

*Materials of Overboard Fittings*

- (8) Materials readily rendered ineffective by heat shall not be used for overboard scuppers, sanitary discharges, and other outlets which are close to the waterline and where the failure of the material in the event of fire would give rise to danger of flooding.

**6.10 Notification of Crew and Passengers**

*Purpose*

- (1) The purpose of this paragraph is to notify crew and passengers of a fire for safe evacuation. For this purpose, a general emergency alarm system and a public address system shall be provided.

*General Emergency Alarm System*

- (2) A general emergency alarm system required by section 7.9(5) shall be used for notifying crew and passengers of a fire.

*Public Address Systems*

- (3) A public address system or other effective means of communication complying with the requirements of Section 7.9(6) shall be available throughout the accommodation, service spaces, control stations and open decks.

**6.11 Means of Escape**

*Purpose*

- (1) The purpose of this paragraph is to provide means of escape so that persons onboard can safely and swiftly escape to the lifeboat and liferaft embarkation deck. For this purpose, the following functional requirements shall be met-
  - (a) safe escape routes shall be provided;
  - (b) escape routes shall be maintained in a safe condition, clear of obstacles; and
  - (c) additional aids for escape shall be provided as necessary to ensure accessibility, clear marking, and adequate design for emergency situations.

*General Requirements*

- (2) Unless expressly provided otherwise in this paragraph, at least two widely separated and ready means of escape shall be provided from all spaces or groups of spaces.
- (3) Lifts shall not be considered as forming one of the means of escape as required by this paragraph.

*Means of Escape from Control Stations, Accommodation Spaces and Service Spaces*

- (4) Stairways and ladders shall be so arranged as to provide ready means of escape to the lifeboat and liferaft embarkation deck from passenger and crew accommodation spaces and from spaces in which the crew is normally employed, other than machinery spaces.
- (5) A corridor, lobby, or part of a corridor from which there is only one route of escape shall be prohibited, provided that-
  - (a) dead-end corridors used in service areas which are necessary for the practical utility of the ship, such as fuel oil stations and athwartship supply corridors, shall be permitted where such dead-end corridors are separated from crew accommodation areas and are inaccessible from passenger accommodation areas; and
  - (b) a part of a corridor that has a depth not exceeding its width is considered a recess or local extension and is permitted.
- (6) All stairways in accommodation and service spaces and control stations shall be of steel frame construction except where the Administration sanctions the use of other equivalent material.
- (7) If a radiotelegraph station has no direct access to the open deck, two means of escape from, or access to, the station shall be provided, one of which may be a porthole or window of sufficient size or other means to the satisfaction of the Administration.
- (8) Doors in escape routes shall, in general, open in way of the direction of escape, except that-
  - (a) individual cabin doors may open into the cabins in order to avoid injury to persons in the corridor when the door is opened; and
  - (b) doors in vertical emergency escape trunks may open out of the trunk in order to permit the trunk to be used both for escape and for access.
- (9) Below the bulkhead deck, two means of escape, at least one of which shall be independent of watertight doors, shall be provided from each watertight compartment or similarly restricted space or group of spaces; provided that, exceptionally, the Administration may dispense with one of the means of escape for crew spaces that are entered only occasionally and where the required escape route is independent of watertight doors.
- (10) Where the Administration has granted dispensation under the provisions of Section (9), this sole means of escape shall provide safe escape and stairways shall not be less than 800 millimetres in clear width with handrails on both sides.
- (11) Above the bulkhead deck there shall be at least two means of escape from each main vertical zone or similarly restricted space or group of spaces, at least one of which shall give access to a stairway forming a vertical escape.
- (12) *Stairway enclosures including "horizontal stairways" in accommodation and service spaces shall comply with the following provisions-*

- (a) they shall have direct access from the corridors and be of a sufficient area to prevent congestion, having in view the number of persons likely to use them in an emergency;
  - (b) within the perimeter of such stairway enclosures, only public toilets and lockers of non-combustible material providing storage for non-hazardous safety equipment are permitted;
  - (c) direct access to the stairway enclosures shall be permitted only from the following spaces-
    - (i) public spaces;
    - (ii) corridors;
    - (iii) lifts;
    - (iv) public toilets;
    - (v) lockers of non-combustible material providing storage for non-hazardous safety equipment;
    - (vi) other escape stairways required by Section (13); and
    - (vii) external areas;
  - (d) small corridors or "lobbies" used to separate an enclosed stairway from galleys or laundries may have direct access to the stairway provided they have a minimum deck area of 4.5 m<sup>2</sup>, a width of no less than 900 millimetres and contain a fire hose station.
- (13) At least one of the means of escape required by Sections (9) and (11) shall consist of a readily accessible enclosed stairway which shall comply with the following provisions<sup>39</sup>-
- (a) it shall provide continuous fire shelter from the level of its origin to the appropriate lifeboat and liferaft embarkation decks, or to the uppermost weather deck if the embarkation deck does not extend to the main vertical zone being considered;
  - (b) where the latter case in Section (a) applies, direct access to the embarkation deck by way of external open stairways and passageways shall be provided and shall have emergency lighting in accordance with section 7.14 and slip-free surfaces underfoot; and
  - (c) boundaries facing external open stairways and passageways forming part of an escape route and boundaries in such a position that their failure during a fire would impede escape to the embarkation deck shall have fire integrity, including insulation values, in accordance with Section 6.7(46).
- (14) Protection of access from the stairway enclosures to the lifeboat and liferaft embarkation areas shall be provided either directly or through protected internal routes which have fire integrity and insulation values for stairway enclosures as determined by Tables 6.1 and 6.2, as appropriate.
- (15) Stairways serving only a space and a balcony in that space shall not be considered as forming one of the required means of escape.

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<sup>39</sup> Refer to Unified Interpretations of SOLAS Chapter II-2, the Fire Safety Systems Code, the Fire Test Procedures Code and Related Fire Test Procedures (MSC/Circular.1120)

- (16) Each level within an atrium shall have two means of escape, one of which shall give direct access to an enclosed vertical means of escape meeting the requirements of Section (13).
- (17) The widths, number and continuity of escapes shall be in accordance with the requirements in the Fire Safety Systems Code.
- (18) *In addition to the emergency lighting supplied by the emergency source of electrical power, the means of escape, including stairways and exits, shall be provided with low-location lighting systems as follows*<sup>40</sup>
- (a) *subject to Section (b) shall be marked by lighting or photoluminescent strip indicators placed not more than 300 millimetres above the deck at all points of the escape route including angles and intersections such that the marking enables passengers to identify the routes of escape and readily identify the escape exits;*
  - (b) *alternative means of achieving safe escape other than lighting and or photoluminescent strips may be considered by the Administration where such alternative provides the same level of efficiency*
  - (c) *the marking or alternative means of achieving escape shall enable passengers to identify the routes of escape and readily identify the escape exits;*
  - (d) *all electrically operated systems shall be operated from the navigation bridge or continuously manned Central Control Station and supplied by the emergency source of power;*
  - (e) *lighting shall be so arranged that the failure of any single component shall not result in the system or any part thereof being rendered ineffective;*
  - (f) *additionally, escape route signs and fire equipment location markings shall be of photoluminescent material or marked by lighting; and*
  - (g) *the Administration shall ensure that such lighting or photoluminescent equipment used in compliance with this Section has been evaluated, tested and applied in accordance with the guidelines developed by the IMO<sup>41</sup>, or to an international standard acceptable to the IMO<sup>42</sup>.*
- (19) Cabin and stateroom doors shall not require keys to unlock them from inside the room. Neither shall there be any doors along any designated escape route which require keys to unlock them when moving in the direction of escape.
- (20) *Escape doors from public spaces that are normally latched shall be fitted with a means of quick release arrangement consisting of a door-latching mechanism incorporating a device that releases the latch upon the application of a force in the direction of escape flow; such quick release mechanisms shall be designed and installed to the satisfaction of the Administration<sup>43</sup>. Power operated sliding doors shall also comply with 6.7(35) (h), (i), (m) and (n).*

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<sup>40</sup> See also MSC/Circular.1168 - Interim Guidelines for the Testing, Approval and Maintenance of Evacuation Guidance Systems Used as an Alternative to Low-Location Lighting Systems.

<sup>41</sup> Refer to the Guidelines for the evaluation, testing and application of low-location lighting on passenger ships as adopted by the IMO by resolution A.752(18).

<sup>42</sup> Refer to the Recommendations by the International Organization for Standardization, in particular, publication ISO 15370:2011 on Low-location lighting on passenger ships

<sup>43</sup> Further requirements for quick release mechanisms are provided for in SOLAS but are not applicable to yachts to which the Code applies due to the fact that the Code limits the total number of persons onboard

- (21) At least two emergency escape breathing devices shall be carried in each main vertical zone.
- (22) Emergency escape breathing devices shall comply with the Fire Safety Systems Code. Spare emergency escape breathing devices shall be kept onboard.

*Means of Escape from Machinery Spaces*

- (23) Where the space is below the bulkhead deck, the two means of escape shall consist of either-
  - (a) two sets of steel ladders, as widely separated as possible, leading to doors in the upper part of the space, similarly separated and from which access is provided to the appropriate lifeboat and liferaft embarkation decks, provided that-
    - (i) one of these ladders shall be located within a protected enclosure that satisfies category (4), as appropriate, from the lower part of the space it serves to a safe position outside the space;
    - (ii) self-closing fire doors of the same fire integrity standards shall be fitted in the enclosure;
    - (iii) the ladder shall be fixed in such a way that heat is not transferred into the enclosure through non-insulated fixing points; and
    - (iv) the protected enclosure shall have minimum internal dimensions of at least 800 millimetres x 800 millimetres<sup>44</sup>, and shall have emergency lighting provisions; or
  - (b) one steel ladder leading to a door in the upper part of the space from which access is provided to the embarkation deck and additionally, in the lower part of the space and in a position well separated from the ladder referred to, a steel door capable of being operated from each side and which provides access to a safe escape route from the lower part of the space to the embarkation deck.
- (24) Subject to Section (25), where the space is above the bulkhead deck, the two means of escape shall be as widely separated as possible and the doors leading from such means of escape shall be in a position from which access is provided to the appropriate lifeboat and liferaft embarkation decks and where such means of escape require the use of ladders, these shall be of steel.
- (25) The Administration may dispense with one of the means of escape required under Section (23) and (24) under the following conditions-
  - (a) in a ship of less than 1,000 gross tonnage due regard being paid to the width and disposition of the upper part of the space;
  - (b) *in a ship of 1,000 gross tonnage and above where either a door or a steel ladder provides a safe escape route to the embarkation deck, due regard being paid to*

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to a maximum of 99 and hence the number of persons (passengers and crew) expected to be situated in such locations is limited.

<sup>44</sup> See MSC.1/Circ.1511 Unified Interpretations of SOLAS Regulations II-2/9 and II-2/13 for interpretation of clear width for escape trunks

*the nature and location of the space and whether persons are normally employed in that space and a space may include a normally unattended auxiliary machinery space.*

- (26) Two means of escape shall be provided from a machinery control room located within a machinery space, at least one of which shall provide continuous fire shelter to a safe position outside the machinery space.
- (27) In the steering gear space, a second means of escape shall be provided when the emergency steering position is located in that space unless there is direct access to the open deck.
- (28) On all ships, within the machinery spaces, emergency escape breathing devices which comply with the Fire Safety Systems Code shall be situated ready for use at easily visible places, which can be reached quickly and easily at any time in the event of fire and the number and location of such devices shall be to the satisfaction of the Administration and shall take into account the layout of the machinery spaces and the number of persons normally working in the spaces.
- (29) The number and location of the emergency escape breathing devices required under Section (28) shall be indicated in the fire control plan.
- (30) All inclined ladders/stairways fitted to comply with Section (23) with open treads in machinery spaces being part of or providing access to escape routes but not located within a protected enclosure shall be made of steel. Such ladders/stairways shall be fitted with steel shields attached to their undersides, such as to provide escaping personnel protection against heat and flame from beneath.

*Escape from main workshops within machinery spaces*

- (31) Two means of escape shall be provided from the main workshop within a machinery space. At least one of these escape routes shall provide a continuous fire shelter to a safe position outside the machinery space.

### **6.12 Emergency Training and Drills**

- (1) See Annex C for requirements

### **6.13 Operations**

*Purpose*

- (1) The purpose of this Section is to provide information and instructions for proper ship handling operations in relation to fire safety and for this purpose, fire safety operational booklets shall be provided onboard.
- (2) The required fire safety operational booklet shall contain the necessary information and instructions for the safe operation of the ship in relation to fire safety and the booklet shall include information concerning the crew's responsibilities for the general fire safety of the ship at all times.

- (3) The fire safety operational booklet shall be in the working language of the ship and shall be provided in each crew mess room and recreation room or in each crew cabin.
- (4) The fire safety operational booklet may be combined with the training manuals required in section 6.13(10).

**6.14 Alternative Design and Arrangements**

- (1) *Vessels may follow Section 1.10 on Alternative Design and Arrangements for this chapter as allowed by SOLAS II-2/17.*
- (2) The engineering analysis required by 1.10(3) shall be prepared and submitted to the Administration, based on the guidelines<sup>45</sup> and shall include, as a minimum, the following engineering analysis elements:
  - (a) determination of the ship type and space(s) concerned;
  - (b) identification of prescriptive requirement(s) with which the ship or the space(s) will not comply;
  - (c) identification of the fire and explosion hazards of the ship or the space(s) concerned, including:
    - (i) identification of the possible ignition sources;
    - (ii) identification of the fire growth potential of each space concerned;
    - (iii) identification of the smoke and toxic effluent generation potential for each space concerned;
    - (iv) identification of the potential for the spread of fire, smoke or of toxic effluents from the space(s) concerned to other spaces;
  - (d) determination of the required fire safety performance criteria for the ship or the space(s) concerned addressed by the prescriptive requirement(s) in particular:
    - (i) performance criteria shall be based on the fire safety objectives and on the functional requirements of this chapter;
    - (ii) performance criteria shall provide a degree of safety not less than that achieved by using the prescriptive requirements; and
    - (iii) performance criteria shall be quantifiable and measurable;
  - (e) detailed description of the alternative design and arrangements, including a list of the assumptions used in the design and any proposed operational restrictions or conditions; and
  - (f) technical justification demonstrating that the alternative design and arrangements meet the required fire safety performance criteria.

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<sup>45</sup> Refer to the Guidelines on alternative design and arrangements for fire safety (MSC/Circ.1002).

### **6.15 Protection of Garage Spaces**

#### *Purpose*

- (1) *The purpose of this paragraph is to provide additional safety measures in order to address the fire safety objectives of this Chapter for ships fitted with garage spaces and for this purpose, the following functional requirements shall be met:*
- (a) *fire protection systems shall be provided to adequately protect the ship from the fire hazards associated with garage spaces;*
  - (b) *sources of ignition shall be separated from garage spaces; and*
  - (c) *garage spaces shall be adequately ventilated.*

#### *Application*

- (2) *In addition to complying with the requirements of this Chapter, as appropriate, garage spaces shall also comply with the requirements of this paragraph.*

#### *Measures*

- (3) *There shall be provided an effective power ventilation system sufficient to give at least 6 air changes per hour, except as provided in Section (21) where there shall be at least 10 air changes per hour, which shall comply with the following provisions-*
- (a) *it shall be separate from other ventilation systems and shall be in operation at all times;*
  - (b) *ventilation ducts serving such spaces capable of being effectively sealed shall be separated for each such space; and*
  - (c) *the system shall be capable of being controlled from a position outside such spaces.*
  - (d) *Ventilation systems may be operated at lower air changes per hour when controlled by a detection system that monitors the flammable and harmful gases in the space<sup>46</sup>;*
- (4) *The ventilation system shall be such as to prevent air stratification and the formation of air pockets.*
- (5) *Means shall be provided on the navigation bridge to indicate any loss of the required ventilating capacity.*
- (6) *Arrangements shall be provided to permit a rapid shutdown and effective closure of the ventilation system from outside of the space in case of fire, taking into account the weather and sea conditions.*
- (7) *Ventilation ducts, including dampers, shall be made of steel and ventilation ducts that pass through other horizontal zones or machinery spaces shall be "A-60" class steel ducts.*

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<sup>46</sup> Refer to the revised design guidelines and operational recommendations for ventilation systems in ro-ro cargo spaces (MSC.1/Circ.1515)

- (8) *Permanent openings in the side plating, the ends or deckhead of the space shall be so situated that a fire in the garage space does not endanger stowage areas and embarkation stations for survival craft and rescue boats where no lifeboats are carried and accommodation spaces, service spaces and control stations in superstructures and deckhouses above the garage spaces.*
- (9) *Except as provided in Section (21), electrical equipment and wiring shall be of a type suitable for use in an explosive petrol and air mixture.<sup>47</sup>*
- (10) *Electrical equipment and wiring, if installed in an exhaust ventilation duct, shall be of a type approved for use in explosive petrol and air mixtures and the outlet from any exhaust duct shall be sited in a safe position, having regard to other possible sources of ignition.*
- (11) *Other equipment which may constitute a source of ignition of flammable vapours shall not be permitted.*
- (12) *Smoking shall not be permitted and “No-Smoking” signs shall be prominently displayed.*
- (13) *Scuppers, piping and drainage connections for the space shall be non-combustible and shall not be led to machinery or other spaces where sources of ignition may be present.*
- (14) *Garage spaces are not to give direct access to any space other than a fuel store or lockers used within the space, unless provided with a lobby in accordance with the fire integrity requirements of Tables 6.1 and 6.2 (considered as a ‘Corridor’) and the provisions of section 3.6 with respect to Load Lines are also to be complied as with as applicable.*
- (15) *There shall be provided a fixed fire detection and fire alarm system complying with the requirements of the Fire Safety Systems Code and with the following provisions-*
  - (a) *the fixed fire detection system shall be capable of rapidly detecting the onset of fire;*
  - (b) *the type of detectors and their spacing and location shall be to the satisfaction of the Administration, taking into account the effects of ventilation and other relevant factors; and*
  - (c) *after being installed, the system shall be tested under normal ventilation conditions and shall give an overall response time to the satisfaction of the Administration.*
- (16) *Manually operated call points shall be spaced so that no part of the space is more than 20 metres from a manually operated call point, and one shall be placed close to each exit from such spaces.*
- (17) *The boundary bulkheads and decks of garage spaces shall have fire integrity in accordance with Tables 6.1 and 6.2.*
- (18) *Garage spaces shall be fitted with a fixed pressure water-spray fire-extinguishing system which shall comply with the Fire Safety Systems Code; provided that the Administration may permit the use of any other fixed fire-extinguishing system<sup>48</sup> that has been shown, by a*

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<sup>47</sup> Refer to the recommendations of the International Electrotechnical Commission, in particular publication 60079

<sup>48</sup> Refer to revised Guidelines for the Design and Approval of Fixed Water-Based Fire-Fighting Systems for Ro-Ro Spaces and Special Category Spaces (MSC.1/Circular.1430)

*full-scale test in conditions simulating a flowing petrol fire in a garage space or a ro-ro space, to be not less effective in controlling fires likely to occur in a garage space.*

- (19) *When fixed pressure water-spray fire-extinguishing systems are provided, in view of the serious loss of stability which could arise<sup>49</sup> due to large quantities of water accumulating on the deck or decks during the operation of the water-spraying system, the following arrangements shall be provided:*
- (a) *in the spaces above the bulkhead deck, scuppers shall be fitted so as to ensure that such water is rapidly discharged directly overboard;*
  - (b) *in the spaces below the bulkhead deck, the Administration may require additional pumping and drainage facilities and in such case-*
    - (iii) *the drainage system shall be sized to remove no less than 125% of the combined capacity of both the water-spraying system pumps and the required number of fire hose nozzles; and*
    - (iv) *the drainage system valves shall be operable from outside the protected space at a position in the vicinity of the extinguishing system controls.*
- (20) *At least two portable foam fire extinguishers or equivalent shall be provided at each deck level in each garage space and at least one portable fire extinguisher shall be located at each access to such space.*
- (21) *Notwithstanding the provisions in Section (9) and (3), except for cases where passengers are allowed access to a garage space, the ventilation system may be so designed and operated as to provide continuous ventilation of the space at the rate of at least 10 air changes per hour subject to, any electrical equipment being of a type so enclosed and protected as to prevent the escape of sparks within a height of 450 millimetres from the deck,*
- (22) *Provision shall be made to ensure that vehicles, craft, recreational diving systems and ancillary equipment are securely fastened with due consideration being given to the motion of the Yacht and possible movement between components. The design of Diving equipment mounting and securing arrangements shall also consider mitigating the effects of heat transmission in the event of a fire in an adjacent space.*

## **6.16 Safety Centre**

### *Purpose*

- (1) The purpose of this regulation is to provide a space to assist with the management of emergency situations

### *Location and arrangement*

- (2) The safety centre shall either be a part of the navigation bridge or be located in a separate space adjacent to and having direct access to the navigation bridge, so that the

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<sup>49</sup> Attention is drawn to IMO Resolution MSC.256(84) and the associated Circular MSC/Circ.1320 (paragraphs 1.1.2 and 3.1.1), with respect to the drainage of fire fighting water from spaces above the bulkhead deck in passenger ships.

management of emergencies can be performed without distracting watch officers from their navigational duties.

*Layout and ergonomic design*

- (3) The layout and ergonomic design of the safety centre shall take into account the guidelines developed by the IMO<sup>50</sup>, as appropriate.

*Communications*

- (4) Means of communication between the safety centre, the central control station, the navigation bridge, the engine control room, the storage room(s) for fire extinguishing system(s) and fire equipment lockers shall be provided.

*Control and monitoring of safety systems*

- (5) *Notwithstanding the requirements set out elsewhere in the Code, the full functionality (operation, control, monitoring or any combination thereof, as required) of the safety systems listed below shall be available from the safety centre if applicable:*

- (a) all powered ventilation systems;
- (b) fire doors;
- (c) general emergency alarm system;
- (d) public address system;
- (e) electrically powered evacuation guidance systems;
- (f) watertight and semi-watertight doors;
- (g) indicators for shell doors, loading doors and other closing appliances;
- (h) water leakage of inner/outer bow doors, stern doors and any other shell door;
- (i) television surveillance system;
- (j) fire detection and alarm system;
- (k) fixed fire-fighting local application system(s);
- (l) sprinkler and equivalent systems;
- (m) water-based systems for machinery spaces;
- (n) alarm to summon the crew;
- (o) atrium smoke extraction system;
- (p) flooding detection systems; and
- (q) fire pumps and emergency fire pumps.

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<sup>50</sup> Refer to Interim Clarifications of SOLAS Chapter II-2 Requirements Regarding Interrelation Between the Central Control Station, Navigation Bridge and Safety Centre (MSC.1/Circular.1368)

**6.17 Arrangements for Recreational Fire Appliances**

- (1) *'Recreational Fire Appliances' as defined in Chapter 2, shall meet the requirements of Annex D*

**6.18 Guidance On The Storage Of Large Quantities Of Petrol In Fixed Tanks**

- (1) *Vessels shall follow the guidance contained in Annex F*

**6.19 Additional Equivalence Considerations**

- (1) *None*

## **CHAPTER 7**

### **LIFE-SAVING APPLIANCES AND ARRANGEMENTS**

#### **7.1 Application**

- (1) *SOLAS regulations referenced in this Chapter apply to ships to which this Code applies in the same way as they apply to passenger ships.*

#### **7.2 General Requirements**

- (1) Except as provided in Sections (5) and (6), life-saving appliances, communication equipment and arrangements required by this Chapter shall be approved by the Administration.
- (2) Before giving approval to life-saving appliances and arrangements, the Administration shall ensure that such life-saving appliances and arrangements-
- (a) are tested, to confirm that they comply with the requirements of this Chapter and the LSA Code; or
  - (b) have successfully undergone, to the satisfaction of the Administration, tests which are substantially equivalent to those specified.
- (3) Prior to giving approval to novel life-saving appliances or arrangements, the Administration shall ensure that such appliances or arrangements-
- (a) provide safety standards at least equivalent to the requirements of this Chapter and the LSA Code and have been evaluated and tested in accordance with the recommendations of the IMO; or
  - (b) have successfully undergone, an engineering analysis, evaluation and approval in accordance with section 7.25.
- (4) Procedures adopted by the Administration for approval shall also include the conditions whereby approval would continue or would be withdrawn.
- (5) Prior to accepting life-saving appliances and arrangements that have not been previously approved by the Administration, the Administration shall be satisfied that life-saving appliances and arrangements comply with the requirements of this Chapter and the LSA Code.
- (6) Life-saving appliances required by this Chapter for which detailed specifications are not included in the LSA Code shall be to the satisfaction of the Administration.

#### **7.3 Stowage of Survival Craft**

- (1) Each survival craft shall be stowed:
  - (a) so that neither the survival craft nor its stowage arrangements shall interfere with the operation of any other survival craft or rescue boat at any other launching station;
  - (b) as near the water surface as is safe and practicable and, in the case of a survival craft other than a liferaft intended for throw over board launching, in such a position that the survival craft in the embarkation position is not less than 2 metres above the waterline with the ship in the fully loaded condition under unfavourable conditions of trim of up to 10° and listed up to 20° either way, or to the angle at which the ship's weatherdeck edge becomes submerged, whichever is less;
  - (c) in a state of continuous readiness so that two crew members can carry out preparations for embarkation and launching in less than 5 minutes;
  - (d) fully equipped as required by this Chapter and the Code;
  - (e) as far as practicable, in a secure and sheltered position and protected from damage by fire and explosion; and
  - (f) in the case of survival craft for which approved launching devices are required, as close to accommodation and service spaces as possible.
- (2) Lifeboats for lowering down the ship's side shall be stowed as far forward of the propeller as practicable and where appropriate, the ship shall be so arranged that lifeboats, in their stowed positions, are protected from damage by heavy seas.
- (3) Lifeboats shall be stowed attached to launching appliances.
- (4) Every liferaft or group of liferafts, as the case may be, shall be stowed-
  - (a) with its painter permanently attached to the ship;
  - (b) with a float-free arrangement complying with the requirements of paragraph 4.1.6 of the LSA Code so that each floats free and, if inflatable, inflates automatically when the ship sinks; and
  - (c) so as to permit manual release of one raft or container at a time from their securing arrangements.
- (5) Davit-launched liferafts shall be stowed within reach of the lifting hooks, unless some means of transfer is provided which is not rendered inoperable within the limits of 10° trim and 20° list either way, or by ship motion or power failure.

**7.4 Stowage of Rescue Boats**

- (1) Rescue boats shall be stowed-
  - (a) in a state of continuous readiness for launching in not more than 5 minutes, and if the inflated type, in a fully inflated condition at all times;
  - (b) in a position suitable for launching and recovery;
  - (c) so that neither the rescue boat nor its stowage arrangements shall interfere with the operation of any survival craft at any other launching station;
  - (d) if it is also a lifeboat, in compliance with the requirements of section 7.3. and

- (e) if stowed forward the launching appliance and rescue boat shall be entirely located in a sheltered position abaft the vertical extension of the aft most portion of the collision bulkhead.

### **7.5 Marine Evacuation Systems**

- (1) Where Marine Evacuation Systems (MES) are installed, all such systems shall be of an approved type in compliance with LSA Code and comply with the following requirements:
  - (a) Due consideration shall be given to the location and protection of MES stowage arrangements with respect to protection against fire. Such locations shall be treated as Category (5) Spaces for the purpose of Structural Fire Protection, Detection and Extinction.
  - (b) Powered hatches and doors that are required to be opened prior to MES deployment shall:
    - (i) be provided with both main and a local source of emergency power and capable of manual operation; and
    - (ii) have the time to operate included in the timed evacuation analysis as described under IMO Resolution MSC.81 (70) Part 1 Section 12.6.1 and in accordance with 13.1(16)
  - (c) At least one suitably sized inflatable slide or chute as applicable shall be provided on either side of the vessel. Where the installation results in the slide or chute coming into direct contact with the hull shell under any of the conditions listed section 13.15(3)(b) below, the side shell shall be locally insulated to A-60. The extent of insulation to be provided shall be sufficient to cover at least +/- 10 degrees of longitudinal trim in way of the applicable areas.
- (2) Stowage of Marine Evacuation Systems
  - (a) The ship's side shall not have any openings (including scuppers and overboard discharges) between the Embarkation Station of the Marine Evacuation System and the waterline in the lightest seagoing condition. Means shall be provided to protect the system from any projections including but not limited to fin stabilisers.
  - (b) Where glazed openings are located in the ship's side between the Embarkation Station of the Marine Evacuation System and the waterline in the lightest seagoing condition, they shall be A-0, unless the side shell in which they are located is required to be of a higher fire rating in accordance with 7.5(1)(c).
  - (c) Marine Evacuation Systems shall be in such positions as to ensure safe launching having particular regard to clearance from the propeller and steeply overhanging portions of the hull and so that, as far as practicable, the system can be launched down the straight side of the Yacht.
  - (d) Each Marine Evacuation System shall be stowed so that neither the passage nor platform nor its stowage or operational arrangements shall interfere with the operation of any other life-saving appliance at any other launching station.

- (e) Where appropriate, the Yacht shall be so arranged that the Marine Evacuation Systems in their stowed positions are protected from damage by heavy seas.
- (3) Functional Requirements for Marine Evacuation Systems
- (a) MES shall be arranged such that liferafts may be securely attached to the platform and released from the platform by a person either in the liferaft or on the platform;
  - (b) MES shall be capable of being deployed from the ship under unfavourable conditions of trim of up to 10° and list of up to 20° either way
  - (c) in the case of being fitted with an inclined slide, operate such that the angle of the slide to the horizontal is:
    - (i) within a range of 30° to 35° when the ship is upright and in the lightest sea-going condition; and
    - (ii) a maximum of 55° in the final stage of flooding set by the applicable requirements in Section 11.3
  - (d) Any part requiring maintenance by the ship's crews shall be readily accessible and easily maintained.
  - (e) So constructed and installed that where one or more Marine Evacuation Systems are provided, at least 50% of such systems shall be subjected to a trial deployment after installation. Subject to these deployments being satisfactory, the untried systems shall be deployed within 12 months of installation.
  - (f) Any inflatable liferaft used in conjunction with the marine evacuation system shall:
    - (i) be sited close to the system container but be capable of dropping clear of the deployed system and boarding platform
    - (ii) be capable of release one at a time from its stowage rack with arrangements which shall enable it to be moored alongside the platform
    - (iii) be stowed with its painter permanently attached to the ship.
    - (iv) stowed with a float-free arrangement complying with the requirements of paragraph 4.1.6 of the LSA Code so that each floats free and, if inflatable, inflates automatically when the ship sinks.
    - (v) be so stowed as to permit manual release of one raft or container at a time from their securing arrangements.
    - (vi) be provided with pre-connected or easily connected retrieving lines to the platform.

## **7.6 Survival Craft Launching and Recovery Arrangements**

- (1) Subject to Section (2), launching and embarkation appliances complying with the requirements of section 6.1 of the LSA Code shall, unless expressly provided otherwise, be provided for all survival craft except those which are;
- (a) provided for use in conjunction with a marine evacuation system, complying with the requirements of section 6.2 of the LSA Code and stowed for launching directly from the stowed position under unfavourable conditions of trim of up to 10° and list of up to 20° either way.

- (2) Section (1) shall not apply to vessels carrying survival craft and launching and embarkation appliances provided in accordance with the full provisions of Chapter III of SOLAS.
- (3) Each lifeboat shall be provided with an appliance which is capable of launching and recovering the lifeboat and in addition there shall be provision for hanging-off the lifeboat to free the release gear for maintenance.
- (4) Launching and recovery arrangements shall be such that the appliance operator on the ship is able to observe the survival craft at all times during launching and for lifeboats during recovery.
- (5) Only one type of release mechanism shall be used for similar survival craft carried onboard the ship.
- (6) Preparation and handling of survival craft at any one launching station shall not interfere with the prompt preparation and handling of any other survival craft or rescue boat at any other station.
- (7) Falls, where used, shall be long enough for the survival craft to reach the water with the ship in its lightest seagoing condition, under unfavourable conditions of trim of up to 10° and list of up to 20° either way.
- (8) During preparation and launching, the survival craft, its launching appliance, and the area of water into which it shall be launched shall be adequately illuminated by lighting supplied from the emergency source of electrical power required by Regulation 42 or 43 of Chapter II-1 of SOLAS, as appropriate.
- (9) Means shall be available to prevent any discharge of water onto survival craft during abandonment.
- (10) If there is a danger of the survival craft being damaged by the ship's stabiliser wings, means shall be available, powered by an emergency source of energy, to bring the stabiliser wings inboard; indicators operated by an emergency source of energy shall be available on the navigation bridge to show the position of the stabilizer wings.
- (11) If partially enclosed lifeboats complying with the requirements of section 4.5 of the LSA Code are carried, a davit span shall be provided, fitted with not less than two lifelines of sufficient length to reach the water with the ship in its lightest seagoing condition, under unfavourable conditions of trim of up to 10° and list of up to 20° either way.
- (12) *Survival craft and rescue boat launching appliances may deviate from the requirement of section 6.1.1.3 of the LSA Code, by permitting the use of stored electrical power, under the following provisions:*
  - (a) *All other applicable elements of the LSA Code and the Code are met;*
  - (b) *Each source of stored electrical power shall:*
    - (i) *serve one launching appliance only during normal use;*
    - (ii) *be configured to only be utilised by the launching appliance during an emergency, after the vessel's main and emergency power sources have failed;*
    - (iii) *be suitable for use in the marine environment with appropriate rating given the location and redundancy of components;*

- (iv) *be located in a space independent from any other sources of stored electrical power, protected from the effects of fire and flooding and in accordance with the vessel's Recognised Organisation rules;*
  - (v) *be located in a space adjacent to the launching appliance it serves;*
  - (vi) *have capacity to power the launching appliance during deployment of all the survival craft or rescue boat it serves twice (including the deployment of any covers, bulwarks or similar required for the operation of the appliance);*
  - (vii) *be independently monitored and alarmed on the bridge, engine control room and safety centre;*
  - (viii) *independently charged from the vessel's main and emergency power sources; and*
  - (ix) *be able to power the launching appliance on the opposite side of the vessel if the local power required by (i) fails.*
- (c) *The cabling serving each source of stored electrical power, and the cabling serving the launching appliance from the source of stored electrical power shall:*
- (i) *be protected from the effects of fire and flooding throughout their length;*
  - (ii) *not to be led through high risk spaces; and*
  - (iii) *be independently run from the charging, cross powering, and powering cables.*
- (d) *Where a hydraulic system is driven by the source of stored electrical power, this shall:*
- (i) *serve one launching appliance only;*
  - (ii) *be located in a space independent from any other hydraulic systems serving launching appliances, protected from the effects of fire and flooding;*
  - (iii) *be located in a space adjacent to the launching appliance it serves;*
  - (iv) *be able to cross power the hydraulic system serving the launching appliance on the opposite side of the vessel (when also in compliance with 7.6(12)); and*
  - (v) *the hydraulics also to be powered from main and emergency source before batteries called into use.*
- (e) *The maintenance of each source of stored electrical power shall:*
- (i) *be in accordance with the manufacturer's instructions;*
  - (ii) *the system equipment shall be included in that identified in the vessels Safety Management System in accordance with the ISM Code section 10.3;*
  - (iii) *include testing in accordance with either IEEE 450/1188/1106 as appropriate or another internationally recognised standard; and*
  - (iv) *not exceed the service life given by the manufacturer.*

- (f) *Discharge capacity test shall be completed at delivery and as required thereafter in-line with the manufacturer's instructions;*
- (g) *A quantitative analysis shall be carried out as a part of a detailed assessment of all critical components to the acceptance of the Administration. As an example, the following may be performed:*
  - (i) *Quantitative analysis of fire risk within a space, supplemented by fire engineering analysis and/or fire testing where necessary (e.g., to assess consequences of a fire casualty on a system or system component);*
  - (ii) *Failure Mode Effect Analysis (FMEA) of a system or system component analyses in accordance with standard IEC 60812, Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA) or Annex 4 of the IMO High Speed Craft Code (Procedures for Failure Mode and Effects Analysis), would be acceptable; or*
  - (iii) *Detailed analysis of possibility of flooding of internal watertight compartments and of consequences of flooding on system components, given the location of the compartment and arrangement of piping within the compartment.*

**7.7 Rescue Boat Embarkation, Launching and Recovery Arrangements**

- (1) The rescue boat embarkation and launching arrangements shall be such that the rescue boat can be boarded and launched in the shortest possible time.
- (2) If the rescue boat is one of the ship's survival craft, the embarkation arrangements and launching station shall comply with the requirements of Sections 7.4 and 7.5.
- (3) Launching arrangements shall comply with the requirements of section 7.6, provided that all rescue boats shall be capable of being launched, where necessary utilising painters, with the ship making headway at speeds up to 5 knots in calm water.
- (4) Recovery time of the rescue boat shall be not more than 5 minutes in moderate sea conditions when loaded with its full complement of persons and equipment and where the rescue boat is also a lifeboat, this recovery time shall be possible when loaded with its lifeboat equipment and the approved rescue boat complement of at least six persons.
- (5) Rescue boat embarkation and recovery arrangements shall allow for safe and efficient handling of a stretcher case and foul weather recovery strops shall be provided for safety if heavy fall blocks constitute a danger.
- (6) *Each rescue boat carried shall be served by its own launching appliance*

**7.8 Survival Craft and Rescue Boat Embarkation Arrangements**

- (1) Survival craft embarkation arrangements shall be designed for-
  - (a) all lifeboats to be boarded and launched either directly from the stowed position or from an embarkation deck but not both; and

- (b) davit-launched liferafts to be boarded and launched from a position immediately adjacent to the stowed position or from a position to which, in compliance with the requirements of section 7.3(5), the liferaft is transferred prior to launching.
- (2) Rescue boat arrangements shall be such that the rescue boat can be boarded and launched directly from the stowed position with the number of persons assigned to crew the rescue boat onboard.
- (3) Notwithstanding the requirements of Section (1)(a), if the rescue boat is also a lifeboat and the other lifeboats are boarded and launched from an embarkation deck, the arrangements shall be such that the rescue boat can also be boarded and launched from the embarkation deck.
- (4) The stowage height of a survival craft shall take into account the requirements of section 7.3(1) (b), the escape provisions of Section 6.11, the size of the ship, and the weather conditions likely to be encountered in the vessel's intended area of operation; for davit-launched survival craft, the height of the davit head with the survival craft in embarkation position, shall, as far as practicable, not exceed 15 metres to the waterline when the ship is in its lightest seagoing condition.

**7.9 Communications**

*VHF Radiotelephone Apparatus*

- (1) At least 3 two-way VHF radiotelephone apparatus shall be provided on every ship which shall conform to performance standards not inferior to those adopted by the IMO<sup>51</sup>.

*Search and Rescue Locating Device*

- (2) At least one search and rescue locating device shall be carried on each side of every ship in accordance with the following provisions-
  - (a) the search and rescue locating device shall be stowed in such locations that they can be rapidly placed in any survival craft or, alternatively, one transponder shall be stowed in each survival craft;
  - (b) one of the search and rescue locating device may be the search and rescue locating device required by SOLAS IV/7.1.3; and
  - (c) the search and rescue locating device shall conform to performance standards not inferior to those adopted by the IMO<sup>52</sup>

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<sup>51</sup> Refer to the Performance standards for survival craft two-way VHF radiotelephone apparatus, adopted by the IMO by Resolution A.809(19), as it may be amended, annex 1 or annex 2 as applicable.

<sup>52</sup> Refer to the Recommendation on performance standards for survival craft radar transponders for use in search and rescue operations, adopted by the IMO by resolution MSC.247(83) (A.802(19)), as amended) and the Recommendation on performance standards for survival craft AIS Search and Rescue transmitter (AIS SART), adopted by the IMO by resolution MSC.246(83).

*Distress Flares*

- (3) Not less than 12 rocket parachute flares, complying with the requirements of section 3.1 of the LSA Code, shall be carried and shall be stowed on or near the navigation bridge.

*Onboard Communications and Alarm Systems*

- (4) An emergency means comprised of either fixed or portable equipment or both shall be provided for two-way communications between emergency control stations, muster and embarkation stations and strategic positions onboard.

*General Emergency Alarm*

- (5) A general emergency alarm system, complying with section 7.2.1 of the LSA Code and with the following provisions, shall be provided on the navigation bridge and shall be used for summoning passengers and crew to muster stations and to initiate the actions included in the muster list-
- (d) the system shall be supplemented by either a public address system or other suitable means of communication;
  - (a) entertainment sound systems shall automatically be turned off when the general emergency alarm system is activated;
  - (b) the general emergency alarm system shall be audible throughout the ship and on all open decks; and
  - (c) on ships fitted with a marine evacuation system communication between the embarkation station and the platform or the survival craft shall be ensured.

*Public Address System*

- (6) All ships shall be fitted with a public address system which shall-
- (b) be clearly audible above the ambient noise in all spaces, as prescribed by paragraph 7.2.2.1 of the LSA Code;
  - (c) be provided with an override function controlled from one location on the navigation bridge and such other places onboard as the Administration deems necessary, so that all emergency messages shall be broadcast if any loudspeaker in the spaces concerned has been switched off, its volume has been turned down or the public address system is used for other purposes;
  - (d) have at least two loops which shall be sufficiently separated throughout their length and have two separate and independent amplifiers;
  - (e) be connected to the emergency source of electrical power required by Regulation 42.2.2 of Chapter II-1, Part D, of SOLAS; and
  - (f) be approved by the Administration having regard to the recommendations adopted by the IMO<sup>53</sup>.

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<sup>53</sup> Refer to MSC/Circ.808, Recommendation on performance standards for public address systems on passenger ships, including cabling.

**7.10 Personal Life Saving Appliances**

*Lifebuoys*

(1) Ships shall carry not less than the number of lifebuoys prescribed in the following table-

<b>LIFEBUOYS AND ATTACHMENTS TO BE CARRIED</b>	<b>GROSS TONNAGE OF SHIP</b>		
	<b>Under 3000</b>	<b>3000-10000</b>	<b>Over 10000</b>
<i>Total Minimum Number of Lifebuoys.</i>	8	12	18
<i>Minimum number of lifebuoys to be fitted with self-igniting lights</i>	4	6	9
<i>Minimum number of lifebuoys provided with self-igniting lights and self-activating smoke signals.</i>	2	2	2
<i>Minimum number of Lifebuoys to be provided with buoyant line.</i>	2	2	2

- (2) *Lifebuoys which are fitted with self-igniting lights or with self-igniting lights and self-activating smoke signals shall not also be fitted with a line.*
- (3) *The lifebuoys fitted with self-igniting lights and with self-activating smoke signals shall capable of quick release from the navigation bridge.*
- (4) At least one lifebuoy on each side of the ship shall be fitted with a buoyant lifeline complying with the requirements of paragraph 2.1.4 of the LSA Code equal in length to not less than twice the height at which it is stowed above the waterline in the lightest seagoing condition, or 30 metres, whichever is the greater.
- (5) Lifebuoys shall be-
  - (a) so distributed as to be readily available on both sides of the ship and as far as practicable on all open decks extending to the ship's side; at least one shall be placed in the vicinity of the stern; and
  - (b) so stowed as to be capable of being rapidly cast loose, and not permanently secured in any way.
- (6) Each lifebuoy shall be marked in block capitals of the Roman alphabet with the name and port of registry of the ship on which it is carried.

*Lifejackets*

- (7) A lifejacket complying with the requirements of paragraph 2.2.1 or 2.2.2 of the LSA Code shall be provided for every person onboard the ship and, in addition-
  - (a) a number of lifejackets suitable for children equal to at least 10% of the number of passengers onboard shall be provided or such greater number as may be required to provide a lifejacket for each child;
  - (b) a sufficient number of lifejackets shall be carried for persons on watch and for use at remotely located survival craft stations and the lifejackets carried for persons on watch shall be stowed on the bridge, in the engine control room and at any other manned watch station, as the case may be;
  - (c) infant lifejackets shall be provided for each infant onboard;

- (d) each lifejacket shall be fitted with a light and whistle according to the requirements of section 2.2 of the LSA Code; and
  - (e) if the adult lifejackets provided are not designed to fit persons weighing up to 140 kg and with a chest girth of up to 1,750 millimetres, a sufficient number of suitable accessories shall be available onboard to allow them to be secured to such person<sup>54</sup>.
- (8) In addition to the lifejackets required by Section (7) an additional number of lifejackets for not less than 5% of the total number of persons onboard shall be carried and these lifejackets shall be stowed in conspicuous places on deck or at muster stations.
- (9) Lifejackets shall be so placed as to be readily accessible and their position shall be plainly indicated and where, due to the particular arrangements of the ship, the lifejackets provided in compliance with the requirements of Section (7) may become inaccessible, alternative provisions shall be made to the satisfaction of the Administration which may include an increase in the number of lifejackets to be carried.
- (10) Where lifejackets for passengers are stowed in staterooms which are located remotely from direct routes between public spaces and muster stations, the additional lifejackets for these passengers required under Section (9), shall be stowed either in the public spaces, the muster stations, or on direct routes between them provided that lifejackets shall be stowed so that their distribution and donning does not impede orderly movement to muster stations and survival craft embarkation stations.
- (11) The lifejackets used in totally enclosed lifeboats shall not impede entry into the lifeboat or seating, including operation of the seat belts in the lifeboat.

*Immersion Suits and anti-Exposure Suits*

- (12) *Passenger Yacht 2 (PY-2) vessels need not carry immersion suits*
- (13) *For all other yachts which do not carry lifeboats an immersion suit<sup>55</sup>, of an appropriate size, shall be provided for every person onboard. Immersion suits need not be required if the ship is constantly engaged on voyages in warm climates<sup>56</sup> where, in the opinion of the Administration, immersion suits are unnecessary.*
- (14) *Immersion suits shall be so placed as to be readily accessible and their position shall be plainly indicated.*

**7.11 Muster List and Emergency Instructions**

- (1) Clear instructions on the procedures to be followed in the event of an emergency shall be provided for every person onboard and these instructions shall be drawn up in the language or languages required by the ship's flag State and in the English language.

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<sup>54</sup> See Resolution MSC.207(81) - Adoption of Amendments to the International Life-Saving Appliance (LSA) Code - (Adopted on 18 May 2006).

<sup>55</sup> Refer to the Recommendation on performance standards for survival craft radar transponders for use in search and rescue operations, adopted by the IMO by resolution MSC.247(83) (A.802(19)), as amended) and the Recommendation on performance standards for survival craft AIS Search and Rescue transmitter (AIS SART), adopted by the IMO by resolution MSC.246(83)

<sup>56</sup> Refer to the Guidelines for assessment of thermal protection (MSC/Circ.1046)

- (2) Muster lists and emergency instructions complying with the requirements of this section shall be exhibited in conspicuous places throughout the ship including the navigation bridge, engine-room and crew accommodation spaces.
- (3) Illustrations and instructions in appropriate languages shall be available in passenger cabins and be conspicuously displayed at muster stations and other passenger spaces to inform passengers of-
  - (a) their muster station;
  - (b) the essential actions they shall take in an emergency; and
  - (c) the method of donning lifejackets.
- (4) The muster list shall specify-
  - (a) details of the general emergency alarm and public address system prescribed by sections 7.9(5) and (6);
  - (b) the action to be taken by crew and passengers when this alarm is sounded; and
  - (c) how the order to abandon ship shall be given.
- (5) There shall be in place procedures in place for locating and rescuing passengers trapped in their staterooms
- (6) The muster list shall show the duties assigned to the different members of the crew including-
  - (a) closing of the watertight doors, fire doors, valves, scuppers, sidescuttles, skylights, portholes and other similar openings in the ship;
  - (b) equipping of the survival craft and other life-saving appliances;
  - (c) preparation and launching of survival craft;
  - (d) general preparation of other life-saving appliances;
  - (e) muster of passengers;
  - (f) use of communication equipment;
  - (g) manning of fire parties assigned to deal with fires; and
  - (h) special duties assigned in respect to the use of fire-fighting equipment and installations.
- (7) The muster list shall also specify-
  - (a) which officers are assigned to ensure that life-saving and fire appliances are maintained in good condition and are ready for immediate use;
  - (b) substitutes for key persons who may become disabled, taking into account that different emergencies may call for different actions; and
  - (c) the duties assigned to members of the crew in relation to passengers in case of emergency, which duties shall include-
    - (i) warning the passengers;
    - (ii) seeing that they are suitably clad and have donned their lifejackets correctly;
    - (iii) assembling passengers at muster stations;

- (iv) keeping order in the passageways and on the stairways and generally controlling the movements of the passengers; and
  - (v) ensuring that a supply of blankets is taken to the survival craft.
- (8) The muster list shall be prepared before the ship proceeds to sea and if any changes in the crew subsequently take place which necessitate an alteration in the muster list, the master shall either revise the list or prepare a new list.
- (9) The format of the muster list used on passenger ships shall be approved by the Administration.

### ***7.12 Operating Instructions***

- (1) Posters or signs shall be provided on or in the vicinity of survival craft and their launching controls and shall-
- (a) illustrate the purpose of controls and the procedures for operating the appliance and give relevant instructions or warnings;
  - (b) be easily seen under emergency lighting conditions; and
  - (c) use symbols in accordance with the recommendations of the IMO<sup>57</sup>

### ***7.13 Manning of Survival Craft and Supervision***

- (1) There shall be a sufficient number of trained persons onboard for mustering and assisting untrained persons.
- (2) There shall be a sufficient number of crew members, who may be deck officers or other appropriately certificated crew members, onboard for operating the survival craft and launching arrangements required for abandonment by the total number of persons onboard.
- (3) A deck officer or certificated person<sup>58</sup> shall be placed in charge of each survival craft to be used provided that the Administration, having due regard to the nature of the voyage, the number of persons onboard and the characteristics of the ship, may permit persons practised in the handling and operation of liferafts to be placed in charge of liferafts in lieu of persons qualified as above and in the case of lifeboats a second-in-command shall also be nominated.
- (4) The person in charge of each of the survival craft shall have a list of the survival craft crew and shall ensure that the crew under his command are acquainted with their duties

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<sup>57</sup> Refer to Refer to the Symbols related to life-saving appliances and arrangements adopted by the IMO by Resolution A.760(18), as amended by resolution MSC.82(70)

<sup>58</sup> means a person who holds a certificate of proficiency in survival craft issued under the authority of, or recognised as valid by, the Administration in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, in force; or a person who holds a certificate issued or recognised by the Administration of a State not a Party to that Convention for the same purpose as the convention certificate

and in the case of lifeboats the second-in-command shall also have a list of the lifeboat crew.

- (5) Every motorised survival craft shall have a person assigned who is capable of operating the engine and carrying out minor adjustments.
- (6) The master shall ensure the equitable distribution of appropriately certificated crew members, referred to Sections (1), (2) and (3), among the ship's survival craft.

#### **7.14 Survival Craft Muster Stations and Embarkation Arrangements**

- (1) Lifeboats and liferafts for which approved launching appliances are required shall be stowed as close to accommodation and service spaces as possible.
- (2) Muster stations shall-
  - (a) be provided in the vicinity of and shall permit ready access to the embarkation stations;
  - (b) have sufficient clear deck space to accommodate all persons (passengers and crew) assigned to muster at that station, with at least 0.35 m<sup>2</sup> per person; and
  - (c) have ample room for the marshalling and instruction of passengers.
- (3) Muster and embarkation stations shall-
  - (a) be readily accessible from accommodation and work areas; and
  - (b) be adequately illuminated by lighting supplied from the emergency source of electrical power required by Regulation 42 or 43 of Chapter II-1, Part D, of SOLAS, as appropriate.
- (4) Alleyways, stairways and exits giving access to the muster and embarkation stations shall be adequately lighted and such lighting shall also be capable of being supplied by the emergency source of electrical power by Regulation 42 or 43 of Chapter II-1, Part D, of SOLAS, as appropriate; also in addition to and as part of the markings required under section 6.11(18) routes to muster stations shall be indicated with the muster station symbol, intended for that purpose, in accordance with the recommendations of the IMO<sup>5960</sup>.
- (5) Davit-launched survival craft muster and embarkation stations shall be so arranged as to enable stretcher cases to be placed in survival craft.
- (6) Subject to Sections (7) and (8), an embarkation ladder complying with paragraph 6.1.6 of the LSA Code, extending, in a single length, from the deck to the waterline in the lightest seagoing condition under unfavourable conditions of trim of up to 10° and a list of up to 20° either way shall be provided at each embarkation station or at every two adjacent embarkation stations for survival craft launched down the side of the ship.

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<sup>59</sup> Refer to the Symbols related to life-saving appliances and arrangements adopted by the IMO by Resolution A.760(18), as amended by MSC.82(80), and to the Guidelines for the evaluation, testing and application of low-location lighting on passenger ships adopted by the IMO by Resolution A.752(18).

<sup>60</sup> Refer to the Revised Guidelines for Passenger Ship Safety Instructions MSC/Circ.699

- (7) The Administration may permit such ladders to be replaced by approved devices to afford access to the survival craft when waterborne, in which case there shall be at least one embarkation ladder on each side of the ship.
- (8) Where necessary, means shall be provided for bringing the davit-launched survival craft against the ship's side and holding them alongside so that persons can be safely embarked.

**7.15 *Launching Stations***

- (1) Launching stations shall be in such positions as to ensure safe launching having particular regard to clearance from the propeller and steeply overhanging portions of the hull and so that, as far as possible, survival craft, can be launched down the straight side of the ship. If positioned forward, they shall be located abaft the collision bulkhead in a sheltered position and, in this respect; the Administration shall give special consideration to the strength of the launching appliance.

**7.16 *Line Throwing Appliance***

- (1) A line-throwing appliance complying with the requirements of section 7.1 of the LSA Code shall be provided.

**7.17 *Emergency Training and Drills***

- (1) See Annex C for requirements

**7.18 *Frequency of Drills and Involvement of Crew and Passenger***

- (1) An abandon ship drill and fire drill shall take place weekly.
- (2) The entire crew need not be involved in every drill, but each crew member shall participate in an abandon ship drill and a fire drill each month.
- (3) Passengers shall be strongly encouraged to attend these drills.

**7.19 *Survival Craft and Rescue Boats to be Carried***

*Survival Craft*

- (1) Passenger Yachts to which this Code applies, shall carry survival craft in accordance with Annex 1.
- (2) Where lifeboats are required in accordance with Annex 1, A Passenger Yacht shall carry -
  - (a) subject to Section (b), partially or totally enclosed lifeboats on each side of such aggregate capacity as shall accommodate not less than 50% of the total number of persons onboard;
  - (b) the Administration may permit the substitution of lifeboats by liferafts of equivalent total capacity provided that there shall never be less than sufficient lifeboats on each side of the ship to accommodate 37.5% of the total number of persons onboard;

- (c) the inflatable or rigid liferafts shall be served by launching appliances equally distributed on each side of the ship; and
  - (d) in addition, inflatable or rigid liferafts of such aggregate capacity as shall accommodate at least 25% of the total number of persons onboard or sufficient liferafts such that in the event of any one survival craft being lost or rendered unserviceable, sufficient aggregate capacity remains on each side of the ship to accommodate 50% of the total number of persons onboard, whichever is the greater;
  - (e) the liferafts in Section (d) shall be served by at least one launching appliance on each side which may be those provided in compliance with the requirements of Section (c) or equivalent approved appliances capable of being used on both sides.
- (3) For vessels carrying Davit Launched Life Rafts (DLLRs) or a combination of DLLRs and Marine Evacuation Systems (MESs) the following shall apply-
- (a) *MESs are not permitted as the sole means of abandonment and in this regard the aggregate capacity of DLLRs each side of the ship shall be sufficient for not less than 100% of the total persons onboard;*
  - (b) in the event of the loss of any one survival craft there shall be at least 100% capacity remaining on either side; and
  - (c) in all cases dry shod evacuation shall be required.
  - (d) DLLR are permitted as the sole means of abandonment
- (4) Any Passenger Yacht to which this Code applies which operates in the Polar Regions shall carry life-saving appliances in accordance with the IMO Guidelines for Polar Regions in accordance with Annex L.
- (5) A passenger Yacht of less than 500GT which carries less than 200 persons may, under SOLAS Chapter III, Part B, Section II, Regulation 21.1-1.4, carry 300% (150% on each side) inflatable or rigid liferafts complying with sections 4.2 or 4.3 of Chapter IV of the LSA Code providing other applicable provisions of the relevant Conventions are complied with.

**Rescue Boats**

- (6) Ships of 500GT and above shall carry at least one rescue boat on each side of the ship.
- (7) Ships of less than 500GT shall carry at least one rescue boat.
- (8) A lifeboat may be accepted as a rescue boat provided it also complies with the requirements for a rescue boat.

**7.20 Time to Launch Survival Craft**

- (1) All survival craft required to provide for abandonment by the total number of persons onboard shall be capable of being launched with their full complement of persons and equipment within a period of 30 minutes from the time the abandon ship signal is given and after all persons have been assembled, with lifejackets donned.

**7.21 *Marshalling of Liferrafts***

- (1) The number of lifeboats and rescue boats that are carried on ships shall be sufficient to ensure that in providing for abandonment by the total number of persons onboard not more than six liferafts need be marshalled by each lifeboat or rescue boat.

**7.22 *Decision Support System for Masters***

- (1) All ships shall be provided with a decision support system for emergency management on the navigation bridge.
- (2) The system shall, as a minimum, consist of a printed emergency plan or plans<sup>61</sup>. All foreseeable emergency situations shall be identified in the emergency plan or plans, including, but not limited to, the following main groups of emergencies-
  - (a) fire;
  - (b) damage to ship;
  - (c) pollution;
  - (d) unlawful acts threatening the safety of the ship and the security of its passengers and crew;
  - (e) personnel accidents; and
  - (f) emergency assistance to other ships.
- (3) The emergency procedures established in the emergency plan or plans shall provide decision support to masters for handling any combination of emergency situations.
- (4) The emergency plan or plans shall have a uniform structure and be easy to use.
- (5) Where applicable, the actual loading condition as calculated for the ship's voyage stability shall be used for damage control purposes.
- (6) In addition to the printed emergency plan or plans, the Administration may also accept the use of a computer-based decision support system on the navigation bridge which provides all the information contained in the emergency plan or plans, procedures, checklists, etc., which is able to present a list of recommended actions to be carried out in foreseeable emergencies.

**7.23 *Information on Passengers***

- (1) Every ship shall have in place a system for counting all persons onboard prior to departure. The system for counting all persons onboard shall be approved by the Administration.
- (2) Details of persons who have declared a need for special care or assistance in emergency situations shall be recorded and communicated to the master prior to departure.
- (3) In addition, the names and gender of all persons onboard, distinguishing between adults, children and infants shall be recorded for search and rescue purposes.

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<sup>61</sup> Refer to the Guidelines for a structure of an integrated system of contingency planning for shipboard emergencies adopted by the IMO by resolution A.852(20).

- (4) The information required by this section shall be kept ashore and made readily available to search and rescue services when needed.

**7.24 *Recovery of persons from the water***

- (1) All ships shall have ship-specific plans and procedures for recovery of persons from the water, taking into account the guidelines developed by the IMO<sup>62</sup>. The plans and procedures shall identify the equipment intended to be used for recovery purposes and measures to be taken to minimize the risk to shipboard personnel involved in recovery operations.

**7.25 *Alternative Design and Arrangements***

- (1) *Vessels may follow Section 1.10 on Alternative Design and Arrangements for this chapter as allowed by SOLAS III/38.*
- (2) The engineering analysis required by 1.10(3) shall be prepared and submitted to the Administration, based on the guidelines<sup>63</sup> and shall include, as a minimum, the following engineering analysis elements:
- (a) determination of the ship type and the life-saving appliance and arrangements concerned;
  - (b) identification of the prescriptive requirement(s) with which the life-saving appliance and arrangements will not comply;
  - (c) identification of the reason the proposed design will not meet the prescriptive requirements supported by compliance with other recognized engineering or industry standards;
  - (d) determination of the performance criteria for the ship and the life-saving appliance and arrangements concerned addressed by the relevant prescriptive requirement(s):
    - (i) performance criteria shall provide a level of safety not inferior to the relevant prescriptive requirements contained in this chapter; and
    - (ii) performance criteria shall be quantifiable and measurable;
  - (e) detailed description of the alternative design and arrangements, including a list of the assumptions used in the design and any proposed operational restrictions or conditions;
  - (f) technical justification demonstrating that the alternative design and arrangements meet the safety performance criteria; and

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<sup>62</sup> Refer to the Guidelines for the development of plans and procedures for recovery of persons from the water (MSC.1/Circ.1447).

<sup>63</sup> Refer to the Guidelines on alternative design and arrangements for SOLAS chapters II-1 and III (MSC.1/Circ.1212).

- (g) risk assessment based on identification of the potential faults and hazards associated with the proposal.

*7.26 Additional Equivalence Considerations*

- (1) None

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## **CHAPTER 8**

### **RADIOCOMMUNICATIONS, SAFETY OF NAVIGATION, INTERNATIONAL SAFETY MANAGEMENT AND MARITIME SECURITY**

#### **8.1 Radiocommunications**

- (1) *Every ship to which this Code applies shall comply with the applicable requirements of SOLAS IV.*

#### **8.2 Safety of Navigation**

- (1) *Subject to any special provisions given in national legislation every ship to which this Code applies shall comply with the applicable requirements of SOLAS V.*
- (2) *Deviations from the requirements of SOLAS V/22.1.9.1 may be considered by the Administration, provided that they:*
- (a) provide safety standards at least equivalent to the requirements of this Chapter;*
  - (b) meet the intent of the requirements concerned; and*
  - (c) where necessary, have successfully undergone testing to the satisfaction of the Administration; or*
  - (d) have successfully undergone, an engineering analysis, evaluation and approval.*

#### **8.3 International Safety Management**

- (1) *Every ship to which this Code applies shall comply with the applicable requirements of SOLAS IX.*

#### **8.4 Maritime Security**

- (1) *Every ship to which this Code applies shall comply with the applicable requirements of SOLAS XI-2, regarding Special Measures to Enhance Maritime Security.*

#### **8.5 Maritime Safety**

- (1) *Every ship to which this Code applies shall comply with the applicable requirements of SOLAS XI-1, regarding Special Measures to Enhance Maritime Safety.*

#### **8.6 Additional Equivalence Considerations**

- (1) *None*

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## **CHAPTER 9**

### **ACCOMMODATION AND RECREATIONAL FACILITIES - DESIGN AND CONSTRUCTION**

#### **9.1 ILO Maritime Labour Convention**

- (1) Ships shall be constructed, certificated and operated under the provisions of the MLC for passenger ships.

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## **CHAPTER 10**

### **REQUIREMENTS FOR VESSELS CARRYING MORE THAN 120 PERSONS**

#### **10.1 Application**

- (1) *This Chapter applies to all yachts certified to carry more than 120 and no more than 200 persons onboard.*
- (2) *Yachts of less than 80m L are not eligible to be certified in accordance with this chapter due to the stability limitations for vessels of this size.*
- (3) *This chapter shall only be applied to Yachts which are built and operated as either PY-P or PY-U yachts in accordance with Part B Annex 1.*

#### **10.2 Construction and Equipment Requirements**

- (1) *Unrestricted PY-P vessels, and PY-U vessels which are limited to an operational area within 60 nautical miles of a safe haven (the Administration may permit single voyages on specified routes with additional restrictions as appropriate) certified to carry more than 120 persons shall:*
  - (a) *comply with the enhanced survivability standard as defined in section 4.30 for all watertight compartments;*
  - (b) *comply with the maximum floodable length requirements as defined in section 4.31;*
  - (c) *have boundaries including windows and doors, with external escape routes and muster stations, of a standard being at least an A-0 Class division;*
  - (d) *have low location lighting in accordance with Section 6.11(18) installed in all corridors and staircases in crew/occasional worker areas;*
  - (e) *have lifebuoys provided in accordance with the requirements of SOLAS III/22.1;*
  - (f) *have immersion Suits provided in accordance with the requirements of SOLAS III/22.4; and*
  - (g) *have a flooding detection system to be provided in accordance with the requirements of SOLAS II-1/22-1*
- (2) *in addition to the requirements of (1), PY-U Vessels wishing to operate outside the limitations specified in 10.2(1), certified to carry over 120 persons shall comply with the requirements of SOLAS II-1/8.1, II-2/21 and 22 for 'Safe Return to Port' as applicable.*

**10.3 Crew Qualifications**

- (1) All seafarers shall hold the following STCW qualifications;
  - (a) A-VI/1-1 - personal survival techniques
  - (b) A-VI/1-2 - fire prevention and firefighting
  - (c) A-VI/1-3 - elementary first aid
  - (d) A-VI/1-4 - personal safety and social responsibilities
  - (e) A-VI/6.5 - Security Awareness Training
  
- (2) All persons who are not passengers or do not meet the definition of a seafarer, shall meet the requirements of an occasional worker as set out in Annex E to the Code.
  - (a) The number of occasional workers shall not exceed 10% of the total number of non-passengers onboard the Yacht.

Table 10.1 – Example numbers of persons onboard

<b>Category of Persons</b>	<b>Number onboard</b>
Passengers	36
Seafarers	148
Occasional Worker	16
<b>TOTAL</b>	<b>200</b>

Table 10.2 – Summary of requirements for vessels carrying more than 120 persons

Category of yacht	<b>Passenger Yacht Unrestricted Engaged in Trade (PY-U)</b>		<b>Pleasure Vessel not Engaged in Trade (PY-P)</b>
	Unlimited	60 nautical miles of a safe haven	Unlimited
Construction and Equipment Requirements (Chapter 10.2)	Section 10.2(1) +	Section 10.2(1)	Section 10.2(1)
	Section 10.2(2) + (SOLAS 'Safe Return to Port')		
Crew Qualifications (Chapter 10.3)	Section 10.3(1) (Seafarers to hold STCW) + Section 10.3(2) (10% Occasional Workers)	Section 10.3(1) (Seafarers to hold STCW) + Section 10.3(2) (10% Occasional Workers)	Section 10.3(1) (Seafarers to hold STCW) + Section 10.3(2) (10% Occasional Workers)

## CHAPTER 11

### REQUIREMENTS FOR SAILING VESSELS

#### 11.1 *General*

- (1) *Sailing vessels as defined in Chapter 2 shall comply with the provisions of this Chapter of the Code in full.*

#### 11.2 *Application*

- (1) *As per Chapter 2, a sailing vessel is a vessel designed to carry sail, whether as a sole means of propulsion or as a supplementary means.*

#### 11.3 *Operating Restrictions*

- (1) *The vessel's "Statement of Operational Limitations" shall give the maximum wind speed or 'Derived Heel Angle' and reference the vessel's 'Sailing Operations Manual'*
- (2) *Any applicable rig limitations shall also be listed on the statement.*

#### 11.4 *Water Freeing Arrangements*

- (1) *Where the solid bulwark height does not exceed 150 millimetres, specific freeing ports, as defined section 2.13, are not required.*

#### 11.5 *Intact Stability*

- (1) *"the 'down-flooding angle' is the angle of heel causing immersion of the lower edge of openings having an aggregate area, in square meters, greater than:-*

$$\frac{\Delta}{1500} = \text{where } \Delta = \text{vessels displacement in tonnes}''$$

- (2) *Vessels shall comply with the appropriate parts of chapter 4 regarding intact stability in full.*
- (3) *Current Chapter 4 requirements are to be assessed without accounting for the added windage of the sails. Vessels with lifting keels, shall meet the requirements of Chapter 4 in the most onerous condition.*
- (4) *Asymmetric ballasting is not permitted whilst sailing*

#### 11.6 *Intact Stability Monohulls*

- (1) *Curves of statical stability (GZ curves) for at least the Loaded Departure with 100% consumables and the Loaded Arrival with 10% consumables shall be produced.*

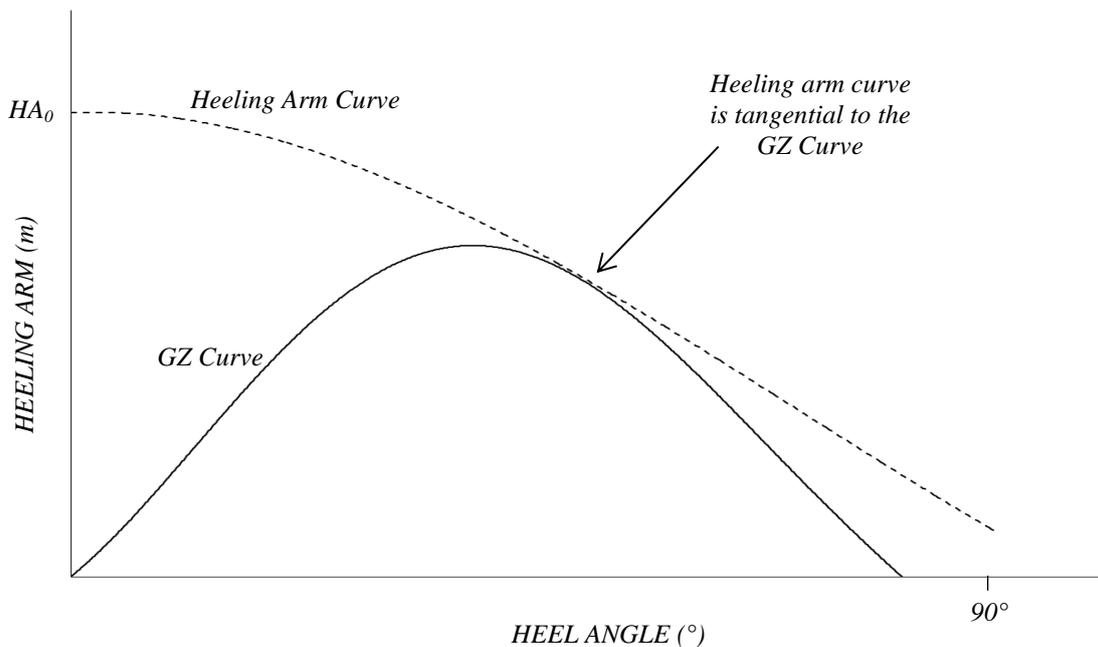
- (2) The GZ curves required by (1) shall have a positive range of not less than 90°, where the ‘Sail Area Displacement Ratio’ is greater than 10 calculated as follows:

$$\frac{A_{sails}}{\nabla \left(\frac{2}{3}\right)} = \text{Sail Area Displacement Ratio}$$

- $\nabla =$  Vessel displacement in metres cubed ( $m^3$ )  
 $A_{sails} =$  is the area of the full upwind sail plan, including sail overlaps in square meters ( $m^2$ )

- (3) For vessels where the ‘Sail Area Displacement Ratio’ is less than 10 calculated as per (2), Where a range of less than 90° exists, the wind speed required to capsize shall be calculated to be more than 38 knots as follows:

The heel angle resulting from a steady wind heeling moment corresponds to the intersection of the righting and heeling arm curves, so the heeling arm at the point of



capsize is defined where the heeling arm curve is tangential to the GZ curve.

The heeling arm curve is defined by the formula:

$$HA_{\theta} = HA_0(\cos\theta)^{1.3}$$

Where

$HA_{\theta}$  = Heeling arm at any given angle  $\theta$

$HA_0$  = Heeling arm at 0° where heeling arm curve is tangential to the GZ curve

*V* is calculated by the formula:

$$V \times 0.514 = v = \sqrt{\left( \frac{\Delta \times 9.81 \times HA_0}{0.5\rho(A_{SAILS}h_{SAILS}C_{SAILS} + A_{HULL}h_{HULL}C_{HULL})} \right)}$$

Where

*V* = Apparent wind speed in knots

*v* = Apparent wind speed in metres per second (m/s)

$\rho$  = Density of Air (assumed to be 1.22)

$\Delta$  = Vessel displacement in kilograms (kg)

$A_{sails}$  = is the area of the full upwind sail plan, including sail overlaps in square meters ( $m^2$ )

$h_{sails}$  = is the height of the centroid of the sail plan above half the draft in meters (m)

$C_{sails}$  = is the maximum sail heeling force coefficient, assumed to be 1.75 (unless proven otherwise)

$A_{hull}$  = is the profile area of the hull and superstructure in square meters ( $m^2$ )

$h_{hull}$  = is the height of the centroid of the hull and superstructure area above half the draft in meters (m)

$C_{hull}$  = is the hull heeling force coefficient, assumed to be 1.0 (unless proven otherwise)

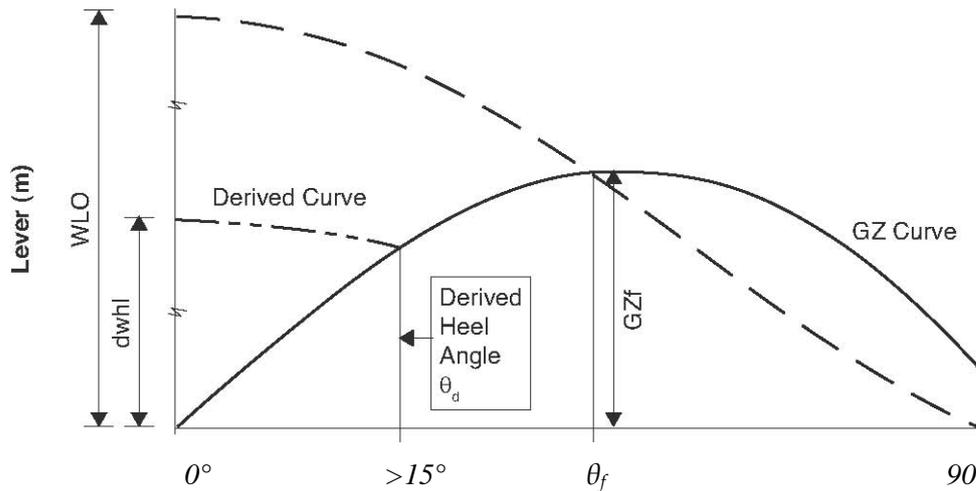
- (4) In addition to the requirements of (2) or (3), the angle of steady heel shall be greater than 15 degrees (see figure). The angle of steady heel is obtained from the intersection of a "derived wind heeling lever" curve with the GZ curve required by (1).

In the figure:-

'dwhl' = the "derived wind heeling lever" at any angle  $\theta^\circ$

$$= 0.5 \times WLO \times \text{Cos}^{1.5}\theta$$

where  $WLO = \frac{GZ_f}{\text{Cos}^{1.5}\theta_f}$



Noting That:

$WLO$  = is the magnitude of the actual wind heeling lever at  $0^\circ$  which would cause the vessel to heel to the 'down flooding angle'  $\theta_f$  or  $60^\circ$  whichever is least.

$GZ_f$  = is the lever of the vessel's GZ at the down flooding angle ( $\theta_f$ ) or  $60^\circ$  whichever is least.

$\theta_d$  = is the angle at which the 'derived wind heeling' curve intersects the GZ curve. (If  $\theta_d$  is less than  $15^\circ$  the vessel will be considered as having insufficient stability for the purpose of the Code).

$\theta_f$  = the 'down-flooding angle' is the angle of heel causing immersion of the lower edge of openings having an aggregate area, in square meters, greater than:-

$$\frac{\Delta}{1500} = \text{where } \Delta = \text{vessels displacement in tonnes}$$

All regularly used openings for access and for ventilation shall be considered when determining the downflooding angle. No opening regardless of size which may lead to progressive flooding shall be immersed at an angle of heel of less than  $40^\circ$ . Air pipes to tanks can, however, be disregarded.

If, as a result of immersion of openings in a superstructure, a vessel cannot meet the required standard, those superstructure openings may be ignored and the openings in the weather deck used instead to determine  $\theta_f$ . In such cases the GZ curve shall be derived without the benefit of the buoyancy of the superstructure.

It might be noted that provided the vessel complies with the requirements of (1) to (4) and is sailed with an angle of heel which is no greater than the 'derived angle of heel', it shall be capable of withstanding a wind gust equal to 1.4 times the actual wind velocity (i.e. twice the actual wind pressure) without immersing the 'down-flooding openings', or heeling to an angle greater than  $60^\circ$ .

## 11.7 Damage Stability

- (1) The maximum assumed wind force ( $M_{wind}$ ) acting in a damage situation as per Section 4.8(6), shall be calculated so that the 'projected lateral area above the waterline' ( $A$ ), includes all running/standing rigging sail controls and spars.

- (2) *The projected lateral area in Section 4.29(10)(c) is to include all running/standing rigging sail controls and spars.*
- (3) *Where applicable, the requirements of Chapter 4 Part VII shall be met whilst under a moment due to wind pressure as calculated by Section 4.29(10)(c).*
- (4) *In order to eliminate the wind heeling moment from the sails in case of damage, 11.18(1) shall be complied with.*

**11.8 Equipment Numeral**

- (1) *When calculating the equipment numeral, sailing vessels shall take into account the additional windage effect of the masts and rigging.*
- (2) *Typically, for square rigged sailing vessels, experience based guidance on approximate increase in anchor mass and cable strength required is:*
  - (a) *for vessels up to 50 meters in length, typically 50% above the requirements for a typical motor vessel having the same total longitudinal profile area of hull and superstructure as the square rigged sailing vessel under consideration; and*
  - (b) *for vessels 100 meters in length and over, typically 30% above the requirements for a typical motor vessel having the same total longitudinal profile area of hull and superstructure as the square rigged sailing vessel under consideration.*
  - (c) *for a square rigged sailing vessel of between 50 and 100 metres in length the increase shall be obtained by linear interpolation.*

**11.9 Machinery and Electrical Installations**

- (1) *Lighting supplied by the emergency source of electrical power shall be provided for illuminating the rigging, sails and sail controls including and dropping/furling in an emergency. The lighting shall be such that the night vision of the watchkeepers is not impaired, and is to be arranged so that it cannot be mistaken for navigation light by another ship. Care shall also be given to preventing glare and stray reflections.*
- (2) *Main engines shall have a minimum power to ensure that the vessel has a minimum speed of 6 knots while heading into Beaufort Force 8 weather and corresponding sea conditions.*
- (3) *The sail handling facilities shall be equipped to allow a controlled emergency release of the sheets from both locally and from the bridge which shall be supplied by stored power. Sail controls shall have a local secondary means of control in the event of failure.*
- (4) *A control system is to be provided so that the setting and trimming of sails may be carried out from the bridge, and is to be such that, once established, the desired setting and trimming may be automatically maintained. The control system is to provide adequate speed of response to automatically neutralize the sail system in the event of wind conditions which may damage the sail system and endanger the ship.*

- (5) Lowering or furling of any combination of the sails shall be operational from a source of power other than the main source of power. These controls shall be operational at the down flooding angle or 60° whichever is least.
- (6) The Emergency Generator, fire pump and bilge pumps shall operate at 22.5 degrees or greater depending on the vessels specific operating conditions.
- (7) Vessels shall have lightning strike protection<sup>64</sup>.
- (8) Watertight Doors shall be able to operate at the maximum steady heel angles.

### **11.10 Fire Protection, Detection and Extinction**

- (1) Within the interior of the vessel, the mast shall be either insulated directly to A-60 class requirements or contained within a space dedicated to the protection of the mast only, and insulated as follows:
  - (a) 'A-30' when adjacent to category (1),(2),(3),(4) & (10) spaces as per 6.7(10)(b)(vi);and
  - (b) 'A-60' when adjacent to cat. (5),(6),(7),(9) spaces as per 6.7(10)(b)(vi).

*The space and those adjacent shall be fitted with a fully addressable fire detection system and a fixed fire fighting system complying with the relevant provision of the Fire Safety Systems Code.*

- (2) Standing and running rigging shall not be located or terminated in Category (11), (9), (7), (6) or (5) spaces. Where this is not possible, the rigging shall be locally protected to A-60 Class.
- (3) When applying 6.3(23) for the application of the requirements to furniture on open deck, all sails and rigging equipment shall be considered in the same way as lifesaving appliances.

### **11.11 Life-Saving Appliances and Arrangements**

- (1) Life-saving appliances shall not be stowed in any position during normal operating conditions where, if required to be used or float free, rigging, the running rigging, spars or any other structure or equipment would cause an obstruction to its use.
- (2) The requirements of Section 7.4(a) shall be achievable under any combinations of sails within the Sailing Operations Manual.
- (3) Equipment shall be provided for the cutting and clearing of the rigging if dismasted.

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<sup>64</sup> See IEC 60092-401:1980 as amended or IEC 60092-507 as appropriate and Recognised Organisation requirements.

**11.12 *Emergency Procedures, Training and Drills***

- (1) *Sail Reduction drills shall be conducted in accordance with the vessel's 'Sailing Operations Manual'. These drills shall be conducted weekly or within the first 24 hours of the ship leaving a port where one has not been conducted within the last 7 days.*

**11.13 *Safety of Navigation***

- (1) *Subject to any special provisions given in the national legislation every ship to which this Code applies shall comply with the applicable requirements of Chapter V of SOLAS.*
- (2) *Special consideration shall be given to 'Bridge Visibility' on sailing vessels in compliance with the Code specifically with regard to the placement of dedicated lookouts which shall:*
  - (a) *have the sole duty, while the ship is underway, of maintaining a lookout,*
  - (b) *be positioned outside the passenger spaces, and*
  - (c) *be instructed by the master to keep a continuous lookout, and in particular over any or all (as the case may be) of the areas which are obstructed from the navigating position which the helmsman cannot see.*
  - (d) *the dedicated lookout may be in the wheelhouse, but if positioned outside the wheelhouse and remote they shall be provided with a means voice communication to the helmsman.*
- (3) *Every sailing vessel shall carry a masthead anemometer, and an inclinometer, both of which shall be readable from the helms position.*
- (4) *Where the GMDSS radio aerial is located in the mast or rigging, an emergency aerial shall be carried so that in the event of a dismasting, the equipment can be rendered serviceable.*

**11.14 *Sailing Operations Manual***

- (1) *'Sailing Operations Manual' shall be approved by the Administration and used to indicate the various applicable sail combinations in relation to maximum wind speed & direction. This data shall be supported by results from appropriate testing and/or sea trials.*
- (2) *The sailing operations manual shall include the following:*
  - (a) *General design parameters, environment data and limited operating conditions.*
  - (b) *Sail combination and reefing schedules with their corresponding, or in the case of a multihull, the values of maximum advised mean apparent wind speed, for the reference of the watchkeeper.*
  - (c) *Curves of maximum steady heel angle to prevent down flooding in squalls*

- (d) *Operational plans shall outline the sailing manoeuvres and numbers of trained crew required to conduct them (this will be considered in the requirements for minimum safe manning) including full particulars and plans of automatic operating systems*
- (e) *The Stability book and Sailing Operations Manual shall contain the following statement for the Master:*

*The vessel has not been reviewed against damage stability criteria whilst under sail. Additional wind heeling moments from the sails could lead to capsize after minor damage.*

**IN THE EVENT OF DAMAGE, ALL SAILS SHALL BE IMMEDIATELY  
FURLED OR DROPPED AS APPROPRIATE**

**11.15 Health and Safety**

- (1) *Consideration will need to be given to the function of doors at adverse angles of heel while not making them dangerous to passengers at adverse heel angles.*
- (2) *Crew and passengers shall be able to move about the vessel safely at angles up to the 'Derived Heeling Angle'.*
- (3) *Consideration shall be given to the protection of persons on board from running rigging, sheets and spars, and in particular the possible flogging of sails and sheets.*
- (4) *Escape routes, muster stations and embarkation stations shall be protected from running rigging, sheets and spars.*

**11.16 Manning Certification**

- (1) *In assessing the appropriate level of manning for a passenger yacht the following factors are among those which shall be taken into account:*
  - (a) *Sail control/handling systems onboard (captive winch systems etc)*
  - (b) *Sail areas & numbers of sails & masts*
  - (c) *Type of rig (traditional square rigger, modern sloop etc)*
  - (d) *Skilled crew requirements for maneuvering as per the 'Sailing Operations Manual'*
  - (e) *Obstructed views from the bridge caused by masts and sails (see 11.13(2))*
- (2) *All deck officers shall have RYA/MCA Yachtmaster Ocean Certificate of Competence for sailing vessel.*
- (3) *A sufficient number of Sail Coordinators may be required by the Administration to be carried dependent on the items in Section (1). Although the ultimate responsibility for the vessel is always with the Master, the on watch Sail Coordinator role is the*

*designated person who's only responsibility is for the number and combination of sails to be set for the prevailing and forecast conditions, staying within the statement of operational limitation related to the sailing and the rig, adhering to the curves of maximum steady heel angle to prevent down flooding in squalls and providing constant reference to the 'Sailing Operations Manual' and Stability Book. Sail Coordinators shall hold as a minimum an RYA/MCA Yachtmaster Ocean Certificate of Competence for sailing vessel.*

**11.17 Masts and Spars and Standing Rigging**

- (1) Dimensions and construction materials of masts and spars and dimensions of standing rigging including connection to chain plates shall be in accordance with the requirements or recommendations of a Recognised Organisation or a recognised national or international standard.*
- (2) The associated structure for masts and spars (including chainplates, fittings, decks and floors) shall be constructed to effectively carry and transmit the forces involved.*
- (3) Running rigging, blocks, shackles, rigging screws, cleats and associated fittings shall be Type approved and sized as per the Recognised Organisation's satisfaction.*
- (4) Sails controls (sheets, Halyards), blocks & attachments shall be Type Approved and sized as per the Recognised Organisation's satisfaction*
- (5) Compliance with (1) to (3) & 4 shall be confirmed by a design review and approval by one of the Classification Societies (e.g. Rig Design Certificate) which is assigned with the review of the rig.*
- (6) The Maintenance Manual provided by the mast manufacturer shall be reviewed and approved by the Recognised Organisation which is assigned to review the rig design.*
- (7) A physical survey on the rig stepping procedure and the rig behaviour during sea trials is to be carried out by or on behalf of the Recognised Organisation that is involved with the classification of the vessel's hull.*
- (8) Annual surveys on the vessel shall include reviewing records and history of rig Maintenance.*
- (9) Rig manuals (Rig Behavior Report and Rig Maintenance Manual) to monitor the condition of the rig in accordance with a Maintenance Manual and a planned maintenance schedule. The schedule shall include, in particular, regular monitoring of all the gear associated with safe work aloft and on the bowsprit.*

**11.18 Sails**

- (1) In order to eliminate the wind heeling moment in case of damage, all the sails for any given sail combination (as per the vessel's Sailing Operations Manual) shall be able to be dropped/stowed or furled within 10 minutes under the conditions described in Section 11.9(5).*

- (2) *Adequate means of reefing or shortening sail shall be provided.*

**11.19 Additional Equivalence Considerations**

- (1) *None*

## **CHAPTER 12**

### **PROTECTION OF PERSONNEL**

#### **12.1 General Requirements**

- (1) *Vessels shall comply with the requirements of Annex O and those of the Administration.*
- (2) *Vessels shall comply with the requirements of Annex B and those of the Administration.*

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## **CHAPTER 13**

### **SHIP-SHORE TRANSFER OF PERSONNEL**

#### **13.1 General Requirements**

- (3) *Vessels shall comply with the requirements of Annex K and those of the Administration.*

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## **CHAPTER 14**

### **MANNING, CERTIFICATION AND HOURS OF WORK**

#### **14.1 General Requirements**

- (1) *Vessels shall comply with the requirements of Annex G and those of the Administration.*

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## **CHAPTER 15**

### **HELICOPTER LANDING AREAS**

#### **15.1 General Requirements**

- (1) *Vessels shall comply with the requirements of Annex H and those of the Administration.*

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## **CHAPTER 16**

### **OPERATIONAL READINESS, MAINTENANCE AND INSPECTIONS**

#### **16.1 General Requirements**

- (1) *Vessels shall comply with the requirements of Annex I and those of the Administration.*

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## **CHAPTER 17**

### **MEDICAL CARE AND CARRIAGE OF MEDICAL STORES**

#### **17.1 General Requirements**

- (1) *A vessel shall carry medical stores as required by Annex J and the Administration.*

*This page is intentionally added to achieve correct pagination.*

## **CHAPTER 18**

### **APPLICATION OF INTERNATIONAL CONVENTIONS AND NATIONAL LEGISLATION**

#### **18.1    *General Requirements***

- (1) *Vessels shall comply with the requirements of Annex L and those of the Administration.*

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## **CHAPTER 19**

### **LIST OF CERTIFICATES TO BE ISSUED**

#### **19.1 General Requirements**

- (1) *Vessels shall have the certificated listed in Annex M issued.*

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## **CHAPTER 20**

### **SURVEY, CERTIFICATION AND ACCIDENT INVESTIGATIONS**

#### **20.1 General Requirements**

- (1) *Vessels shall comply with the requirements of Annex N and those of the Administration.*

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**ANNEX 1**

**TABLE SUMMARISING CATEGORIES OF PASSENGER YACHT AND STANDARDS OF STABILITY AND SURVIVABILITY, LIFE-SAVING APPLIANCES SCALES, MAXIMUM PERSONS CARRIED AND OTHER RELATED MATTERS.**

Category of yacht		Passenger Yacht Unrestricted Engaged in Trade (PY-U)		Pleasure Vessel not Engaged in Trade (PY-P)		PY-1		PY-2	
Operational Area		Unlimited		Unlimited		Prescribed international voyage (see definitions)		60n.m. of a safe haven and 20n.m from land in conditions not exceeding wind force six and sea state five on Beaufort scale	
Damage Stability Standard		<80m L Chapter 4 Part VI	≥80m L Chapter 4 Part II	<80m L Chapter 4 Part VI	≥80m L Chapter 4 Part II	<80m L Chapter 4 Part VI	≥80m L Chapter 4 Part II	<80m L Chapter 4 Part VI	≥80m L Chapter 4 Part II
LSA <sup>65, 66</sup>	≤ 50 Persons	300% Liferrafts + Additional Provisions (Chapter 4 part VII)	300% Liferrafts + Additional Provisions (Chapter 4 part VII)	300% Liferrafts		300% Liferrafts + Additional Provisions (Chapter 4 part VII)		300% Liferrafts	
	> 50 and ≤ 99 Persons		Lifeboats (in accordance with Section 7.19)						
	> 99 and ≤ 120 persons	Lifeboats (in accordance with Section 7.19) + Doctor	Lifeboats (in accordance with Section 7.19)	Lifeboats (in accordance with Section 7.19) + Doctor	Lifeboats (in accordance with Section 7.19)	Lifeboats (in accordance with Section 7.19) + Doctor	Lifeboats (in accordance with Section 7.19) + Doctor	Lifeboats (in accordance with Section 7.19) + Doctor	
	> 120 and ≤ 200 persons	Not Applicable (see Section 10.1(2))	Lifeboats + Doctor	Not Applicable (see Section 10.1(2))	Lifeboats + Doctor	Not Applicable (see Section 10.1(2))	Not Applicable (see Section 10.1(2))	Not Applicable (see Section 10.1(2))	

<sup>65</sup> 300% Liferrafts can be 300% Davit Launched Liferrafts or a combination of DLLR & MES in accordance with Section 7.21(3)(d)

<sup>66</sup> Lifeboats may be carried in place of 300% liferafts and the Additional Provisions of Chapter 4 part VII need not be complied with

## ANNEX 2

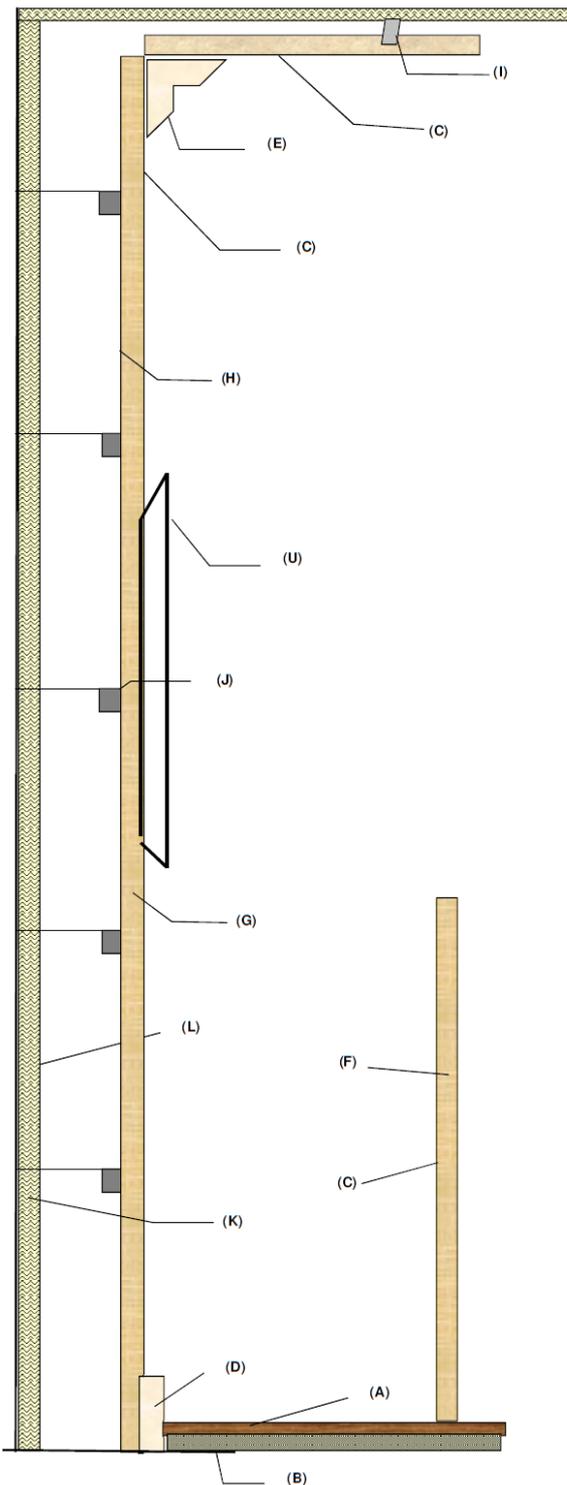
### GUIDANCE MATERIALS MATRIX FOR ACCOMMODATION SPACES, SERVICE SPACES AND CONTROL STATIONS

Type of Space	Control Stations	Stairway Enclosures	Corridors	Accommodation Areas	Service spaces and Garage Spaces	Balconies see note (10)	Included in Calorific value Calculation	Included in Fire Volume Calculation
Category Of Space	1	4	2	3	5, 9, 11	10	1 - 9	1 - 9
Material								
(A) Floor coverings	No Applicable Requirements	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 2 (PYC 6.4 refers)	No Applicable Requirements	Annex 1, Part 5 Annex 1, Part 2 <b>Except natural hardwood decking systems</b> <b>See Note (10)</b>		
(B) Primary deck coverings	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2		
(C) Exposed surfaces of walls and ceilings, panel surfaces and ceiling linings, including paints, varnishes, fabrics and veneers (see note 16)	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	✓	✓ (except Balconies)
(D) Skirting Board	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	No Applicable Requirements		✓
(E) Combustible facings, mouldings, decorations	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	Annex 1 Part 2 Annex 1 Part 5 <b>see note (6)</b>	✓	✓
(F) Partial Bulkhead	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1		
(G) Wall panel/Lining	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1		
(H) Concealed panel surface	Annex 1, Part 5	Annex 1, Part 5	Annex 1, Part 5	Annex 1, Part 5	Annex 1, Part 5	No Applicable Requirements	✓	
(I) Draught stops	Annex 1, Part 1 <b>see note (14)</b>	Annex 1, Part 1 <b>see note (14)</b>	Annex 1, Part 1 <b>see note (14)</b>	Annex 1, Part 1 <b>see note (14)</b>	Annex 1, Part 1 <b>see note (14)</b>	Annex 1, Part 1 <b>see notes (14) and (15)</b>	Not applicable	
(J) Grounds and supports	Annex 1, Part 1 <b>see note (15)</b>	Annex 1, Part 1 <b>see note (15)</b>	Annex 1, Part 1 <b>see note (15)</b>	Annex 1, Part 1 <b>see note (15)</b>	Annex 1, Part 1 <b>see notes (14) and (15)</b>	Annex 1, Part 1 <b>see notes (14) and (15)</b>		
(K) Insulation	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1	Annex 1, Part 1 <b>see note (12)</b>	Annex 1, Part 1		
(L) Insulation surface	Annex 1, Part 5 <b>see note (13)</b>	Annex 1, Part 5 <b>see note (13)</b>	Annex 1, Part 5 <b>see note (13)</b>	Annex 1, Part 5 <b>see note (13)</b>	Annex 1, Part 5 <b>see note (13)</b>	Annex 1, Part 5 <b>see note (13)</b>		
(M) Curtains and other suspended textiles	Annex 1, Part 7 <b>see note (5)</b>	Annex 1, Part 7	Annex 1, Part 7	<b>see note (17)</b>	Annex 1, Part 7	Not applicable		
(N) Upholstered furniture (including Sofas and Chairs)	<b>see note (5)</b>	<b>see notes (2) and (4)</b>	<b>see note (11)</b>	<b>see note (17)</b>	<b>see note (5)</b>	Annex 1, Part 8 <b>see note (9)</b>		
(O) Case furniture (desks, wardrobes, dressing tables, bureaux, dressers etc.)	<b>see note (5)</b>	Not allowed	Not allowed	<b>see note (17)</b>	No Applicable Requirements	No Applicable Requirements		
(P) Free standing furniture (tables etc.)	<b>see note (5)</b>	Not allowed	Not allowed	<b>see note (17)</b>	No Applicable Requirements	<b>see note (9)</b>		
(Q) Window box surface	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	Annex 1, Part 5 Annex 1, Part 2	✓	✓ <b>see note (1)</b>
(R) GRP surfaces in private Bathroom/Toilet Modules	Not applicable	Not applicable	Not applicable	Annex 1, Part 5 Annex 1, Part 2	Not applicable	Not applicable	✓	✓
(S) Light fixtures	In general no certification required, but to be looked at on a case by case basis, in particular when at ceiling or fixed to bulkhead							
(T) Waste receptacles	Not allowed	Not allowed	Not allowed	Non-combustible <b>see note (3)</b>	Non-combustible <b>see note (3)</b>	Non-combustible <b>see note (3)</b>		
(U) Object d'art, planters, paintwork (NEVER TO REDUCE ESCAPE WIDTHS)	Not allowed	<b>see notes (7) and (8)</b>	<b>see notes (7) and (8)</b>	<b>see note (8)</b>	Not allowed	No Applicable Requirements		

(to be read in conjunction with Chapter 6 of the Code and MSC/Circ. 1120, Annex, Interpretation of SOLAS II-2/5 .3 and 6. For guidance only, actual requirements shall be taken from the text within chapter 6 of the Code)

**Red Ensign Group Yacht Code  
Part B**

Description	FTP Code Part	Test Procedure
Non-combustibility test	FTP Code Annex 1, Part 1	ISO 1182:2010
Smoke and toxicity test	FTP Code Annex 1, Part 2	ISO 5659-2: 2012 and reference to MSC/Circ. 1120
"A", "B" & "F" class divisions	FTP Code Annex 1, Part 3	-
Test for fire door control systems	FTP Code Annex 1, Part 4	-
Test for surface flammability	FTP Code Annex 1, Part 5	-
Test for primary deck covering	FTP Code Annex 1, Part 5	-
Test for vertically supported textiles	FTP Code Annex 1, Part 7	-
Test for upholstered furniture	FTP Code Annex 1, Part 8	-
Test for bedding components	FTP Code Annex 1, Part 9	-
Determination of calorific potential	SOLAS II-2/5.3.2.2	ISO 1716:2002



<b>Note that where the words 'No Applicable Requirements' appear, although no compliance is required by the Regulations, use of materials having restricted fire risk in accordance with applicable requirements, is recommended</b>	
<b>note(1):</b>	The windows box shall have a non-combustible structure. Where the structure is faced with a combustible veneer, this item shall be included in the fire volume calculation.
<b>note(2):</b>	Furniture in stairway enclosures shall be limited to seating. It shall be fixed, limited to six seats on each deck in each stairway enclosure, of restricted fire risk, and shall not restrict the passenger escape route.
<b>note(3):</b>	Refer to PYC 6.2(32) for detailed requirements
<b>note(4):</b>	These items shall be constructed with frames of non-combustible materials and, if upholstered are to comply with FTP Annex 1, Part 8
<b>note(5):</b>	Such spaces were not originally meant to be outfitted as accommodation spaces and fire volume calculations were in fact not required by SOLAS. Should they be constructed as such they shall be treated as spaces of restricted fire risk as defined in 6.7(1)(d)
<b>note(6):</b>	FTP Code, Annex 1, Parts 2 and 5 are applicable only to paints, varnishes and other finishes (Reg. II-2/6.2) (i.e. not veneers or substrate).
<b>note(7):</b>	To be kept to a minimum, be fixed and have properties that are not readily ignitable.
<b>note(8):</b>	Large artworks that form the majority of the bulkhead are to have low frame spread surface.
<b>note(9):</b>	Refer to PYC 6.3 (21), (22) and (23) for details regarding Furniture and furnishings on cabin balconies.
<b>note (10):</b>	For open deck spaces other than balconies, attention shall be paid to MSC.1/Circ.1274 when adjacent to LSA
<b>note (11):</b>	Not allowed in cabin corridors. In other corridors (i.e. corridors not forming part of an Escape Route), notes 2 and 4 apply.
<b>note (12):</b>	Insulating materials located in cargo spaces, mail rooms and refrigerated compartments of service spaces need not be non-combustible. SOLAS II-2/5.3.1.1 refers.
<b>note (13):</b>	Combustible vapour barriers and adhesives used in conjunction with insulation shall be kept to the minimum quantity practicable. SOLAS II-2/5.3.1.1 refers.
<b>note (14):</b>	Linings, grounds, draught stops and ceilings in mail rooms, baggage rooms, saunas or refrigerated compartments need not be non-combustible. SOLAS II-2/5.3.1.2.1 refers.
<b>note (15):</b>	Grounds in concealed or inaccessible spaces in accommodation, service spaces and control stations shall have low flame spread characteristics in accordance with FTP Code Annex 1, Part 5. SOLAS II-2/5.3.2.4.1.2 refers.
<b>note (16):</b>	See PYC 6.3 (18) for details regarding the possible relaxation of Low Flame-spread characteristics in areas appropriated for the use of the Owners and passengers, subject to agreement by the Flag Administration.
<b>note (17):</b>	Refer to PYC 6.7(1)(d) and for detailed requirements where the space shall be treated as spaces of restricted fire risk.

**The content of Annex 2 is generously provided by Lloyds Register to the appreciation of the Red Ensign Group (REG).**

