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AUSTRALIAN NAVAL CLASSIFICATION AUTHORITY MANUAL (VOLUME 2)

DIVISION 3: SHIP RULES

CHAPTER 06: FIRE SAFETY

PART 2: SOLUTIONS TO THE ANC RULES

This document is issued for use by Defence and Defence Industry personnel and is effective forthwith.

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Assistant Secretary
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Department of Defence
CANBERRA ACT 2600
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ANCA Manual (Volume 2)

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3 https://www.legislation.gov.au/Series/C2004A03712

4 http://drnet/AssociateSecretary/security/policy/Pages/dspf.aspx

AUSTRALIAN NAVAL CLASSIFICATION RULES

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AMENDMENTS

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Division 3: Ship Rules
Part 2: Solutions to the ANC Rules

Chapter 06: Fire Safety

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Solutions to the ANC Rules

Rule 0. Goal

0.1 Goal for this Chapter is contained in Part 1.

Rule 1. General

Solutions

1.1 The Naval Vessel Operator shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. All decisions that affect compliance with the requirements of this chapter shall be recorded at all stages from concept to disposal and these records shall be maintained throughout the life of the ship.

1.2 For the purpose of this Chapter's Solutions, three Ship Types are defined in Division 1 Annex A *Definitions and Abbreviations*; Ship Type A, Type B and Type C. These Ship Types are defined by the number of Embarked Persons and the number of Passengers which the ship can carry, Type A having the largest capacity. Additionally, some of the requirements of the Chapter Solutions are specific to ships not constructed from steel e.g., ships using aluminium or composite construction, which is also defined in Division 1 Annex A *Definitions and Abbreviations*.

1.3 The Chapter Solutions are only applicable to either steel ships (selecting common and Type A, Type B or Type C requirements) or ships not constructed of steel (selecting common and Type C ships not constructed of steel requirements) and are not intended to be mixed. For ships not constructed from steel, the application of these Solutions is limited to Type C ships with no more than 60 embarked persons. If the Solutions are to be applied to a ship with a combination of materials (steel and non-steel/composite) or for a Type A or Type B ship not constructed of steel, a fire safety analysis is to be undertaken in accordance with Division 2 *General Requirements* Chapter 01 *Core Design Rules* Rule 3 *System Safety*.

Note: The fire safety analysis may demonstrate that the requirements of this Chapter's Solutions are applicable for aluminium or composite parts of the ship.

1.4 The Chapter Solutions are not applicable to tankers or to ships with the Special Function of Bulk Fuel Carriage where the fuel is carried in a clearly defined cargo section. SOLAS Chapter II-2 should be directly applied instead.

1.5 For naval ships designed for combat operations, with a developed damage control capability and survivability requirement, the requirements of Chapter 01 *Integrated Platform Survivability* may require an enhancement of the Solutions provided in this chapter to meet the requirements in the OSI.

1.5.1 For divisions with "H" fire resistance notation, the tests required by the International Code for Application of Fire Test Procedures 2010 (FTP Code) shall be amended to use the hydrocarbon pool fire curve as specified by ANSI/UL1709 *Rapid Rise Fire Tests of Protection Materials for Structural Steel*.

1.5.2 For divisions with "N" fire resistance notation, the tests required by the FTP Code shall be amended to use the tests required by US MIL-STD-3020 *Fire Resistance of U.S. Naval Surface Ships*, including shock-testing prior to fire testing.

1.6 For naval ships with a Post Damage Capability requirement, equipment provision and system routing maybe impacted by Chapter 01 *Integrated Platform Survivability*, Rule 2 *Post Damage Capability*.

1.7 All Rules, Regulations, Codes and Standards used shall be the latest versions as amended at the time of drafting the ANC Basis unless a specific version date is specified in the text.

Rule 2. Structural Integrity in case of fire

2.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

2.2 Where a FI methodology is adopted (see Rule 8 *Containment of Fire* Solution 2), the boundaries are not to be less than B-0(R) for Cat-B and Cat-C areas, or A-0(R) for Cat-A areas for ships in the constabulary role. The boundaries shall not be less than A-0 (R) for Cat-A, Cat-B and Cat-C areas for ships in the combat role.

Note: Where critical structure is required to comply with tests required by the FTP Code in this Rule, refer also to the requirements of Rule 1 paragraph 1.5.

Materials of construction

2.3 The hull, superstructure, structurally effective bulkheads, decks, deckhouses and pillars shall be constructed of steel or approved non-combustible materials having adequate structural properties. The use of other fire-restricting materials may be permitted provided the following requirements are complied with and the materials are in compliance with the FTP Code as amended;

Note: Reference is made to IMO MSC.1/Circ.1457 on how to apply fire-restricting materials on ships not constructed of steel.

2.4 If load bearing structures are made of steel components, critical elements of structure that require insulation shall be protected such that the temperature of the structural core does not rise more than 400°C above the ambient temperature when exposed for the structural fire protection time to the tests required by the FTP code as amended.

2.5 If load bearing structures are made of composite material, their insulation shall be such that their temperatures will not rise to a level where deterioration of the construction will occur to such an extent that the load-carrying capability will be impaired, when exposed for the structural fire protection time to the tests required by the FTP code as amended.

2.6 If load bearing structures are made of aluminium alloy components, they shall be protected such that the temperature of the structural core does not rise more than 200°C above the ambient temperature when exposed for the structural fire protection time to the tests required by the FTP code as amended.

2.7 Fire insulation need not be applied to those parts of the structure in contact with water at the lightweight condition, if it can be demonstrated that there is adequate through thickness cooling for areas of the hull in contact with water and that there is no heat transfer from any uninsulated structure in contact with water to insulated structure above the water.

Protection of Hull Structure

2.8 Sufficient structural integrity is to be maintained during and after a fire by protecting critical structure.

2.9 Critical structure constructed from aluminium or composite, shall be fire-resisting and shall provide by themselves or due to insulation provided, adequate structural integrity properties at the end of the structural fire protection time when exposed to the tests required by the FTP code as amended. The structural fire protection time for critical structure is not to be taken as less than 60 minutes for all areas of the ship.

Note: For aluminium and composite ships critical structures shall be provided with fire insulation appropriate for the structural fire protection time. Where it is proposed to build Type A or Type B ships out of aluminium or composite a residual strength assessment should be carried out at multiple locations to determine structural redundancy.

Note: The consequences of a fire outside of the outer boundaries of the hull and superstructures on mooring decks, walkways and weather decks should be evaluated carefully for ships not constructed of steel. Active means of controlling an external fire should be considered.

Note: All load-carrying structures shall be considered within areas of major and moderate fire hazard (classified as A or B) and all structures which are necessary to support control stations irrespective of where they are located. Reference is made to IMO MSC.1/Circ.1457 for more information on how to apply fire insulation to critical structure on ships not constructed of steel.

Note: See MSC.1/Circular.1574 – *Interim Guidelines for Use of Fibre Reinforced Plastic (FRP) Elements Within Ship Structures: Fire Safety Issues*

2.10 Where the hull, superstructures, load bearing bulkheads, decks, deckhouses and pillars are constructed of steel, insulation is not generally required. Critical structure constructed of steel that could lead to a collapse of the hull girder or primary hull structure, are to be insulated to provide adequate structural integrity properties at the end of the structural fire protection time when exposed to the tests required by the FTP code as amended. The structural fire protection time for critical structure is not to be taken less than 60 minutes for all areas of the ship.

Note: Where a ship is of conventional mono hull multi deck design, with multiple partition bulkheads, structural protection above that required by Rule 8 *Containment of Fire* will not be required.

Note: The consequences of a fire outside of the outer boundaries of the hull and superstructures on mooring decks, walkways and weather decks should be evaluated carefully for the ships not constructed of steel. Active means of controlling an external fire should be considered.

Protection of escape arrangements

2.11 Sufficient structural integrity is to be maintained for the structural fire protection time in way of escape arrangements during and after a fire by protecting the following structure in areas of major and minor fire hazard:

2.11.1 Load bearing structure supporting, evacuation, launch or muster stations and equipment stowage;

2.11.2 Load bearing structure that could obstruct access for escape and fire-fighting activities;

2.11.3 Load bearing structure supporting control stations.

2.12 Load bearing structure constructed from aluminium or composite, shall be fire-resisting and shall provide by themselves or due to insulation provided, adequate structural integrity properties at the end of the structural fire protection time when exposed to the tests required by the FTP code as amended. The structural fire protection time is to be specified in the OSI based on the time required for escape.

Note: For aluminium and composite ships load bearing structures supporting these elements will normally be provided with fire insulation. Protection should be provided in spaces vertically underneath the space

protected down to the double bottom unless it can be demonstrated there is sufficient structural redundancy.

2.13 For load bearing structure constructed of steel, components that could lead to collapse of structure supporting escape arrangements are to be insulated to provide adequate structural integrity properties at the end of the structural fire protection time when exposed to the tests required by the FTP code as amended. The structural fire protection time is not to be less than 60 minutes.

Note: If load bearing structure supporting these elements are constructed of steel using conventional framing and pillar bulkheads (not pillars), structural protection above that required by Rule 8 *Containment of Fire* will not be required.

2.14 All inclined ladders/stairways 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.

Protection of fire divisions

2.15 Sufficient structural integrity is to be maintained in way of fire divisions during and after a fire by protecting structure supporting “A”, “B”, “H” and “N” class divisions in areas of major and minor fire hazard.

2.16 For structure constructed from aluminium or composite, fire-resisting bulkheads and decks shall provide by themselves or due to insulation provided, adequate structural and integrity properties at the end of the fire protection time defined in Rule 8 *Containment of Fire* for the boundary concerned, when exposed to the tests required by the FTP code as amended;

Note: For aluminium and composite ships load bearing structures supporting these elements will normally be provided with fire insulation. Protection should be provided in spaces vertically underneath the space protected down to the double bottom unless it can be demonstrated there is sufficient structural redundancy.

2.17 If N-class load bearing divisions are made of aluminium and composites, additional requirements on the testing are to be included. These additional testing requirements shall take into account the weakening of the structure due to heat. Therefore, the structures are to be placed under an appropriate weight load during the test, the testing of composite and aluminium structures shall be in accordance with US NAVSEA DDS 078-1, *Composite Material, Surface Ships, Topside Structural and Other Topside Applications- Fire Performance Requirements*.

Note: Light-weight structures, such as doors, are divisions that do not carry any structural load. These structures may be exempted from the load bearing test if made from composite or aluminium and confirmed non-load bearing.

2.18 For structure constructed of steel, components that could lead to collapse of structure supporting a fire division are to be insulated to provide adequate structural integrity properties at the end of the fire protection time defined in Rule 8 *Containment of Fire* for the boundary concerned when exposed to the tests required by the FTP code as amended.

Note: If load bearing structure supporting these elements are constructed of steel using conventional framing and pillar bulkheads (not pillars), structural protection above that required by Rule 8 *Containment of Fire* will not be required.

Protection from flooding

2.19 Materials readily rendered ineffective by heat shall not be used for overboard scuppers, sanitary discharges, and other outlets which are below the submergence limit and where the failure of the material in the event of fire would give rise to danger of flooding.

2.20 The ANC Authority may also restrict the use of such materials for all components preserving internal watertight integrity, including penetrations.

Protection of minor structure

2.21 The raised floor plating and supporting structure of normal passageways in Category A machinery spaces, control stations, all staircases, and access ladders on primary and secondary escape routes, shall be made of steel.

2.22 The ANC Authority may allow alternative materials where it can be demonstrated that the structure remains efficient during and after a fire.

2.23 The ANC Authority may require that all raised floor plating, catwalks and ladders be made of steel to assist in fire-fighting and damage control.

Additional naval requirements

2.24 Load bearing components of columns, stanchions and other structural members supporting specific naval systems or compartments are to be provided with adequate fire protection as defined by the Naval Vessel Operator and based on the risks identified.

2.25 If there is a requirement from the OSI to consider a fire co-incident with a significant structural loading from an extreme load event or damage event, adequate fire protection is to be arranged in way of critical structure identified from extreme or damage strength assessments.

Rule 3. Risk of Ignition

3.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

3.2 Ships shall meet the requirements of SOLAS Chapter II-2, Part B, Regulation 4 *Probability of Ignition*, including the *Guidelines for Measures to Prevent Fires in Engine-Rooms and Cargo Pump-Rooms* given in MSC.1/Circular.1321, supplemented by the following.

Control of Leaks

3.3 Oil fuel injection pipes on all engines, irrespective of the cylinder bore, shall be effectively shielded and secured.

3.4 The number of joints in oil, fuel and lubricating oil pressure piping systems shall be kept to a minimum.

3.5 Pipe joints shall be of welded construction. Mechanical couplings and threaded metallic joints are not permitted unless agreed by the ANC Authority.

3.6 Oil fuel pipes and their valves and fittings (including filters and pre-heaters) are to be of steel or other approved material, except that restricted use of flexible pipes will be permissible in positions where the ANC Authority is satisfied that they are necessary.

3.7 Flexible pipe assemblies, where fitted, shall comply with the requirements of the ship's Classification Society including typically the following standards as applicable:

3.7.1 ISO 15540 *Ships and marine technology — Fire resistance of non-metallic hose assemblies and non-metallic compensators — Test methods*;

3.7.2 ISO 15541 *Ships and marine technology — Fire resistance of non-metallic hose assemblies and non-metallic compensators — Requirements for the test bench*;

3.7.3 ISO 6802 Rubber or plastics hoses and hose assemblies – Hydraulic impulse test with flexing;

3.7.4 ISO 6803 Rubber or plastics hoses and hose assemblies – Hydraulic impulse testing without flexing.

3.8 Such flexible pipes and end attachments shall be of approved fire-resisting materials of adequate strength and shall be constructed to the satisfaction of the ANC Authority.

3.9 For valves fitted to oil fuel tanks and under static pressure, steel or spheroidal-graphite cast iron may be accepted. However, 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.

Note: The ship's survivability requirements defined in the OSI may lead to additional restrictions on pipework to meet shock and explosion, and smoke and toxicity requirements.

3.10 For ships not constructed of steel, tanks containing fuel and other flammable liquids shall be separated from accommodation spaces by vapour-proof enclosures or cofferdams which are suitably ventilated and drained.

3.11 As far as practicable, oil fuel tanks are to be part of the ship's structure and are to be located outside Category A machinery spaces and areas of major fire hazard. Where oil fuel tanks, other than double bottom tanks, are necessarily located adjacent to or within Category A machinery spaces and areas of major fire hazard, at least one of their vertical sides is to be contiguous to the machinery space boundaries, and preferably have a common boundary with the double bottom tanks, and the area of the tank boundary common with the machinery spaces is to be kept to a minimum. Where such tanks are situated within the boundaries of Category A machinery spaces and areas of major fire hazard they are not to contain oil fuel having a flash point of less than 60°C. In general, the use of free-standing oil fuel tanks is to be avoided. When such tanks are employed their use is prohibited in category A and areas of major fire hazard machinery spaces. Where permitted, they are to be placed in an oil-tight spill tray of ample size having a suitable drain pipe leading to a suitably sized spill oil tank.

3.12 For ships with the Special Function of Bulk Fuel Carriage, the pump rooms for the treatment, transfer and discharge of bulk fuel are to be fitted with a fixed hydrocarbon detection system that complies with the Fire Safety Systems (FSS) Code as amended and which alarms at the continuously manned control station.

Note: For carriage of fuels with a flash point less than 60°C, see Rule 14 *Carriage of Low Flash Point Fuels*.

3.13 Other oil-level gauges may be used in place of sounding pipes subject to the following conditions:

3.13.1 Gauge glasses of any type are not to be used on oil fuel tanks or tanks integral to the ships structure.

3.13.2 Other oil-level gauges used on oil fuel tanks or tanks integral to the ships structure are not to require penetrations below the top of the tank and their failure or overfilling of the tanks is not to permit release of fuel.

3.13.3 Flat glass gauge glasses may be used on lube oil and hydraulic oil tanks and are to be fitted with a self-closing valve at the top and bottom of the gauge. The arrangement may incorporate a single point of operation for the valves.

Accumulation of Gas/Vapour

3.14 Natural or mechanical ventilation shall be provided for hazardous enclosed or semi-enclosed areas to prevent the accumulation of explosive gas atmosphere, leaving no areas of stagnant air. Ventilation rates are to be calculated based on IEC 60079-10-1: *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*.

3.15 Natural or mechanical ventilation shall be provided under all operating conditions except during a fire when some ventilation will be crash-stopped.

3.16 The ventilation of all machinery spaces is to be sufficient under normal conditions to prevent the accumulation of oil vapour.

Note: See Chapter 03 *Buoyancy and Stability* and Chapter 04 *Engineering Systems* for non-fire related Rules for ventilation.

3.16.1 The ventilation can be either continuous or, where advised by the system safety risk assessment required by Division 2 Chapter 01 *Core Design Rules*, activated by a gas detection system.

3.17 Ventilators from enclosed hangars, small craft bays, vehicle decks, well docks and ro-ro spaces and other spaces storing flammable liquids shall be positioned to prevent the risk of ignition of exhaust gases or unburnt fuel.

Note: For ventilation systems in ro-ro spaces, refer to Rule 15 *Special Requirements for Vehicle, Well dock and Ro-ro spaces and Small craft bays*.

3.18 Where oil fuel may be heated by the internal environment to within 10°C below the flash point temperature in normal operating conditions, there are to be no openings from the vapour space of the oil fuel tanks into machinery spaces or other enclosed spaces, except for well ventilated cofferdams. Bolted manholes are acceptable and suitable warning signs are to be provided.

3.19 Where fuel vapour from air or overflow pipes may be heated by the internal or external environment to within 10°C below the flash point temperature, the openings of pipes are to be fitted with a flame screen and located 3m away from sources of ignition and ventilation intakes.

Note: The prevention of overpressure requirements of SOLAS Chapter II-2, Part B, Regulation 4 *Probability of Ignition* also apply to systems used during Replenishment at Sea (RAS) operations.

Restriction of Ignition Sources

3.20 Electrical equipment and wiring shall not be fitted in enclosed hangars, small craft bays, vehicle decks, well docks and ro-ro spaces and other spaces storing flammable liquids unless it is essential for operational purposes, in the opinion of ANC Authority. However, if electrical equipment is fitted in such spaces, it shall be of a certified safe type (see note) for use in the dangerous environments to which it may be exposed unless it is possible to completely isolate the electrical system (e.g. by removal of links in the system, other than fuses).

3.21 Cable penetrations of the decks and bulkheads of enclosed hangars, small craft bays, vehicle decks, well docks and ro-ro spaces and other spaces storing flammable liquids shall be sealed against the passage of gas or vapour.

3.22 Through runs of cables and cables within the enclosed hangars, small craft bays, vehicle decks, well docks and ro-ro spaces and other spaces storing flammable liquids shall be protected against damage from impact.

3.23 Fans serving magazines and spaces containing possible explosive mixtures, such as Battery Charging Rooms, shall be centrifugal type, non-sparking in accordance with IACS UR F29 *Non sparking fans*, and situated clear of the spaces served. The fan motors shall comply with AS2380 *Electrical equipment for explosive atmospheres - Explosion-protection techniques*.

3.24 Any other equipment which may constitute a source of ignition of flammable vapour shall not be permitted in enclosed hangars, small craft bays, vehicle decks, well docks and ro-ro spaces and other spaces storing flammable liquids.

Note: Refer to the recommendations of the International Electrotechnical Commission, in particular, the latest version of publication IEC 60092, *Electrical installations in ships*.

Note: See Chapter 10 *Dangerous Goods* for the requirements relating to electrical fittings in hazardous areas.

Separation of Ignition Sources

3.25 Electrical equipment located in the same spaces as combustible fluid systems shall be intrinsically safe and comply with IEC 60079-14 *Explosive atmospheres - Electrical installations design, selection and erection*.

3.26 The maximum surface temperature of all electrical equipment shall be below the auto-ignition temperature of the system fluid.

3.27 Flammable and combustible fluid system pipework (Fuel, Lubrication, Hydraulic, ULP) shall not be led through the following spaces:

3.27.1 Motor Rooms;

3.27.2 Generator Rooms;

3.27.3 Switchboard Rooms;

3.27.4 Electrical, Electronic and Weapon Control Rooms;

3.27.5 Oxygen & Nitrogen Producing Rooms;

3.27.6 Accommodation and messing compartments;

3.27.7 Uptake Spaces; and

3.27.8 Freshwater tanks.

3.28 Valves in flammable and combustible fluid systems shall be of the ‘fire safe’ type (complying with API 6FA *Standard for Fire Test of Valves* or ISO 10497 *Testing of valves. Fire type-testing requirements*).

3.29 Surfaces with temperatures above 160°C which may be impinged as a result of a fuel system failure shall be properly insulated.

Note: Hot surfaces above 60°C which can be touched by persons, require insulation in accordance with WHS requirements.

3.30 Tanks or reservoirs shall be separated from hot surfaces as far as available spaces allow. If separation to at least 5m is not possible, shielding and insulation of hot surfaces shall be provided.

Storage of flammable gases

Arrangements for flammable gases and oxygen

3.31 Where two or more cylinders of each gas are intended to be carried in an enclosed space, separate dedicated storage compartments shall be provided for each gas. The storage compartment shall be arranged in accordance with the following.

3.32 The compartment shall be designated in the same category as flammable liquids, and the correct insulation shall be installed according to tables in Rule 8 *Containment of Fire*.

3.33 A fixed fire detection and fire alarm system of an approved type, complying with the requirements of the FSS Code**,** as amended, shall be installed.

3.34 The compartment shall be equipped with an automatic sprinkler system of an approved type, complying with the requirements of the FSS Code, as amended.

3.35 Electrical equipment and wiring shall be of a type suitable for use in an explosive atmosphere.

Note: Refer to the recommendations of the latest version of the International Electrotechnical Commission, in particular, IEC 60079.

3.36 The compartment shall be gas-tight and have at least one door opening outwards, giving direct access to open deck.

3.37 The compartment shall be provided with a separate mechanical ventilation system providing a minimum of 10 air changes per hour, ventilated to open deck at a position that prevents the exhaust air from being drawn back into the vessel.

3.38 The compartment shall be fitted with a leakage detection system.

3.39 The compartment shall be provided with racks to facilitate secure stowage of the cylinders.

3.40 The ship's survivability requirements defined in the OSI may lead to ballistic protection of the storage compartment being required.

3.41 Gaseous fuel systems used for domestic purposes shall be approved by the ANC Authority. Where installed, the cylinders shall be located on the open deck or in a storage compartment which meets the requirements of paragraph 3.8.

Arrangements for Battery Stowage and Charging

3.41.1 Battery room ventilators shall be fitted with a means of closing whenever:

3.41.1.1 The battery room does not open directly onto an exposed deck;

3.41.1.2 The ventilation opening for the battery room is fitted with a closing device; or

3.41.1.3 The battery room is fitted with a fixed gas fire-extinguishing system.

Note: See paragraph 3.4.4 and Chapter 04 *Engineering Systems* Rule 10 *Electrical Generation and Power Supplies* for the requirements related to battery room ventilation systems.

Note: Different battery technologies may have additional or different fire risks that will need to be prevented and mitigated in the Solution proposed for the ship.

Note: The carriage of low flashpoint fuels (flashpoint below 60ºC, i.e. Flammable classification) is not generally permitted on Defence ships. Where the OSI requires that low flashpoint fuels are to be carried in support of operations, the requirements described in this Chapter shall be applied.

Rule 4. Fire Growth Potential

4.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

4.2 Ships shall meet the requirements of SOLAS Chapter II-2, Part B, Regulation 5 *Fire Growth Potential*, supplemented by the following.

4.3 The requirements applicable to passenger ships shall apply to Ship Type A and Type B.

Note: IMO MSC.1/Circ.1555 *Unified Interpretation to SOLAS II-2/5.2.1.2, II-2/5.2.1.3 and II-2/7.9.3* applies:

Ventilation by fan coil units and internal circulation fans

The fan in a heat, ventilation and air conditioning (HVAC) temperature control unit, or a circulation fan inside a cabinet/switchboard, is not considered to be a ventilation fan as addressed in SOLAS regulations II-2/5.2.1.2, II-2/5.2.1.3 and II-2/7.9.3, if it is not capable of supplying outside air to the space when the power ventilation is shut down (e.g. small units intended for recirculation of air within a cabin). Therefore, such fans need not be capable of being stopped from an easily accessible position (or a safe position) outside the space being served when applying SOLAS regulations II-2/5.2.1.2 or II-2/5.2.1.3, and need not be capable of being controlled from a continuously manned central control station for passenger ships carrying more than 36 passengers when applying SOLAS regulation II-2/7.9.3.

4.4 For periodically unattended machinery spaces, the location and centralisation of the fire-extinguishing system controls, the required shutdown arrangements (e.g. ventilation, fuel pumps, etc.) shall be in a permanently attended space.

Insulating materials

4.5 Insulating materials shall be non-combustible, except in refrigerated compartments of service spaces. 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. For ships not constructed of steel all insulating materials shall be non-combustible or fire restricting.

Note: The fire main is not considered a cold service system.

Ceilings and linings

4.6 For Type A and Type B ships

4.6.1 All linings, grounds, draught stops and ceilings shall be of non-combustible material except in saunas or refrigerated compartments of service spaces. Partial bulkheads or decks used to subdivide a space shall also be of non-combustible materials.

4.7 For Type C ships

4.7.1 All linings, ceilings, draught stops and their associated grounds shall be of non-combustible materials (or fire restricting materials for ships not constructed of steel), in accommodation and service spaces and control stations.

Use of combustible materials

4.8 All furniture and furnishings shall be of restricted fire risk.

Note: Furniture and furnishings of restricted fire risk are defined in Division 1 Annex A *Definitions and Abbreviations*. For combatants and non-combatants with a Chemical, Biological, Radiological and Nuclear (CBRN) lockdown requirement, where the FTP Code is referred in the definition, this should be replaced by STANAG 4602 *Assessment of Reaction-to-Fire of Materials* / BS7176 / BS7177 as applicable, with the acceptance criteria given in Table 1.

4.9 Calculations for the Total Amount of Combustible Materials per Unit Area in Accommodation and Service Spaces shall be performed in accordance with IMO MSC/Circ.1003 *Guidelines on a Simplified Calculation for the Total Amount of Combustible Materials per Unit Area in Accommodation and Service Spaces*.

Note: Refer to the recommendations published by the International Organisation for Standardisation, in particular publication ISO 1716:2018 *Reaction to fire tests for products Determination of the gross heat of combustion (calorific value)*.

Table 1: Acceptance criteria when applying STANAG 4602 in Rules 4 and 5

<table>
<tr><th></th><th>Fire Reaction</th><th>Smoke Opacity</th><th>Smoke Toxicity</th></tr>
<tr><td>Deck Coverings</td><td rowspan="3">CFE > 20 kW/m^2
Qsb > 1.5 MJ/m^2
Qt < 0.7 MJ
qp < 4.0 kW
MARHE < 90 kW/m^2</td><td>Dm < 200</td><td rowspan="10">CO2 < 100000 ppm
CO < 200 ppm
HCl < 100 ppm
HF < 50 ppm
HBr < 150 ppm
NOx < 100 ppm
HCN < 30 ppm
SO2 < 120 ppm
C6H5OH < 250 ppm
HCHO < 500 ppm
CH2CHCHO < 5 ppm
TI < 10</td></tr>
<tr><td>Bulkhead Sheathing</td><td>Dm < 75</td></tr>
<tr><td>Overhead Sheathing</td><td>Dm < 75</td></tr>
<tr><td>Furniture</td><td>Pass Crib No. 5 (BS7176)
MARHE < 75 kW/m^2</td><td>Dm < 200</td></tr>
<tr><td>Bedding</td><td>Pass Crib No. 7 (BS7177)
MARHE < 75 kW/m^2</td><td>Dm < 200</td></tr>
<tr><td>Textiles</td><td>Oxygen Index > 27%
Flammability Temperature > 170°C</td><td>Dm < 20</td></tr>
<tr><td>Insulation</td><td rowspan="3">CFE > 20 kW/m^2
Qsb > 1.5 MJ/m^2
Qt < 0.7 MJ
qp < 4.0 kW
MARHE < 90 kW/m^2</td><td>Dm < 50</td></tr>
<tr><td>Composites</td><td>Dm < 200</td></tr>
<tr><td>Paint and Adhesive</td><td>Dm < 200</td></tr>
<tr><td colspan="4">Notes:</td></tr>
</table>

CFE = Critical heat flux at extinguishment (kW/m^2)

Qsb = Average heat for sustained burning (MJ/m^2)

Qt = Total heat release (MJ)

qp = Peak heat release rate (kW)

MARHE = Maximum Average Rate of Heat Emission (kW/m^2)

Dm = Average of the maximum specific optical density of smoke

Low flame-spread characteristics of exposed surfaces

4.10 The following surfaces shall have low flame-spread characteristics in accordance with the FTP Code as amended; or for combatants and non-combatants with a CBRN lockdown requirement, NATO AFAP 1 to 5 under STANAG 4602 *Assessment of Reaction-to-Fire of Materials*, with the acceptance criteria given in Table 1.

4.10.1.1 Surfaces and grounds in concealed or inaccessible spaces in accommodation and service spaces and control stations and internal assembly and evacuation stations.

4.10.1.2 For Type A and Type B Ships,

a. Exposed surfaces in corridors and stairway enclosures and of bulkhead and ceiling linings in accommodation and service spaces (except saunas) and control stations and internal assembly and evacuation stations;

4.10.1.3 For Type C ships

a. Exposed surfaces in corridors and stairway enclosures and of ceilings in accommodation and service spaces (except saunas), control stations and internal assembly and evacuation stations;

4.10.1.4 For Type C, ships not constructed of steel,

a. Exposed surfaces in corridors and stairway enclosures, in accommodation and service spaces (except saunas) and control stations and internal assembly and evacuation stations.

Note: low flame spread is not applicable to elements of ships not constructed of steel, as the composite/aluminium assembly have to qualify as Fire Restricting Material in full scale and in end use condition (Ref: IMO Resolution MSC.40(64) as amended. The Low Flame Spread test (IMO Resolution A.653 as amended) is a small scale test designed for combustible surfaces on non-combustible structures, and is not appropriate for composite structures.

Furniture in escape routes

4.11 For Type A and Type B ships

4.11.1 Furniture shall not be permitted in stairways or corridors forming escape routes in cabin areas with the following exceptions, providing that they do not restrict escape routes or access for fire fighters:

4.11.1.1 Lockers of non-combustible material providing storage for non-hazardous safety equipment required by these Rules;

4.11.1.2 Drinking water dispensers;

4.11.1.3 Ice cube machines.

Storage of flammable liquids and gasses

4.12 The maximum quantity of flammable liquid stores in high-risk spaces such as machinery, EO Stowage Areas and Special Category spaces is to be agreed with the ANC Authority.

4.13 The maximum quantity and location of flammable gas stores on the ship is to be agreed with the ANC Authority.

Rule 5. Smoke Generation and Toxicity

5.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

5.2 Ships shall meet the requirements of SOLAS Chapter II-2, Part B, Regulation 6 *Smoke generation potential and toxicity*, supplemented by the following.

5.3 Smoke and toxic products released from materials exposed to the effects of elevated temperatures and/or fire are to be limited and demonstrated to be in accordance with either:

5.3.1 for non-combatants with no Chemical, Biological, Radiological and Nuclear (CBRN) lockdown requirement, the FTP Code as amended; or,

5.3.2 for combatants and non-combatants with a CBRN lockdown requirement, STANAG 4602 *Assessment of Reaction-to-Fire of Materials* as amended with the acceptance criteria given in Table 1.

5.4 Control stations, evacuation stations, escape routes and muster stations, shall be kept free of materials which generate smoke and toxic products if exposed to heat or fire.

5.5 For all ships, new installation of materials which contain asbestos shall be prohibited.

5.6 All electric, data and fibre optic cables are to be in accordance with SOLAS II-1 Reg.45.5 or have equivalent fire requirements (such as IEC 60332 - *Test on electrical cables under fire conditions*) and the requirements of Chapter 04 *Engineering Systems.*

Paints, Varnishes and other Finishes

5.7 Paints, varnishes and other finishes shall be limited and when used, such products shall be approved in accordance with either:

5.7.1 For non-combatants with no CBRN lockdown requirement, the FTP Code as amended; or

5.7.2 For combatants and non-combatants with a CBRN lockdown requirement, STANAG 4602 *Assessment of Reaction-to-Fire of Materials* as amended, with the acceptance criteria given in Table 1.

Primary deck coverings

5.8 Primary deck coverings, if applied within accommodation and service spaces and control stations, shall be of approved material which will not give rise to smoke or toxic or explosive hazards at elevated temperatures, this being determined in accordance with either:

5.8.1 For non-combatants with no CBRN lockdown requirement, the FTP Code as amended; or

5.8.2 For combatants and non-combatants with a CBRN lockdown requirement, STANAG 4602 *Assessment of Reaction-to-Fire of Materials* as amended, with the acceptance criteria given in Table 1.

Combustible Insulation Materials

5.9 For Type A and Type B ships

5.9.1 Where combustible insulation materials are used, the requirements of Rule 4 *Fire Growth Potential* paragraph 4.5 also need to consider smoke and toxicity properties.

Note: The use of combustible insulation materials is restricted in Rule 4 *Fire Growth Potential*, paragraph 4.7.

5.10 All materials used in accommodation spaces require testing and compliance with the smoke generation and toxicity criteria, regardless of their non-combustibility, fire resistance or low-flame spread characteristics.

Note: In general, products made only of glass, concrete, ceramic products, natural stone, and masonry units may be installed without testing and approval.

Rule 6. Control of Smoke Spread

Note: The following requirements are applicable where Rule 8 *Containment of Fire* Solution 1 is adopted. Where Rule 8 *Containment of Fire* Solution 2 is applied, then the requirements of this rule, are integrated into those for Rule 8 *Containment of Fire*.

6.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

6.2 Ships shall meet the requirements of SOLAS Chapter II-2, Part C, Regulation 8 *Control of smoke spread*, supplemented by the following.

6.3 The requirements applicable to passenger ships shall apply to Ship Type A and Type B.

6.4 Smoke curtains shall be fitted where necessary to allow passage through the smoke boundary.

Smoke Extraction

6.5 Means shall be provided to control and configure ventilation, to:

6.5.1 Increase the pressure in any one or more smoke zones to protect the zone from smoke ingress. The pressure difference shall not cause any constraint of opening in escape routes.

6.5.2 Draw air from and exhaust smoke and other gases to different sides of the vessel, or exhaust to external areas of the ship with sufficient vertical or longitudinal separation to prevent smoke being drawn back into the vessel;

6.5.3 Enable smoke clearance for smoke zones and other spaces in accordance with the smoke clearance philosophy/policy specified in the OSI. Extraction is required from all spaces protected by a fixed firefighting system, some of which may produce toxic by-products.

Note: See 9.13.1 and 9.15, for requirements for gaseous fire-fighting systems. MSC.1/Circ.1514 provides guidance on smoke extraction but its scope is too limited for a Naval Ship.

6.5.4 The smoke extraction system in high volume manned smoke zones shall be activated by the required smoke detection system and be capable of manual control. The fans shall be sized that the entire volume within the space can be exhausted within the time specified in the OSI.

Note: Hydraulically or electrically driven portable fans with sufficient ducting to enable nominated spaces to be cleared of smoke may be used to supplement the ship's ventilation system.

Additional requirements for ships not constructed of steel

6.6 Release of smoke from machinery spaces requirements apply to all machinery spaces.

Ventilation zones and active smoke control

6.7 The ventilation systems in public spaces, cabins and corridor areas shall be divided into zones. Each zone shall not exceed 150 m^2 and shall be enclosed by either fire resisting divisions or smoke tight boundaries.

6.8 The ventilation zones shall be independent of each other both with respect to ventilation duct layout and control of fans and dampers. Ducts can be routed through other ventilation zones provided that smoke divisions and fire resisting divisions are not impaired.

6.9 When in line with the approved smoke control philosophy, balancing duct can be installed in divisions between cabins and corridors without the provision of smoke dampers. Elevation of balancing ducts, air intakes and extracts shall be designed with care to evacuate smoke effectively without impairing escape ways. All balancing ducts shall be provided with closing dampers operable from corridor side.

6.10 Each zone shall be designed to operate in the early stage of a fire. All essential components (ventilation fans, any dampers and control system for these) shall be designed to resist the smoke, moisture and heat expected in the first 10 minutes of a fire.

Note: Materials capable of operating at 200°C can be used for supply ducts, steel or equivalent should be provided for exhaust ducts. Fans and electrical motors with a rating of IP56 or above and cables design according to the latest version of IEC 60332 are considered to meet this requirement, even when located inside the zone or exhaust ducts serving such zones.

Rule 7. Detection and Alarm

7.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

7.2 A fixed fire detection and fire alarm system shall be provided in accordance with SOLAS Chapter II-2, Part C, Regulation 7 *Detection and Alarm*, supplemented by the following.

General requirements

7.3 The fixed fire detection and fire alarm system shall be of an approved type and comply with the FSS Code as amended, taking into account the requirements of paragraph 7.23.

7.4 A fixed fire detection and fire alarm system for all ships, with a length greater than 50 m, shall be capable of remotely and individually identifying each detector and manually operated call point.

7.5 Detection and alarm arrangements in spaces adjacent to high fire risk spaces (for example Category A machinery spaces and special category spaces) shall be based on a systems safety analysis, as required by Division 2 Chapter 01 *General Requirements* Rule 3 *System Safety* for fire control and monitoring.

Protection of machinery spaces

7.6 In addition to the requirements of SOLAS Chapter II-2, Part C 7.4.1.2, a fixed fire detection and alarm system shall be installed in machinery spaces where flammable liquids are in circuits.

7.7 In addition to the requirements of SOLAS Chapter II-2, Part C 7.4.1.3 a fixed fire detection and alarm system shall be installed in machinery spaces containing gasification and pyrolysis equipment.

7.8 Main propulsion Category A machinery spaces that are periodically unattended or other high fire risk spaces, such as pump rooms, shall be supervised by CCTV cameras monitored from the continuously manned control station.

Note: Machinery Enclosures containing machinery defined in Division 1 Annex A *Definitions and Abbreviations* are to be treated as periodically unattended machinery spaces.

7.9 For machinery enclosures:

7.9.1 A minimum of two different detector types or sensors; smoke, heat or flame shall be provided.

7.9.2 Automatic release of the local application fire extinguishing system for the enclosure shall be activated upon detection by two detectors of different types.

7.9.3 A fault in one detector shall initiate an alarm at an attended control station and shall not inhibit activation of the system under the control of the other detector or manually.

7.10 For machinery enclosures, the detection system shall initiate a visual and audible alarm within the enclosure and in the space in which the enclosure is located.

Note: Machinery spaces may be fitted with flame detectors in addition to smoke detectors.

7.11 The fixed fire detection and fire alarm system shall be able to detect a fire with a response time not exceeding 3 minutes, based on an agreed test method as detailed in paragraphs 7.25 to 7.29.

Protection of accommodation and service spaces

7.12 The activation of detection or a single extinguishing system shall not result in the loss of Essential Safety Functions outside of the space protected.

7.13 Fire detectors shall be installed in all stairways, corridors and escape routes within accommodation spaces. Consideration shall be given to the installation of special purpose smoke detectors within ventilation ducting.

For Type A and Type B ships

7.14 A fixed fire detection and fire alarm system shall be so installed and arranged as to provide fire detection in service spaces, control stations and accommodation spaces, including corridors, stairways and escape routes within accommodation spaces. Smoke detectors need not be fitted in private bathrooms. Spaces having little or no fire risk such as voids, public toilets, carbon dioxide rooms and similar spaces need not be fitted with a fixed fire detection and alarm system.

7.15 Smoke detectors with variable set tuned for commissioning are acceptable in galleys in which heat detectors are fitted.

For Type C ships

7.16 A fixed fire detection and fire alarm system shall be installed and arranged to provide smoke detection in all corridors, stairways and escape routes within accommodation spaces.

For ships not constructed of steel

7.17 A fixed fire detection and fire alarm system shall be installed in accordance with paragraph7.6.

Protection of cargo spaces

7.18 A fixed fire detection and fire alarm system or a sample extraction smoke detection system shall be provided in any cargo space and any enclosed space within a cargo space.

Manually operated call points

7.19 In addition to the requirements of SOLAS Chapter II-2, Part C 7.7, manually operated call points shall be available on each exit of the Category A machinery spaces, on each exit of the

galleys, as well as those of the special category spaces and all other areas of major and significant fire hazard.

Fire alarm signalling systems

7.20 Where the fire alarm is not responded to at the continuously manned control station, the ship's general emergency alarm shall be sounded after 2 minutes.

7.21 An alarm shall sound immediately in the space where a detector has been activated as well as the continuously manned control station. The alarm signal can be an integrated part of the detector or be provided from the fire detection control unit.

7.22 Ships shall have the fire detection alarms for the systems required centralised in a central control station.

7.23 In addition to the requirements of SOLAS Chapter II-2, Part C 9.3, the control panel shall be categorised as an Essential Safety Function (E) and be provided with alternative and transitional power in accordance with Chapter 04 *Engineering Systems* Rule 13 *Electrical Distribution Systems*.

Requirements for fixed fire detection and fire alarm systems

7.24 Chapter 9 of the FSS Code for fixed fire detection and fire alarm systems as amended shall be applied with the changes incorporated below.

7.25 Sources of power supply

7.25.1 The fire detection and alarm system shall be categorised as an Essential Safety Function (E) and be provided with alternative and transitional power in accordance with Chapter 04 *Engineering Systems* Rule 13 *Electrical Distribution Systems*.

7.25.2 All electrical equipment and fittings for the fire detection and alarm system shall have a minimum ingress protection rating in accordance with Chapter 04 *Engineering Systems* Rule 13 *Electrical Distribution Systems*.

7.25.3 The main (respective emergency) feeder shall run from the main (respective emergency) switchboard to the changeover switch without passing through any other distributing switchboard.

7.25.4 The supply shall be provided by separate feeders reserved solely for that purpose. Such feeders shall run to an automatic change-over switch situated in or adjacent to the control panel for the fire detection system. The change-over switch shall be arranged such that a fault will not result in the loss of both power supplies.

7.25.5 The operation of the automatic changeover switch or a failure of one of the power supplies shall not result in loss of fire detection capability.

7.25.6 Where a momentary loss of power would cause degradation of the system, a battery of adequate capacity shall be provided to ensure continuous operation during changeover.

7.25.7 The alarm sounder system utilised by the fixed fire detection and fire alarm system shall be powered from no less than two sources of power in accordance with Chapter 04 *Engineering Systems* Rule 13 *Electrical Distribution Systems*.

7.26 Detectors

7.26.1 The operation temperature of heat detectors in drying rooms and similar spaces of a normal high ambient temperature may be up to 30°C above the maximum deckhead temperature.

7.26.2 A section of fire detectors which covers a control station, a service space or an accommodation space shall not include a Category A machinery space.

7.26.3 For fixed fire detection and fire alarm systems with remotely and individually identifiable fire detectors, a loop covering sections of fire detectors in accommodation, service spaces and control station shall not include sections of fire detectors in Category A machinery spaces or EO Stowage Areas.

7.26.4 Where a fire detection loop passes through several spaces of which at least one is an area of major fire hazard the loop shall be protected against failure from a single fault.

7.26.5 The parts of the loop outside the space of origin (of the fire) shall not be disabled by single or multiple faults on the loop within the space of origin.

7.26.6 Each section of detectors and manually operated call points shall be limited to 50 detectors.

7.26.7 If the ship is divided into damage control zones, there shall be one control panel per damage control zone. Associated loops of detectors shall not extend outside the damage control zone in which its control panel is fitted. In any case a loop shall not extend beyond one main fire zone.

7.26.8 For ships with a length less or equal to 50 m, remotely and individually identifiable fire detectors are not mandatory. Where used, no section covering more than one deck within accommodation spaces, service spaces and control stations shall normally be permitted except a section which covers an enclosed stairway. In no case shall more than 50 enclosed spaces be permitted in any section.

7.26.9 The maximum spacing of detectors shall be in accordance with the Table 2 below:

Table 2: Maximum spacing of detectors

Type of detector	Maximum floor area per detector (m^2)	Maximum distance apart between centres (m)	Maximum distance away from bulkheads (m)
Heat	37	9	4.5
Smoke	74 [60*]	11 [10*]	5.5 [5.0*]
*The reduced area and distances are to be applied to high fire risk areas.			

7.26.10 Indicating units shall, as a minimum, denote the section in which a detector has been activated or manually operated call point has been operated. At least one unit shall be so located that it is easily accessible to responsible members of the crew at all times. One indicating unit shall be located on the Bridge. if the control panel is located in the main fire control station.

7.26.11 Detection and alarm arrangements may also be required in adjacent spaces for fire control and monitoring.

7.26.12 It is necessary to identify all spaces and any associated fire zones.

7.27 Detector Type

7.27.1 Areas of major and moderate fire hazard and other enclosed spaces not regularly occupied within public spaces and accommodation, such as stairway enclosures, corridors and escape routes shall be provided with an approved automatic smoke detection system and

manually operated call points complying with the requirements of the FSS Code as amended to indicate at the control station the location of outbreak of a fire in all normal operating conditions of the installations. Detectors operated by heat instead of smoke may be installed in galleys.

7.27.2 Category A machinery spaces shall be provided with a suitable combination of smoke and heat detectors. In addition, flame detectors shall cover all engines, heated oil fuel separators, oil-fired boilers and similar equipment. One flame detector may as a maximum cover a pair of engines. Where prime movers are fitted within acoustic enclosures, these enclosures are to be treated as separate main machinery spaces and detectors fitted accordingly.

7.27.3 In addition to the above requirements, gas turbines are to be monitored by flame detectors.

7.27.4 Auxiliary machinery spaces of minor fire hazard, cargo spaces, fuel tank compartments and similar spaces shall also be fitted with smoke detectors.

7.27.5 Areas of no fire risk and areas with minor fire risk and limited areas such as bathrooms within cabins, void spaces and tank compartments need not to be provided with fire detectors.

7.27.6 All switchboard cabinets above 0.5 m^3 shall be provided with a fire detection system and a fire extinguishing system in accordance with Rule 9 *Fire Fighting*.

7.27.7 Switchboard cabinets requiring fire detection shall be fitted with Class A smoke detectors meeting the requirements of ISO 7240-20 *Fire detection and alarm systems – Part 20: Aspirating smoke detectors*.

7.28 It should be possible to isolate a section/loop of detectors for a duration of less than 30 minutes with the aim of smoke evacuation for recovering a damaged space. The isolation shall automatically revert to the operational mode after 30 minutes.

7.29 It should be possible to isolate individual detectors to avoid nuisance alarms during hot work.

7.30 When any detector is temporarily switched off or isolated, this status shall be clearly indicated at the fire detection control panel.

Rule 8. Containment of Fire

8.1 For this Rule, two alternative Solutions are provided, Solution 1 and Solution 2. Solution 1 is based on SOLAS and is to be applied in conjunction with Part 2 Rule 6 *Control of Smoke Spread*, whilst Solution 2 is based on a Risk/Value approach and includes Solutions that meet the Performance Requirements of Rule 6 *Control of Smoke Spread*, negating the need to apply Part 2, Rule 6 *Control of Smoke Spread*.

8.2 The Naval Vessel Operator and the ANC Authority shall agree if Solution 1 or Solution 2 is to be applied, the two solutions should not be combined.

Note: Where required the details of the underlying methodology and its use can be found in Part 3 to this Chapter.

Note: Solution 1 is considered to be appropriate for vessels with a OSI similar to cargo and commercial vessels, whilst Solution 2 is suitable where the OSI has an active fire-fighting and damage control philosophy in constabulary and combat operation for ship types detailed in Part 3.

Solution 1

8.3 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Thermal and structural boundaries for all ships

8.4 A Replenishment at Sea (RAS) Station on an open deck is to be taken as the RAS clear area plus a distance of 3m longitudinally and vertically is to include any adjacent bulkhead vertically to the next tier plus 3m. Alternatively, fire modelling calculations undertaken to determine the extent of protection to be provided.

8.5 For RAS stations, a risk assessment shall be undertaken to identify potential ignition sources and define precautions shall be taken to isolate and protect ignition sources whilst undertaking RAS operations.

Note: Fire protection arrangements need not be fitted for RAS stations which only transfer non-flammable liquids

Thermal and structural boundaries for Type A Ships

8.6 Main fire zones

8.6.1 In all Type A ships, the hull, superstructure and deckhouses shall be subdivided into vertical main fire zones by "A-60(S)" class divisions. The mean length and width of which on any deck does not in general exceed 40 m. The length and width of vertical main fire zones may be extended to a maximum of 48 m in order to bring the ends of vertical main fire zones to coincide with the watertight subdivision bulkheads or in order to accommodate a large space extending for the whole length of the vertical main fire zone provided that the total area of the vertical main fire zone is not greater than 1,600 m2 of any deck. Steps and recesses shall be kept to a minimum, but where they are necessary they shall also be "A-60(S)" class divisions. Where tanks are on both sides of the division the standard may be reduced to "A-0(S)".

8.6.2 As far as practicable, the bulkheads forming the boundaries of the vertical main fire zones above the submergence limit shall be in line with watertight subdivision bulkheads situated immediately below the submergence limit.

8.6.3 Such bulkheads shall extend from deck to deck and to the shell or other boundaries.

8.6.4 On ships designed for special purposes, in spaces such as vehicle spaces, ro-ro vehicle spaces or hangars, where the provision of vertical main fire zone bulkheads would defeat the purpose for which the ship is intended, equivalent means for controlling and limiting a fire shall be substituted and specifically approved by ANC Authority. Service spaces and ship stores shall not be located on ro-ro decks unless protected in accordance with the applicable requirements.

8.6.5 The boundary bulkheads and decks of vehicle spaces, ro-ro vehicle spaces or hangars shall be insulated to "A-60" class standard. Where tanks are below vehicle spaces, ro-ro vehicle spaces or hangars, the integrity of the deck between such spaces, may be reduced to "A-0" standard.

8.7 Bulkheads within a vertical main fire zone

8.7.1 Bulkheads which are not required to be "A" class divisions shall be at least "B" class or "C" class divisions as prescribed in the Table 4 and Table 5.

8.7.2 Bulkheads required to be "B" class divisions shall extend from deck to deck and to the shell or other boundaries. However, 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.

8.8 Fire integrity of bulkheads and decks

8.8.1 The minimum fire integrity of all bulkheads and decks shall be as prescribed in Table 4 and Table 5.

8.8.2 Where, due to any particular structural arrangements in the ship, difficulty is experienced in determining from the tables the minimum fire integrity value of any divisions, such values shall be determined to the satisfaction of ANC Authority.

8.8.3 The following requirements shall govern application of the tables:

8.8.3.1 Table 4 shall apply to bulkheads not bounding either vertical main fire zones or horizontal main fire zones. Table 5 shall apply to decks not forming steps in vertical main fire zones nor bounding horizontal main fire zones;

8.8.3.2 For determining the appropriate fire integrity standards to be applied to boundaries between adjacent spaces, such spaces are classified according to their fire risk as shown in categories (1) to (15) below. Where the contents and use of a space are such that there is a doubt as to its classification for the purpose of this Rule, 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. Smaller, enclosed rooms within a space that have less than 30% communicating openings to that space are considered separate spaces. The fire integrity of the boundary bulkheads and decks of such smaller rooms shall be as prescribed in Table 4 and Table 5. The title of each category is intended to be typical rather than restrictive. The number in parentheses preceding each category refers to the applicable column or row in the tables.

Table 3: Solution 1 - Categorisation of spaces for Type A ships

(1) Control stations Damage control stations: continuously manned control station in which the control and indicator of functions and operations for fire, flooding alarms, essential machineries, NBC protection, public address etc. are centralised as may be deemed necessary by ANC Authority. Spaces containing emergency sources of power and lighting. Wheelhouse and chartroom. Spaces containing the ship's radio equipment. Fire-extinguishing rooms, fire control stations, fire extinguishing equipment rooms. Control room for propulsion machinery when located outside the propulsion machinery space. Spaces containing centralised fire alarm equipment. Spaces containing centralised emergency public address system stations and equipment. Spaces containing naval systems for detection, command, defence, offence, communication, combat or weapon/control operation (e.g. COC). Spaces containing centralised ship's operation equipment (e.g. COP).
(2) Stairways 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 at only one level shall be regarded as part of the space from which it is not separated by a fire door.
(3) Corridors Corridors and lobbies. Individual wet space cubicles which contain no combustible materials, wholly contained within a corridor.

(1) Control stations Damage control stations: continuously manned control station in which the control and indicator of functions and operations for fire, flooding alarms, essential machineries, NBC protection, public address etc. are centralised as may be deemed necessary by ANC Authority. Spaces containing emergency sources of power and lighting. Wheelhouse and chartroom. Spaces containing the ship's radio equipment. Fire-extinguishing rooms, fire control stations, fire extinguishing equipment rooms. Control room for propulsion machinery when located outside the propulsion machinery space. Spaces containing centralised fire alarm equipment. Spaces containing centralised emergency public address system stations and equipment. Spaces containing naval systems for detection, command, defence, offence, communication, combat or weapon/control operation (e.g. COC). Spaces containing centralised ship's operation equipment (e.g. COP).
(4) Evacuation stations and external escape routes Survival craft stowage area. Open deck spaces and passageway forming lifeboat and liferaft embarkation and lowering stations. Muster stations, internal and external. External stairs and open decks used for escape routes. The ship's side to the waterline in the lightest seagoing condition, superstructure and deckhouse sides situated below and adjacent to the life raft and evacuation slide embarkation areas.
(5) Open deck spaces Open deck spaces and passageway clear of lifeboat and liferaft embarkation and lowering stations. Air spaces (the space outside superstructures and deckhouses).
(6) Accommodation spaces of minor fire risk Cabins containing furniture and furnishings of restricted fire risk. Offices and dispensaries containing furniture and furnishings of restricted fire risk. Public spaces containing furniture and furnishings of restricted fire risk and having a deck area of less than 50 m2.
(7) Accommodation spaces of moderate fire risk Public spaces containing furniture and furnishings of restricted fire risk and having a deck area of 50 m2 or more. Isolated lockers and small store-rooms in accommodation spaces having areas less than 4 m2 (in which flammable liquids are not stowed). Cleaning gear lockers (in which flammable liquids are not stowed). Laboratories (in which flammable liquids are not stowed). Pharmacies. Small drying rooms (having a deck area of 4 m2 or less). Specie rooms. Operating rooms.
(8) Sanitary and similar spaces Communal sanitary facilities, showers, baths, water closets, etc. Small laundry rooms. Private sanitary facilities shall be considered a portion of the space in which they are located.
(9) Tanks, voids and auxiliary machinery spaces having little or no fire risk Water tanks forming part of the ship's structure. Voids and cofferdams. Auxiliary machinery spaces which do not contain machinery having a pressure lubrication system and where storage of combustibles is prohibited, such as: ventilation and air-conditioning rooms; windlass room;

(1) Control stations Damage control stations: continuously manned control station in which the control and indicator of functions and operations for fire, flooding alarms, essential machineries, NBC protection, public address etc. are centralised as may be deemed necessary by ANC Authority. Spaces containing emergency sources of power and lighting. Wheelhouse and chartroom. Spaces containing the ship's radio equipment. Fire-extinguishing rooms, fire control stations, fire extinguishing equipment rooms. Control room for propulsion machinery when located outside the propulsion machinery space. Spaces containing centralised fire alarm equipment. Spaces containing centralised emergency public address system stations and equipment. Spaces containing naval systems for detection, command, defence, offence, communication, combat or weapon/control operation (e.g. COC). Spaces containing centralised ship's operation equipment (e.g. COP).
enclosed mooring deck or quarter deck; steering gear room; stabiliser equipment room; electrical propulsion motor room; rooms containing section switchboards and purely electrical equipment other than oil-filled electrical transformers (above 10 kVA); including shore connection spaces. shaft alleys and pipe tunnels; spaces for pumps and refrigeration machinery (not handling or using flammable liquids). Closed trunks serving the spaces listed above. Other closed trunks such as pipe and cable trunks.
(10) Auxiliary machinery spaces, cargo spaces, other oil tanks and other similar spaces of moderate fire risk Cargo oil tanks. Cargo Spaces Refrigerated chambers. Oil fuel tanks (where installed in a separate space with no machinery). Shaft alleys and pipe tunnels allowing storage of combustibles. Auxiliary machinery spaces as in category (9) which contain machinery having a pressure lubrication system or where storage of combustibles is permitted. Oil fuel filling stations and RAS stations on an open deck. Spaces containing oil-filled electrical transformers (above 10 kVA). Spaces containing turbine and reciprocating steam engine driven auxiliary generators and/or small internal combustion engines of power output up to 110 kW driving generators, sprinkler, drencher or fire pumps, bilge pumps, etc. Closed trunks serving the spaces listed above.
(11) Machinery spaces and galleys Main propulsion machinery rooms (other than electric propulsion motor rooms) and boiler rooms. Auxiliary machinery spaces other than those in categories (9) and (10) which contain internal combustion machinery or other oil-burning, heating or pumping units. Aircraft, small craft, vehicle oil fuel and lube oil pump rooms, refuelling stations and areas for storage of low flash fuel. Galleys and annexes. Trunks and casings to the spaces listed above. Aircraft or helicopter hangars.
(12) Store-rooms, workshops, pantries, etc. Pantries not annexed to galleys. Main laundry. Large drying rooms (having a deck area of more than 4 m2) Miscellaneous stores.

(1) Control stations Damage control stations: continuously manned control station in which the control and indicator of functions and operations for fire, flooding alarms, essential machineries, NBC protection, public address etc. are centralised as may be deemed necessary by ANC Authority. Spaces containing emergency sources of power and lighting. Wheelhouse and chartroom. Spaces containing the ship's radio equipment. Fire-extinguishing rooms, fire control stations, fire extinguishing equipment rooms. Control room for propulsion machinery when located outside the propulsion machinery space. Spaces containing centralised fire alarm equipment. Spaces containing centralised emergency public address system stations and equipment. Spaces containing naval systems for detection, command, defence, offence, communication, combat or weapon/control operation (e.g. COC). Spaces containing centralised ship's operation equipment (e.g. COP).
Garbage rooms. Workshops (not part of machinery spaces, ro-ro spaces, hangars, galleys, etc.). Lockers and store-rooms having areas greater than 4 m2, other than those spaces that have provisions for the storage of flammable liquids.
(13) Other spaces in which flammable materials are stowed Paint lockers. Store-rooms containing flammable liquids (including dyes, medicines, etc.), flammable gases or oxygen. Laboratories (in which flammable liquids are stowed).
(14) Special Category spaces Closed Ro-ro spaces.* Aircraft or Helicopter decks * Closed vehicle and well dock spaces (including unmanned vehicles). Enclosed or semi enclosed RAS station.
(15) Explosion risk spaces Integral Class I Dangerous Goods Stowage Areas – those forming an integral part of the ship. Independent Class I Dangerous Goods Stowage Areas – that are non-integral, portable Class I Dangerous Goods Stowage Areas with a capacity of 3m3 or greater. Class I Dangerous Goods Stowage Boxes – that are non-integral, portable Class I Dangerous Goods Stowage Areas with a capacity of less than 3m3.

Note to Table 3:

* Where an asterisk(*) appears in the table, the requirements of Part 2, Chapter 06, paragraphs 13.9.1.1, 13.11.1.1 13.21 may take precedence over the categorisation and subsequent requirements of this section.

8.8.3.3 Where a single value is shown for the fire integrity of a boundary between two spaces, that value shall apply in all cases;

8.8.3.4 Notwithstanding the provisions of paragraph 8.7 there are no special requirements for material or integrity of boundaries where only a dash appears in the tables;

8.8.3.5 ANC Authority shall determine in respect of category (5) spaces whether the insulation values in Table 4 shall apply to ends of deckhouses and superstructures, and whether the insulation values in Table 5 shall apply to open deck spaces. In no case shall the requirements of category (5) of Table 4 or Table 5 necessitate enclosure of spaces, which in the opinion of ANC Authority need not be enclosed.

8.8.4 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.

8.8.5 External boundaries which are required by Rule 2 *Structural Integrity in Case of Fire* to be steel or other equivalent material may be pierced for the fitting of windows and side scuttles 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 ANC Authority.

8.9 Protection of stairways and lifts in accommodation area

8.9.1 Stairways shall be within enclosures formed of "A" class divisions, with positive means of closure at all openings, except that 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 5.

8.9.2 Lift trunks shall be so fitted as to prevent the passage of smoke and flame from one ‘tween-deck to another and shall be provided with means of closing so as to permit the control of draught and smoke. Machinery for lifts located within stairway enclosures shall be arranged in a separate room, surrounded by steel boundaries, except that small passages for lift cables are permitted. 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.

8.10 Continuous Fire Shelter

8.10.1 Notwithstanding the provisions of the applicable tables, the fire resistance of divisions bounding primary escape routes shall not decrease from their level of origin to the evacuation stations.

Table 4: Solution 1 - Bulkheads bounding neither vertical main fire zones nor horizontal main fire zones (Type A ships)

SPACES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Control stations (1)	A-0	A-0	A-0	A-0	A-0	A-60	A-60	A-0	A-0	A-60	A-60	A-60	A-60	A-60	A-60
Stairways (2)		A-0 [a]	A-0	A-0	A-0	A-0	A-15	A-0	A-0	A-15	A-30	A-15	A-30	A-30	A-30
Corridors (3)			B-15	A-60	A-0	B-15	B-15	B-15	A-0	A-15	A-30	A-0	A-30	A-30	A-30
Evacuation stations and external escape routes (4)				_	A-0	A-60 [b]	A-60 [b]	A-60 [b]	A-0	A-0	A-60 [b]	A-60 [b]	A-60 [b]	A-60 [b]	A-30 [b]
Open deck spaces (5)					_	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Accomodation spaces of minor fire risk (6)						B-0	B-0	C	A-0	A-0	A-30	A-0	A-30	A-30	A-60
Accomodation spaces of moderate fire risk (7)							B-0	C	A-0	A-15	A-60	A-15	A-60	A-60	A-60
Sanitary and similar spaces (8)								C	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Tanks, voids and auxiliary machinery spaces having little or no fire risk (9)									A-0 [a]	A-0	A-0	A-0	A-0	A-0	A-0
Auxiliary machinery spaces, oil tanks and other similar spaces of moderate fire risk (10)										A-0 [a]	A-0	A-0	A-15	A-30	A-60
Machinery spaces and galleys (11)											A-30 [a]	A-0	A-60	A-60	A-60
Storerooms, workshops, pantries, etc. (12)												A-0 [a]	A-0	A-30	A-60
Other spaces in which flammable liquids are stowed (13)													A-30	A-60	A-60
Special purpose spaces (14)														A-30 [a]	A-60
Explosive risk spaces (15)															A-60

Note to Table 4:

[a] Highlighted cells are above SOLAS requirements

Where adjacent spaces are in the same numerical category and letter "a" appears, a bulkhead or deck between such spaces need not be fitted if deemed unnecessary by ANC Authority. For example, in category (11) a bulkhead need not be required between a galley and its annexed pantries provided the pantry bulkheads and decks maintain the integrity of the galley boundaries. A bulkhead is, however, required between a galley and a machinery space, or between two different machinery spaces, e.g. main propulsion room and Diesel Generator room or oil pump room, even though both spaces are in category (11)

[b] The ship's side, to the waterline in the lightest seagoing condition, superstructure and deckhouse sides situated below and adjacent to the liferaft and evacuation slide embarkation areas may be reduced to A-30.

Table 5: Solution 1 - Decks not forming steps in vertical main fire zones nor bounding horizontal main fire zones (Type A ships)

SPACE below	SPACE above														
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Control stations (1)	A-30	A-30	A-15	A-0	A-0	A-0	A-15	A-0	A-0	A-0	A-60	A-0	A-60	A-30	A-60
Stairways (2)	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-30	A-0	A-30	A-0	A-30
Corridors (3)	A-15	A-0	A-60	A-60	A-0	A-0	A-15	A-0	A-0	A-0	A-30	A-0	A-30	A-0	A-30
Evacuation stations and external escape routes (4)	A-0	A-0	A-0	A-0		A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-30
Open deck spaces (5)	A-0	A-0	A-0	A-0		A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Accomodation spaces of minor fire risk (6)	A-60	A-15	A-0	A-60	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-15	A-30
Accomodation spaces of moderate fire risk (7)	A-60	A-15	A-15	A-60	A-0	A-0	A-15	A-0	A-0	A-0	A-0	A-0	A-0	A-30	A-30
Sanitary and similar spaces (8)	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Tanks, voids and auxiliary machinery spaces having little or no fire risk (9)	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0 [a]	A-0	A-0	A-0	A-0	A-0	A-30
Auxiliary machinery spaces, oil tanks and other similar spaces of moderate fire risk (10)	A-60	A-60	A-60	A-60	A-0	A-0	A-15	A-0	A-0	A-0 [a]	A-0	A-0	A-30	A-0	A-60
Machinery spaces and galleys (11)	A-60	A-60	A-60	A-60	A-0	A-60	A-60	A-0	A-0	A-30	A-30 [a]	A-0	A-60	A-60	A-60
Storerooms, workshops, pantries, etc. (12)	A-60	A-30	A-15	A-60	A-0	A-30	A-60	A-30	A-0	A-0	A-0	A-0	A-0	A-0	A-60
Other spaces in which flammable liquids are stowed (13)	A-60	A-60	A-60	A-60	A-0	A-30	A-60	A-0	A-0	A-0	A-0	A-0	A-0	A-30	A-60
Special purpose spaces (14)	A-60	A-60	A-60	A-60	A-0	A-30	A-60	A-0	A-0	A-0	A-0	A-30	A-30	A-0	A-60
Explosive risk spaces (15)	A-60	A-60	A-60	A-60	A-0	A-30	A-60	A-0	A-30	A-60	A-60	A-60	A-60	A-60	A-60

Note to Table 5:

[a] Highlighted cells are above SOLAS requirements

Where adjacent spaces are in the same numerical category and letter "a" appears, a bulkhead or deck between such spaces need not be fitted if deemed unnecessary by ANC Authority. For example, in category (11) a bulkhead need not be required between a galley and its annexed pantries provided the pantry bulkheads and decks maintain the integrity of the galley boundaries. A bulkhead is, however, required between a galley and a machinery space, or between two different machinery spaces, e.g. main propulsion room and Diesel Generator room or oil pump room, even though both spaces are in category (11)

[b] The ship's side, to the waterline in the lightest seagoing condition, superstructure and deckhouse sides situated below and adjacent to the liferaft and evacuation slide embarkation areas may be reduced to A-30.

8.11 Construction and arrangement of saunas

8.11.1 The perimeter of the sauna shall be of "A" class boundaries and may include changing rooms, showers and toilets. The sauna shall be insulated to "A-60" standard against other spaces except those inside of the perimeter and spaces of categories (5), (8) and (9).

8.11.2 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.

8.11.3 The traditional wooden lining on the bulkheads and ceiling are permitted in the sauna. The ceiling above the oven shall be lined with a non-combustible plate with an air gap of at least 30 mm. The distance from the hot surfaces to combustible materials shall be at least 500 mm or the combustible materials shall be protected (e.g. non-combustible plate with an air gap of at least 30 mm).

8.11.4 The traditional wooden benches are permitted to be used in the sauna.

8.11.5 The sauna door shall open outwards by pushing.

8.11.6 Electrically heated ovens shall be provided with a timer.

Thermal and structural boundaries for Type B and Type C ships

8.12 Main fire zones

8.12.1 In Type B ships, the hull, superstructure and deckhouses in way of accommodation and service spaces shall be subdivided into vertical main fire zones by at least "A-60(S)" class divisions. The mean length and width of which on any deck does not in general exceed 40 m. The length and width of vertical main fire zones may be extended to a maximum of 48 m in order to bring the ends of vertical main fire zones to coincide with the watertight subdivision bulkheads or in order to accommodate a large space extending for the whole length of the vertical main fire zone provided that the total area of the vertical main fire zone is not greater than 1,600 m2 of any deck.

Note: To provide crew refuge from the effects of a fire on ships less than 48m, it is recommended that the vessel has 2 fire zones as far as is practicable.

Note: It is recommended that Type C ships have an A-0 vertical zone where accommodation and service spaces extend over a significant proportion of the vessel.

8.12.2 As far as practicable, the bulkheads forming the boundaries of the vertical main fire zones above the submergence limit shall be in line with watertight subdivision bulkheads situated immediately below the submergence limit.

8.12.3 Such bulkheads shall extend from deck to deck and to the shell or other boundaries.

8.12.4 On spaces designed for special purposes, such as vehicle spaces, ro-ro vehicle spaces or hangars, where the provision of vertical main fire zone bulkheads would defeat the purpose for which the ship is intended, equivalent means for controlling and limiting a fire shall be substituted and specifically approved by ANC Authority. Service spaces and ship stores shall not be located on ro-ro decks unless protected in accordance with the applicable Rules.

8.13 Bulkheads within accommodation area

8.13.1 Bulkheads required to be "B" class divisions shall extend from deck to deck and to the shell or other boundaries. Where a continuous "B" class ceiling or lining is fitted which is at least of the same fire resistance as the adjoining bulkhead, the bulkhead may terminate at the continuous ceiling or lining.

8.13.2 Bulkheads not required by this or other Rules to be "A" or "B" class divisions, shall be of at least "C" class construction.

8.14 Fire integrity of bulkheads and decks

8.14.1 The minimum fire integrity of bulkheads and decks shall be as prescribed in Table 7 and Table 8.

8.14.2 Where, due to any particular structural arrangements in the ship, difficulty is experienced in determining from the tables the minimum fire integrity value of any divisions, such values shall be determined to the satisfaction of ANC Authority.

8.14.3 The following requirements shall govern application of the tables:

8.14.3.1 Table 7 and Table 8 shall apply respectively to the bulkheads and decks separating adjacent spaces;

8.14.3.2 For determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces, such spaces are classified according to their fire risk as shown in categories (1) to (11) below. Where the contents and use of a space are such that there is a doubt as to its classification for the purpose of this Rule, 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. Smaller, enclosed rooms within a space that have less than 30% communicating openings to that space are considered separate spaces. The fire integrity of the boundary bulkheads and decks of such smaller rooms shall be as prescribed in Table 7 and Table 8. The title of each category is intended to be typical rather than restrictive. The number in parentheses preceding each category refers to the applicable column or row in the tables;

Table 6: Solution 1 - Categorisation of spaces according to fire risk

(1) Control stations Damage control stations: continuously manned control station in which are centralised the control and indicator of functions and operations for fire , flooding alarms, essential machineries, NBC protection, public address etc. as may be deemed necessary by ANC Authority. Spaces containing emergency sources of power and lighting. Wheelhouse and chartroom. Spaces containing the ship's radio equipment. Fire-extinguishing rooms, fire control stations, fire extinguishing equipment rooms. Control room for propulsion machinery when located outside the propulsion machinery space. Spaces containing centralised fire alarm equipment. Spaces containing centralised emergency public address system stations and equipment. Spaces containing naval systems for detection, command, defence, offence, communication, combat or weapon/control operation (e.g. COC). Spaces containing centralised ship's operation equipment (e.g. COP).
(2) Corridors Corridors and lobbies. Individual wet space cubicles which contain no combustible materials, wholly contained within a corridor.
(3) Accommodation spaces Cabins containing furniture and furnishings of restricted fire risk. Offices and dispensaries containing furniture and furnishings of restricted fire risk. Public spaces containing furniture and furnishings of restricted fire risk. Isolated lockers and small store-rooms in accommodation spaces having areas less than 4 m^2 (in which flammable liquids are not stowed). Cleaning gear lockers (in which flammable liquids are not stowed). Laboratories (in which flammable liquids are not stowed). Pharmacies. Small drying rooms (having a deck area of 4 m^2 or less). Specie rooms. Operating rooms. Saunas. Film stowage and shops.
(4) Stairways and evacuation stations 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 at only one level shall be regarded as part of the space from which it is not separated by a fire door. External stairs and open decks used for escape routes. Passageway forming lifeboat and liferaft embarkation and lowering stations. Survival craft stowage area. Muster stations, internal and external. The ship's side to the waterline in the lightest seagoing condition, superstructure and deckhouse sides situated below and adjacent to the liferaft and evacuation slide embarkation areas.
(5) Service spaces (low risk) Main laundry. Drying rooms. Miscellaneous stores. Garbage rooms. Lockers and store-rooms having areas less than 4 m^2.
(6) Category A machinery spaces Main propulsion machinery rooms (other than electric propulsion motor rooms) and boiler rooms.

(1) Control stations Damage control stations: continuously manned control station in which are centralised the control and indicator of functions and operations for fire , flooding alarms, essential machineries, NBC protection, public address etc. as may be deemed necessary by ANC Authority. Spaces containing emergency sources of power and lighting. Wheelhouse and chartroom. Spaces containing the ship's radio equipment. Fire-extinguishing rooms, fire control stations, fire extinguishing equipment rooms. Control room for propulsion machinery when located outside the propulsion machinery space. Spaces containing centralised fire alarm equipment. Spaces containing centralised emergency public address system stations and equipment. Spaces containing naval systems for detection, command, defence, offence, communication, combat or weapon/control operation (e.g. COC). Spaces containing centralised ship's operation equipment (e.g. COP).
Auxiliary machinery spaces other than those in category (7) which contains internal combustion machinery or other oil-burning, heating or pumping units. Aircraft, small craft, vehicle oil fuel and lube oil pump rooms, refuelling stations and areas for storage of low flash fuel. Trunks and casings to the spaces listed above. Aircraft or helicopter hangars
(7) Other machinery spaces Ventilation and air-conditioning rooms. Windlass room. Enclosed mooring deck or quarter deck. Steering gear room. Stabilizer equipment room. Electrical propulsion motor room. Rooms containing section switchboards and purely electrical equipment other than oil-filled electrical transformers (above 10 kVA), including shore connection spaces. Shaft alleys and pipe tunnels. Spaces for pumps and refrigeration machinery. Oil fuel filling stations and RAS stations on an open deck. Spaces containing oil-filled electrical transformers (above 10 kVA). Spaces containing turbine and reciprocating steam engine driven auxiliary generators and/or small internal combustion engines of power output up to 110 kW driving generators, sprinkler, drencher or fire pumps, bilge pumps, etc. Tanks, and voids. Cofferdams. Trunks serving the spaces listed above.
(8) Service spaces (high risk) Galleys and annexes. Pantries. Paint lockers. Store-rooms having areas more than 4 m2. Store-rooms containing flammable liquids (including dyes, medicines, etc.), flammable gases or oxygen. Laboratories (in which flammable liquids are stowed). Workshops (not part of machinery spaces, ro-ro spaces, hangars, galleys, etc.).
(9) Open deck spaces Open deck spaces and passageway clear of lifeboat and liferaft embarkation and lowering stations. Air spaces (the space outside superstructures and deckhouses).
(10) Special Category spaces Closed Ro-ro spaces.*

(1) Control stations Damage control stations: continuously manned control station in which are centralised the control and indicator of functions and operations for fire , flooding alarms, essential machineries, NBC protection, public address etc. as may be deemed necessary by ANC Authority. Spaces containing emergency sources of power and lighting. Wheelhouse and chartroom. Spaces containing the ship's radio equipment. Fire-extinguishing rooms, fire control stations, fire extinguishing equipment rooms. Control room for propulsion machinery when located outside the propulsion machinery space. Spaces containing centralised fire alarm equipment. Spaces containing centralised emergency public address system stations and equipment. Spaces containing naval systems for detection, command, defence, offence, communication, combat or weapon/control operation (e.g. COC). Spaces containing centralised ship's operation equipment (e.g. COP).
Aircraft or Helicopter decks * Closed vehicle and well dock spaces (including unmanned vehicles). Enclosed or semi enclosed RAS station.
(11) Explosion risk spaces Integral EO Stowage Areas – those forming an integral part of the ship. Independent EO Stowage Areas – that are non-integral, portable EO Stowage Areas with a capacity of $3m^3$ or greater. EO Stowage Boxes – that are non-integral, portable EO Stowage Areas with a capacity of less than $3m^3$.

Note to Table 6:

* Where an asterisk(*) appears in the table, the requirements of Part 2, Chapter 06, paragraph 13.11.1.1 may take precedence over the categorisation and subsequent requirements of this section.

8.14.4 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.

8.15 Continuous Fire Shelter

8.15.1 Notwithstanding the provisions of the applicable tables, the fire resistance of divisions bounding primary escape routes shall not decrease from their level of origin to the evacuation stations.

Table 7: Solution 1 - Bulkheads in Type B and C ships

SPACES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control stations (1)	A-0	A-0	A-60	A-0	A-15	A-60	A-15	A-60	*	A-60	A-60
Corridors (2)		C	B-0	A-0	B-0	A-60	A-0	A-15	*	A-30	A-30
Accomodation spaces (3)			C	A-0	B-0	A-60	A-0	A-15	*	A-30	A-60
Stairways (4)				A-0	A-0	A-60	A-0	A-0	*	A-30	A-30
Service spaces (low risk) (5)					C	A-60	A-0	A-0	*	A-0	A-60
Machinery spaces of category A (6)						A-30 [a]	A-0	A-60	*	A-60	A-60
Other mahinery spaces (7)							A-0 [a]	A-0	*	A-0	A-60
Service spaces (high risk) (8)								A-0 [a]	*	A-30	A-60
Open decks (9)									*	A-30	A-0
Special purpose spaces (10)										A-30	A-60
Explosive risk spaces (11)											A-60

Table 8: Solution 1 - Decks in Type B and C ships

SPACE below	SPACE above										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control stations (1)	A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0	*	A-60	A-60
Corridors (2)	A-0	*	*	A-0	*	A-60	A-0	A-0	*	A-30	A-30
Accomodation spaces (3)	A-60	A-0	*	A-0	*	A-60	A-0	A-0	*	A-30	A-60
Stairways (4)	A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0	*	A-30	A-30
Service spaces (low risk) (5)	A-15	A-0	A-0	A-0	*	A-60	A-0	A-0	*	A-0	A-60
Machinery spaces of category A (6)	A-60	A-60	A-60	A-60	A-60	A-30 [a]	A-60	A-60	*	A-60	A-60
Other mahinery spaces (7)	A-15	A-0	A-0	A-0	A-0	A-0	A-0	A-0	*	A-0	A-60
Service spaces (high risk) (8)	A-60	A-0	A-0	A-0	A-0	A-60	A-0	A-0	*	A-30	A-60
Open decks (9)	*	*	*	*	*	*	*	A-0	*	A-0	A-0
Special purpose spaces (10)	A-60	A-30	A-30	A-30	A-0	A-60	A-0	A-30	A-0	A-30	A-60
Explosive risk spaces (11)	A-60	A-30	A-30	A-30	A-60	A-60	A-60	A-60	A-0	A-60	A-60

Notes to Table 7 and Table 8:

[a] Highlighted cells are above SOLAS requirements

Where spaces are of the same numerical category and note [a] 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

(8)). A galley next to a galley does not require a bulkhead but a galley next to a paint room requires an "A-0" bulkhead.

* Where an asterisk appears in the tables, the division is required to be of steel or other equivalent material but is not required to be of "A" class standard. However, where a deck, except an open deck, is penetrated for the passage of electric cables, pipes and vent ducts, such penetrations should be made tight to prevent the passage of flame and smoke. Divisions between control stations (emergency generators) and open decks may have air intake openings without means for closure, unless a fixed gas fire-fighting system is fitted.

The ship's side, to the waterline in the lightest seagoing condition, superstructure and deckhouse sides situated below and adjacent to the liferaft and evacuation slide embarkation areas may be reduced to A-30.

The fire integrity characteristics of decks, bulkheads, movable ramps, access doors, ventilation ducts and ventilators should also comply with the unified interpretations of SOLAS Regulation II-2/9 (IMO MSC/Circ.1511).

For water tanks the fire boundary requirements need not be greater than A-0

For Type B ships

8.16 Protection of stairways and lifts in accommodation area

8.16.1 Stairways shall be within enclosures formed of "A" class divisions, with positive means of closure at all openings, except that 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 5.

8.16.2 Lift trunks shall be so fitted as to prevent the passage of smoke and flame from one ‘tween-deck to another and shall be provided with means of closing so as to permit the control of draught and smoke. Machinery for lifts located within stairway enclosures shall be arranged in a separate room, surrounded by steel boundaries, except that small passages for lift cables are permitted. 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.

For Type C ships

8.17 Protection of stairways and lift trunks in accommodation spaces, service spaces and control stations

8.17.1 Stairways which penetrate only a single deck shall be protected, at a minimum, at one level by at least "B-0" class divisions and self-closing doors. Lifts which penetrate only a single deck shall be surrounded by "A-0" class divisions with steel doors at both levels. Stairways and lift trunks which penetrate more than a single deck shall be surrounded by at least "A-0" class divisions and be protected by self-closing doors at all levels.

Thermal and structural boundaries for ships not constructed of steel

8.18 Structural Fire Protection - Main structure

8.18.1 The structural fire protection times for separating bulkheads and decks shall be in accordance with Table 10, and the structural fire protection times are all based on providing protection for a period of 60 minutes as referred to in the definition of Structural Fire Protection time. If any other lesser structural fire protection time is determined from the escape analysis, then the times given below may be amended pro rata. In no case shall the structural fire protection time be less than 30 minutes.

8.18.2 In using Table 10, it shall be noted that the title of each category is intended to be typical rather than restricted. For determining the appropriate fire integrity standards to be applied to boundaries between adjacent spaces, where there is doubt as to their classification for the purpose of this section, they shall be treated as spaces within the relevant category having the most stringent boundary requirement.

8.18.3 In approving structural fire protection details, ANC Authority shall have regard to the risk of heat transmission at intersections and terminal points of required thermal barriers.

8.18.4 When a space is divided by partial bulkheads into two (or more) smaller areas such that they form enclosed spaces, then the enclosed spaces shall be surrounded by bulkheads and decks in accordance with Table 10, as applicable. However, if the separating bulkheads of such spaces are at least 30% open, then the spaces may be considered as the same space.

8.18.5 Cabinets or lockers having a deck area of less than 2 m^2 may be accepted as part of the space they serve provided they have open ventilation to the space and do not contain any material or equipment which could be a fire risk.

8.19 Structural fire protection times

8.19.1 Where a space has the special characteristics of two or more space groupings, the structural fire protection time of the divisions shall be the highest for the space groupings concerned from Table 10.

8.20 Fire-resisting divisions

8.20.1 Areas of major and moderate fire hazard shall be enclosed by fire-resisting divisions complying with the requirements listed in the Division 1 Annex A *Definitions and Abbreviations* except where the omission of any such division would not affect the safety of the ship. These requirements need not apply to those parts of the structure in contact with water at the lightweight condition, but due regard shall be given to the effect of temperature of hull in contact with water and heat transfer from any uninsulated structure in contact with water to insulated structure above the water.

8.20.2 Fire-resisting bulkheads and decks shall be constructed to resist exposure to the standard fire test for a period of 30 minutes for areas of moderate fire hazard and 60 minutes for areas of major fire hazards except as provided in paragraph 8.18.1.

8.21 The hull, superstructure and deckhouses in way of accommodation and service spaces shall be subdivided into vertical main fire zones by boundaries with a structural fire protection time of at least 60 minutes, the mean length and width of which on any deck does not in general exceed 40 m. The length and width of vertical main fire zones may be extended to a maximum of 48 m in order to bring the ends of vertical main fire zones to coincide with the watertight subdivision bulkheads or in order to accommodate a large space extending for the whole length of the vertical main fire zone provided that the total area of the vertical main fire zone is not greater than 1,600 m^2 of any deck.

Note: To provide crew refuge from the effects of a fire on ships less than 40m, it is recommended that the vessel has 2 fire zones as far as is practicable.

8.22 In addition to the fire resisting divisions specified by the rules, other load carrying structures shall be provided with fire insulation, unless it can be documented, for all parts of the vessel, that a fire in two adjacent compartments will not threaten the structural integrity of the vessel.

8.23 For the purpose of these rules, cabins and corridors shall be considered as areas of minor fire hazard. Divisions enclosing these spaces shall be smoke tight.

8.24 Fire integrity of bulkheads and decks

8.24.1 The minimum fire integrity of bulkheads and decks shall be as prescribed in Table 10.

8.24.2 Where, due to any particular structural arrangements in the ship, difficulty is experienced in determining from the tables the minimum fire integrity value of any divisions, such values shall be determined to the satisfaction of ANC Authority.

8.24.3 The following requirements shall govern application of the tables:

8.24.3.1 Table 10 shall apply to the bulkheads and decks separating adjacent spaces;

8.24.3.2 For determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces, such spaces are classified according to their fire risk as shown in categories A to F below

Table 9: Solution 1 - Categorisation of spaces according to fire risk

(A) "Areas of major fire hazard" include the following spaces: Propulsion machinery spaces. Ro-ro spaces. Spaces containing dangerous goods. Special category spaces. Store-rooms containing flammable liquids, flammable gases or oxygen. Galleys. Trunks in direct communication with the above spaces. EO Stowage Areas. Enclosed or semi enclosed RAS station. Aircraft, small craft, vehicle oil fuel and lube oil pump rooms, refuelling stations and areas for storage of low flash fuel.
(B) "Areas of moderate fire hazard" include the following spaces: Auxiliary machinery spaces. Bond stores containing packaged beverages with alcohol content not exceeding 24% by volume. Accommodation containing sleeping berths. Service spaces. Shore connection spaces. Pantries. Trunks in direct communication with the above space. Oil fuel filling stations and RAS stations on an open.
(C)"Areas of minor fire hazard" include the following spaces: Auxiliary machinery spaces. Cargo spaces. Fuel tank compartments. Public spaces. Tanks, voids and areas of little or no fire risk. Enclosed mooring deck or quarter deck; Corridors and stairway enclosures. Trunks in direct communication with the above spaces.
(D) “Control stations” include the following areas:

(A) "Areas of major fire hazard" include the following spaces: Propulsion machinery spaces. Ro-ro spaces. Spaces containing dangerous goods. Special category spaces. Store-rooms containing flammable liquids, flammable gases or oxygen. Galleys. Trunks in direct communication with the above spaces. EO Stowage Areas. Enclosed or semi enclosed RAS station. Aircraft, small craft, vehicle oil fuel and lube oil pump rooms, refuelling stations and areas for storage of low flash fuel.
Damage control stations: continuously manned control station in which are centralised the control and indicator of functions and operations for fire, flooding alarms, essential machineries, NBC protection, public address etc. as may be deemed necessary by ANC Authority. Spaces containing emergency sources of power and lighting. Wheelhouse and chartroom. Spaces containing the ship's radio equipment. Fire-extinguishing rooms, fire control stations, fire extinguishing equipment rooms. Control room for propulsion machinery when located outside the propulsion machinery space. Spaces containing centralised fire alarm equipment. Spaces containing centralised emergency public address system stations and equipment. Spaces containing naval systems for detection, command, defence, offence, communication, combat or weapon/control operation (e.g. COC). Spaces containing centralised ship's operation equipment (e.g. COP).
(E) "Evacuation stations and external escape routes" include the following areas: Survival craft stowage area. Open deck spaces and passageway forming lifeboat and life raft embarkation and lowering stations. Assembly stations, internal and external. External stairs and open decks used for escape routes. The ship's side to the waterline in the lightest seagoing condition, superstructure and deckhouse sides situated below and adjacent to the life raft and evacuation slide embarkation areas.
(F) "Open spaces" include the following areas: Open deck spaces and passageway clear of lifeboat and life raft embarkation and lowering stations. Air spaces (the space outside superstructures and deckhouses).

Table 10: Solution 1 - Structural fire protection times for separating bulkheads and decks for ships not constructed of steel

	A	B	C	D	E	F
Areas of major fire hazard A	60 / 60 1), 2)	30 / 60 1)	60 / 60 1), 8)	3) / 60 1)	3) / 60 1)	- / 60 1), 7), 9)
Areas of moderate fire hazard B		2), 6) / 2), 6)	3) / 6)	60 / 3), 4)	3) / 6)	- / 3)
Areas of minor fire hazard C			3) / 3)	30 / 3), 4) 8)	3) / 3)	- / 3)
Control stations D				3), 4) / 3), 4)	3) / 3), 4)	- / 3)
Evacuation stations and escape routes E					3) / 3)	- / 3)
Open spaces F						- / -

Note to Table 10:
The figures on either side of the diagonal line represent the required structural fire protection time for the protection system on the relevant side of the division. When steel construction is used and two different structural fire protection times are required for a division in the table, only the greater one need be applied.

Table 11: Solution 1 - Structural fire protection times – Notes to Table 10

(1) The upper side of the decks of special category spaces, ro-ro spaces and open ro-ro spaces need not be insulated.
(2) Where adjacent spaces are in the same alphabetical category and a note 2 appears, a bulkhead or deck between such spaces need not be fitted if deemed unnecessary by ANC Authority. For example, a bulkhead need not be required between two store-rooms. A bulkhead, is however, required between a machinery space and a special category space even through both spaces are in the same category.
(3) No structural fire protection requirements; however, a smoke-tight division made of non-combustible or fire restricting material is required.
(4) Control stations which are also auxiliary machinery spaces shall be provided with 30 minutes structural fire protection.
(5) There are no special requirements for material or integrity of boundaries where only a dash appears in the tables.
(6) The fire protection time is 0 minutes and the time for prevention of passage of smoke and flame is 30 minutes as determined by the first 30 minutes of the standard fire test.
(7) When steel construction is used, fire resisting divisions adjacent to void spaces need not comply with point 5 of the definitions of Fire Resisting Divisions in Division 1 Annex A Definitions and Abbreviations.
(8) The fire protection time may be reduced to 0 minutes for those parts of open ro-ro spaces which are not essential parts of the ship's main load bearing structure, where passengers have no access to them and the crew need not have access to them during any emergency.

(1) The upper side of the decks of special category spaces, ro-ro spaces and open ro-ro spaces need not be insulated.
(9) On Type B ships not constructed of steel, this value may be reduced to 0 minutes where the ship is provided with only a single public space (excluding lavatories) protected by a sprinkler system and adjacent to the operating compartment

Penetration in fire-resisting divisions and prevention of heat transmission in all Ship Types except ships not constructed of steel

8.25 Where "A" class divisions are penetrated, such penetrations shall be tested in accordance with the FTP Code as amended. In the case of ventilation ducts, paragraphs 8.39.2 and 8.41.1 apply. However, where a pipe penetration is made of steel or equivalent material having a thickness of 3 mm or greater and a length of not less than 900 mm (preferably 450 mm on each side of the division), and no openings, testing is not required. Such penetrations shall be suitably insulated by extension of the insulation at the same level of the division.

Note: Tests on penetrations shall be representative of the division in which the penetration will be fitted. Many penetration systems require additional insulation particularly if the fire hazard is from the non-insulated side of the bulkhead.

8.26 Not Used

8.27 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, arrangements shall be made to ensure that the fire resistance is not impaired, subject to the provisions of paragraph 8.41.2. Pipes other than steel or copper that penetrate "B" class divisions shall be protected by either:

8.27.1 A fire tested penetration device, suitable for the fire resistance of the division pierced and the type of pipe used provided the penetration device is installed & insulated as tested; or

8.27.2 A steel sleeve, having a thickness of not less than 1.8 mm and a length of not less than 900 mm for pipe diameters of 150 mm or more and not less than 600 mm for pipe diameters of less than 150 mm (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 mm; or any clearance between pipe and sleeve shall be made tight by means of non-combustible or other suitable material.

8.28 Uninsulated metallic pipes penetrating "A" or "B" class divisions shall be of materials having a melting temperature which exceeds 950ºC for “A-0” and 850ºC for “B-0” class divisions.

8.29 In approving structural fire protection details, the ANC Authority 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 mm 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 mm.

Protection of penetrations in fire resisting divisions in ships not constructed of steel

8.30 Where a fire-resisting division is penetrated by pipes, ducts, electrical cables etc., arrangements shall be made to ensure that the fire-resisting integrity of the division is not impaired, and necessary testing shall be carried out in accordance with the FTP Code as amended.

Protection of Openings in Fire-Resisting Divisions in all Ship Types

8.31 General

8.31.1 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. Hatches between cargo, special category, store, and baggage spaces, and openings between such spaces and the weather decks need not be fitted with a closing appliance effective for resisting fire.

8.31.2 Doors and hatches in fire-resisting divisions are to be type approved. The fire resistance of doors and hatches shall be determined in accordance with the FTP Code as amended. Doors and hatches in "A" class Divisions are to be smoke tight during the fire exposure test.

8.31.3 The ANC Authority may require doors in fire resisting divisions to have a smoke tight, gastight or watertight integrity or be operable following fire exposure. Doors and hatches in watertight subdivisions are to comply with Part 1 Chapter 03 *Buoyancy and Stability* Rule 2 *Watertight Integrity* Paragraph 2.18. Tests to demonstrate capability post fire will need to be undertaken to a defined standard.

Note: In general, doors and hatches are to be fire tested in accordance with IMO Resolution A.754(18).

Smoke tight is defined as having a leakage rate not greater than that defined in BS 476 Pt31 section 31.1 (1983). $3m^3/m/hr$. Gas tight and water tight doors can be assumed to be smoke tight.

8.31.4 The construction of doors, hatches and frames in "A" class divisions with the means of securing them when closed, shall provide resistance to fire equivalent to that of the divisions in which they are situated, and shall be constructed of steel or other equivalent material.

8.31.5 The ANC Authority may permit a limited number of large hydraulic watertight doors or hatches constructed of steel without insulation or demonstrated fire resistance.

8.31.6 Doors, hatches and 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, in which they are fitted, except that ventilation openings may be permitted in the lower portion of doors. Where such openings are in or under a door, the total net area of any such opening or openings shall not exceed 0.05 m^2. Alternatively, a non-combustible air balance duct routed between the cabin and the corridor, and located in the lower part of the bulkhead is permitted where the cross-sectional area of the duct does not exceed 0.05 m^2. All ventilation openings shall be fitted with a grill made of non-combustible material. Doors in "B" class divisions shall be non-combustible. Doors approved without the sill being part of the frame, shall be installed such that the gap under the door does not exceed 25mm.

8.31.7 The requirements for Fire integrity of the outer boundaries of a ship shall not apply to external doors, hatches, glass partitions, windows and side scuttles, provided that there are no requirements for such boundaries to have fire integrity to protect life-saving arrangements as defined in paragraph 8.35.3 or specific requirements from the ANC Authority for high risk spaces such as flight decks or Ro-Ro spaces.

8.31.8 The ANC Authority may permit the use of combustible materials in doors separating cabins from the individual interior sanitary spaces such as showers.

8.31.9 It shall be possible for each fire door and hatch to be opened and closed from each side of the bulkhead by one person only.

8.31.10 Special care shall be put into fastening arrangement of steel door and hatch frames in aluminium and composite bulkheads to avoid heat bridges that may threaten the integrity of the division in a fire.

Note: Fire doors and hatches of aluminium or composites may be permitted in fire-resisting divisions if successfully tested in their bulkhead in accordance with IMO Resolution A.754(18) and to the satisfaction of the ANC Authority.

8.32 Manual doors in fire resisting divisions

8.32.1 Manually operated watertight doors and hatches should be insulated as far as practicable to meet the fire resisting performance of the division of which it is a part.

Note: Manually operated watertight doors or hatches of steel construction without fire insulation may be accepted by the ANC Authority if there is no risk of igniting combustible materials on the other side of the fire-resisting divisions. If the bulkhead is not constructed of steel, the fastening of the door is arranged to avoid excessive heat transfer to the bulkhead.

8.32.2 Where required to be self-closing, doors and hatches shall be capable of closing against an inclination of 3.5° opposing closure.

8.32.3 Doors or hatches required to be self-closing and requiring hold-back arrangements are to be fitted with remotely operated release devices of the fail-safe type. The controls for remote release shall be located outside the space concerned, where they will not be cut off in the event of fire in the space it serves. The door or hatch shall also be capable of release 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.

8.32.4 Where manual hold backs or hooks are required for operational purposes, suitable arrangements and procedures are to be developed and agreed with the Naval Vessel Operator and the ANC Authority.

8.32.5 Doors and hatches for emergency escape trunks need not be fitted with a fail-safe hold-back facility and a remotely operated release device.

8.32.6 Where manual fire doors or hatches without self-closing mechanisms are fitted the arrangements to contain the fire shall be in accordance with requirements such that they maintain the integrity of the division.

8.32.7 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.

8.32.8 The Naval Vessel Operator or ANC Authority may require doors to operate at larger angles of heel or with faster response times for certain operating scenarios.

8.33 Powered doors in main fire divisions

8.33.1 Where powered fire doors or hatches are fitted they shall satisfy the following requirements:

8.33.1.1 The doors and hatches shall be self-closing and be capable of closing with an angle of inclination of up to 3.5º opposing closure;

8.33.1.2 The approximate time of closure for hinged fire doors and hatches 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 and hatches shall be of no more than 0.2 m/s and no less than 0.1 m/s with the ship in upright position;

8.33.1.3 The controls for operation of the door or hatch shall be located outside the space concerned, where they will not be cut off in the event of fire in the space it serves;

8.33.1.4 A door or hatch closed remotely from the central control station shall be capable of being reopened from both sides of the door or hatch by local control. After such local opening, the door or hatch shall automatically close again;

8.33.1.5 Indication shall be provided at the fire door and hatch indicator panel in the continuously manned central control station whether each door or hatch is closed; the release mechanism shall be so designed that the door or hatch will automatically close in the event of disruption of the control system or central power supply;

8.33.1.6 Local power accumulators for power-operated doors and hatches shall be provided in the immediate vicinity of the doors or hatch to enable the operation after disruption of the control system or central power supply at least ten times (fully opened and closed) using the local controls;

8.33.1.7 Disruption of the control system or central power supply at one door or hatch shall not impair the safe functioning of the other doors and hatches;

8.33.1.8 Power-operated doors or hatches shall be equipped with an alarm that sounds at least 5 seconds but no more than 10 seconds after the door or hatch being released from the central control station and before the door begins to move and continues sounding until the door is completely closed;

8.33.1.9 A door or hatch designed to re-open upon contacting an object in its path shall re-open not more than 1 metre from the point of contact;

8.33.1.10 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;

8.33.1.11 Doors or hatches giving direct access to special category spaces which are power-operated and automatically closed need not be equipped with the alarms and remote-release mechanisms.

8.33.1.12 The components of the local control system shall be accessible for maintenance and adjusting;

8.33.1.13 Power-operated doors and hatches 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 FTP code as amended. This system shall satisfy the following requirements:

a. The control system shall be able to operate the door or hatch at the temperature of at least 200°C for at least 60 minutes, served by the power supply;

b. The power supply for all other doors or hatches not subject to fire shall not be impaired;

c. At temperatures exceeding 200°C the control system shall be automatically isolated from the power supply and shall be capable of keeping the door or hatch closed up to at least 945°C.

Note: Powered doors, doors or hatches of steel construction without fire insulation may be accepted by ANC Authority if there is no risk of igniting combustible materials on the other side of the fire-resisting division. If the bulkhead is not constructed of steel, the fastening of the door is arranged to avoid excessive heat transfer to the bulkhead.

8.34 Protection of openings in machinery space, cargo, explosive risk and special purpose space boundaries in all Ship Types

8.34.1 Doors and hatches, in the boundaries of Category A machinery spaces, spaces of major fire hazard and other high risk spaces nominated by ANC Authority, shall be so arranged that positive closure is assured in case of fire in the space by power-operated closing

arrangements in accordance with paragraph 8.33 or by the provision of self-closing arrangements in accordance with paragraph 8.32.

8.34.2 Indicators shall be provided on the Bridge or continuously manned control centre which shall indicate when any fire door or hatch leading to or from a machinery, major fire hazard, cargo, explosive risk or special purpose space is closed.

8.34.3 The number of skylights, doors, hatches, 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.

8.34.4 Skylights shall be of steel and shall not contain glass panels.

8.34.5 Windows shall not be fitted in machinery space boundaries except for viewing ports in doors on the boundary and control rooms contained within the machinery spaces.

8.34.6 Viewing ports in fire-resisting divisions in machinery spaces are to be type approved and the fire resistance determined in accordance with the FTP Code as amended.

8.34.7 ANC Authority may require the glass to be protected from blast or pressure by a screw down cover or alternative arrangement.

Note: Ventilators and trunks passing through watertight and weathertight boundaries also need to comply with Chapter 03 *Buoyancy and Stability*.

8.35 Windows, viewing ports and side scuttles

8.35.1 Windows, viewing ports and side scuttles in bulkheads within accommodation and service spaces and control stations other than those to which the provisions of paragraph 8.31.7 and of paragraph 8.36.4 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 FTP Code as amended.

8.35.2 Notwithstanding the requirements of Tables 4, 5, 6 and 8, windows and side scuttles in bulkheads exposed to the weather, separating accommodation and service spaces and control stations shall be constructed with frames of steel or other suitable material. The glass shall be retained by a metal glazing bead or angle.

8.35.3 Windows facing life-saving appliances, embarkation and assembly stations, external stairs and open decks used for escape routes, and windows situated below liferaft and escape slide embarkation areas shall have fire integrity as required in Table 4. Where dedicated sprinkler heads are provided for windows, "A-0" windows may be accepted as equivalent. To be considered under this paragraph, the sprinkler heads shall either be:

8.35.3.1 Dedicated heads located above the windows, and installed in addition to the conventional ceiling sprinklers; or

8.35.3.2 Conventional ceiling sprinkler heads arranged such that the window is protected by an average application rate of at least 5 l/min/ m^2 and the additional window area is included in the calculation of the area of coverage; or

8.35.3.3 Water-mist nozzles that have been tested and approved in accordance with the requirement specified in Rule 9 *Fire Fighting*.

8.35.4 Windows located in the ship's side below any lifeboat embarkation area shall have fire integrity at least equal to "A-0" class.

8.36 Additional requirements for Type A and Type B ships not constructed of steel

8.36.1 All fire doors and hatches fitted in main fire zone bulkheads, boundaries of major fire hazards, galley boundaries and stairway enclosures 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 and hatches.

8.36.2 For Type A and Type B ships, cabin doors in "B" class divisions shall be of a self-closing type.

8.36.3 The means of control provided for closing power-operated doors, hatches or actuating release mechanisms shall be situated at one continuously manned central control station or grouped in as few positions as possible to the satisfaction of the ANC Authority. Such positions shall have safe access from the open deck. Actuating release mechanisms shall operate simultaneously or in groups and shall be capable of release individually from a position at both sides of the door or hatch. Release switches shall have an on-off function to prevent automatic resetting of the system.

8.36.4 In Type B ships, where a space is protected by an automatic water extinguishing fire detection and alarm system, complying with the provisions the FSS Code as amended, or fitted with a continuous "B" class ceiling, openings in decks not forming steps in vertical main fire zones nor bounding horizontal zones shall be closed reasonably tight rather than smoke and gas tight and such decks shall meet the "A" class integrity requirements in so far as is reasonable and practicable.

Note: For automatic water extinguishing, fire detection and alarm system, complying with the provisions the FSS Code as amended, refer also to the Revised Guidelines, for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 as adopted by IMO resolution A.800(19).

8.36.5 For Type A and Type B ships, except for watertight doors, weather tight doors (semi-watertight doors), doors leading to the open deck and doors which need to be gastight, all "A" class doors located in stairways, public spaces and main fire zone bulkheads in escape routes shall be equipped with a self-closing hose port of material, construction and fire resistance which is equivalent to the door into which it is fitted, and shall be a 150 mm 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.

8.36.6 The Naval Vessel Operator and/or the ANC Authority may require hose ports to be fitted in Non-watertight or gas tight doors and bulkhead through connectors adjacent to watertight and gas tight doors, depending on the fire-fighting philosophy adopted. Where hose ports or bulkhead through connectors are used consideration need to be given to preserving, smoke, gas, water and fire integrity of the boundary.

8.36.7 The ANC Authority may require hatch coamings to be fitted with waterwall devices to assist in fire-fighting where defined in OSI.

8.36.8 Where manually operated fire doors or hatches are fitted with self-closing arrangement, they are to satisfy the following:

8.36.8.1 The approximate time of closure for hinged fire doors or hatches 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;

8.36.8.2 Remote-released sliding doors or hatches 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 which continues sounding until the door is completely closed;

8.36.8.3 Indication shall be provided at the fire door and hatch indicator panel in the continuously manned central control station whether each door or hatch is closed; the release mechanism shall be so designed that the door or hatch will automatically close in the event of disruption of the control system or central power supply.

Machinery Enclosures in all Ship Types

8.37 Where Machinery Enclosures are fitted, the following requirements for Machinery enclosures shall be applied.

8.37.1 Enclosures are to be constructed of non-combustible materials.

8.37.2 For non-steel ships, enclosures are to be constructed of Fire-restricting or non-combustible materials.

8.37.3 The ANC Authority may require the enclosure to provide a Category “A-0” fire boundary (smoke tight, non-combustible for ships not constructed of steel) for the protection of the enclosure and surrounding space.

8.37.4 For all enclosures containing gas turbines, uptakes and downtakes are to be “A-0” including the seals (smoke tight, non-combustible for ships not constructed of steel).

8.37.5 Means of enclosure ventilation shall be fitted with suitable closing devices for fire and smoke control purposes which shall operate automatically on activation of the fire extinguishing system. Manual operation from outside the machinery space shall also be possible. Any trunking to a damper that has been fitted on the enclosure boundary in preference to the compartment boundary is to be “A-0” (smoke tight, non-combustible for ships not constructed of steel).

8.37.6 Enclosures fitted with gaseous fire extinguishing systems or with requirements to operate in a CBRN environment are, as far as reasonably practicable, to be gas tight.

8.37.7 Arrangements are to be provided to prevent the spray of flammable liquids onto insulation.

8.37.8 Insulation shall be impervious to oil or oil vapours.

8.37.9 Where operation in a CBRN environment is required, the ventilation and air pressurisation arrangements are to prevent contamination of the machinery spaces.

8.37.10 Means to monitor the enclosure air temperature and differential pressure shall be provided.

8.37.11 Enclosures shall be fitted with a liquid leakage detection system on drains.

8.37.12 An access door, adequate internal lighting and observation windows, with suitable fire rating if required by the Naval Vessel Operator, are to be located to afford a clear view of both sides of the equipment within the enclosure.

8.38 Not Used

Ventilation systems in all Ship Types except ships not constructed of steel

8.39 Duct and dampers

8.39.1 Ventilation ducts shall be of steel or equivalent material. However, short ducts, not generally exceeding 2 m in length and with a free cross-sectional area not exceeding 0.02 m^2, need not be steel or equivalent subject to the following conditions:

8.39.1.1 Subject to paragraph 8.39.1.2 the ducts are made of any material which has low flame spread characteristics;

8.39.1.2 The ducts shall be made of heat resisting non-combustible material, which may be faced internally and externally with membranes having low flame spread characteristics and, in each case, a calorific value not exceeding 45MJ/m^2 of their surface area for the thickness used.

Note: Refer to the recommendations published by the International Organisation for Standardization, in particular publication ISO 1716:2018, Reaction to fire tests for products- Determination of the gross heat of combustion (calorific value).

8.39.1.3 The ducts are only used at the end of the ventilation device;

8.39.1.4 The ducts are not situated less than 600 mm, measured along the duct, from an opening in an "A" or "B" class division including continuous "B" class ceiling.

8.39.2 The following arrangements shall be tested in accordance with the FTP Code as amended:

8.39.2.1 Fire dampers, including their relevant means of operation;

8.39.2.2 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.

8.40 Arrangement of ducts

8.40.1 The ventilation systems for Category A machinery spaces, vehicle spaces, ro-ro spaces galleys, special category spaces and EO Stowages shall, in general, be separated from each other and from the ventilation systems serving other spaces. Except that the galley ventilation systems on Type C ships, need not be completely separated, but may be served by separate ducts from a ventilation unit serving other spaces. In any case, an automatic fire damper shall be fitted in the galley ventilation duct near the ventilation unit. Ducts provided for the ventilation of Category A machinery spaces, vehicle spaces, ro-ro spaces, galleys, special category spaces and EO Stowages shall not pass through accommodation spaces, service spaces or control stations unless they comply with the conditions specified in paragraphs 8.40.1.1 to 8.40.1.4 or 8.40.1.5 and 8.40.1.6 below:

8.40.1.1 The ducts are constructed of steel having a thickness of at least 3 mm and 5 mm for ducts the widths or diameters of which are up to and including 300 mm and 760 mm and over respectively and, in the case of such ducts, the widths or diameters of which are between 300 mm and 760 mm having a thickness obtained by interpolation;

8.40.1.2 The ducts are suitably supported and stiffened;

8.40.1.3 The ducts are fitted with automatic fire dampers close to the boundaries penetrated;

8.40.1.4 The ducts are insulated to "A-60" class standard from the Category A machinery spaces, vehicle spaces, ro-ro spaces, galleys, special category spaces and EO Stowages to a point at least 5 m beyond each fire damper;

Or:

8.40.1.5 The ducts are constructed of steel in accordance with paragraphs 8.40.1.1 and 8.40.1.2 above;

8.40.1.6 The ducts are insulated to "A-60" class standard throughout the accommodation spaces, service spaces or control stations;

a. Except that penetrations of main zone divisions shall also comply with the requirements of paragraph 8.51.

8.40.2 Ducts provided for ventilation to accommodation spaces, service spaces or control stations shall not pass through Category A machinery spaces, vehicle spaces, ro-ro spaces, galleys, special category spaces and EO Stowages unless they comply with the conditions specified in paragraphs 8.40.2.1 to 8.40.2.3 or 8.40.2.4 and 8.40.2.5 below:

8.40.2.1 The ducts where they pass through a Category A machinery space, vehicle space, ro-ro space, galleys, special category spaces, and EO Stowages are constructed of steel in accordance with paragraphs 8.40.1.1 and 8.40.1.2;

8.40.2.2 Automatic fire dampers are fitted close to the boundaries penetrated;

8.40.2.3 The integrity of the Category A machinery space, vehicle space, ro-ro space, galleys, special category spaces, and EO Stowages boundaries is maintained at the penetrations;

Or:

8.40.2.4 The ducts where they pass through a Category A machinery spaces, vehicle spaces, ro-ro spaces, galleys, special category spaces and EO Stowages are constructed of steel in accordance with paragraphs 8.40.1.1 and 8.40.1.2.

8.40.2.5 The ducts are insulated to "A-60" standard within the Category A machinery spaces, vehicle spaces, ro-ro spaces, galleys, special category space, and EO Stowages; except that penetrations of main zone divisions shall also comply with the requirements of paragraph 8.51.

8.41 Details of duct penetrations

8.41.1 Where a thin plated duct with a free cross-sectional area equal to, or less than, 0.02 m^2 passes through "A" class bulkheads or decks, the opening shall be lined with a steel sheet sleeve having a thickness of at least 3 mm and a length of at least 200 mm, divided preferably into 100 mm on each side of the bulkhead or, in the case of the deck, wholly laid on the lower side of the decks pierced. Where ventilation ducts with a free cross-sectional area exceeding 0.02 m^2 pass through "A" class bulkheads or decks, the opening shall be lined with a steel sheet sleeve. However, where such ducts are of steel construction and pass through a deck or bulkhead, the ducts and sleeves shall comply with the following:

8.41.1.1 The sleeves shall have a thickness of at least 3 mm and a length of at least 900 mm. When passing through bulkheads, this length shall be divided preferably into 450 mm on each side of the bulkhead. These ducts, or sleeves lining such ducts, shall be provided with fire insulation. The insulation shall have at least the same fire integrity as the bulkhead or deck through which the duct passes;

8.41.1.2 Ducts with a free cross-sectional area exceeding 0.075 m^2 shall be fitted with fire dampers in addition to the requirements of paragraph 8.41.1.1. The fire damper shall operate automatically, but shall also be capable of being closed manually from both sides of the bulkhead or deck. The damper shall be provided with an indicator which shows whether the damper is open or closed. 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 pierce. Fire dampers shall be easily accessible. Where they are placed behind ceilings or linings, these ceilings or linings shall be provided with an inspection door on which a plate reporting the identification number of the fire damper is provided. The fire damper identification number shall also be placed on any remote controls required. Fire dampers in vent ducts shall have photo luminescent labels. The Smoke containment policy may require smoke dampers at

smoke zone boundaries. The Naval Vessel Operator may require additional fire dampers on ducts with a free cross-sectional area less than 0.075 m^2 to satisfy operational requirements and fire-fighting practices.

8.41.2 Ventilation ducts with a free cross-sectional area exceeding 0.02 m^2 passing through "B" class bulkheads shall be lined with steel sheet sleeves of 900 mm in length divided preferably into 450 mm on each side of the bulkheads unless the duct is of steel for this length.

8.41.3 The ANC Authority may permit a reduced sleeve length if it can be demonstrated that the fire integrity is equivalent to the bulkhead or deck through which the duct passes.

Ventilation systems – additional requirements for Type A ships

8.42 The ventilation system of a Type A ship shall be in compliance with the following additional requirements.

8.43 In general, the ventilation fans shall be so disposed that the ducts reaching the various spaces remain within the main fire zone.

8.44 Where ventilation systems penetrate decks, precautions shall be taken, in addition to those relating to the fire integrity of the deck required by paragraphs 8.25 and 8.36.4, to reduce the likelihood of smoke and hot gases passing from one 'tween-deck space to another through the system. In addition to insulation requirements contained in paragraphs 8.42 to 8.47, vertical ducts shall, if necessary, be insulated as required by the appropriate Table 4 and Table 5.

8.45 Ventilation ducts shall be constructed of the following materials:

8.45.1 Ducts not less than 0.075 m^2 in free cross-sectional area and all vertical ducts serving more than a single 'tween-deck space shall be constructed of steel or other equivalent material;

8.45.2 Ducts less than 0.075 m^2 in free cross-sectional area other than the vertical ducts referred to in paragraph 8.45.1 shall be constructed of steel or equivalent materials. Where such ducts penetrate "A" or "B" class division due regard shall be given to ensuring the fire integrity of the division;

8.45.3 Short length of duct, not in general exceeding 0.02m^2 in free cross-sectional area nor 2 m in length, need not be steel or equivalent provided that all of the following conditions are met:

8.45.3.1 Subject to paragraph 8.45.3.2 the duct is constructed of any material which has low flame spread characteristics;

8.45.3.2 The ducts shall be made of heat resisting non-combustible material, which may be faced internally and externally with membranes having low flame spread characteristics and, in each case, a calorific value not exceeding 45MJ/m^2 of their surface area for the thickness used.

Note: refer to the recommendations published by the international organisation for standardisation, in particular publication ISO 1716:2018, *Reaction to fire tests for products-Determination of the gross heat of combustion (calorific value)*.

8.45.3.3 The duct is used only at the terminal end of the ventilation system;

8.45.3.4 The duct is not located closer than 600mm measured along its length to a penetration of an "A" or "B" class division, including continuous "B" class ceilings.

Note: MSC.1/Circ.1480 interpretation allowing short lengths of combustible material adjacent to ventilation fans shall not apply.

8.46 Stairway enclosures shall be ventilated and served by an independent fan and duct system which shall not serve any other spaces in the ventilation systems.

8.47 Exhaust ducts shall be provided with hatches for inspection and cleaning. The hatches shall be located near the fire dampers.

Exhaust ducts from galley ranges and laundries - requirements for Type A ships

8.48 Exhaust ducts from galley ranges shall meet the requirements of paragraphs 8.40.1.5 and 8.40.1.6 and shall be fitted with:

8.48.1 A grease trap readily removable for cleaning unless an alternative approved grease removal system is fitted;

8.48.2 A fire damper located in the lower end of the duct which is automatically and remotely operated, and in addition a remotely operated fire damper located in the upper end of the duct;

8.48.3 A fixed means for extinguishing a fire within the duct;

8.48.4 Remote-control arrangements for shutting off the exhaust fans and supply fans, for operating the fire dampers mentioned in paragraph 8.48.2 and for operating the fire extinguishing system, which shall be placed in a position close to the entrance to the galley. Where a multi-branch system is installed, a remote means located with the above controls shall be provided to close all branches exhausting through the same main duct before an extinguishing medium is released into the system;

8.48.5 Suitably located hatches for inspection and cleaning.

8.49 Exhaust ducts from ranges for cooking equipment installed on open decks shall conform to paragraph 8.48, as applicable, when passing through accommodation spaces or spaces containing combustible materials.

8.50 Exhaust ducts from main laundries shall be fitted with:

8.50.1 Filters readily removable for cleaning purposes;

8.50.2 A fire damper located in the lower end of the duct which is automatically and remotely operated;

8.50.3 Remote-control arrangements for shutting off the exhaust fans and supply fans from within the space and for operating the fire damper mentioned in paragraph 8.40.2.2; and

8.50.4 Suitably located hatches for inspection and cleaning.

Ventilation systems – additional Requirements for Type A and Type B ships

8.51 Where it is necessary that a ventilation duct passes through a main fire zone division, a fail-safe automatic closing 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 operating position shall be readily accessible and be marked in red light-reflecting colour. 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 paragraph 8.25. 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.

Exhaust ducts from galley ranges - requirements for Type C ships

8.52 Where they pass through accommodation spaces or spaces containing combustible materials, the exhaust ducts from galley ranges shall be constructed of "A" class divisions. Each exhaust duct shall be fitted with:

8.52.1 A grease trap readily removable for cleaning;

8.52.2 A fire damper located in the lower end of the duct and, in addition, a fire damper in the upper end of the duct;

8.52.3 Arrangements, operable from within the galley, for shutting off the exhaust fans;

8.52.4 Fixed means for extinguishing a fire within the duct.

Ventilation systems for ships not constructed of steel

8.53 The main inlets and outlets of all ventilation systems shall be capable of being closed from outside the spaces being ventilated. In addition, such openings to areas of major fire hazard shall be capable of being closed from a continuously manned control station.

8.54 All ventilation fans shall be capable of being stopped from outside the spaces which they serve, and from outside the spaces in which they are installed. Ventilation fans serving areas of major fire hazard shall be capable of being operated from a continuously manned control station. The means provided for stopping the power ventilation to the machinery spaces shall be separated from the means provided for stopping ventilation of other spaces.

8.55 Areas of major fire hazard and spaces serving as muster stations shall have independent ventilation systems and ventilation ducts. Ventilation ducts for areas of major fire hazard shall not pass through other spaces, unless they are contained within a trunk or in an extended machinery space or casing insulated in accordance with Table 10; ventilation ducts of other spaces shall not pass through areas of major fire hazard. Ventilation outlets from areas of major fire hazard shall not terminate within a distance of 1m from any control station, evacuation station or external escape route. In addition, exhaust ducts from galley ranges shall be fitted with:

8.55.1 A grease trap readily removable for cleaning unless an alternative approved grease removal system is fitted;

8.55.2 A fire damper located in the lower end of the duct which is automatically and remotely operated, and in addition a remotely operated fire damper located in the upper end of the duct;

8.55.3 A fixed means for extinguishing a fire within the duct;

8.55.4 Remote control arrangements for shutting off the exhaust fans and supply fans, for operating the fire dampers mentioned in paragraph 8.55.2 and for operating the fire-extinguishing system, which shall be placed in a position close to the entrance to the galley. Where a multi-branch system is installed, means shall be provided to close all branches exhausting through the same main duct before an extinguishing medium is released into the system;

8.55.5 Suitably located hatches for inspection and cleaning.

8.56 Where a ventilation duct passes through a fire-resisting division, a fail-safe automatic closing fire damper shall be fitted adjacent to the division. The duct between the division and the damper shall be of steel or other equivalent material and insulated to the same standard as

required for the fire resisting division. The fire damper may be omitted where ducts pass through spaces surrounded by fire-resisting divisions without serving those spaces providing that the duct has the same structural fire protection time as the divisions it penetrates. Where a ventilation duct passes through a smoke-tight division, a smoke damper shall be fitted at the penetration unless the duct which passes through the space does not serve that space.

8.57 Where ventilation systems penetrate decks, the arrangements shall be such that the effectiveness of the deck in resisting fire is not thereby impaired and precautions shall be taken to reduce the likelihood of smoke and hot gases passing from one between-deck space to another through the system.

8.58 All dampers fitted on fire-resisting or smoke-tight divisions shall also be capable of being manually closed from each side of the division in which they are fitted, except for those dampers fitted on ducts serving spaces not normally manned such as stores and toilets that may be manually operated only from outside the served spaces. All dampers shall also be capable of being remotely closed from the continuously manned control station.

8.59 Ducts shall be made of non-combustible or fire restricting materials. Short ducts, however, may be of combustible materials subject to the following conditions:

8.59.1 Their cross-section does not exceed 0.02 m^2;

8.59.2 Their length does not exceed 2 m;

8.59.3 They may only be used at the terminal end of the ventilation system;

8.59.4 They shall not be situated less than 600 mm from an opening in a fire-resisting or fire restricting division; and

8.59.5 Their surfaces have low flame spread characteristics.

8.60 Dampers in fire-resisting divisions are to be of an approved type. Special care is to be put into fastening arrangement of steel ducts and steel frames in aluminium and composite structures to avoid heat bridges that may threaten the integrity of the division in a fire.

8.61 Supply and exhaust ducts for gas turbines may be accepted without dampers, provided the integrity of the ducts are maintained throughout the spaces they penetrate. Supply ducts for gas turbines need not be fire insulated outside the machinery spaces, provided their integrity is maintained inside the machinery spaces.

8.62 Not used.

8.63 Not used.

8.64 Not used.

8.65 Not used.

Solution 2

8.66 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Note: Whereas Solution 1 categorises spaces by their type (Cat 1 to 15 for Type A Ships, Cat 1 to 11 for Type B and C Ships, and Cat A to F for Type C non-steel ships), Solution 2 categorises spaces by their Risk Category (Cat A to E) and their Value Category (Cat 1 to 5). Guidance for the risk and value categorisation of a compartment is included in Part 3. The application of Solution 2 is dependent on the ship's OSI as follows:

- Solution 2a is suitable where the OSI has an active fire-fighting and damage control philosophy and a vessel is engaged in constabulary role.

- Solution 2b is suitable where the OSI has an active fire-fighting and damage control philosophy and a vessel is engaged in combat role.

Solution 2a

8.67 The ship shall be subdivided by fire resisting divisions to control and contain the spread of fire and smoke, having due regard to the risk and value categorisation of adjacent spaces, and the OSI.

8.67.1 Fire and smoke shall be contained at the boundary of Main Fire Zones, Cat-A spaces, Cat-5 spaces and other spaces nominated by ANC Authority.

8.67.2 Smoke shall be contained at the boundary of Smoke Zones, Stairway Enclosures and other spaces nominated by the ANC Authority defined in the smoke control philosophy. The following specific spaces are to be considered in addition to the above: Category A Machinery spaces, Special category spaces of high fire risk, Muster stations and Evacuation stations, Control Stations manned in an emergency. A smoke boundary plan is to be provided.

8.67.3 The fire and smoke integrity of the fire resisting divisions shall have due regard to the fire risk of the space of origin and the value of the adjacent spaces. Active or passive means of containment may be used.

8.68 The passage of smoke in air spaces behind ceilings, linings and panels shall be restricted.

8.69 The ship shall be provided with arrangements to control the spread of smoke and to extract smoke:

8.69.1 Operability of Cat-5 spaces shall be maintained with adequate ventilation

8.70 Smoke clearance arrangements shall be provided for all Smoke Zones, Cat-A spaces and other spaces nominated by the ANC Authority. The normal ventilation systems may be acceptable for this purpose.

Fire and Smoke Sub-Divisions

8.71 The ship shall be subdivided by fire and smoke resisting divisions, to prevent the passage of fire and smoke at the boundary of:

8.71.1 Main Fire Zones;

8.71.2 Smoke Zones;

8.71.3 Cat-A spaces (spaces of High Risk);

8.71.4 Cat-5 spaces (spaces of High Value);

8.71.5 Decks; and

8.71.6 Stairways and Lift Trunks.

Note: For Type-A and Type-B ships, “Light-weight constructions" (honeycomb type, etc.) of steel or equivalent material are not be used as an integral part of Main Fire Zones, smoke control bulkheads or the boundaries of Cat-A, Cat-5 spaces, Stairway enclosures and Lift Trunks.

8.72 Main Fire Zones

8.72.1 The ship shall be subdivided by fire and smoke resisting divisions to create Main Fire Zones as defined below:

8.72.2 For Type A Ships

8.72.2.1 The hull, superstructure and deckhouses shall be subdivided by vertical Main Fire Zone divisions with FI no less than A-60(S). The mean length and width of which on any deck does not in general exceed 40 m. The length and width of vertical main fire zones may be extended to a maximum of 48 m in order to bring the ends of vertical main fire zones to coincide with the watertight subdivision bulkheads or in order to accommodate a large space extending for the whole length of the vertical main fire zone provided that the total area of the vertical main fire zone is not greater than 1,600 m^2 of any deck.

8.72.3 For Type B & Type C Ships

8.72.3.1 For Type B ships, the hull, superstructure and deckhouses, in way of accommodation and service spaces, shall be subdivided by Main Fire Zone divisions with a FI no less than A-60(S). The mean length and width of which on any deck does not in general exceed 40 m. The length and width of vertical main fire zones may be extended to a maximum of 48 m in order to bring the ends of vertical main fire zones to coincide with the watertight subdivision bulkheads or in order to accommodate a large space extending for the whole length of the vertical main fire zone provided that the total area of the vertical main fire zone is not greater than 1,600 m^2 of any deck.

Note: To provide crew refuge from the effects of a fire on ships less than 48m, it is recommended that the vessel has 2 fire zones as far as is practicable.

Note: It is recommended that Type C ships have an A-60(S) vertical zone where accommodation and service spaces extend over a significant proportion of the vessel.

8.72.4 The ANC Authority may permit the FI of the division to be reduced to A-0(S) where Cat-E spaces are on both sides of a Main Fire Zone division.

8.72.5 Steps and recesses in the Main Fire Zone shall be kept to a minimum, but where they are necessary they shall maintain the integrity of the division.

8.72.6 As far as practicable, the bulkheads forming the boundaries of Main Fire Zones above the submergence limit shall be in line with watertight subdivision bulkheads situated immediately below the submergence limit.

8.72.7 Main Fire Zone bulkheads shall extend from deck to deck and to the shell or other equivalent boundary.

8.72.8 The ANC Authority may require smoke curtains to be fitted over doors and hatches in the boundary of the Main Fire Zone to allow passage through the smoke boundary.

8.73 Smoke Zones

8.73.1 The ship shall be subdivided by fire and smoke resisting divisions with a FI no less than A-0, to create Smoke Zones as defined in this section.

8.73.2 The FI of Smoke Zone boundaries shall be enhanced with the fire resistance notation ‘S’ to ensure smoke tightness.

Note: In accordance with the requirements of the ANC rules, to provide crew refuge from the effects of a fire on ships less than 48m, it is recommended that the vessel has 2 fire zones as far as is practicable.

8.73.3 For Type A Ships

8.73.3.1 For each deck, where the deck area between Main Fire Zone boundaries exceeds 250 m^2, less: enclosed stairs; Cat-A; and Cat-5 space, the area shall be sub-divided by divisions with an FI of not less than A-0 to form Smoke Zones. Each deck of a Smoke Zone shall have a deck area no greater than 60% of the Main Fire Zone or 400 m^2, whichever is the smaller.

8.73.3.2 The FI of Cat-A, Cat-5 spaces, Stairways and Lift Trunks, within a Smoke Zone, shall be enhanced with the fire resistance notation 'S' to ensure smoke tightness.

8.73.3.3 Within a Main Fire Zone the Smoke Zones are, as far as is practicable, to be of equivalent size and are to be evenly distributed.

8.73.4 For Type B and Type C Ships

8.73.4.1 As Type A ships, except that a Smoke Zone can reside over two decks to form a vertical Smoke Zone.

8.73.5 For ships not constructed of steel

8.73.5.1 Each deck of the Smoke Zone shall have a deck area no greater than 150 m^2.

8.73.5.2 A Smoke Zone can reside over more than two decks. Where a deck does not provide a boundary of a Smoke Zone, the Smoke Zone is considered to extend between the two decks to create a vertical Smoke Zone. The boundary of a vertical Smoke zone shall be continuous to ensure smoke cannot spread between adjacent zones.

8.73.6 As far as is practicable, steps and recesses in the Smoke Zone boundaries shall be kept to a minimum and should coincide with watertight subdivisions, Main Fire Zones and divisions which in accordance with paragraphs 8.71 to 8.76 are required to have an FI not less than A-0.

8.73.7 Where the provision of a Smoke Zone boundary would defeat the purpose for which a space is intended, such that a single compartment has a deck area greater than that permitted for a Smoke Zone, the compartment is to be considered an enlarged Smoke Zone. The remaining deck area is to be provided with further Smoke Zones, as necessary, except that the area of the enlarged Smoke Zone can be increased to include spaces where the ANC Authority agree that it would be impractical to meet the ventilation requirements of paragraphs 8.112 to 8.114.

Note: Where the deck area of a Smoke Zone is greater than the maximum permitted, the ANC Authority may require a safety justification to demonstrate an equivalent level of safety with regard to escape and fire-fighting activities.

Note: For Type-A and Type-B ships, "Light-weight constructions" (honeycomb type, etc.) of steel or equivalent material are not be used as an integral part of main fire zones, smoke control bulkheads or the boundaries of Cat-A, Cat-5 spaces, Stairway enclosures or Lift Trunks.

8.73.8 Smoke curtains shall be fitted where necessary to allow passage through the smoke boundary.

8.74 Cat-A Spaces (spaces of High Risk)

8.74.1 All Cat-A spaces shall be suitably constructed to prevent the passage of flame, as required through application of Table 13, Table 14 and Table 15, with a FI of no less than A-0 to contain fire and smoke to the space of origin.

8.74.2 The ANC Authority may require that the FI of divisions bounding Cat-A spaces is enhanced with the fire resistance notation 'S' to ensure smoke tightness.

8.75 Cat-5 Spaces (Spaces of High Value)

8.75.1 All Cat-5 spaces shall be suitably constructed to prevent the passage of flame, as required through application of Table 13, Table 14 and Table 15, with a FI of no less than A-0 to contain fire and smoke to the space of origin.

8.75.2 The ANC Authority may require that the FI of divisions bounding Cat-5 spaces is enhanced with the fire resistance notation 'S' to ensure smoke tightness.

8.75.3 The ANC Authority may agree to a reduction in the FI of specific Cat-5 spaces, on a case by case basis, where either:

8.75.3.1 The contents of the Cat-5 space are not combustible and will be unaffected from the heat of a fire in the adjoining space; or

8.75.3.2 The contents of the Cat-5 space are separated from the adjoining division, such that it will be unaffected by the heat of a fire in the adjoining space.

8.76 Fire and Smoke Integrity of Decks

8.76.1 All decks shall be constructed to prevent the passage of flame, as required through application of Table 14 and Table 15.

8.76.2 Where a deck is penetrated for the passage of electric cables, pipes and vent ducts, such penetrations shall be made tight to maintain the integrity of the deck and to prevent the passage of flame and smoke.

8.76.3 For Type-B and Type-C ships

8.76.3.1 Where the deck between two vertical adjacent compartments of the same type the fire resisting divisions need only to be of a non-combustible or fire resisting construction capable of restricting the passage of smoke as far as is reasonably practicable in the opinion of the ANC Authority.

8.77 Protection of Stairways and Lift Trunks

8.77.1 Stairways and Lift trunks shall maintain the integrity of the decks penetrated and shall be so fitted as to prevent the passage of smoke and flame from one deck to another, with positive means of closure at all openings as to permit the control of draught and smoke.

8.77.2 All stairways and lift trunks serving more than two decks shall be enclosed by divisions with a FI no less than A-0, except where the stairway or lift trunk is wholly contained within a space providing that:

8.77.2.1 Where a fixed fire protection system is provided within the space, the whole space including the stairway or lift trunk is protected by the same system;

8.77.2.2 Means are provided to automatically alert persons, within the space, of a developing fire or other hazardous situation located elsewhere within the space;

8.77.2.3 Safe means are provided for persons escaping from lower parts of the space.

8.77.3 The ANC Authority may require that the FI of Stairways and Lift Trunks is enhanced with the fire resistance notation 'S' to ensure smoke tightness.

8.77.4 Where a stairway or lift trunk connects two adjacent decks, the stairway or lift trunk need not be enclosed provided the integrity of the deck is maintained by proper bulkheads and self-closing doors in one 'tween-deck space which meets the requirements of Table 14 and Table 15.

Note: For Type-A and Type-B ships, “Light-weight constructions" (honeycomb type, etc.) of steel or equivalent material are not be used as an integral part of main fire zones, smoke control bulkheads or the boundaries of Cat-A, Cat-5 spaces or Stairway enclosures.

8.77.5 Lifts Trunks serving Cat-A spaces shall not also serve spaces which are included in the means of escape.

8.77.6 Machinery for lifts shall be arranged in a separate room protected in accordance with Table 14 and Table 15, except that small passages for lift cables are permitted in the division adjacent to the lift trunk.

8.78 Machinery Enclosures within Cat-A spaces

8.78.1 The ANC Authority may allow machinery to be installed in an enclosure for the reduction of noise, for operation in a CBRN environment and/or to provide a fire boundary. Where Machinery Enclosures are fitted, the following requirements shall be applied.

8.78.2 Enclosures shall be constructed of non-combustible materials.

8.78.3 For non-steel ships, enclosures shall be constructed of Fire-restricting or non-combustible materials.

8.78.4 The ANC Authority may for the protection of the enclosure and surrounding space, require the machinery enclosure to have a FI no less than A-0.

8.78.5 For all enclosures containing gas turbines, the uptakes and downtakes are to have a FI not less than A-0, including the seals

8.78.6 Enclosure ventilation shall be fitted with suitable closing devices for fire and smoke control purposes which shall operate automatically upon activation of the fire extinguishing system. Manual operation from outside the machinery space shall also be possible. Any trunking to a damper that has been fitted on the enclosure boundary in preference to the compartment boundary is to maintain the integrity of the enclosure.

8.78.7 Enclosures fitted with gaseous fire extinguishing systems or with requirements to operate in a CBRN environment are, as far as reasonably practicable, to be gas tight with an outward opening access door.

8.78.8 Where operation in a CBRN environment is required, the ventilation of the enclosure and the air pressurisation arrangements are to prevent contamination of the machinery spaces.

8.78.9 Means to monitor the enclosure air temperature and differential pressure shall be provided.

8.78.10 Enclosures shall be fitted with a liquid leakage detection system on drains.

8.78.11 An access door, adequate internal lighting and observation windows, with suitable fire rating if required, are to be located to afford a clear view of both sides of the equipment within the enclosure.

8.79 The external boundary of the Ship

8.79.1 In all cases the external boundary of the ship is to have a FI not less than A-0, irrespective of the risk associated with the open deck areas.

8.79.2 The requirements for the outer boundary of a ship shall not apply to external doors, hatches, glass partitions, windows and side scuttles where there are no requirements for such boundaries to have fire integrity to protect life-saving arrangements as defined in paragraph 8.111.1 or specific requirements from the ANC Authority for spaces of significant fire risk.

Note: For ships not constructed of steel consideration is to be given to the prevention of fire spread across the external boundary of the ship.

8.80 Construction and arrangement of saunas

8.80.1 The perimeter of the sauna complex, which may include changing rooms, showers and toilets, shall have a FI not less than A-0. The sauna shall have a FI not less than A-60 against other spaces except those inside the perimeter of the sauna complex and Cat-E spaces.

8.80.2 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.

8.80.3 The traditional wooden lining on the bulkheads and ceiling are permitted in the sauna. The ceiling above the oven shall be lined with a non-combustible plate with an air gap of at least 30 mm. The distance from the hot surfaces to combustible materials shall be at least 500 mm or the combustible materials shall be protected (e.g. non-combustible plate with an air gap of at least 30 mm).

8.80.4 The traditional wooden benches are permitted to be used in the sauna.

8.80.5 The sauna door shall open outwards by pushing.

8.80.6 Electrically heated ovens shall be provided with a timer.

FI of Bulkhead and Decks

8.81 For determining the appropriate FI for a fire resisting division between adjacent spaces, each space is to be categorised according to its risk and value, as identified in Table 12. When using this approach, it shall be noted that the title of each space is intended to be typical rather than restricted.

Note: Risk and Value categorisation of spaces has been developed for Type A ships in Table 12. Application of Table 12 to Type B & Type C Ships and Ships not constructed from steel, will require the Risk and Value categories to be agreed with the ANC Authority for each space identified in Table 12. The detail of compartment classification determining the risk and value of a compartment can be found in Part 3.

Table 12: Solution 2a - Risk and Value Categories for all Ship Types

Space ↓	Category of Space →	Type A		Type B & Type C		Ships not Constructed from Steel	
		Risk	Value	Risk	Value	Risk	Value
Control stations							
Control room for propulsion machinery when located outside the propulsion machinery space.		C	4				
Fire control stations.		D	5				
Spaces containing centralised emergency public address system stations and equipment.		D	4				
Spaces containing centralised fire alarm equipment.		D	5				
Spaces containing emergency sources of power and lighting.		B	5				
Spaces containing the ship's radio equipment.		C	5				
Fire Extinguishing Equipment Store		E	5				
Fire Extinguishing Gas Storage Room		E	5				
Wheelhouse and chartroom.		D	5				
Spaces containing centralised ship's operation equipment		D	5				
Spaces containing naval systems for detection, command, defence, offence, communication, combat or weapon/control operation (e.g. COC).		D	5				
Fire Repair Party Post		E	3				
Damage Control Stations		D	3				
Stairways							
Enclosed Escape Trunks		E	5				
Enclosed Stairways		D	3				
Lift Trunks		D	2				

Corridors						
Passenger and crew corridors and lobbies (not on primary escape routes)	D	3				
Passenger and crew corridors and lobbies (on primary escape routes)	D	4				
Evacuation stations and external escape routes						
Assembly stations, internal and external.	D	3				
External stairs and open decks used for escape routes.	E	4				
Open deck spaces and enclosed promenades forming lifeboat and liferaft embarkation and lowering stations.	D	5				
Survival craft stowage area.	E	5				
The ship's side to the waterline in the lightest seagoing condition, superstructure and deckhouse sides situated below and adjacent to the liferaft and evacuation slide embarkation areas.	E	5				
Open deck spaces						
Open spaces and enclosed promenades clear of lifeboat and liferaft embarkation, evacuation stations and external escape routes and control stations.	E	2				
Air spaces (the space outside superstructures and deckhouses).	E	1				
Replenishment At Sea (RAS) Station	C	3				
Personnel spaces of minor fire risk						
CBRN Cleansing Station	E	3				
Operational Spaces inc HQ1, etc and other operationally important spaces defined by the Naval Administration	D	5				
Personnel spaces (inc offices and cabins) containing furniture and furnishings of a restricted fire risk and having a deck area of less than 50 m^2.	D	2				
Personnel spaces of moderate fire risk						
Isolated lockers and small store-rooms in accommodation spaces having areas less than 4 m^2 (in which flammable liquids are not stowed).	E	1				
Isolated pantries (containing cooking appliance but no open flame).	D	2				
Laboratories (in which flammable liquids are not stowed).	D	1				
Personnel spaces (inc offices and cabins) containing furniture and furnishings of a restricted fire risk and having a deck area of 50 m^2 or more.	D	3				

Personnel spaces (inc offices and cabins) containing furniture and furnishings not of a restricted fire risk and having and area less than 50m^2	C	2				
Pharmacies	D	1				
Small drying rooms (having a deck area of 4 m^2 or less).	D	1				
Personnel spaces of greater fire risk						
Personnel spaces (inc offices and cabins) containing furniture and furnishings not of a restricted fire risk and having a deck area of 50 m^2 or more.	C	3				
Saunas.	E	1				
Sanitary and similar spaces						
Isolated pantries (containing no cooking appliance).	D	1				
Sanitary facilities, washroom corridors, showers, baths, water closets, etc.	E	1				
Small laundry rooms.	B	1				
Machinery spaces - minor risk						
Air-Conditioning Rooms	D	2				
Battery Charging Room	C	4				

Electrical Distribution Room including shore connection spaces	C	3				
Electric Propulsion Motor Room	B	4				
Lift Machinery Spaces	C	3				
Oil-filled electrical transformers below 8kW (10 kVA)	C	3				
Semi-Enclosed Mooring Deck	D	2				
Shaft alleys and pipe tunnels not for the storage of combustibles	E	4				
Spaces for pumps and refrigeration machinery (not handling or using flammable liquids).	C	2				
Spaces not containing machinery with a pressurised lubrication system and where storage of combustibles is prohibited.	C	4				
Stabiliser Room	C	4				
Steering Gear Room	B	5				
Switchboards of aggregate capacity 800kW (1000kVA)	C	3				
Ventilation Room	D	3				
Voids and cofferdams.	E	1				
Water tanks forming part of the ship's structure.	E	1				
Windlass Room	C	3				

Machinery spaces - moderate fire risk						
Cargo spaces.	C	2				
Oil fuel filling stations and pump rooms (flash point ≥60ºC)	B	4				
Oil fuel tanks where installed in a separate space with no machinery (flash point ≥60ºC)	C	3				
Propulsion Transformers	B	4				
Refrigerated chambers.	C	2				
Shaft alleys and pipe tunnels allowing storage of combustibles.	D	4				
Spaces containing oil-filled electrical transformers above 8kW (10 kVA)	B	3				
Spaces containing small internal combustion engines of power output up to 110 kW driving generators, sprinkler, drencher or fire pumps, bilge pumps, etc.	B	3				
Switchboards of aggregate capacity exceeding 800 kW (1000kVA)	B	4				

Machinery spaces - high risk (SOLAS Category A)						
Machinery spaces containing any oil-burning, heating or pumping units, such as inert gas generators, incinerators, etc.	A	5				
Machinery spaces containing internal combustion engines with a power output between 110kW and 375kW	A	5				
Machinery spaces of containing internal combustion machinery used for main propulsion	A	5				
Machinery spaces which contain internal combustion machinery with an aggregate total power output of not less than 375 kW	A	5				
Main galleys and annexes, including those spaces containing cooking facilities with exposed heating surfaces, or which have any cooking or food heating appliances each having a power of more than 5 kW.	A	3				
Machinery spaces with a pressurised lubrication system or where storage of combustibles is permitted.	A	4				
Oil fuel filling stations and pump rooms (flash point <60ºC)	A	4				
Oil fuel tanks where installed in a separate space with no machinery (flash point <60ºC)	A	3				

Store-rooms, workshops, pantries, etc.						
Garbage rooms.	C	2				
Large drying rooms (having a deck area of more than 4m^2).	C	2				
Lockers and store-rooms having areas greater than 4 m^2, that do not contain flammable liquids.	C	3				

Other spaces in which flammable liquids are stowed						
Laboratories (in which flammable liquids are stowed).	B	2				
Paint and Grease stores	B	3				
Spaces containing Dangerous Goods	B	3				
Store-rooms containing flammable liquids (including dyes, medicines, etc.), flammable gases or oxygen.	B	3				

Special Category Spaces						
Closed Vehicle and well dock spaces (inc Ro-Ro decks)	B	5				
Independent Class I Dangerous Goods Stowage Areas – that are non-integral, portable Class I Dangerous Goods Stowage Areas with a capacity of $3m^3$ or greater.	A	5				
Integral Class I Dangerous Goods Stowage Areas – those forming an integral part of the ship.	A	5				
Flight Deck (multiple aircraft)	A	5				
Flight Deck (single aircraft inc UAV)	A	4				
Open Ro-Ro decks	B	4				
Hangars (multiple aircraft)	A	5				
Hangars (Singular aircraft, inc UAV)	A	4				
Enclosed or Semi Enclosed Replenishment At Sea (RAS) Station	A	3				

8.82 Where it is proposed to deviate from Table 12 and use a different risk or value category, to reflect the OSI, or where it is considered that a space is not adequately represented by Table 12, a risk assessment of the space is to be undertaken against the framework of Part 3, using a recognised safety management methodology in accordance with Division 2, Chapter 01 *General Requirements* Rule 3 *System Safety*.

8.83 The FI of a division between two adjacent spaces is to be determined through the appropriate application of either: Table 13, Table 14 or Table 15. Each division is to be considered in both directions, with respect to the Risk of one space to the Value of the adjacent space, with the integrity of the division being as follows:

8.83.1 For divisions with a non-combustible core, the minimum FI of a division shall be the most onerous required by the application of Table 13 for bulkheads, with the insulation applied to the side of the division associated with the Highest Risk category and, Table 14 and Table 15 for decks.

8.83.2 For divisions with a combustible core, the minimum FI on each side of the division shall be as prescribed by application of Table 13 for bulkheads and, Table 14 and Table 15 for decks for the opposing Risk to Value categories of the adjacent spaces. Except that insulation is not required on the upper side of decks within spaces with Cat-A spaces when fitted with a water based fire extinguishing system.

8.84 When considering application of Table 13, Table 14 and Table 15 to a division which forms the boundary of a Main Fire Zones or a Smoke Zone, the most onerous integrity requirements for a division are to be met.

Table 13: Solution 2a - FI Index Matrix – Bulkheads

Value Category	Risk Category A	B	C	D	E
5	A-60	A-60	A-30	A-0	A-0
4	A-60	A-30	A-15	A-0	B-15
3	A-30	A-15	A-0	B-15	B-0
2	A-0	A-0	B-15	B-0	B-0
1	A-0	B-15	B-0	B-0	C

Table 14: Solution 2a - FI Index Matrix – Decks (Risk Above)

Value Category	Risk Category A	B	C	D	E
5	A-60(S)	A-30(S)	A-15(S)	A-0	A-0
4	A-30(S)	A-15(S)	A-0	A-0	A-0
3	A-15(S)	A-0	A-0	A-0	A-0
2	A-0	A-0	A-0	A-0	A-0
1	A-0	A-0	A-0	A-0	A-0

Table 15: Solution 2a - FI Index Matrix – Decks (Risk Below)

Value Category	Risk Category A	B	C	D	E
5	A-60(S)	A-60(S)	A-60(S)	A-30(S)	A-0
4	A-60(S)	A-60(S)	A-30(S)	A-15(S)	A-0
3	A-60(S)	A-30(S)	A-15(S)	A-0	A-0
2	A-30(S)	A-15(S)	A-0	A-0	A-0
1	A-30(S)	A-0	A-0	A-0	A-0

8.85 Where the contents and use of a space are such that there is a doubt as to the category of the space for the purpose of this Rule, or where it is possible for a space to be assigned two or more Risk or Value categories, the space shall be assigned a Risk and Value category that results in the most onerous boundary requirements.

8.86 Where, due to any particular structural arrangements in the ship, difficulty is experienced in the application of the tables, the minimum FI of a division shall be determined to the satisfaction of the ANC Authority.

8.87 In no case shall the requirements of Table 13, Table 14 or Table 15 necessitate enclosure of spaces, which in the opinion of the ANC Authority need not be enclosed.

8.88 Where adjacent spaces within a Smoke Zone are of the same type, a bulkhead between such spaces need not be fitted if deemed unnecessary by the ANC Authority. The Risk and Value categories of the resulting, enlarged, space shall be re-assessed.

8.89 Cabinets or lockers having a deck area of less than 2 m^2 may be accepted as part of the space they serve provided they have open ventilation to the space and do not contain any material or equipment which could be a fire risk.

8.90 Where two adjacent spaces share permanent openings of less than 30% of the area of the shared division, the spaces are to be assessed as separate spaces with regard to application of Table 13, Table 14 and Table 15.

8.91 Where a space is open to the atmosphere it is to be considered either a semi-enclosed or a total enclosed space. Total enclosed spaces are to be categorised as the equivalent internal space, semi-enclosed spaces are to be subjected to a risk assessment in accordance with Part 3.

Note: Semi-enclosed spaces can be assessed using the framework of MSC.1/Circ.1274 - *Guidelines for Evaluation of Fire Risk of External Areas on Passenger Ships.*

Note: The FI resulting from application of Table 13, Table 14 or Table 15 considered the fire integrity requirements only and does not consider other requirements or practicable application, for example a water tank may only require a A-0 division, but more substantial structure may be required for reasons of watertight integrity, etc.

Insulation Arrangements

8.92 In approving fire resisting divisions, consideration is to be given 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 intersection or terminal point for a distance of at least 450 mm, and for intersection or terminal points for a distance of at least 450 mm for steel and aluminium divisions. If a space is divided with a deck or a bulkhead of with different values thermal integrity requirements, the thermal integrity 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 mm.

8.93 Where the upper side of a deck is to be constructed of steel or equivalent, to fulfil the intended function of the space, any insulation required in accordance with Table 14 and Table 15 shall be located on the underside of the deck.

8.94 Unless specified elsewhere in this or another Rule, all separating divisions shall be non-combustible or, for ships not constructed of steel, fire restricting.

8.95 Continuous ceilings or linings with an FI not less than B-0, 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 where the effectiveness of that arrangement can be demonstrated.

8.96 Bulkheads shall extend from deck to deck and to the shell or other boundaries. Where a continuous ceiling or lining is fitted which is at least of the same fire resistance as the adjoining bulkhead, the bulkhead may terminate at the continuous ceiling or lining, where the effectiveness of that arrangement can be demonstrated.

8.97 Where insulation is installed in areas in which it could come into contact with any flammable fluids or their vapours, its surface shall be impermeable to such flammable fluids or vapours. The fire insulation in such spaces may be covered by metal sheets (not perforated) or by vapour proof glass cloth sealed at joints.

8.98 Draught Stops

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

Penetrations in Fire Resisting Divisions

8.99 Where a fire-resisting division is penetrated by pipes, ducts, electrical cables etc. arrangements shall be made to ensure that the FI of the division is not impaired, and necessary testing shall be carried out in accordance with the FTP Code as amended.

Note: All bulkhead penetrations are to be tested to the FTP Code including pipes and cables for pneumatic, hydraulic and mechanical remote control.

Note: For divisions with “H” and “N” fire resistance notations, the tests required by the FTP Code shall be amended as specified in Rule 1 paragraph 1.5

8.100 Penetration of fire-resisting divisions by ventilation ducts shall, in addition, meet the requirements of paragraphs 8.112 to 8.114.

8.101 Special care is to be put into fastening arrangement of steel ducts and steel frames in aluminium and composite structures to avoid heat bridges that may threaten the integrity of the division in a fire.

8.102 Where fire rated, watertight divisions are penetrated, e.g. machinery shafts, arrangements shall be made to ensure that the required watertight and fire-resisting integrity of the division is not impaired.

8.103 Penetration of “A” Class Divisions

8.103.1 When a division is penetrated, such penetrations shall meet the classification of the surrounding area or be tested in accordance with the FTP Code as amended. However testing is not required for:

8.103.1.1 Pipe penetrations, when the penetration is made of steel or equivalent material, having a thickness of 3mm or greater and a length of not less than 900 mm (preferably 450 mm on each side of the division), and no openings;

8.103.1.2 Ventilation duct penetrations where a sleeve of steel, or equivalent material, is joined directly to the duct by means of rivets, screwed flanges or by welding.

Note: Where a division is penetrated within a Smoke Zone, such penetrations need not be tested for smoke tightness, unless required elsewhere in this Rule.

8.103.2 Where un-insulated metallic pipes penetrate a division, the pipe shall be constructed of materials having a melting temperature which exceeds 950ºC.

8.103.3 Where ventilation ducts with a free cross-sectional area equal to, or less than, 0.02 m^2 passes through a bulkheads or deck, the opening shall be lined with a steel sheet sleeve having a thickness of at least 3 mm and a length of at least 200 mm, divided where practicable into 100 mm on each side of the bulkhead or, in the case of the deck, on the lower side of the decks pierced.

8.103.4 Where ventilation ducts with a free cross-sectional area exceeding 0.02 m^2 pass through a bulkheads or deck, the opening shall be lined with a steel sheet sleeve having a thickness of at least 3 mm and a length of at least 900 mm, divided, where practicable into 450 mm on each side of the bulkhead or, in the case of the deck, on the lower side of the decks pierced.

8.103.5 Ventilation ducts, or sleeves lining such ducts, shall be provided with fire insulation which shall have at least the same fire integrity as the bulkhead or deck through which the duct passes.

8.104 Penetration of “B” Class Divisions

8.104.1 Where 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, arrangements shall be made to ensure that the fire resistance is not impaired.

8.104.2 Where ventilation ducts with a free cross-sectional area exceeding 0.02 m^2 passes through a bulkhead or deck, the duct shall be lined with steel sheet sleeves of 900 mm in length, where practicable divided into 450 mm on each side of the bulkheads unless the duct is of steel for this length.

8.104.3 The ANC Authority may permit a reduced sleeve length if it can be demonstrated that the fire integrity is equivalent to the bulkhead or deck through which the duct passes.

8.104.4 Pipes other than steel or copper that penetrate divisions shall be protected by either:

8.104.4.1 A fire tested penetration device, suitable for the fire resistance of the division pierced and the type of pipe used provided the penetration is installed & insulated as tested; or

8.104.4.2 A steel sleeve, having a thickness of not less than 1.8 mm and a length of not less than 900 mm for pipe diameters of 150 mm or more and not less than 600 mm for pipe diameters of less than 150 mm (where practicable 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 mm; or any clearance between pipe and sleeve shall be made tight by means of non-combustible or other suitable material.

8.104.5 Where an un-insulated metallic pipes penetrates a division, the pipe shall be constructed of materials having a melting temperature which exceeds 850ºC.

8.105 Penetration of Divisions other than “A” or “B” Class

8.105.1 When a division is penetrated, such penetrations shall be tested in accordance with a recognised international standard.

8.106 Penetration of Insulated Divisions

8.106.1 All penetrations, where the Fire– Insulation of the division is not equal to zero, shall be suitably insulated to maintain the integrity of the division in accordance with the FTP Code as amended.

8.106.2 Fire resisting divisions shall have regard to the risk of heat transmission through penetrations in fire resisting divisions. The insulation of the deck or bulkhead shall be carried past the penetration for a distance of at least 450mm in the case of “A” class divisions. Special care is to be taken for penetrations in composite bulkheads to avoid heat bridges that may threaten the integrity of the division in the event of fire.

Note: Tests on penetrations shall be representative of the division in which the penetration will be fitted. Many penetration systems require additional insulation particularly if the fire hazard is from the non-insulated side of the bulkhead.

Protection of Openings in Fire-Resisting Divisions

8.107 Openings shall be provided with permanently attached means of securing when closed which shall be at least as effective for resisting fires as the divisions in which they are fitted.

8.108 The OSI may require doors in fire resisting divisions to have a smoke tight, gastight or watertight integrity or be operable following fire exposure. Doors and hatches in watertight subdivisions are to comply with Part 1 Chapter 03 *Buoyancy and Stability* Rule 2 *Watertight Integrity*. Tests to demonstrate capability post fire will need to be undertaken to a defined standard.

Note: In general, doors and hatches are to be fire tested in accordance with IMO Resolution A.754(18).

8.109 The number of skylights, doors, hatches, ventilators, openings in funnels to permit exhaust ventilation and other openings to spaces of Significant fire risk shall be reduced to a minimum consistent with the needs of ventilation and the proper and safe working of the ship. Where skylights are provided there are to be constructed of steel or equivalent and shall not contain glass panels.

Note: Ventilators and trunks passing through watertight and weathertight boundaries shall also comply with Chapter 03 *Buoyancy and Stability*.

8.110 Doors and Hatches

8.110.1 Doors and hatches in fire-resisting divisions are to be type approved which shall be at least as effective for resisting fires as the divisions in which they are fitted. The fire resistance of doors and hatches shall be determined in accordance with the FTP Code as amended.

Note: Fire insulated doors and hatches of aluminium or composites may be permitted in fire-resisting divisions if successfully tested in their bulkhead in accordance with IMO Resolution A.754(18) and to the satisfaction of the ANC Authority.

Note: Typical ‘A’-class doors testing in accordance with the FTP code as amended are permitted to have a gap beneath the door, such doors are not suitable for installation in the boundary of Smoke Containment Zones, Main Fire Zone, Cat-A and Cat-5 spaces or enclosed stairways and lift trunks, as all penetrations and openings in these divisions are to be tight.

8.110.2 The ANC Authority may permit a limited number of large hydraulic watertight doors or hatches constructed of steel without insulation or demonstrated fire resistance.

8.110.3 Watertight doors and hatches should be insulated as far as practicable to meet the fire resisting performance of the division of which it is a part.

Note: Watertight doors or hatches of steel construction without fire insulation may be accepted by the ANC Authority if the space on the other side of the fire-resisting divisions is Cat-4 or Cat-5. If the bulkhead is not constructed of steel, the fastening of the door is to be arranged to avoid excessive heat transfer to the bulkhead.

8.110.4 The ANC Authority may permit the use of combustible materials in doors separating cabins from the individual interior sanitary spaces such as showers.

8.110.5 It shall be possible for each door and hatch to be opened and closed from each side of the division by one person only.

8.110.6 The ANC Authority may specify some doors to be operable from one side only, these are to be clearly defined and assessed to ensure personnel can not become inadvertently trapped.

Note: See Chapter 07 *Escape, Evacuation and Rescue* Rule 16 *Escape Routes and Escape Exits* for the requirement related to escape from a compartment subject to controlled access restrictions with locked doors.

8.110.7 Special care is to be put into fastening arrangement of steel door and hatch frames in aluminium and composite bulkheads to avoid heat bridges that may threaten the integrity of the division in a fire.

8.110.8 Doors in “B” Class divisions shall be non-combustible and where approved without the sill being part of the frame, shall be installed such that the gap under the door does not exceed 25mm. Ventilation openings with a total net area not exceeding 0.05 m^2 are permitted in the lower portion of the door when fitted with a non-combustible grill.

8.110.9 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 Fire Zone and Smoke Containment Zone bulkheads in escape routes shall be equipped with a self-closing hose port. The material, construction and fire resistance of the hose port shall be equivalent to the door into which it is fitted, and shall be a 150 mm 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.

8.110.10 Doors and hatches, in the Main Fire Zone divisions, Smoke Control Zone boundaries and in the boundary of Cat-A and Cat-5 spaces, and other spaces nominated by the ANC Authority, shall be so arranged that positive closure is assured, in case of fire, by power-operated closing arrangements in accordance with paragraph 8.110.15 or by the provision of self-closing arrangements in accordance with paragraph 8.110.13. Manual hold backs are prohibited in all such cases.

8.110.11 Doors and hatches for emergency escape trunks need not be fitted with a fail-safe hold-back facility or a remotely operated release device.

8.110.12 For Type A and B Ships

8.110.12.1 Unless normally closed, doors in divisions with a FI no less than B-0, are to be of a self-closing type, meeting the requirements of paragraph 8.110.13;

8.110.12.2 All doors in divisions with a FI no less than A-0, except those that are power-operated (see paragraph 8.110.15) or those which are normally closed, are to be of a self-closing type meeting the requirements of paragraph 8.110.13;

8.110.12.3 The ANC Authority may permit some doors to be exempt from paragraph 8.110.12.1 and paragraph 8.110.12.2 for operational reasons (except for those doors and hatches covered by paragraph 8.110.10), providing that appropriate arrangements and procedures are in place to maintain the integrity of the division in accordance with ANC Authority requirements.

8.110.13 Manual fire doors and hatches

8.110.13.1 Where hold back facilities are provided they are to be of a fail-safe type, capable of remote release from the continuous manned central control station, either simultaneously or in groups, and shall be capable of release also individually from a position both sides of the door. Release switches shall have an on-off function to prevent automatic resetting of the system.

8.110.13.2 The ANC Authority may permit some doors to be fitted with manual hold backs (hook and eye) for operational reasons, except those locations stated in 8.110.10, providing that appropriate arrangements and procedures are in place to minimise the risk of fire and smoke.

8.110.14 Self-closing doors and hatches

8.110.14.1 When doors are equipped with a latch which is necessary to maintain the fire integrity of the door, the latch shall automatically engage by operation of the door or hatch, when closed;

8.110.14.2 The approximate time of closure for hinged fire doors shall be no more than 40 s and no less than 10 s 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;

8.110.14.3 Doors and hatches shall be capable of closing against an inclination of 3.5° opposing closure.

8.110.14.4 Doors in divisions with a FI not less than A-0:

a. Indication shall be provided at the door and hatch indicator panel on the Bridge or continuously manned control centre whether each door or hatch is closed and latched; the release mechanism shall be so designed that the door or hatch will automatically close in the event of disruption of the control system or central power supply;

b. 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;

c. Remote-released sliding door or hatch shall be equipped with an alarm that sounds at least 5 s but no more than 10 s, 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.

d. OSI may require doors to operate at larger angles of heel or with faster response times for certain operating scenarios.

8.110.15 Powered doors and hatches

8.110.15.1 In addition to the requirements for Self-Closing Doors, paragraph 8.110.14, powered doors and hatches shall also satisfy the following requirements:

a. The controls for operation of the door or hatch shall be located outside the space concerned at one continuously manned central control station or grouped in as few positions as possible to the satisfaction of the ANC Authority. Such control positions shall have safe access from the open deck, where they will not be cut off in the event of fire in the space it serves;

b. Local power accumulators for power-operated doors and hatches shall be provided in the immediate vicinity of the doors or hatch to enable the operation after disruption of the control system or central power supply at least ten times (fully opened and closed) using the local controls;

c. Disruption of the control system or central power supply at one door or hatch shall not impair the safe functioning of the other doors and hatches;

d. Power-operated doors or hatches shall be equipped with an alarm that sounds at least 5 seconds but no more than 10 seconds after the door or hatch being released from the central control station and before the door begins to move and continues sounding until the door is completely closed;

e. A door or hatch designed to re-open upon contacting an object in its path shall re-open not more than 1 metre from the point of contact;

f. Doors or hatches giving direct access to special category spaces which are power-operated and automatically closed need not be equipped with the alarms and remote-release mechanisms.

g. The components of the local control system shall be accessible for maintenance and adjusting;

h. Power-operated doors and hatches 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 FTP Code as amended. This system shall satisfy the following requirements:

(1) The control system shall be able to operate the door or hatch at the temperature of at least 200°C for at least 60 minutes, served by the power supply;

(2) The power supply for all other doors or hatches not subject to fire shall not be impaired;

(3) At temperatures exceeding 200°C the control system shall be automatically isolated from the power supply and shall be capable of keeping the door or hatch closed up to at least 945°C.

Note: Power doors or hatches of steel construction without fire insulation may be accepted by the ANC Authority if the space on the other side of the fire-resisting divisions is of low or negligible fire risk. If the bulkhead is not constructed of steel, the fastening of the door is arranged to avoid excessive heat transfer to the bulkhead.

8.110.15.2 OSI may require doors to operate at larger angles of heel or with faster response times for certain operating scenarios.

8.111 Windows, viewing ports and side scuttles

8.111.1 Windows shall not be fitted in the boundary of Cat-A spaces, except for viewing ports in doors on the boundary of the space and into control rooms contained within the space. Where viewing ports in doors are fitted, they 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 FTP Code as amended.

8.111.2 The ANC Authority may require the glass to be protected from blast or pressure by a screw down cover or alternative arrangement.

8.111.3 Windows, viewing ports and side scuttles in bulkheads within spaces other than those in Cat-A spaces and those to which the provisions of paragraph 8.79.2 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 FTP Code as amended.

8.111.4 Windows and side scuttles in bulkheads exposed to the weather shall be constructed with frames of steel or other suitable material. The glass shall be retained by a metal glazing bead or angle.

8.111.5 Notwithstanding the requirements of Table 13, Table 14 and Table 15, where windows are installed in divisions with a FI not less than A-0, windows with a FI of A-0 may be considered acceptable if protected by a sprinkler heads that shall either be:

8.111.5.1 Dedicated heads located above the windows, and installed in addition to the conventional ceiling sprinklers; or

8.111.5.2 Conventional ceiling sprinkler heads arranged such that the window is protected by an average application rate of at least 5 l/min/m^2 and the additional window area is included in the calculation of the area of coverage; or

8.111.5.3 Water-mist nozzles that have been tested and approved in accordance with the requirement specified in Rule 9 *Fire Fighting*.

Ventilation Systems

8.112 Control of ventilation systems

8.112.1 All ventilation fans shall be capable of being stopped from outside the Main Fire Zone which they serve, and from outside the smoke containment zone in which they are installed. Ventilation fans serving Cat-A, Cat-B or Cat-5 spaces shall be capable of being operated from a continuously manned control station.

8.112.2 The controls shall be easily accessible as well as prominently and permanently marked and shall indicate whether the shut-off is open or closed.

8.112.3 The means provided for stopping the powered ventilation to the Cat-A spaces shall be separated from the means provided for stopping ventilation of other spaces.

8.113 Construction of Ventilation Ducts

8.113.1 Ventilation ducts shall be of steel or equivalent, and are to be suitably supported and stiffened.

8.113.2 For ships not constructed of steel

8.113.2.1 Ducts shall be made of non-combustible or fire restricting materials.

8.113.2.2 Short ducts, not generally exceeding 2 m in length and with a free cross-sectional area not exceeding 0.02 m^2, may be of other materials subject to the following conditions:

a. Subject to paragraph 8.113.2.2 the ducts are made of any material which has low flame spread characteristics;

b. The ducts shall be made of heat resisting non-combustible material, which may be faced internally and externally with membranes having low flame spread characteristics and, in each case, a calorific value not exceeding 45 MJ/m^2 of their surface area for the thickness used.

Note: Refer to the recommendations published by the International Organisation for Standardisation, in particular publication ISO 1716:2018, *Reaction to fire tests for products- Determination of the gross heat of combustion* (*calorific value*).

c. The ducts are only used at the end of the ventilation device;

d. The ducts are not situated less than 600 mm, measured along the duct, from an opening in a division with a FI no less than B-0, including continuous B-0 ceilings.

8.113.2.3 Exhaust ducts shall be provided with hatches for inspection and cleaning. The hatches shall be located near the fire dampers.

8.114 Ventilation Dampers (fire and smoke)

8.114.1 Where a Fire or Smoke Damper is required, the following requirements shall be met.

8.114.1.1 The damper shall be of a fail-safe automatically closing type where necessary;

8.114.1.2 The damper shall be capable of being manually closed from each side of the division, except for those dampers fitted on ducts serving spaces not normally manned such as stores and toilets that may be manually operated only from outside the served spaces.

8.114.1.3 The damper shall be easily accessible. Where the damper is placed behind ceilings or linings, these ceilings or linings shall be provided with an inspection door on which a plate reporting the identification number of the fire damper is provided. The fire damper identification number shall also be placed on any remote controls required. Fire dampers in vent ducts shall have photo-luminescent labels.

8.114.1.4 The operating position shall be readily accessible and be marked in red light-reflecting colour.

8.114.1.5 The damper shall be capable of being remotely closed from a continuously manned control station.

8.114.1.6 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 paragraphs 8.81 to 8.91.

8.114.1.7 On at least one side of the division, a visible indicator shall be located showing whether the damper is in the open position.

8.114.2 In addition to paragraph 8.114 a fire damper shall operate automatically by means of fusible link or other arrangement.

8.114.3 Fire dampers, including their relevant means of operation, shall be tested in accordance with the FTP Code as amended.

8.114.4 The main inlets and outlets of all ventilation systems shall be capable of being closed from outside the spaces being ventilated. In addition, such openings to Cat-A spaces shall be capable of being closed from a continuously manned control station.

Arrangement of Ventilation Ducts

8.115 Ventilation of Main Fire Zones

8.115.1 In general, ventilation systems (including the ventilation fans) shall be so disposed that the duct reaching the various spaces remains within the Main Fire Zone.

8.115.2 Where it is necessary that a ventilation duct penetrates a Main Fire Zone division:

8.115.2.1 A fire damper shall be fitted adjacent to the division, irrespective of duct cross-sectional area.

8.115.2.2 The duct shall be insulated to A-60 standard to a point at least 5m beyond the fire damper.

8.116 Ventilation of Smoke Zones

8.116.1 Where it is necessary that a ventilation duct penetrates a Smoke Zone division a fire or smoke damper shall be fitted adjacent to the division, irrespective of duct cross-sectional area.

8.116.2 A damper is not required where the duct passes through but does not serve a Smoke zone, providing the duct is constructed to have a FI no less than A-0.

8.116.3 Where a damper is fitted in a deck to meet the requirements of paragraph 8.116 the damper shall be manually operable from the deck in which the passage of smoke, due to a fire in the deck immediately below, will be avoided.

8.116.4 Within a Smoke Zone non-combustible balancing ducts with a maximum free cross-sectional area of 0.05m^2 can be fitted in fire resisting divisions not forming the boundary of enclosed stairways, lift trunks, Cat-A or Cat-5 spaces, providing that the top of the duct is not more than 300mm above the deck and the fire integrity of the division is maintained.

8.116.5 Except for the boundaries of enclosed stairways, lift trunks, Cat-A and Cat-5 spaces, where ducts penetrate fire resisting divisions within a Smoke Zone, the ventilation duct need not be fitted with a fire or smoke damper, providing that:

8.116.5.1 The penetration meets the requirements of paragraphs 8.99 to 8.106;

8.116.5.2 The distance between adjacent openings in the duct either side of the penetrated fire resisting division is at least 900 mm;

8.116.5.3 The length of duct between adjacent openings is constructed to maintain the integrity of the division penetrated;

8.116.5.4 The duct is arranged in create a convoluted route for the passage of smoke, such that smoke shall rise and fall a distance of at least 200mm (as indicated) or a distance equal to the diameter of the duct opening, whichever is the larger.

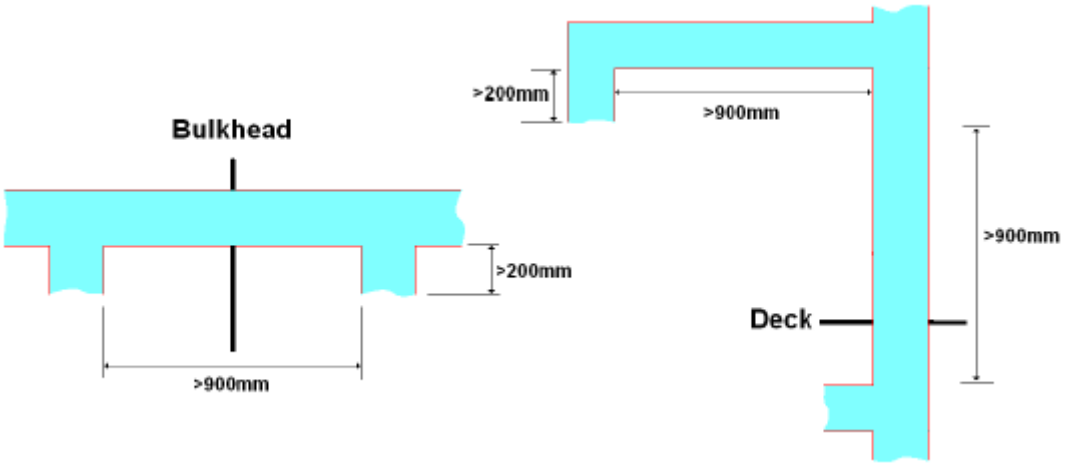

Figure 1: Duct Arrangements

8.117 Ventilation of Cat-A Spaces

8.117.1 The ventilation systems (fan and ductwork) for Cat-A shall be separated from each other and from the ventilation systems serving other spaces.

Note: Where ventilation trunks and ducts pass through enclosed spaces, insulation shall be determined in accordance with MSC.1/CIrc.1276/Rev.1 Revised Unified Interpretations of SOLAS Chapter II-2 Regs. II-2/9.7.2 and 9.7.5.

8.117.2 For Type B and C ships

8.117.2.1 Galley ventilation systems may be served by a separate duct from a ventilation unit serving other spaces.

8.117.2.2 The ANC Authority may permit a common ventilation system for Cat-A spaces in some instances.

8.117.2.3 Where ducts penetrate the boundary of Cat-A space, a fire damper shall be fitted adjacent to the division, irrespective of duct cross-sectional area. A damper is not required where the duct passes through but does not serve the space, providing the duct is constructed to have a FI no less than A-0 and insulated throughout to same integrity as the highest division penetrated.

8.117.2.4 Ventilation ducts serving Cat-A spaces, shall be constructed to have FI not less than A-0 and shall be insulated to have a FI of A-60 from the boundary of the space to a point at least 5 m beyond the fire damper.

8.117.2.5 Exhaust ducts shall be provided with hatches for inspection and cleaning. The hatches shall be located near the fire dampers and other locations necessary for cleaning, see also paragraphs 8.120 and 8.121.

8.117.3 Where necessary the ventilation system for Cat-A spaces shall be fitted with an over pressure relief device to protect the structural integrity of the compartment boundary from the high pressures that can result during the initial stages of a fire. The relief of over pressure shall discharge in a safe manner without the risk of smoke spread.

Note: Compartments not constructed of steel or equivalent, are to be assessed to determine the necessity for the fitting of over pressure relief devices.

8.118 Ventilation of Cat-5 Spaces

8.118.1 Where ducts penetrate the boundary of Cat-5 space, a fire or smoke damper shall be fitted adjacent to the division, irrespective of duct cross-sectional area. A damper is not required where the passes through but does not serve the space, providing the duct is constructed to have a FI not less than A-0 and insulated throughout the space to same integrity as the highest division penetrated.

8.118.2 Where the function of a Cat-5 space is not duplicated in another Main Fire Zone or Smoke Zone, to the satisfaction of the ANC Authority, the Cat-5 space shall be provided with alternative and separate means of air supply with the air inlets of the two sources being so disposed that the risk of both inlets drawing in smoke simultaneously is minimised. At the discretion of the ANC Authority, such requirements need not apply to control stations situated on, and opening on to, an open deck where local closing arrangements would be equally effective.

8.119 Ventilation of Stairways and Lift Trunks

8.119.1 When a duct penetrates the boundary of a Stairway Enclosure or Lift Trunk, a fire or smoke damper shall be fitted adjacent to the division, irrespective of duct cross-sectional area. A damper is not required where the duct passes through but does not serve the space, providing the duct is constructed to have a FI not less than A-0 and insulated throughout the space to same integrity as the highest division penetrated.

8.119.2 For Type-A ships

8.119.2.1 Stairway enclosures shall be ventilated and served by an independent fan and duct system which shall not serve any other space.

8.120 Exhaust ducts from galley ranges

8.120.1 Requirements for Type A ships

8.120.1.1 Exhaust ducts from galley ranges shall be:

a. constructed of steel having a thickness of at least 3 mm for ducts with a free cross-sectional area of less than 0.075 m^2, at least 4 mm for ducts with a free cross-sectional area of between 0.075 m^2 and 0.45 m^2, and at least 5 mm for ducts with a free cross-sectional area of over 0.45 m^2, and suitably supported and stiffened; and

b. insulated to "A-60", or N-30 for shock rated platforms, class standard throughout the spaces they pass through, except for ducts that pass through spaces having little or no fire risk.

8.120.1.2 Exhaust ducts from galley ranges shall also be fitted with:

a. A grease trap readily removable for cleaning unless an alternative approved grease removal system is fitted;

b. A fire damper located in the lower end of the duct at the junction between the duct and the galley range hood, which is automatically and remotely operated, and in addition a remotely operated fire damper located in the upper end of the duct close to the outlet of the duct;

c. A fixed means for extinguishing a fire within the duct *;

d. Remote-control arrangements for shutting off the exhaust fans and supply fans, for operating the fire dampers mentioned in paragraph 8.120.1.2b and for operating the fire extinguishing system, which shall be placed in a position outside the galley close to the entrance to the galley. Where a multi-branch system is installed, a remote means located with the above controls shall be provided to close all branches exhausting through the same main duct before an extinguishing medium is released into the system;

e. Suitably located hatches for inspection and cleaning, including one provided close to the exhaust fan and one fitted in the lower end where grease accumulates.

8.120.1.3 Exhaust ducts from ranges for cooking equipment installed on open decks shall conform to paragraph 8.120.1.1 and 8.120.1.2, as applicable, when passing through accommodation spaces or spaces containing combustible materials.

8.120.2 Requirements for Type B and C ships

8.120.2.1 When passing through accommodation spaces or spaces containing combustible materials, the exhaust ducts from galley ranges shall be constructed in accordance with paragraph 8.120.1.1.

8.120.2.2 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 *.

Note: * Refer to the recommendations published by the International Organization for Standardization, in particular publication ISO 15371 Ships and marine technology - Fire-extinguishing systems for protection of galley cooking equipment.

8.121 Ventilation of Laundries

8.121.1 Exhaust ducts from main laundries shall be fitted with:

8.121.1.1 Filters readily removable for cleaning purposes;

8.121.1.2 A fire damper located in the lower end of the duct which is automatically and operable remotely and from outside the exits from the laundry.

8.121.1.3 Suitably located hatches for inspection and cleaning.

8.122 Smoke Extraction

8.122.1 Smoke clearance shall be provided for Cat-A, for Smoke Zones and, where the ANC Authority consider it desirable, to other spaces.

8.122.2 Suitable arrangements or means of control shall be made to permit the safe release of smoke, in the event of a fire, from the space or zone protected. The normal ventilation system may be acceptable for this purpose, providing that there is no risk of smoke spread in to other areas of the ship and normal ventilation is meeting the engineering requirements of the FTP and FSS Codes as amended.

8.122.3 The design and arrangement of the smoke extraction manifolds or pipes shall be such as to ensure the safe discharge of exhaust, smoke and other gases.

8.122.4 Means of control shall be provided for permitting the release of smoke and such controls shall be located outside the space or zone concerned, so that they will not be cut off in the event of a fire in the space they serve.

8.122.5 Means are to be provided to control and configure ventilation, to;

8.122.5.1 Increase the pressure in any one or more smoke zones to protect the zone from smoke ingress.

8.122.5.2 Draw air from and exhaust smoke and other gases to different sides of the vessel, or areas of the ship with sufficient vertical or longitudinal separation to prevent smoke being drawn back into the vessel.

8.122.6 For Type A and B ships

8.122.6.1 The controls required by paragraph 8.122.3 shall be situated at one control position or grouped in as few positions as possible to the satisfaction of the ANC Authority. Such positions shall have a safe access from the open deck.

8.122.7 For ships not constructed of steel

8.122.7.1 For smoke extraction, materials capable of operating at 200°C can be used for ventilation supply ducts, steel or equivalent should be provided for exhaust ducts. Fans and electrical motors with a rating of IP56 or above and cables designed according to the latest version of IEC 60332 are considered to meet this requirement, even when located inside the zone or exhaust ducts serving such zones.

Solution 2b

8.123 In case of Fire safety in vessels engaged in combat, solution 2a will be applicable except the following cases:

8.123.1 The hull, superstructure and deckhouse for Type A, Type B & Type C ships Vertical Main Fire Zone shall be as follows

8.123.1.1 No FI less than N-30 (S) or A-60 (S). The mean length and width of which on any deck shall not be greater than 40m. Where the fire boundary has steps in it, the fire insulation needs to be continuous.

Note: For divisions with “H” and “N” fire resistance notations, the tests required by the FTP code shall be amended as specified in Rule 1 paragraph 1.5.

8.123.1.2 For Type A vessels further categorised as Major Surface Combatants, Combat Capable L & C class platform, Minor Surface Combatants, the mean length and width of vertical Main Fire Zone shall be no greater than 30m.

Note: Guidance for categorisation of Type A, Type B and Type C ships is included in Part 3

8.123.2 For Type A, Type B and Type C ships, horizontal Fire Zone divisions shall be as follows

8.123.2.1 For all vessel type that has more than 3 decks in the hull there shall be at least one fire boundary deck, which should be continuous deck designed to have specific fire rating.

8.123.2.2 For vessels with 3 to 6 decks within the hull, the underside of the 2 deck shall be fire boundary deck

8.123.2.3 For vessels with 7 or more decks within the hull, the underside of the 2 and 5 decks shall be the fire boundary decks.

8.123.3 All Cat-A spaces or high value spaces shall be constructed to prevent the passage of flame, as required through application of Table 17, Table 18 and Table 19, with a FI of no less than A-0 to contain fire and smoke to the space of origin.

8.123.4 All decks are to be constructed to prevent the passage of flame, as required through application of Table 18 and Table 19.

8.123.5 Where a deck is penetrated for the passage of electric cables, pipes and vent ducts, such penetrations shall maintain the integrity of the deck and to prevent the passage of flame and smoke. Additionally, insulation on penetrations through fire resisting division shall comply with MIL-STD-3020.

8.123.6 Where a stairway or lift trunk connects two adjacent decks, the stairway or lift trunk need not be enclosed provided the integrity of the deck is maintained by proper bulkheads and self-closing doors in one ‘tween-deck space which meets the requirements of Table 18 and Table 19.

8.123.7 Machinery for lifts shall be arranged in a separate room protected in accordance with Table 18 and Table 19, except that small passages for lift cables are permitted in the division adjacent to the lift trunk.

8.123.8 Where operation in a CBRN environment is required, the ventilation of the enclosure and the air pressurisation arrangements are to prevent contamination of the machinery spaces. CBRN cleansing station shall have a FI no less than N-0.

8.123.9 In all cases the external boundary of the ship is to have a FI not less than A-0, irrespective of the risk associated with the open deck areas. The shell of the superstructure for Type A, Type B and Type C ships further categorised as Major Surface Combatants, Amphibious Assault Ships, Auxiliary and Amphibious Platforms, Patrol Boats and Landing Crafts shall be fire rated to N-0, except where the superstructure connects with a high risk weather deck and then that section of superstructure shell shall be N-30 (internal) to the top of the superstructure or for at least 2 decks up from the high risk weather deck.

8.123.10 For determining the appropriate FI for a fire resisting division between adjacent spaces, each space is to be categorised according to its risk and value, as identified in Table 16. When using this approach, it shall be noted that the title of each space is intended to be typical rather than restricted.

Note: Risk and Value categorisation of spaces has been developed for Type A, Type B & Type C ships in Table 16. Application of Table 16 to ships not constructed from steel, will require the Risk and Value categories to be agreed with the ANC Authority for each space.

8.123.11 Where it is proposed to deviate from Table 16 and use a different risk or value category, to reflect the OSI, or where it is considered that a space is not adequately represented by Table 16, a risk assessment of the space is to be undertaken against the framework of Part 3, using a recognised safety management methodology in accordance with Division 2 Chapter 01 *General Requirements* Rule 3 *System Safety*.

Table 16: Solution 2b - Risk and Value Categories for all Ship Types

Space	Type A		Type B		Type C		Ships not Constructed from Steel	
	Risk	Value	Risk	Value	Risk	Value	Risk	Value
Control Stations								
Control room for propulsion machinery when located outside the propulsion machinery space.	C	4	C	4	C	4		
Fire control stations	C	5	C	5	C	5		
Spaces containing centralised emergency public address system stations and equipment.	C	4	C	4	C	4		
Spaces containing centralised fire alarm equipment	C	4	C	4	C	4		
Spaces containing emergency sources of power and lighting.	C	4	C	4	C	4		
Spaces containing the ship's radio equipment.	C	3	C	3	C	3		
Fire Extinguishing Equipment Store	C	2	C	2	C	2		
Fire Extinguishing Gas Storage Room	C	5	C	5	C	5		
Wheelhouse and chartroom.	C	5	C	5	C	5		
Spaces containing centralised ship's operation equipment	C	5	C	5	C	5		
Spaces containing naval systems for detection, command, defence, offence, communication, combat or weapon/control operation (e.g. COC).	C	5	C	5	C	5		
Fire Repair Party Post	C	3	C	3	C	3		
Damage Control Stations	C	3	C	3	C	3		
Stairway								
Enclosed Escape Trunks	A	5	A	5	A	5		
Enclosed Stairways	B	5	B	5	B	5		
Lift Trunks	B	5	B	5	B	5		
Corridors								
Passenger and crew corridors and lobbies (not on primary escape routes)	E	1	E	1	E	1		
Passenger and crew corridors and lobbies (on primary escape routes)	D	4	D	4	D	4		
Evacuation Stations and external escape routes								
Assembly stations, internal and external.	E	3	E	3	E	3		
External stairs and open decks used for escape routes.	E	4	E	4	E	4		
Open deck spaces and enclosed promenades forming lifeboat and liferaft embarkation and lowering stations.	E	4	E	4	E	4		
Survival craft stowage area.	E	4	E	4	E	4		
The ship's side to the waterline in the lightest seagoing condition, superstructure and deckhouse sides situated below and adjacent to the liferaft and evacuation slide embarkation areas.	E	4	E	4	E	4		

Open deck spaces								
Open spaces and enclosed promenades clear of lifeboat and liferaft embarkation, evacuation stations and external escape routes and control stations.	F	1	F	1	F	1		
Air spaces (the space outside superstructures and deckhouses).	F	1	F	1	F	1		
Replenishment At Sea (RAS) Station	B	4	B	4	B	4		
Personnel spaces of minor fire risk								
CBRN cleansing station	C	3	C	3	C	3		
Operational Spaces inc HQ1, etc and other operationally important spaces defined by the Naval Administration	C	3	C	3	C	3		
Personnel spaces (inc offices and cabins) containing furniture and furnishings of a restricted fire risk and having a deck area of less than 50 m2.	B	2	B	2	B	2		
Personnel spaces of minor fire risk								
CBRN cleansing station	C	3	C	3	C	3		
Operational Spaces inc HQ1, etc and other operationally important spaces defined by the Naval Administration	C	3	C	3	C	3		
Personnel spaces (inc offices and cabins) containing furniture and furnishings of a restricted fire risk and having a deck area of less than 50 m2.	B	2	B	2	B	2		
Personnel spaces of moderate fire risk								
Isolated lockers and small store-rooms in accommodation spaces having areas less than 4 m2 (in which flammable liquids are not stowed).	D	1	D	1	D	1		
Isolated pantries (containing cooking appliance but no open flame).	D	2	D	2	D	2		
Laboratories (in which flammable liquids are not stowed).	D	3	D	3	D	3		
Personnel spaces (inc offices and cabins) containing furniture and furnishings of a restricted fire risk and having a deck area of 50 m2 or more.	B	2	B	2	B	2		
Personnel spaces (inc offices and cabins) containing furniture and furnishings not of a restricted fire risk and having and area less than 50m2	B	2	B	2	B	2		
Pharmacies	B	3	B	3	B	3		
Small drying rooms (having a deck area of 4 m2 or less).	D	1	D	1	D	1		
Personnel spaces of greater fire risk								
Personnel spaces (inc offices and cabins) containing furniture and furnishings not of a restricted fire risk and having a deck area of 50 m2 or more.	B	2	B	2	B	2		
Saunas.	E	1	E	1	E	1		
Sanitary and similar spaces								
Isolated pantries (containing no cooking appliance).	B	2	B	2	B	2		
Sanitary facilities, washroom corridors, showers, baths, water closets, etc.	E	1	E	1	E	1		
Small laundry rooms.	B	1	B	1	B	1		

Machinery Spaces- Minor Risk								
Air-Conditioning Rooms	D	5	D	5	D	2		
Battery Charging Room	B	4	B	4	B	4		
Electrical Distribution Room including shore connection spaces	B	3	B	3	B	3		
Electric Propulsion Motor Room	A	5	A	5	A	5		
Lift Machinery Spaces	D	3	D	3	D	3		
Oil-filled electrical transformers below 8kW (10 kVA)	D	4	D	4	D	4		
Semi-Enclosed Mooring Deck	D	3	D	3	D	3		
Shaft alleys and pipe tunnels not for the storage of combustibles	D	3	D	3	D	3		
Spaces for pumps and refrigeration machinery (not handling or using flammable liquids).	D	3	D	3	D	3		
Spaces not containing machinery with a pressurised lubrication system and where storage of combustibles is prohibited.	D	3	D	3	D	3		
Stabiliser Room	B	4	B	4	B	4		
Steering Gear Room	B	4	B	4	B	4		
Switchboards of aggregate capacity 800kW (1000kVA)	B	4	B	4	B	4		
Ventilation Room	D	4	D	4	D	2		
Voids and cofferdams.	E	1	E	1	E	1		
Water tanks forming part of the ship's structure.	E	1	E	1	E	1		
Windlass Room	D	3	D	3	D	3		

Machinery Spaces- moderate fire risk								
Cargo spaces (inside machinery space)	D	3	D	3	D	3		
Oil fuel filling stations and pump rooms (flash point ≥60oC)	D	4	D	4	D	4		
Oil fuel tanks where installed in a separate space with no machinery (flash point ≥60oC)	D	4	D	4	D	4		
Propulsion Transformers	A	5	A	5	A	5		
Refrigerated chambers.	D	2	D	2	D	2		
Shaft alleys and pipe tunnels allowing storage of combustibles.	B	3	B	3	B	3		
Spaces containing oil-filled electrical transformers above 8kW (10 kVA)	B	4	B	4	B	4		
Spaces containing small internal combustion engines of power output up to 110 kW driving generators, sprinkler, drencher or fire pumps, bilge pumps, etc.	B	4	B	4	B	4		
Switchboards of aggregate capacity exceeding 800 kW (1000kVA)	B	5	B	5	B	5		

Machinery spaces- high risk								
Machinery spaces containing any oil-burning, heating or pumping units, such as inert gas generators, incinerators, etc.	A	4	A	4	A	4		
Machinery spaces containing internal combustion engines with a power output between 110kW and 375kW	A	5	A	5	A	5		
Machinery spaces of containing internal combustion machinery used for main propulsion	A	5	A	5	A	5		
Machinery spaces which contain internal combustion machinery with an aggregate total power output of not less than 375 kW	A	5	A	5	A	5		
Main galleys and annexes, including those spaces containing cooking facilities with exposed heating surfaces, or which have any cooking or food heating appliances each having a power of more than 5 kW.	A	5	A	5	A	5		
Machinery spaces with a pressurised lubrication system or where storage of combustibles is permitted.	A	5	A	5	A	5		
Oil fuel filling stations and pump rooms (flash point <60oC)	A	5	A	5	A	5		
Oil fuel tanks where installed in a separate space with no machinery (flash point <60oC)	A	4	A	4	A	4		
Store rooms, workshops, pantries								
Garbage rooms.	D	2	D	2	D	2		
Large drying rooms (having a deck area of more than 4m2).	B	2	B	2	B	2		
Lockers and store-rooms having areas greater than 4 m2, that do not contain flammable liquids.	D	2	D	2	D	2		
Main laundry.	B	2	B	2	B	2		
Main pantries not annexed to galleys.	D	2	D	2	D	2		
Miscellaneous stores.	D	2	D	2	D	2		
Workshops (not part of machinery spaces, galleys, etc.).	D	1	D	1	D	1		
Other spaces in which flammable liquids are stowed								
Laboratories (in which flammable liquids are stowed).	B	3	B	3	B	3		
Paint and Grease stores	A	3	A	3	A	3		
Spaces containing Dangerous Goods	A	5	A	5	A	5		
Store-rooms containing flammable liquids (including dyes, medicines, etc.), flammable gases or oxygen.	A	4	A	4	A	4		
Special category spaces								
Closed Vehicle and well dock spaces (inc Ro-Ro decks)	A	5	A	5	A	5		
Independent Class I Dangerous Goods Stowage Areas – that are non-integral, portable Class I Dangerous Goods Stowage Areas with a capacity of 3m3 or greater.	A	5	A	5	A	5		
Integral Class I Dangerous Goods Stowage Areas – those forming an integral part of the ship.	A	5	A	5	A	5		
Flight Deck (multiple aircraft)	A	5	A	5	A	5		
Flight Deck (single aircraft inc UAV)	A	5	A	5	A	5		
Open Ro-Ro decks	A	4	A	4	A	4		
Hangars (multiple aircraft)	A	5	A	5	A	5		
Hangars (Singular aircraft, inc UAV)	A	5	A	5	A	5		
Enclosed or Semi Enclosed Replenishment At Sea (RAS) Station	A	4	A	4	A	4		

8.123.12 The FI of a division between two adjacent spaces is to be determined through the appropriate application of either: Table 17, Table 18 or Table 19. Each division is to be considered in both directions, with respect to the Risk of one space to the Value of the adjacent space, with the integrity of the division being as follows:

8.123.12.1 For divisions with a non-combustible core, the minimum FI of a division shall be the most onerous required by the application of Table 17 for bulkheads, with the insulation applied to the side of the division associated with the Highest Risk category and, Table 18 and Table 19 for decks.

8.123.12.2 For divisions with a combustible core, the minimum FI on each side of the division shall be as prescribed by application of Table 17 for bulkheads and, Table 18 and Table 19 for decks for the opposing Risk to Value categories to the adjacent spaces. Except that insulation is not required on the upper side of decks within spaces with Cat-A spaces when fitted with a water based fire extinguishing system.

8.123.13 When considering application of Table 17, Table 18 and Table 19 to a division which forms the boundary of a Main Fire Zone or a Smoke Zone, the most onerous integrity requirements for a division are to be met.

8.123.14 In no case shall the requirements of Table 17, Table 18 or Table 19 necessitate enclosures of spaces, which in the opinion of the ANC Authority need not be enclosed.

8.123.15 Where two adjacent spaces share permanent openings of less than 30% of the area of the shared division, the spaces are to be assessed as separate spaces with regard to application of Table 17, Table 18 and Table 19.

8.123.16 Where the upper side of a deck is to be constructed of steel or equivalent, to fulfil the intended function of the space, any insulation required in accordance with Table 18 and Table 19 is to be located on the underside of the deck.

8.123.17 No fire resisting division in a combat ship will have a FI less than A-0.

8.123.18 Notwithstanding the requirements of Table 17, Table 18 and Table 19, where windows are installed in divisions with a FI not less than A-0, windows with a FI of A-0 may be considered acceptable if protected by a sprinkler heads that shall either be:

8.123.18.1 Dedicated heads located above the windows, and installed in addition to the conventional ceiling sprinklers; or

8.123.18.2 Conventional ceiling sprinkler heads arranged such that the window is protected by an average application rate of at least 5 l/min/m^2 and the additional window area is included in the calculation of the area of coverage; or

8.123.18.3 Water-mist nozzles that have been tested and approved in accordance with the requirement specified in Rule 9 *Fire Fighting*.

8.123.19 In ships with no shock loading, N-30 fire insulation may be substituted for H-30 (approved for internal use) or A-60 and N-0 may be replaced by A-30 except for high risk and high value areas as shown in Table 17, Table 18 and Table 19.

Note: if “N” class fire insulation is substituted by “A” class and vice versa, insulations shall be proved as a functional alternative by appropriate fire testing.

Table 17: Solution 2b - FI Index Matrix – Bulkheads

Type A ship Bulkheads		Risk Category				
		A	B	C	D	E
Value Category	5	N-30	N-30	N-30	N-0	A-0

Type A ship Bulkheads		Risk Category				
		A	B	C	D	E
	4	N-30/A-60	N-0/A-30	N-0/A-30	N-0/A-30	A-0
	3	N-30/A-60	N-0/A-30	N-0/A-30	N-0/A-30	A-0
	2	A-30	A-30	A-0	A-0	A-0
	1	A-30	A-30	A-0	A-0	A-0

Type B ship Bulkheads		Risk Category				
		A	B	C	D	E
Value Category	5	N-30	N-30	N-30	N-0	A-0
	4	N-30/A-60	N-0/A-30	N-0/A-30	N-0/A-30	A-0
	3	N-30/A-60	N-0/A-30	N-0/A-30	N-0/A-30	A-0
	2	A-30	A-30	A-0	A-0	A-0
	1	A-30	A-30	A-0	A-0	A-0

Type C ship Bulkheads		Risk Category				
		A	B	C	D	E
Value Category	5	N-30	N-30	N-30	N-0	A-0
	4	N-30/A-60	N-0/A-30	N-0/A-30	A-0	A-0
	3	N-30/A-60	N-0/A-30	N-0/A-30	A-0	A-0
	2	A-30	A-30	A-0	A-0	A-0
	1	A-30	A-30	A-0	A-0	A-0

Table 18: Solution 2b - FI Index Matrix – Decks (Risk Above)

Type A ship Decks (Risk Above)		Risk Category				
		A	B	C	D	E
Value Category	5	N-30 (S)	N-0 (S)	N-0 (S)	N-0	A-0
	4	N-0/A-30 (S)	N-0/A-30(S)	N-0/A-30	N-0/A-30	A-0
	3	N-0/A-30 (S)	N-0/A-30	N-0/A-30	N-0/A-30	A-0
	2	A-0	A-0	A-0	A-0	A-0
	1	A-0	A-0	A-0	A-0	A-0

Type B ship Decks (Risk Above)		Risk Category				
		A	B	C	D	E
Value Category	5	N-30 (S)	N-0 (S)	N-0 (S)	N-0	A-0
	4	N-0/A-30 (S)	N-0/A-30(S)	N-0/A-30	N-0/A-30	A-0
	3	N-0/A-30 (S)	N-0/A-30	N-0/A-30	N-0/A-30	A-0
	2	A-0	A-0	A-0	A-0	A-0
	1	A-0	A-0	A-0	A-0	A-0

Type C ship Decks (Risk Above)		Risk Category				
		A	B	C	D	E
Value Category	5	N-30	N-0	N-0	N-0	A-0
	4	N-0/A-30	N-0/A-30	N-0/A-30	A-0	A-0
	3	N-0/A-30	N-0/A-30	N-0/A-30	A-0	A-0
	2	A-0	A-0	A-0	A-0	A-0
	1	A-0	A-0	A-0	A-0	A-0

Table 19: Solution 2b - FI Index Matrix – Decks (Risk Below)

Type A ship Decks (Risk Below)		Risk Category				
		A	B	C	D	E
Value Category	5	N-30 (S)	N-30 (S)	N-30 (S)	N-0 (S)	A-0
	4	N-30 (S) /A-60 (S)	N-30(S) /A-60(S)	N-0 /A-30 (S)	N-0 /A-30 (S)	A-0
	3	N-30 (S) / A-60 (S)	N-0 /A-30 (S)	N-0 /A-30 (S)	N-0 /A-30	A-0
	2	A-30 (S)	A-30 (S)	A-0	A-0	A-0
	1	A-30 (S)	A-0	A-0	A-0	A-0

Type B ship Decks (Risk Below)		Risk Category				
		A	B	C	D	E
Value Category	5	N-30 (S)	N-30 (S)	N-30 (S)	N-0 (S)	A-0
	4	N-30 (S) /A-60 (S)	N-30(S) /A-60(S)	N-0 /A-30 (S)	N-0 /A-30 (S)	A-0
	3	N-30 (S) / A-60 (S)	N-0 /A-30 (S)	N-0 /A-30 (S)	N-0 /A-30	A-0

Type B ship Decks (Risk Below)		Risk Category				
		A	B	C	D	E
	2	A-30 (S)	A-30 (S)	A-0	A-0	A-0
	1	A-30 (S)	A-0	A-0	A-0	A-0

Type C ship Decks (Risk Below)		Risk Category				
		A	B	C	D	E
Value Category	5	N-30 (S)	N-30 (S)	N-30 (S)	N-0 (S)	A-0
	4	N-30 (S) /A-60 (S)	N-30(S) /A-60(S)	N-0 /A-30 (S)	A-0	A-0
	3	N-30 (S) / A-60 (S)	N-0 /A-30 (S)	N-0 /A-30 (S)	A-0	A-0
	2	A-30 (S)	A-30 (S)	A-0	A-0	A-0
	1	A-30 (S)	A-0	A-0	A-0	A-0

Rule 9. Fire Fighting

9.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

Note: This Solution is adapted from SOLAS Chapter II-2 Regulation 10 and supplemented by the Naval Ship Code.

Water Supply Systems

9.2 Ships shall be provided with fire pumps, fire mains, hydrants and hoses complying with the applicable requirements of this Rule.

9.3 The fire main shall be capable of immediately supplying water for a fire incident response. Water shall be immediately available from the hydrants. A continuously pressurised fire main, with start of at least one fire pump upon loss of pressure is considered to meet this requirement. Other equally reliable arrangements can be accepted. Fire main arrangements shall also comply with the survivability requirements of Chapter 01 *Integrated Platform Survivability* applicable to the ship's OSI.

9.4 Fire mains and hydrants

9.4.1 The fire main, including supports, couplings and valves shall be made of fire resistant and corrosion resistant materials, such as CuNi. Other materials may be considered for vessels with single fire zone and limited survivability. Such materials shall comply with IMO Resolution A.753(18), L3 (test in wet condition, 30 minutes).

9.4.2 Materials readily rendered ineffective by heat shall not be used for fire mains and hydrants unless adequately protected.

9.4.2.1 Materials used for fire mains and hydrants shall be suitable protected against corrosion.

9.4.2.2 The pipes and hydrants shall be so placed that the fire hoses may be easily coupled to them.

9.4.2.3 The arrangement of pipes and hydrants shall be such as to avoid the possibility of freezing.

9.4.2.4 Suitable drainage provisions shall be provided for fire main piping.

9.4.2.5 Isolation valves shall be installed for all open deck fire main branches used for purposes other than fire-fighting.

Note: Where such systems are routed through spaces containing High Voltage equipment, materials and connections are to meet applicable High Voltage safety standards.

Note: If trace heating is employed this system shall be included in the essential safety functions.

9.4.3 Diameter of fire mains

9.4.3.1 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 or maximum design flow through the system, whichever is greater.

9.4.4 Isolating valves and relief valves

9.4.4.1 Isolating valves to separate the section of the fire main within the machinery spaces 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. 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. The emergency fire pump, its seawater inlet, and suction and delivery pipes and isolating valves shall be located in a separate machinery space unless there are secondary fire pumps in another machinery space.

9.4.4.2 The spindles of manually operated valves shall be easily accessible and all valves shall be clearly marked.

9.4.4.3 The position and number of isolating valves shall align with the arrangement of damage control zones.

9.4.4.4 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.

9.4.4.5 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.

9.4.5 Number and position of hydrants

9.4.5.1 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 to the embarked persons while the ship is being navigated and any part of any cargo space when empty, any ro–ro space or any vehicle space, in which latter case the two jets shall reach any part of the space, each from a single length of hose. Furthermore, such hydrants shall be positioned near the accesses to the protected spaces.

Note: Where the Naval Vessel Operator fire safety policy requires it, the hydrants may be located outside the protected space.

9.4.5.2 All hydrants onboard shall have the same diameter. All couplings on nozzles, hoses and hydrants shall be interchangeable. A spanner is to be provided adjacent to each fire hydrant.

9.4.5.3 In addition to the requirements stated above, Type A and Type B 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 above may be complied with when all watertight doors and all doors in main fire zone bulkheads are closed;

b. Where access is provided to a Category A machinery space 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 Category A machinery space. Such provision need not be made where the tunnel or adjacent spaces are not part of the escape route.

9.4.6 System Pressure and Pressure at hydrants

9.4.6.1 With the two pumps simultaneously delivering water through the nozzles specified in paragraph 9.8 with the quantity of water as specified in paragraph 9.4.3, through any adjacent hydrants, the following minimum pressures shall be maintained at all hydrants:

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

b. For Type A and Type B ships

(1) 0.40 N/mm^2 or greater if required to provide effective operation of the fire-fighting equipment.

c. For Type C ships

(1) 0.27 N/mm^2 or greater if required to provide effective operation of the fire-fighting equipment.

9.4.7 International shore connection

9.4.7.1 Ships shall be provided with at least one international shore connection complying with the FSS Code, as amended.

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

9.4.7.3 Ships shall carry at least two NATO fire hose coupling adapter sets in accordance with STANAG 1169 *Firefighting Equipment and Principles for Harmonisation of Present and Future Equipment and Materials*, Edition 2 as amended.

9.5 Fire pumps

9.5.1 Pumps accepted as fire pumps

9.5.1.1 Sanitary, ballast, bilge or general service pumps may be accepted as fire pumps, provided that they are not used for pumping oil and that if they are subject to occasional duty for the transfer or pumping of oily bilge water, suitable change-over arrangements are fitted.

9.5.2 Number of fire pumps

9.5.2.1 Ships shall be provided with independently driven fire pumps to meet the performance and redundancy requirements of the OSI with a minimum as follows:

a. For Type A and Type B ships at least three independently driven fire pumps;

b. For Type C ships at least two independently driven fire pumps.

9.5.2.2 The number and location of fire pumps and their associated sources of power shall be consistent with the ship's OSI, action preparations and survivability requirements. Where fire pumps may also be used as bilge/ballast pumps, simultaneous fire and bilge/ballast pumping requirements shall be accommodated.

9.5.3 Arrangement of Fire pumps

9.5.3.1 Fire pumps shall not be fitted forward of the collision bulkhead or of its vertical extension.

9.5.3.2 For Type A and Type B ships

a. The arrangement of sea connections, fire pumps and their sources of power shall be so as to ensure that in the event of a fire in any one compartment, at least two fire pumps will remain operational.

9.5.3.3 For Type C ships with a single fire zone,

a. 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 arranged in accordance with the FSS Code, as amended, providing a capacity not less than 25 m^3/hr and shall be capable of delivering at least the two jets of water required by 9.4.5.1 at the hydrants furthest from the emergency fire pump with its source of power and sea connection located outside the space where the main fire pumps or their sources of power are located subject to the requirements of paragraph 9.4.4.1.

b. Where other pumps, such as general service, bilge and ballast, etc., are fitted in a machinery space, arrangements shall be made to ensure that at least one of these pumps, having the capacity and pressure required by paragraphs 9.4.6 and 9.5.4 is capable of providing water to the fire main.

9.5.3.4 For ships not constructed of steel

a. The arrangement of the pumps shall be such that in the event of a fire in any one compartment, not all the fire pumps will be put out of action. In general there should be no more than one fire pump in any one watertight space.

9.5.4 Total capacity of required fire pumps

9.5.4.1 The required fire pumps shall be capable of delivering for fire-fighting purposes a quantity of water, at the pressure specified in paragraph 9.4.6.

9.5.4.2 The sea water requirements of all consumers on the fire main system are to be considered to ensure that sufficient water and pressure for all fire-fighting and operational scenarios, as identified in the OSI, is available, when fire-fighting systems are run concurrently with other essential sea water consumers.

Note: The capacity of the bilge system shall be designed accordingly.

9.5.4.3 For ships with a single fire zone each pump is to have at least 40% of the total required capacity defined in paragraphs 9.5.4.1 and 9.5.4.2.

9.5.4.4 For ships with two or more fire zones, the capacity of pumps is to be such that with any one fire zone out of action the remaining pumps are to provide the total required capacity defined in paragraphs 9.5.4.1 and 9.5.4.2.

9.5.4.5 Each fire pump shall have a capacity of at least 25 m^3/h and shall be capable of delivering at least the two jets of water required by paragraph 9.4.5.1.

9.5.5 Requirements for the space containing the emergency fire pump

9.5.5.1 The space containing the emergency fire pump shall not be contiguous to the boundaries of Category A machinery spaces, special category spaces or those spaces containing main fire pumps. 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.

9.5.5.2 No direct access shall be permitted between the machinery space containing the main fire pump and the space containing the emergency fire pump and its source of power. 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. In such cases, a second means of access to the space containing the emergency fire pump and its source of power shall be provided.

9.5.5.3 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 another machinery space fire entering or being drawn into that space.

Fire hoses and nozzles

9.6 General specifications

9.6.1 Fire hoses shall be:

9.6.1.1 of non-perishable material;

9.6.1.2 certified to AS 2792 *Fire hose - Delivery layflat*, or equivalent standard; and

9.6.1.3 sufficient in length to project a jet of water to any of the spaces in which they may be required to be used.

9.6.2 Each hose shall be provided with a nozzle and the necessary couplings.

9.6.3 Hoses specified in this Rule as ‘‘fire hoses’’ shall, together with any necessary fittings and tools, be kept ready for use in conspicuous positions near the water service hydrants or connections. Additionally, in interior locations, fire hoses shall be connected to the hydrants at all times.

9.6.4 Fire hoses shall have a length of at least 10 m, but not more than:

9.6.4.1 15 m in machinery spaces;

9.6.4.2 20 m in other spaces and open decks;

9.6.4.3 25 m for open decks on ships with a maximum breadth in excess of 30 m.

9.6.5 Unless one hose and nozzle is provided for each hydrant in the ship, there shall be complete interchangeability of hose couplings and nozzles.

9.7 Number and diameter of fire hoses

9.7.1 Ships shall be provided with fire hoses, the number and diameter of which shall be to the satisfaction of the ANC Authority.

9.7.2 For Type A and Type B ships the number of hoses are to be in no case less than the following:

9.7.2.1 At least one fire hose for each of the hydrants required by paragraph 9.4.5 and these hoses shall be used only for the purposes of extinguishing fires or testing the fire-extinguishing apparatus at fire drills and surveys.

9.7.3 For Type C Ships,

9.7.3.1 The number of fire hoses to be provided shall be one for each 30 metre length of the ship and one spare, but in no case less than five in all. This number does not include any hoses required in any engine-room or boiler room.

9.7.4 The ANC Authority may increase the number of hoses required so as to ensure that hoses in sufficient number are available and accessible at all times, having regard to the type of ship and the OSI.

Note: For ships carrying dangerous goods additional requirements are contained in Rule 13 *Special Requirements for Carriage of Dangerous Goods* and Chapter 10 *Dangerous Goods (Explosives)*.

9.8 Size and types of nozzles

9.8.1 The size and types of nozzles shall comply with the following, unless the ship's OSI justifies other sizes and types:

9.8.1.1 For the purposes of this Rule, standard nozzle sizes shall be 12 mm, 16 mm and 19 mm or as near thereto as possible.

9.8.1.2 For accommodation and service spaces, a nozzle size greater than 12 mm need not be used.

9.8.1.3 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 mentioned in paragraph 9.4.6 from the smallest pump, provided that a nozzle size greater than 19 mm need not be used.

9.8.1.4 Nozzles shall be of an approved dual-purpose type (i.e. spray/jet type) incorporating a shutoff.

9.9 For ships not constructed of steel:

9.9.1 An approved fire hose and nozzle shall be connected to each hydrant at all times.

9.9.2 Hydrant and hoses shall be installed in dedicated cabinets or clearly marked safety lockers.

9.9.3 Fire hoses with a diameter exceeding 38 mm shall not be installed in accommodation areas.

Portable fire extinguishers

9.10 General Requirements

9.10.1 The number and types of extinguishers carried on board shall meet the ship's OSI and shall not be less than the requirements of this Rule;

Note: Guidance is provided for types of extinguisher in IMO Resolution A.951(23).

9.10.2 Portable fire extinguishers shall comply with the requirements of:

9.10.2.1 the FSS Code as amended; and

9.10.2.2 AS/NZS 1841 *Portable fire extinguishers*.

9.11 Arrangement of fire extinguishers

9.11.1 Accommodation spaces, service spaces and control stations shall be provided with portable fire extinguishers of appropriate types and in accordance with the requirements of IMO MSC/Circ.1275. Ships of all types shall carry at least five portable fire extinguishers.

9.11.2 One of the portable fire extinguishers intended for use in any space shall be stowed near the entrance to that space.

9.11.3 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.

9.11.4 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. Portable fire extinguishers shall be provided with devices which indicate whether they have been used.

9.12 Spare charges and extinguishers

9.12.1 Spare charges shall be provided for not less than 100% of the first ten extinguishers and 50% of the remaining fire extinguishers capable of being recharged on board. Not more than sixty total spare charges are required. Instructions for recharging shall be carried on board.

9.12.2 For fire extinguishers which cannot be recharged on board or where charges are not carried, additional portable fire extinguishers of the same quantity, type, capacity and number as determined in paragraph 9.12.1 above shall be provided in lieu of spare charges.

Note: In general spare extinguishers should be distributed throughout the vessel.

Fixed fire-extinguishing systems

9.13 Types of fixed fire-extinguishing systems

9.13.1 A fixed fire-extinguishing system required for machinery spaces and high risk spaces may be any of the following systems:

9.13.1.1 A fixed gas fire-extinguishing system complying with the provisions of the FSS Code and IMO MSC/Circ.848 and MSC/Circ.1487 as amended; See 9.14 for details.

9.13.1.2 A fixed high-expansion foam fire-extinguishing system complying with the provisions of the FSS Code as amended;

9.13.1.3 A fixed pressure water-spraying fire-extinguishing system complying with the provisions of:

a. the FSS Code and IMO MSC/Circ.1165 as amended; or

b. for combatants with machinery spaces not equivalent to the IMO MSC/Circ.1165 test apparatus, the Naval Research Laboratory requirements* appropriate to the space. See 9.15 for details.

Note: *Back, et al. “Fire Performance Requirements for Water Mist Systems Installed in Machinery Spaces on U.S. Navy Ships,” NRL Ltr Rpt Ser 6180/0460, Naval Research Laboratory, Washington, DC, November 10, 2005.

9.13.1.4 An aerosol fire-extinguishing system complying with the provisions of the FSS Code and IMO MSC/Circ.1270 as amended.

9.13.2 A fixed water based suppression system required by paragraph 9.22 for control stations, accommodation and service spaces complying with the provisions of IMO Resolution A.800 as amended;

9.13.3 A fixed local application system for machinery and equipment complying with the provisions of the FSS Code and IMO MSC/Circ.913 as amended; See 9.16 for details.

9.13.4 The post damage capability requirements may require the operability of a compartment to be maintained following a fire and therefore, if required, this should be taken into consideration when selecting fixed fire protection systems, for example, the use of gaseous systems in electrical spaces. Where such systems are used, suitable warning notices are to be displayed and operating procedures established to isolate the affected space. Reference is to be made to the material safety datasheet and OEM information for release and subsequent clean up.

9.13.5 The ANC Authority may require the installation of additional systems to augment the solution provided by the Rules and the FSS Code as amended where necessary to meet the OSI. Where a fixed fire-extinguishing system not required by this chapter is installed, it shall meet the requirements of the relevant Rules of this chapter.

Note: Additional systems may include diverse redundant systems, additional capacity for multiple application of extinguishing media or systems to address a specific risk e.g. machinery bilge foam.

Note: Compartments containing equipment with Lithium batteries with a capacity greater than 100Wh require special attention. A Lithium battery fire produces a lot of heat and toxic fumes, and most water based fire-fighting systems cannot be used to extinguish Lithium battery fires, since it can lead to the production of hydrogen gas, which is highly explosive. Since there are currently no type approved fire-fighting systems for Lithium batteries available on the market, a risk-analysis will have to be performed to assess the risks, and provide mitigation. The requirements of Rules 5, 6 and 8 should also be taken into consideration. A battery specialist and a health and safety specialist should be part of the risk assessment.

Note: Fire-extinguishing systems using Halon and perfluorocarbons are prohibited in accordance with Chapter 14 *Environmental Protection*.

9.13.6 Steam shall not be used as a fire-extinguishing medium in fixed fire-extinguishing systems.

9.13.7 Fixed fire-extinguishing systems are to be operable from a local control position which is appropriate for the fire hazard that may exist and remote control from the continuously manned control stations. System plans shall be displayed at each system operating position.

9.14 Requirements for Gaseous Systems

9.14.1 Where a fixed gas fire-extinguishing system is used:

9.14.1.1 effective compartment isolation is to be achieved such that openings which may admit air to, or allow gas to escape from a protected space shall be capable of being closed and reopened from outside the protected space.

9.14.1.2 Means are to be provided for removing gas and toxic by-products from spaces protected by fixed gas extinguishing systems. Fans shall be located outside the space protected.

9.14.2 Gaseous systems are to have audible and visual alarms that indicate before activation at all operating locations, within the protected space and at the continuously manned control station.

9.14.3 For a fixed gas fire-extinguishing system complying with the provisions of the FSS Code as amended, where the quantity of the fire-extinguishing medium is required to protect more than one space, either:

9.14.3.1 the quantity of medium available need not be more than the largest quantity required for one discharge for any one space so protected; or

9.14.3.2 the quantity of fire-extinguishing medium shall be sufficient to provide one or two discharges for each protected space.

9.14.4 The protected space shall have a means of relieving any pressure over the compartment structural design pressure produced by the gaseous fire extinguishing system.

9.14.5 For ships not constructed of steel

9.14.5.1 Where gas or aerosol systems are used, the quantity of extinguishing medium shall be sufficient to provide two independent discharges. The second discharge into the space shall only be activated manually from a position outside the space being protected. Where the space has a local fire suppression system installed, in accordance with paragraph 9.16 a second discharge is not required.

9.14.6 Gaseous systems that produce by-products that are potentially dangerous to personnel and difficult to remove from equipment or the space after a fire, e.g. Hydrogen Fluoride, shall not be fitted.

Note: Consideration should be given to the over pressurisation of compartments (particularly EO Stowage Areas) with gaseous suppression systems, or compartments fitted with water based suppression systems with a high discharge rate, including closures of openings in the compartment boundaries.

Consideration should be given to the isolation of ventilation systems that supply and exhaust spaces protected by fixed gas systems.

9.15 Requirements for Water Systems

9.15.1 Pumps, other than those serving the fire main, required for the provision of water for fire-extinguishing systems required by this Rule, 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 will not put any such system out of action.

9.15.2 Suitable arrangements shall be made for the drainage of water discharged when the system is activated. Where this is not practicable, documentation shall be submitted to confirm that the sprinkler system can be operated (with full pump capacity) without impairing the stability of the vessel for a minimum of 30 minutes or the Evacuation time defined in Chapter 07 *Escape, Evacuation and Rescue*. Whichever is greater.

9.15.3 For ships not constructed of steel and ships with more than one damage control zone

9.15.3.1 All extinguishing systems shall be designed with 100% redundancy. Water based systems shall have 100% redundancy in pump units, including control systems. A pressure accumulator with water storage capacity is not required.

9.15.3.2 Water based systems requiring fresh water shall be connected to dedicated water tanks with capacity for minimum 5 minutes operation for the largest space to be protected and automatic switch-over to sea-water supply. Such systems can alternatively be provided with a manual switchover and fresh water supply tanks design for 15 minutes operation.

Note: Utility service tanks with low-level alarms can be considered as equivalent to dedicated tanks.

Note: Consideration should be given to the over pressurisation of compartments (particularly EO Stowage Areas) with water based suppression systems with a high discharge rate.

9.16 Requirements for Fixed local application fire-extinguishing systems

9.16.1 Category A machinery spaces above 500 m^3 in volume shall, in addition to the fixed fire-extinguishing system required in paragraph 9.17.1, 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*. 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.

Note: *Refer to IMO MSC.1/Circ.1387 as amended *Revised Guidelines for the approval of fixed water-based local application fire-fighting systems for use in Category A machinery spaces (MSC/Circ.913)*.

9.16.2 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:

9.16.2.1 The fire hazard portions of internal combustion machinery;

9.16.2.2 Boiler fronts;

9.16.2.3 The fire hazard portions of incinerators;

9.16.2.4 Purifiers for oil fuel.

9.16.3 Activation of any local application system shall give a visual and distinct audible alarm in the protected space and at continuously manned stations. The alarm shall indicate the specific system activated. The system alarm requirements described within this paragraph are in addition to, and not a substitute for, the detection and fire alarm system required elsewhere in this chapter.

Fire-extinguishing arrangements in machinery spaces and other High Risk Spaces

9.17 Machinery spaces containing oil-fired boilers or oil fuel units

9.17.1 Fixed fire-extinguishing systems

9.17.1.1 Category A machinery spaces containing oil-fired boilers or oil fuel units shall be provided with any one of the fixed fire-extinguishing systems in paragraph 9.13.1. In each case, if the machinery spaces are not entirely separate, or if oil fuel can drain from the boiler room into the machinery spaces, the combined spaces shall be considered as one compartment.

9.17.2 Additional fire-extinguishing arrangements

9.17.2.1 There shall be in each boiler room or at an entrance outside of the boiler room at least one portable foam applicator unit complying with the provisions of the FSS Code as amended.

9.17.2.2 There shall be at least two portable foam extinguishers or equivalent in each firing space in each boiler room and in each space in which a part of the oil fuel installation is situated. There shall be not less than one approved foam-type extinguisher of at least 135 litre capacity or equivalent in each boiler room. These extinguishers shall be provided with hoses on reels suitable for reaching any part of the boiler room. In the case of domestic boilers of less than 175 kW, or boilers protected by fixed water-based local application fire-extinguishing systems as required by paragraph 9.16, an approved foam-type extinguisher of at least 135 litre capacity is not required.

9.18 Machinery spaces of category A containing internal combustion machinery

9.18.1 Fixed fire-extinguishing systems:

9.18.1.1 Machinery spaces of category A containing internal combustion machinery shall be provided with one of the fixed fire-extinguishing systems in paragraph 9.13.1.

9.18.2 Additional fire-extinguishing arrangements:

9.18.2.1 There shall be at least one portable foam applicator unit complying with the provisions of the FSS Code as amended.

9.18.2.2 There shall be in each such space approved foam-type 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 lube oil pressure systems, gearing and other fire hazards. 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 more than 10 m walking distance from an extinguisher and that there are at least two such extinguishers in each such space.

9.19 Machinery spaces containing steam turbines or enclosed steam engines

9.19.1 Fixed fire-extinguishing systems:

9.19.1.1 In spaces containing steam turbines or enclosed steam engines used for main propulsion or other purposes having in the aggregate a total output of not less than 375 kW, one of the fire-extinguishing systems specified in paragraph 9.13.1 shall be provided if such spaces are periodically unattended.

9.19.2 Additional fire-extinguishing arrangements:

9.19.2.1 There shall be approved foam fire extinguishers, each of at least 45 litre capacity or equivalent, sufficient in number to enable foam or its equivalent to be directed on to any part of the pressure lubrication system, on to any part of the casings enclosing pressure-lubricated parts of the turbines, engines or associated gearing, and any other fire hazards. However, such extinguishers shall not be required if protection, at least equivalent to that required by this subparagraph, is provided in such spaces by a fixed fire extinguishing system fitted in compliance with paragraph 9.13.1.

9.19.2.2 There shall be a sufficient number of portable foam extinguishers or equivalent which shall be so located that no point in the space is more than 10 m walking distance from an extinguisher and that there are at least two such extinguishers in each such space, except that such extinguishers shall not be required in addition to any provided in compliance with paragraph 9.18.2.2.

9.20 Machinery Enclosures

9.20.1 Machinery enclosures shall be provided with a fixed local application system in accordance with paragraph 9.16, or in accordance with ANSI/FM Approvals 5560 American National Standard for Watermist Systems or with an independent gas fire-extinguishing system where recommended by the manufacturer of the machinery.

9.20.2 The ANC Authority may also require that the enclosures be supplied by the fixed fire extinguishing system fitted to protect the machinery spaces within which the enclosures are contained.

9.20.3 The local application system shall be initiated automatically in accordance with Rule 7 *Detection and Alarm* paragraph 7.9 and also be operable both remotely and locally (from within the machinery space containing the enclosure).

9.20.4 Machinery within the enclosure shall be shut down automatically on activation of the fire extinguishing system, unless continued operation of the machinery is agreed with the ANC Authority.

9.20.5 If continued operation of machinery with fire extinguishing systems activated is required, consideration shall be given to:

9.20.5.1 The capacity of the installed system;

9.20.5.2 The impact of cooling on the machinery.

9.21 Other machinery and high risk spaces

9.21.1 Replenishment at Sea highpoint zones used for the transfer of flammable materials shall:

9.21.1.1 be provided with fixed foam nozzles, monitors or other approved fire extinguishing system suitable for the materials;

9.21.1.2 have ready access to at least one portable foam applicator unit complying with the provisions of the FSS Code as amended.

Note: See Chapter 05 *Seamanship Systems* for non-fire related Rules for Replenishment at Sea systems.

9.21.2 Where a fire hazard exists in any machinery, high risk or Cat-A space for which no specific provisions for fire-extinguishing appliances are prescribed in paragraphs 9.17 to 9.19, 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 ANC Authority may deem sufficient.

9.21.3 Other spaces

9.21.3.1 Additional means of fire extinction may be required where other spaces not included in this Rule, and which may contain a fire hazard, are required for the operational capability of the ship.

Fire-suppression systems

9.22 A fixed water based suppression system is to be fitted in accordance with the following requirements.

9.22.1 For Type A ships

9.22.1.1 An automatic water based suppression, fire detection and fire alarm system is to be fitted. The system is to be of an approved type complying with the requirements of the FSS Code as amended, in all control stations, accommodation and service spaces, including corridors and stairways. Alternatively, control stations, where water may cause damage to essential equipment, may be fitted with an approved fixed fire-extinguishing system of another type. Spaces having little or no fire risk such as voids, public toilets, carbon dioxide rooms and similar spaces need not be fitted with an automatic water based suppression system.

9.22.2 For Type B and Type C ships

9.22.2.1 The scope of any water based suppression, fire detection and fire alarm system shall be determined based on the ship's OSI and guided by SOLAS II-2 Reg.10.6. The system if fitted is to be of an approved type complying with the requirements of the FSS Code as amended.

9.22.3 For ships not constructed of steel

9.22.3.1 All public spaces, cabins and service spaces, storage rooms other than those required to have a fixed fire-fighting system, and similar spaces shall be protected by a fixed water based suppression system meeting Standards for fixed sprinkler systems for high speed-craft, IMO Resolution MSC.44(65) as amended; Areas of no fire risk and areas with minor fire risk and limited area such as void spaces and bathrooms within cabins need not to be provided with sprinklers.

Note: See IMO MSC/Circ.912, *Interpretation of standards for fixed sprinkler system for high-speed craft* (Resolution MSC.44(65)).

9.22.3.2 Only automatic water based suppression systems are accepted. The system is to cover the largest area of the following:

a. 75 m^2;

b. Area covered by four largest sprinkler heads;

c. Largest public space including largest space adjacent to this.

9.22.3.3 The fresh water supply shall be arranged as for water based fixed fire extinguishing systems. Dedicated water tanks with capacity for minimum 5 minutes operation of demanded pumps shall be provided.

Fire-extinguishing arrangements in other High Risk Spaces

9.23 Spaces containing flammable liquid

9.23.1 Paint lockers shall be protected by at least one of the following means:

9.23.1.1 A carbon dioxide system, designed to give a minimum volume of free gas equal to 40% of the gross volume of the protected space;

9.23.1.2 A dry powder system, designed for at least 0.5 kg powder/m^3;

9.23.1.3 A water spraying or sprinkler system, designed for 5 litres/m^2/minute. Water spraying systems may be connected to the fire main of the ship; or

9.23.1.4 A system providing equivalent protection, as determined by the ANC Authority.

9.23.2 In all cases, the system shall be operable from outside the protected space.

9.23.3 Flammable liquid lockers shall be protected by an appropriate fire-extinguishing arrangement.

9.23.4 For lockers of a deck area of less than 4 m^2, 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. A discharge port shall be arranged in the locker to allow the discharge of the extinguisher without having to enter into the protected space. The required portable fire extinguisher shall be stowed adjacent to the port. Alternatively, a port or hose connection may be provided to facilitate the use of fire main water.

9.23.5 Sonar cable installations can be accepted if solely located on open deck and not containing liquids with flash point under 100°C. Alternatively, designs complying with the requirements for seismic cable installations will be accepted.

9.23.6 Requirements for seismic cables containing flammable liquids: Storage space for seismic cables, gun deck and other areas where equipment containing flammable liquids are handled or stored, shall be protected by a fixed fire extinguishing system. Special attention shall be given to vessels with a wooden gun deck above the steel deck, allowing for flammable liquid to collect in the closed space. In such cases the fixed fire extinguishing is also to protect the space below the wooden deck.

Note: One suitable fire extinguishing system is a low expansion foam system with the following capacity:

• 3 litre/minute/m^2 of streamer deck area

• 10 litre/minute/m^2 of cable reels area.

Sufficient foam concentrate to ensure at least 20 minutes of foam generation.

9.24 Fire extinguishing arrangements in Galleys

9.24.1 Deep-fat cooking equipment shall be fitted with the following:

9.24.1.1 Automatic and manually activated fire-extinguishing system certified to ISO 15371 *Fire-extinguishing systems for protection of galley cooking equipment*, as amended.

9.24.1.2 A primary and backup thermostat with an alarm to alert the operator in the event of failure of either thermostat;

9.24.1.3 Arrangements for automatically shutting off the electrical power upon activation of the fire-extinguishing system;

9.24.1.4 An alarm for indicating operation of the fire-extinguishing system in the galley where the equipment is installed;

9.24.1.5 Controls for manual operation of the fire-extinguishing system which are clearly labelled for ready use by the crew.

9.24.2 Fire blankets shall be provided and positioned such that they are available for immediate use in the event of a fire in the galley cooking area.

9.25 Fire-extinguishing arrangements in general cargo spaces

9.25.1 Except as provided for in paragraph 9.25.2, the cargo spaces of all ships shall be protected by a fixed fire-extinguishing system appropriate to the fire risk in the space complying with the provisions of the FSS Code as amended.

9.25.2 Fixed gas fire-extinguishing systems for dangerous goods

9.25.2.1 A ship engaged in the carriage of dangerous goods in any cargo spaces shall be provided with a fixed carbon dioxide or inert gas fire-extinguishing system complying with the provisions of the FSS Code as amended or with a fire-extinguishing system which gives equivalent protection for the cargoes carried.

9.26 Fire-extinguishing arrangements for ships with the Special Function of Bulk Fuel Carriage

9.26.1 A fixed deck foam system complying with the requirements of the FSS Code as amended, shall be fitted on open decks that form the upper boundary of bulk fuel storage tanks and in way of fuel filling and discharging points.

9.27 Fire-extinguishing arrangements in other spaces

9.27.1 All switchboards shall be enclosed by cabinets made of steel or materials having equivalent fire resistance.

9.27.2 All switchboard cabinets shall be provided with a fire detection system in accordance with Rule 7 *Detection and Alarm*.

9.27.3 All switchboard cabinets above 0.5 m^3 shall be provided with a fixed fire extinguishing system suitable for such spaces.

Note: Fixed fire extinguishing requirements for High voltage equipment may need special consideration, arrangements are to be agreed with the ANC Authority based on the equipment type and fire risk.

Note: A modular gas fire extinguishing system is recommended.

Location of Damage Control Stations

9.28 Damage Control stations shall be located above the submergence limit.

9.29 The arrangement of the damage control stations shall be such that all the equipment is easily accessible and ready for immediate use. There shall be arrangements for hanging up protective clothing in a suspended position.

9.30 For ships not constructed of steel

9.30.1 each damage control station shall be provided with 3 fire hoses, including nozzles and spanners, 2 portable extinguishers (12 kg powder or equivalent) and three emergency breathing apparatus (as defined by the FSS Code).

Fire-fighter's outfits and Breathing Apparatus

9.31 For all ships:

9.31.1 Fire fighter's outfits shall comply with the FSS Code as amended.

9.31.2 Each fire-fighter's outfits shall include either:

9.31.2.1 A self-contained compressed air-operated breathing apparatus, for which the volume of air contained in the cylinders shall be at least 2,080 litres capacity, or

9.31.2.2 Other self-contained breathing apparatus which shall be capable of functioning for at least 52 minutes at 40 litres per minute.

Note: Apparatus with less capacity may be accepted if they are deemed to be more suitable for the intended service and more spare cylinders are provided.

9.31.3 All air cylinders for breathing apparatus shall be interchangeable.

9.31.4 Ships shall carry NATO breathing air charging adapter sets in accordance with STANAG 1169 *Firefighting Equipment and Principles for Harmonisation of Present and Future Equipment and Materials*, as amended.

9.32 Number of fire fighter's outfits

9.32.1 The number and location of fire fighter's outfits are to be in accordance with the Naval Vessel Operator's firefighting philosophy. Ships shall carry at least six.

9.32.2 For ships not constructed of steel

9.32.2.1 At least three sets of fire fighter's outfit shall be provided for each main fire zone.

9.32.3 The ANC Authority may require additional sets of personal equipment and breathing apparatus, having due regard to the size and type of the ship.

9.32.4 Two spare charges shall be provided for each required breathing apparatus. Type B and Type C 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. For Type A ships, at least two spare charges for each breathing apparatus shall be provided.

9.32.5 An onboard means of recharging breathing apparatus cylinders used during drills shall be provided or a suitable number of spare cylinders shall be carried on board to replace those used.

Note: A suitable number of spare air cylinders to be provided to support fire drills. MSC.1/Circ.1555.

9.32.6 When more than one main fire zone is provided, the fire fighter's outfits shall be divided between two fire stations placed at a safe distance from each other. The fire stations shall be clearly marked. On vessels with only one main fire zone and one locker for fire fighter's outfit, this locker shall have access from open deck or wheelhouse.

9.32.7 In addition, for Type A and Type B ships there shall be provided:

9.32.7.1 For every 80m, or part thereof, of the aggregate of the lengths of all Public 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 lengths, two fire fighter's outfits and, in addition, two sets of personal equipment. Each set shall comprise the items stipulated in the FSS Code as amended.

9.32.7.2 For Type A ships, two additional fire fighter's outfits shall be provided for each main fire zone. However, for stairway enclosures which constitute individual main fire zones and for the main fire zones in the fore or aft end of a ship which do not contain spaces of categories (6), (7),or (11) defined in Rule 8 *Containment of Fire* Table 3 or categories (6), (7),or (12) defined in Rule 8 *Containment of Fire* Table 12 where Solution 2 is adopted, no additional fire fighter's outfits are required;

9.32.7.3 For Type A ships, for each pair of breathing apparatus, one water fog applicator which shall be stored adjacent to such apparatus.

9.32.8 Type A ships shall be fitted with a suitably located means for fully recharging breathing air cylinders, free from contamination. Similar arrangements for Type B and C ships may be required depending on the Naval Vessel Operator's firefighting philosophy and number of breathing apparatus spare charges carried (see para.9.32.4). This means for recharging shall be either:

9.32.8.1 breathing air compressors supplied from the main and emergency switchboard, or independently driven, with a minimum capacity of 60 litres/minute per required breathing apparatus, not to exceed 420 litres/minute; or

9.32.8.2 self-contained high-pressure storage systems of suitable pressure to recharge the breathing apparatus on board, with a capacity of at least 2,400 litres per required breathing apparatus, not to exceed 50,000 litres of free air.

Note: The means of recharging shall meet the requirements of Chapter 04 *Engineering Systems* Rule 28 *Compressed Air Systems*.

9.33 Storage of fire fighter's outfits

9.33.1 The fire fighter's outfits or sets of firefighter's personal equipment shall be kept ready for use in an easily accessible location that is permanently and clearly marked.

9.33.2 At least two fire fighter's outfits and, in addition, one set of firefighter's personal equipment shall be available at any one position. At least two fire fighter's outfits shall be stored in each main fire zone.

9.34 Fire fighter communication

9.34.1 For all ships a minimum of two two-way portable radiotelephone apparatus for each fire party, for fire-fighter's communication, shall be carried on board. Those two-way portable radiotelephone apparatus shall be of an explosion-proof type or intrinsically safe.

Additional Naval Requirements

9.35 The electrical fire hazards shall be identified and suitable controls provided to include appropriate automatic fault protection systems and effective means of dealing with the

potential fires, recognising the ship safety and mission criticality of the equipment, including equipment that may be exposed to the effects of the fire or the extinguishing media. These may comprise: use of generic portable equipment, local application (in cabinet) systems or compartment flood systems, both manual and automatic initiation.

9.36 Fire fighting media shall not cause damage to equipment providing essential safety and mission critical functions or, where this is not possible, redundancy of the equipment shall be provided in accordance with Chapter 01 *Integrated Platform Survivability*.

9.37 For combatants and constabulary vessels, means shall be provided for assessing the atmosphere inside a space to facilitate recovery of a space following a fire, in accordance with NATO ANEP 68 *Ship Combat Recoverability*.

Rule 10. Not Used

Rule 11. Not Used

Rule 12. Provision of Operational Information

12.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

Operational readiness and maintenance

12.2 General requirements

12.2.1 At all times while the ship is in-service, the fire protection systems and fire-fighting systems and appliances shall be maintained ready for use.

12.2.2 Fire plans with a general arrangement shall be permanently exhibited showing clearly for each deck the damage control stations, the various fire sections enclosed by "A" class divisions, the sections enclosed by "B" class divisions together with particulars of the fire detection and fire alarm systems, the sprinkler installation, the fire-extinguishing appliances, means of access to different compartments, decks, etc., and the ventilating system including particulars of the fan control positions, the position of dampers and identification numbers of the ventilating fans serving each section.

12.2.3 A duplicate set of fire plans shall be permanently stored in a prominently marked weathertight enclosure outside the deckhouse for the assistance of shore-side fire-fighting personnel.

12.3 Operational readiness

12.3.1 The following fire protection systems shall be kept in good order so as to ensure their required performance if a fire occurs:

12.3.1.1 Structural fire protection including fire-resisting divisions, and protection of openings and penetrations in these divisions;

12.3.1.2 Fire detection and fire alarm systems;

12.3.1.3 Means of escape systems and appliances.

12.3.1.4 Where applicable, smoke curtains and smoke clearance systems.

12.3.2 Fire-fighting systems and appliances, Personal Protective Equipment and breathing apparatus shall be kept in good working order and readily available for immediate use. Portable extinguishers which have been discharged shall be immediately recharged or replaced with an equivalent unit.

12.4 Maintenance, testing and inspections

12.4.1 Maintenance, testing and inspections shall be carried out based on IMO MSC.1/Circular.1432 *Revised Guidelines for the Maintenance and Inspection of Fire Protection Systems and Appliances*, as amended and, where applicable, MSC.1/Circular.1516 *Amendments to the Revised Guidelines for the Maintenance and Inspection of Fire Protection Systems and Appliances (MSC.1/Circ.1432)*, MSC.1/Circular.1318 *Revised Guidelines for the Maintenance and Inspections of Fixed Carbon Dioxide Fire-Extinguishing Systems*, as amended, and in a manner having due regard to ensuring the reliability of fire-fighting systems and appliances.

12.4.2 The maintenance plan shall be kept on board the ship and shall be available for inspection.

12.4.3 The maintenance plan shall include at least the following fire protection systems and fire-fighting systems and appliances, where installed:

12.4.3.1 Fire mains, fire pumps and hydrants including hoses, nozzles and international shore connections;

12.4.3.2 Fixed fire detection and fire alarm systems;

12.4.3.3 Flammable gas and hydrocarbon detectors;

12.4.3.4 Fixed fire-extinguishing systems and other fire extinguishing appliances;

12.4.3.5 Automatic water extinguishing, fire detection and fire alarm systems;

12.4.3.6 Inert gas systems;

12.4.3.7 Deck foam systems;

12.4.3.8 Fire safety arrangements in pump rooms;

12.4.3.9 Ventilation systems including fire and smoke dampers, fans and their controls;

12.4.3.10 Emergency shutdown of fuel supply;

12.4.3.11 Fire doors, including their controls;

12.4.3.12 General emergency alarm systems;

Note: Refer also to Chapter 07 *Escape, Evacuation and Rescue* Rules 4 *Inspection and Maintenance* & Rule 10 *General Emergency Alarm System*.

12.4.3.13 Portable fire extinguishers including spare charges;

12.4.3.14 Fire fighter's outfits including PPE and breathing apparatus;

12.4.3.15 Fire, search and rescue equipment;

12.4.3.16 Penetrations with closing devices;

12.4.3.17 Smoke curtains and smoke clearance systems.

12.4.4 The maintenance programme may be computer-based.

Operations

12.5 Purpose

12.5.1 The purpose of this section of this Rule is to provide information and instructions for proper ship operations in relation to fire safety. For this purpose, the following requirements shall be met:

12.5.1.1 Fire safety operational booklets shall be provided on board;

12.5.1.2 Flammable vapo438r releases from cargo tank venting shall be controlled.

12.6 Fire safety operational booklets

12.6.1 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. The booklet shall include information concerning the crew's responsibilities for the general fire safety of the ship in all conditions. For ships carrying dangerous goods, refer to the requirements of Rule 13 *Special Requirements for Carriage of Dangerous Goods*.

12.6.2 The fire safety operational booklet shall be provided in each crew mess room and recreation room or in each crew cabin.

12.6.3 The fire safety operational booklet shall be written in English.

12.6.4 The fire safety operational booklet may be combined with training manuals.

Rule 13. Special Requirements for Carriage of Dangerous Goods

13.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

Transportation of Dangerous Goods as Cargo

13.2 General Requirements

13.2.1 The following ship types and cargo spaces shall govern the application of Tables 16, and 17:

13.2.1.1 Ships and cargo spaces not specifically designed for the carriage of freight containers, but intended for the carriage of dangerous goods in packaged form including goods in freight containers and portable tanks;

13.2.1.2 Purpose-built container cargo spaces intended for the carriage of dangerous goods in freight containers and portable tanks;

13.2.1.3 Ro-ro ships and ro-ro spaces intended for the carriage of dangerous goods;

Note: The requirements of this chapter do not address carriage of Dangerous Goods in bulk or the carriage of Dangerous Goods on ship's small crafts or landing craft. Chapter 10 *Dangerous Goods (Explosives)* supplements this Chapter with additional fire safety requirements for the carriage of Class I Dangerous Goods (EO).

13.3 Special requirements

13.3.1 Unless otherwise specified, the following requirements shall govern the application of Table 20, and Table 21 to both "on-deck" and "under-deck" stowage of dangerous goods where the numbers of the following paragraphs are indicated in the first column of the tables.

Table 20: Application of the requirements to different modes of carriage of dangerous goods in ships and cargo spaces

Where X appears in Table 20 it means this requirement is applicable to all classes of dangerous goods as given in the appropriate line of Table 21, except as indicated by the notes.

Rule 13 Paragraph 13.2 / **Rule 13 Paragraph**	**Open deck spaces 13.2.1.1 to 13.2.1.3 inclusive**	**13.2.1.1 Not specifically designed**	**13.2.1.2 Container cargo spaces**	**13.2.1.3**	
				Closed ro-ro spaces	**Open ro-ro spaces**
13.3.2.1	X	X	X	X	X
13.3.2.2	X	X	X	X	X
13.3.2.3	-	X	X	X	X
13.3.2.4	-	X	X	X	X
13.3.3.1	-	X	X	X	X
13.3.4.1	-	X	X	X	-
13.3.5.1	-	X	X[1]	X	-
13.3.5.2	-	X	X[1]	X	-
13.3.6	-	X	X	X	-
13.3.7.1	X	X	X	X	X
13.3.7.2 & 13.3.7.3	X	X	X	X	X
13.3.8.1	X	X	-	-	X
13.3.9.1	X	X	X[2]	X	X
13.3.10.1	-	-	-	X[3]	X
13.3.11.1	-	-	-	X	-
13.3.11.2	-	-	-	X	-

Notes:

1 For classes 4 and 5.1 not applicable to closed freight containers.

For classes 2, 3, 6.1 and 8 when carried in closed freight containers the ventilation rate may be reduced to not less than two air changes per hour. For classes 4 and 5.1 liquids when carried in closed freight containers, the ventilation rate may be reduced to not less than two air changes per hour. For the purpose of this requirement a portable tank is a closed freight container.

2 Applicable to decks only.

3 Applies only to closed ro-ro spaces, not capable of being sealed.

Table 21: Application of the requirements to different classes of dangerous goods except solid dangerous goods in bulk

Class	1.1 to 1.6	1.4S	2.1	2.2	2.3	2.3	3	3	4.1	4.2	4.3	4.3	5.1	5.2	6.1	6.1	6.1	6.1	8	8	8	8	9
Rule 13 Paragraph					Flammable[10]	non-flammable	FP[5]<23°C	FP[5]≥23°C to ≤60°C			Liquids[11]	solids			Liquids FP[5]<23°C	Liquids FP[5]≥23°C to ≤60°C	liquids	solids	Liquids FP[5]<23°C	Liquids FP[5]≥23°C to ≤60°C	liquids	solids	
13.3.2.1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13.3.2.2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-
13.3.2.3	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13.3.2.4	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13.3.3.1	X	-	X	-	X	-	X	-	-	-	X[8]	-	-	-	X	-	-	-	X-	-	-	-	X[7]
13.3.4.1	X	X	X	X	-	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	-
13.3.5.1	-	-	X	-	-	X	X	-	X[1]	X[1]	X	X	X[1]	-	X	X	-	X[1]	X	X	-	-	X[1]
13.3.5.2	-	-	X	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	X	-	-	-	X[7]
13.3.6	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	X[9]	X	-	X	X[9]	X[9]	-	-
13.3.7.1	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X[4]
13.3.8.1	-	-	-	-	-	-	X	X	X	X	X	X	X	-	X	X	-	-	X	X	-	-	-
13.3.9.1	X[2]	-	X	X	X	X	X	X	X	X	X	X	X[3]	X	X	X	-	-	X	X	-	-	-
13.3.10.1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13.3.11.1	X	X	X	X	X	X	X	X	X	X	X	X	X	X[6]	X	X	X	X	X	X	X	X	X
13.3.11.2	X	X	X	X	X	X	X	X	X	X	X	X	X	X[6]	X	X	X	X	X	X	X	X	X

Class	1.1 to 1.6	1.4S	2.1	2.2	2.3	2.3	3	3	4.1	4.2	4.3	4.3	5.1	5.2	6.1	6.1	6.1	6.1	8	8	8	8	9

Notes:

1 When "mechanically-ventilated spaces" are required by the International Maritime Dangerous Goods Code, as amended.

2 Stow 3 m horizontally away from the machinery space boundaries in all cases.

3 Refer to the International Maritime Dangerous Goods Code, as amended.

4 As appropriate to the goods to be carried.

5 Refers to flash point.

6 Under the provisions of the IMDG Code, as amended, stowage of class 5.2 dangerous goods under deck or in enclosed ro-ro spaces is prohibited.

7 Only applicable to dangerous goods evolving flammable vapour listed in the IMDG Code.

8 Only applicable to dangerous goods having a flash point less than 23°C.

9 Only applicable to dangerous goods having a subsidiary risk class 6.1.

10 Under the provisions of the IMDG Code, stowage of class 2.3 having subsidiary risk class 2.1 under deck or in enclosed ro-ro spaces is prohibited.

11 Under the provisions of the IMDG Code, stowage of class 4.3 liquids having a flash point less than 23°C under deck or in enclosed ro-ro spaces is prohibited.

13.3.2 Water supplies

13.3.2.1 Arrangements shall be made to ensure immediate availability of a supply of water from the fire main at the required pressure either by permanent pressurisation or by suitably placed remote arrangements for the fire pumps.

13.3.2.2 The quantity of water delivered shall be capable of supplying four nozzles of a size and at pressures as specified in Rule 9 *Fire Fighting* paragraphs 9.2 to 9.5, capable of being trained on any part of the cargo space when empty.

13.3.2.3 Means shall be provided for effectively cooling the designated underdeck cargo space by at least 5 l/min/m^2 of the horizontal area of cargo spaces, either by a fixed arrangement of spraying nozzles or flooding the cargo space with water. However, the drainage and pumping arrangements shall be such as to prevent the build-up of free surfaces. 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. The drainage system valves shall be operable from outside the protected space at a position in the vicinity of the extinguishing system controls. Bilge wells shall be of sufficient holding capacity and shall be arranged at the side shell of the ship at a distance from each other of not more than 40 m in each watertight compartment.

Note: Refer to the Recommendation on fixed fire-extinguishing systems for special category spaces adopted by the IMO by Resolution A.123(V).

13.3.2.4 Provision to flood a designated under-deck cargo space with suitable specified media may be substituted for the requirements in paragraph 13.3.2.3.

13.3.2.5 The total required capacity of the water supply shall satisfy paragraphs 13.3.2.2 and 13.3.2.3, if applicable, simultaneously calculated for the largest designated cargo space. The capacity requirements of paragraph 13.3.2.2 shall be met by the total capacity of the main fire pump(s), not including the capacity of the emergency fire pump, if fitted. If a drencher system is used to satisfy paragraph 13.3.2.3, the drencher pump shall also be taken into account in this total capacity calculation.

13.3.3 Sources of ignition

13.3.3.1 Electrical equipment and wiring shall not be fitted in enclosed cargo spaces or vehicle spaces unless it is essential for operational purposes in the opinion of the ANC Authority.

a. However, if electrical equipment is fitted in such spaces, it shall be of a certified safe type (see note) for use in the dangerous environments to which it may be exposed unless it is possible to completely isolate the electrical system (e.g. by removal of links in the system, other than fuses).

b. Cable penetrations of the decks and bulkheads shall be sealed against the passage of gas or vapour.

c. Through runs of cables and cables within the cargo spaces shall be protected against damage from impact.

d. Any other equipment which may constitute a source of ignition of flammable vapour shall not be permitted.

Note: Refer to the recommendations of the International Electrotechnical Commission, in particular, the latest version of publication IEC 60092, *Electrical installations in ships*.

13.3.4 Detection system

13.3.4.1 Ro-ro spaces shall be fitted with a fixed fire detection and fire alarm system complying with the requirements of the FSS Code as amended. All other types of cargo spaces shall be fitted with either a fixed fire detection and fire alarm system or a sample extraction smoke detection system complying with the requirements of the FSS Code as amended.

13.3.4.2 Any sample extraction smoke detection system shall be designed, constructed and installed so as to prevent the leakage of any toxic or flammable substances or fire-extinguishing media into any accommodation and service space, control station or machinery spaces.

13.3.5 Ventilation Arrangement

13.3.5.1 Adequate power ventilation shall be provided in enclosed cargo spaces. The arrangement shall be such as to provide for at least six air changes per hour in the cargo space based on an empty cargo space and for removal of vapours from the upper or lower parts of the cargo space, as appropriate.

13.3.5.2 The fans shall be such as to avoid the possibility of ignition of flammable gas air mixtures in accordance with 13.3.3.1 and IACS UR F29 *Non sparking fans*. Suitable wire mesh guards shall be fitted over inlet and outlet ventilation openings.

13.3.6 Bilge pumping

13.3.6.1 Where it is intended to carry flammable or toxic liquids in enclosed cargo spaces, the bilge pumping system shall be designed to protect against inadvertent pumping of such liquids through machinery space piping or pumps. Where large quantities of such liquids are carried, consideration shall be given to the provision of additional means of draining those cargo spaces.

13.3.6.2 If the bilge drainage system is additional to the system served by pumps in the machinery space, the capacity of the system shall be not less than 10 m^3/h per cargo space served. If the additional system is common, the capacity need not exceed 25 m^3/h. The additional bilge system need not be arranged with redundancy.

13.3.6.3 Whenever flammable or toxic liquids are carried, the bilge line into the machinery spaces shall be isolated either by fitting a blank flange or by a closed lockable valve.

13.3.6.4 Enclosed spaces outside machinery spaces containing bilge pumps serving cargo spaces intended for carriage of flammable or toxic liquids should be fitted with separate mechanical ventilation giving at least 6 air changes per hour. If the space has access from another enclosed space, the door shall be self-closing.

13.3.6.5 If bilge drainage of cargo spaces is arranged by gravity drainage, the drainage shall be either led directly overboard or to a closed drain tank located outside the machinery spaces. The tank shall be provided with a vent pipe to a safe location on the open deck. Drainage from a cargo space into bilge wells in a lower space is only permitted if that space satisfies the same requirements as the cargo space above.

13.3.7 Personnel protection

13.3.7.1 Four sets of full protective clothing, resistant to chemical attack, shall be provided in addition to the fire fighter's outfits required by Rule 9 *Fire Fighting*, paragraphs 9.31 to 9.33 and shall be selected taking into account the hazards associated with chemicals transported and the standards developed by the IMO according to the class and physical state. The protective clothing shall cover all skin, so that no part of the body is unprotected.

Note: For packaged goods, the protective clothing should satisfy the equipment provisions specified in emergency procedures (EmS) of the supplement to the IMDG Code for the individual substances.

13.3.7.2 At least two self-contained breathing apparatuses additional to those required by Rule 9 *Fire Fighting* shall be provided. Two spare charges suitable for use with the breathing apparatus shall be provided for each required apparatus.

13.3.7.3 For Type B and Type C ships

a. 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.

13.3.8 Portable fire extinguishers

13.3.8.1 Two portable extinguishers, each having a capacity of not less than 6kg of dry powder or equivalent should be provided when dangerous goods are carried on the weather deck, in open ro-ro spaces and vehicle spaces, and in cargo spaces as appropriate. These extinguishers shall be in addition to any portable fire extinguishers required elsewhere in this chapter.

13.3.9 Insulation of machinery space boundaries

13.3.9.1 Bulkheads forming boundaries between cargo spaces and Category A machinery spaces shall be insulated to "A-60" class standard, unless the dangerous goods are stowed at least 3 m horizontally away from such bulkheads. Other boundaries between such spaces shall be insulated to "A-60" class standard.

Note: Where Rule 8 *Containment of Fire* Solution 2 has been applied, the "A-60" class divisions required by this paragraph should be replaced by "N-30" class divisions.

13.3.10 Water spray system

13.3.10.1 Each open ro-ro space having a deck above it and each space deemed to be a closed ro-ro space not capable of being sealed, shall be fitted with an approved fixed pressure water-spraying system, as per Rule 15 *Special Requirements for Vehicle, Well dock and Ro-ro spaces and Small craft bays* paragraph 15.5.1.2, for manual operation which shall protect all parts of any deck and vehicle platform in the space. However, the drainage and pumping arrangements shall be such as to prevent the build-up of free surfaces. 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. The drainage system valves shall be operable from outside the protected space at a position in the vicinity of the extinguishing system controls. Bilge wells shall be of sufficient holding capacity and shall be arranged at the side shell of the ship at a distance from each other of not more than 40 m in each watertight compartment. 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 ANC Authority in its approval of the stability information.

13.3.10.2 The ANC Authority may permit the use of any other fixed fire-extinguishing system that has been shown by full-scale test to be no less effective.

13.3.11 Separation of ro-ro spaces

13.3.11.1 In ships having ro-ro spaces, a separation shall be provided between a closed ro-ro space and an adjacent open ro-ro space. The separation shall be such as to minimize the passage of dangerous vapours and liquids between such spaces. Alternatively, such separation need not be provided if the ro-ro space is considered to be a closed cargo space over its entire length and shall fully comply with the relevant special requirements of this Rule.

13.3.11.2 In ships having ro-ro spaces, a separation shall be provided between a closed ro-ro space and the adjacent open deck space. The separation shall be such as to minimize the passage of dangerous vapours and liquids between such spaces. Alternatively, a separation need not be provided if the arrangements of the closed ro-ro spaces are in accordance with those required for the dangerous goods carried on adjacent open deck spaces.

Rule 14. Carriage of Low Flash Point Fuels

14.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Note: This Rule supplements Rule 13 *Special Requirements for Carriage of Dangerous Goods* in specifying additional requirements for carriage of low flash point fuels.

Solutions

Small Quantities

Note: Small quantities is used to mean containers or tanks which hold less than 150 litres. ANC Authority may allow small quantities <60l to be stored in a number of readily portable containers which may be manually jettisoned overboard.

14.2 Low flash point fuel with a flash point 35°C or above, stored in small quantities shall be:

14.2.1 stored in independent, sealed containers or tanks;

14.2.2 stored adjacent to the ship's side and sited such that:

14.2.2.1 they are aft of the collision bulkhead and forward of the aft peak bulkhead;

14.2.2.2 they are protected from sources of heat that may raise the fuel or vapour to a temperature above the auto-ignition point, including solar and electromagnetic radiation;

14.2.2.3 they do not obstruct the access to or interfere with the operation of any lifesaving appliances, fire-fighting appliances, closing appliances or the proper navigation of the ship;

14.2.2.4 vapour boundaries do not impinge on machinery exhausts or other sources of ignition, ventilation intakes or openings that can lead to vapour leakage to the internals of the ship;

14.2.2.5 spillages are collected and drained to a safe location.

14.2.3 securely restrained from movement and; readily jettisonable, via a remote release mechanism, up to an angle of at least 30 degrees port and starboard at any trim of the vessel.

Large Quantities

Note: Large quantities is used to mean any single tank that will hold more than 150 litres, or is in a position where it cannot be readily jettisoned overboard in the event of a fire in the immediate vicinity.

14.3 Tanks for the carriage of low flash point fuel with a flash point 35°C or above are to be:

14.3.1 Free standing (not part of ship structure);

14.3.2 Located in spaces where there are no other sources of fire risk;

14.3.3 Have a capacity of less than 1000 litres;

14.3.4 Tank is to be made of steel with minimum wall thickness in accordance with appropriate standard;

Note: Classification Society Rules have requirements for the scantlings of free standing tanks.

14.3.5 Be fitted with means for remote isolation of filling and suction lines from the tank;

14.3.6 The compartment shall be provided with a separate mechanical ventilation system providing a minimum of 10 air changes per hour, ventilated to open deck at a position which prevents the exhaust air being drawn back into the vessel;

14.3.7 The tank(s) shall be vented to atmosphere at a safe location with a means to prevent ingress of a flame, water or foreign matter to the tank;

14.3.8 Fitted with bund or save all with capacity of at least 150% of capacity of tank, fitted around and underneath the tank to contain any leakage either from the tank boundary or tank fittings;

14.3.9 Fitted with an overflow to a safe space;

14.3.10 Protected by an automatic water spray system, complying with the FSS Code as amended;

14.3.11 Means to measure level in the tanks shall be provided local to the tank; such means shall not require penetration below the top of the tank and its failure shall not permit release of fuel;

14.3.12 Duplicated, independent means of measuring contents shall be provided.

14.3.13 The compartment shall be provided with a suitable gas detection system, with audible and visual alarm sounding at a continuously manned control station, consistent with the requirements of Chapter 16 of the FSS Code, as amended.

14.4 Spaces with tanks for the storage of low flash point petroleum products are to comply the requirements of the UK Maritime and Coastguard Agency Yacht Code (Jan. 2019) Annex H Section H.5 for aviation fuel or Annex F for petrol. Tanks are to be arranged to prevent the contents being raised to a temperature above the auto-ignition point by ships systems or solar radiation.

14.5 Where overflow arrangements are led to another internal tank, means to control the explosive risk of the atmosphere of the tank and adjacent spaces are to be provided.

14.6 Procedures for the filling of the storage tank and transfer of contents to vehicles, small craft or other consumers are to be provided and agreed with the Naval Vessel Operator and ANC Authority.

14.7 All safety devices fitted to the tank are to be tested periodically, with a maximum interval of 12 calendar months.

14.8 Tanks which contain fuel with a flash point of less than 35°C shall be specially considered by the ANC Authority.

Rule 15. Special Requirements for Vehicle, Well dock and Ro-ro spaces and Small craft bays

15.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

15.2 General requirements

15.2.1 Application

15.2.1.1 In addition to complying with the requirements of the relevant Rules of this chapter, as appropriate, vehicle, well docks and ro-ro spaces and small craft bays shall comply with the requirements of this Rule.

a. The requirements of this Rule may be applied to large multipurpose spaces that include the storage of aircraft. For such spaces, a fire risk assessment is to be carried out to determine the appropriate prevention, detection, containment and firefighting measures.

15.2.2 For Type A and Type B ships

15.2.2.1 The basic principle underlying the provisions of this Rule is that the main vertical zoning required by Rule 8 *Containment of Fire* may not be practicable in vehicle spaces of Type A and Type B ships and, therefore, equivalent protection shall be obtained in such spaces on the basis of a horizontal zone concept and by the provision of an efficient fixed fire-extinguishing system.

15.2.2.2 The basic principle underlying the provisions of paragraph 15.2.2.1 are also applicable to well docks and Ro-Ro spaces.

15.2.2.3 The requirements of ventilation systems, openings in "A" class divisions and penetrations in "A" class divisions for maintaining the integrity of vertical zones in this chapter shall be applied equally to decks and bulkheads forming the boundaries separating horizontal zones from each other and from the remainder of the ship and to machinery space uptakes and downtakes.

15.3 Precaution against ignition of flammable vapours in closed vehicle spaces, well docks and closed ro-ro spaces and closed small craft bays.

15.3.1 Ventilation systems

Note: For design guidance and operational recommendations for ventilation systems in ro-ro spaces refer to (IMO MSC/Circ.1515).

15.3.1.1 Capacity of ventilation systems

a. There shall be provided an effective power ventilation system sufficient to give at least 10 air changes per hour.

b. An increased number of air changes shall be provided when vehicles are being loaded and unloaded, where necessary to dilute the polluted air to within the permitted occupational exposure limits when calculated in accordance with ISO 9785 *Ships and marine technology — Ventilation of cargo spaces where vehicles with internal combustion engines are driven — Calculation of theoretical total airflow required*.

15.3.1.2 Performance of ventilation systems

a. For Type A and Type B ships,

(1) The power ventilation system required in paragraph 15.3.1.1 shall be separate from other ventilation systems and shall be in operation at all times when vehicles are in such spaces. Ventilation ducts serving such spaces capable of being effectively sealed shall be separated for each such space. The system shall be capable of being controlled from a position outside such spaces.

b. For Type C ships,

(1) Ventilation fans shall normally be run continuously whenever vehicles are on board. Where this is impracticable, they shall be operated for a limited period daily as weather permits and in any case for a reasonable period prior to discharge, after which period the ro-ro or vehicle space shall be proved gas-free. One or more portable combustible gas detecting instruments shall be carried for this purpose. The system shall be entirely separate from other ventilating systems. Ventilation ducts

serving ro-ro or vehicle spaces shall be capable of being effectively sealed for each space. The system shall be capable of being controlled from a position outside such spaces.

c. The ventilation system shall be such as to prevent air stratification and the formation of air pockets.

15.3.1.3 Indication of ventilation systems

a. Means shall be provided on the Bridge and the continuously manned control station to indicate any loss of the required ventilating capacity.

15.3.1.4 Closing appliances and ducts

a. Arrangements shall be provided to permit the 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. This can be achieved by either ensuring all routes to the controls for closure of the ventilation system are:

(1) Clearly marked and at least 600 mm clear width;

(2) Provided with a single handrail or wire rope lifeline not less than 10 mm in diameter, supported by stanchions not more than 10 m apart in way of any route which involves traversing a deck exposed to weather; and

(3) Fitted with appropriate means of access (such as ladders or steps) to the closing devices of ventilators located in high positions (i.e. 1.8 m and above).

(4) Alternatively, by remote closing and position indicator arrangements from the bridge or a fire control station for those ventilator closures is acceptable.

b. Ventilation ducts, including dampers, within a common horizontal zone shall be made of steel.

c. For Type A and Type B ships,

(1) Ventilation ducts that pass through other horizontal zones or machinery spaces shall be "A-60" class steel ducts constructed in accordance with Rule 8 *Containment of Fire*, paragraph 8.40.1, or where Rule 8 *Containment of Fire* Solution 2 is adopted, paragraph 8.114.

15.3.1.5 Permanent openings

a. Permanent openings in the side plating, the ends or deckhead of the space shall be so situated that a fire in the space does not endanger stowage areas and embarkation stations for survival craft and accommodation spaces, service spaces and control stations in superstructures and deckhouses above the spaces.

15.3.2 Electrical equipment and wiring

15.3.2.1 Except as provided in paragraph 15.3.2.2, electrical equipment and wiring shall be of a type suitable for use in an explosive petrol and air mixture.

Note: Refer to the recommendations of the latest version of the International Electrotechnical Commission, in particular publication IEC 60079.

15.3.2.2 All electrical equipment and wiring in closed vehicle spaces, closed ro-ro spaces and well docks spaces and closed small craft bays shall be of a type suitable for use in an explosive low flash point fuel and air mixture, unless the following conditions are met:

a. The space is above the submergence limit and the electrical equipment/wiring is located 450mm from the deck;

b. The electrical equipment is of a type so enclosed and protected as to prevent the escape of sparks;

c. The ventilation system in the space is so designed and operated as to provide continuous ventilation of the space at the rate of at least ten air changes per hour whenever vehicles are on board.

Note: Equipment used for vehicle and small craft maintenance and repair should be suitable for use in an explosive gas atmosphere.

15.3.3 Electrical equipment and wiring in exhaust ventilation ducts

15.3.3.1 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.

15.3.4 Other ignition sources

15.3.4.1 Other equipment which may constitute a source of ignition of flammable vapours shall not be permitted.

15.3.5 Scuppers and discharges

15.3.5.1 Scuppers shall not be led to machinery or other spaces where sources of ignition may be present.

15.3.6 Separation of ro-ro spaces

15.3.6.1 In ships having ro-ro spaces, a separation shall be provided between a closed ro-ro space and an adjacent open ro-ro space. The separation shall be such as to minimize the passage of dangerous vapours and liquids between such spaces. Alternatively, such separation need not be provided if the ro-ro space is considered to be a closed ro-ro space over its entire length and shall fully comply with the relevant special requirements of paragraphs 13.3.1 to 13.3.9.

15.3.6.2 In ships having ro-ro spaces, a separation shall be provided between a closed ro-ro space and the adjacent open deck space. The separation shall be such as to minimize the passage of dangerous vapours and liquids between such spaces.

15.4 Detection and alarm

15.4.1 Fixed fire detection, hydrocarbon detection and fire alarm systems

15.4.1.1 There shall be provided a fixed fire detection and fire alarm system complying with the requirements of the FSS Code as amended. The fixed fire detection system shall be capable of rapidly detecting the onset of fire. The type of detectors and their spacing and location shall be to the satisfaction of the ANC Authority taking into account the effects of ventilation and other relevant factors. After being installed the system shall be tested under normal ventilation conditions and shall give an overall response time to the satisfaction of the ANC Authority.

15.4.1.2 Pump rooms for the treatment, transfer and discharge of vehicle fuel are to be fitted with a fixed hydrocarbon detection system that complies with the FSS code as amended and which alarms at the continuously manned control station.

15.5 Structural fire protection

15.5.1 For Type A ships,

15.5.1.1 Notwithstanding the provisions of Rule 8 *Containment of Fire*, the boundary bulkheads and decks of vehicle, well docks and ro-ro spaces and small craft bays shall be insulated to "A-

60" class standard. However, where a category (5), (8) or (9), or where Rule 8 *Containment of Fire*, Solution 2 is adopted, category (5), (9), or (10) space, as defined in Rule 8 *Containment of Fire*, paragraph 8.8.3, is on one side of the division the standard may be reduced to "A-0". Where oil fuel tanks are below a vehicle, well docks or ro-ro space or small craft bay, the integrity of the deck between such spaces may be reduced to "A-0" standard.

Note: Where Rule 8 *Containment of Fire* Solution 2b has been applied, the "A-60" and "A-0" class divisions required by this paragraph should be replaced by "N-30" and "N-0" class divisions respectively.

15.6 Fire-extinction

15.6.1 Fixed fire-extinguishing systems.

Note: Refer to the Guidelines for the approval of alternative fixed water-based fire-fighting systems for special category spaces (IMO MSC/Circ.1430 as amended;) For large multipurpose spaces that include the storage of aircraft, additional test scenarios and criteria may be required by the ANC Authority. For fixed wing aircraft and large vehicles, the effects of shadowing are to be considered.

15.6.1.1 Vehicle spaces, well dock and ro-ro spaces and small craft bays which are capable of being sealed from a location outside of the spaces shall be fitted with one of the following fixed fire-extinguishing systems:

a. a fixed gas fire-extinguishing system complying with the provisions of the FSS Code, as amended;

b. a fixed high-expansion foam fire-extinguishing system complying with the provisions of the FSS Code, as amended; or

c. a fixed water-based firefighting system for ro-ro spaces and special category spaces complying with the provisions of the FSS Code as amended and paragraph 15.6.1.2;

d. If a carbon dioxide system is fitted, the quantity of gas available shall be at least sufficient to give a minimum volume of free gas equal to 45% of the gross volume of the largest such space which is capable of being sealed, and the arrangements shall be such as to ensure that at least two thirds of the gas required for the relevant space shall be introduced within 10 minutes.

15.6.1.2 Vehicle spaces, well docks and ro-ro spaces not capable of being sealed shall be fitted with a fixed water-based fire-fighting system for ro-ro spaces and special category spaces complying with the provisions of the FSS Code, as amended, which shall protect all parts of any deck and vehicle platform in such spaces. Such a water-based fire-fighting system shall have:

a. A pressure gauge on the valve manifold;

b. Clear marking on each manifold valve indicating the spaces served;

c. Instructions for maintenance and operation located adjacent to the operating valves or at the activation point;

d. A sufficient number of drainage valves to ensure complete drainage of the system.

15.6.1.3 The ANC Authority may permit the use of any other fixed fire-extinguishing system that has been shown, by a full-scale test in conditions simulating a flowing petrol fire in a vehicle space or a ro-ro space, to be not less effective in controlling fires likely to occur in such a space.

Note: For other fixed fire-extinguishing systems refer to the guidelines for the approval of alternative fixed water-based fire-fighting systems for special category spaces (IMO MSC/Circ.1430 as amended;). For large multi-use spaces, the ANC Authority may require additional test scenarios.

15.6.1.4 When fixed pressure water-spraying fire-extinguishing systems are provided, in view of the serious loss of stability which could arise 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. Type A and Type B ships:

(1) In the spaces above the submergence limit, scuppers shall be fitted so as to ensure that such water is rapidly discharged directly overboard;

(2) The scuppers on each side of the deck shall have an aggregate capacity of not less than 100% of the maximum flow rate of the fixed fire-extinguishing system water pumps plus the flow from two fire hoses.

(3) Discharge valves for scuppers, fitted with positive means of closing operable from a position above the submergence limit in accordance with the requirements of the International Convention on Load Lines in force, shall be kept open while the ships are at sea;

(4) Any operation of valves referred to in paragraph 15.6.1.4 shall be recorded;

(5) In spaces below the submergence limit, pumping and drainage facilities shall be provided. In such case, 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. Additionally, the drainage system shall be sized to remove no less than 100% of the combined capacity of both sides of the ship. The drainage system valves shall be operable from outside the protected space at a position in the vicinity of the extinguishing system controls. Bilge wells shall be of sufficient holding capacity and shall be arranged at the side shell of the ship at a distance from each other of not more than 40 m in each watertight compartment;

b. Type C ships:

(1) The drainage and pumping arrangements shall be such as to prevent the build-up of free surfaces. In such case, 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. Additionally, the drainage system shall be sized to remove no less than 100% of the combined capacity of both sides of the ship. The drainage system valves shall be operable from outside the protected space at a position in the vicinity of the extinguishing system controls. Bilge wells shall be of sufficient holding capacity and shall be arranged at the side shell of the ship at a distance from each other of not more than 40 m in each watertight compartment. 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 ANC Authority in its approval of the stability information. Such information shall be included in the stability information supplied to the Commanding Officer as required by Chapter 03 *Buoyancy and Stability* Rule 8 *Provision of Operation Information*.

Note: Refer to the Recommendation on fixed fire-extinguishing systems for special cargo spaces adopted by the IMO by Resolution A.123(V).

15.6.1.5 For closed vehicle, well docks and ro-ro spaces, where fixed pressure water spraying systems are fitted, means shall be provided to prevent the blockage of drainage arrangements.

15.6.2 Portable fire-extinguishers

15.6.2.1 Portable extinguishers shall be provided at each deck level in each hold or compartment where vehicles or small craft are carried, spaced not more than 20 m apart on both sides of the space. At least one portable fire-extinguisher shall be located at each access to such a space.

15.6.2.2 In addition to the provision of paragraph 15.6.2.1, the following fire extinguishing appliances shall be provided in vehicle, well docks, ro-ro spaces intended for the carriage of vehicles with fuel in their tanks for their own propulsion:

a. At least three water-fog applicators;

b. One portable foam applicator unit complying with the provisions of the FSS Code as amended, provided that at least two such units are available in the ship for use in such ro-ro spaces.

15.6.2.3 For large multipurpose spaces that include the storage of aircraft portable fire-fighting equipment is to be determined by a fire risk assessment.

Vehicle and Small Craft refuelling facilities

15.7 Application

15.7.1 Ships provided with facilities for vehicle and small craft refuelling, shall comply with the additional requirements of this section of this Rule.

15.8 Enclosed spaces containing refuelling installations shall be provided with mechanical ventilation, as required by paragraphs 15.3.1 to 15.3.3.1 for closed ro-ro spaces. Ventilation fans shall be of non-sparking type;

15.9 Electric equipment and wiring in enclosed spaces containing refuelling installations shall comply with paragraphs 15.3.2 to 15.3.4;

15.10 Pump rooms for the treatment, transfer and discharge of vehicle or small craft fuel shall be fitted with a fixed hydrocarbon detection system that complies with the FSS code as amended and which alarms at the continuously manned control station.

Note: Equipment used for vehicle or small craft maintenance and repair should be suitable for use in an explosive gas atmosphere.

15.11 Where portable fuel storage tanks are used, special attention shall be given to:

15.11.1 Provision of a designated area for the storage of fuel tanks which shall be as remote as is practicable from accommodation spaces, escape routes, muster stations and evacuation stations;

15.11.2 Design of the tank for its intended purpose;

15.11.3 Mounting and securing arrangements;

15.11.4 Electric bonding;

15.11.5 Inspection procedures;

15.11.6 Isolation from areas containing a source of vapour ignition;

15.11.7 Provision of arrangements whereby fuel spillage may be collected and drained to a safe location.

15.11.8 Fuelling pumps shall be provided with means which permit shutdown from a safe remote location in the event of a fire. Where a gravity fuelling system is installed, equivalent closing arrangements shall be provided to isolate the fuel source;

15.12 The fuelling unit shall be connected to one tank at a time. The piping between the tank and the fuelling unit shall be of steel or equivalent material, as short as possible, and protected against damage;

15.13 Electrical fuelling units and associated control equipment shall be of a type suitable for the location and potential hazards;

15.14 Fuelling units shall incorporate a device which will prevent over-pressurisation of the delivery or filling hose;

15.15 Equipment used in refuelling operations shall be electrically bonded;

15.16 "NO SMOKING" signs shall be displayed at appropriate locations;

15.17 The procedures and precautions to be followed during refuelling operations shall be in accordance with recognised safe practices and contained in the operations manual.

15.18 Where low flash point fuels are used, the de-fuelling and refuelling the equipment and arrangements shall comply with the requirements of Rule 14 *Carriage of Low Flash Point Fuels*. Stowage of other fuels shall comply with the Special Function of Bulk Fuel Carriage, see Rule 1 *General* paragraph 1.4.

Rule 16. Special Requirements for Aircraft Facilities

16.1 The Naval Vessel Operator shall present and justify a Solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

Solutions

16.2 Application

16.2.1 Ships equipped with aircraft shall comply with the additional requirements of this Rule and Chapter 11 *Aviation Systems*.

16.2.2 Where aircraft land or conduct winching operations on an occasional or emergency basis on ships without organic aircraft facilities, fire-fighting equipment fitted in accordance with the requirements of the fire suppression sections (Rules 2, 6, 7, 8 & 9) of this chapter may be used. This equipment shall be made readily available in close proximity to the landing or winching areas during aircraft operations.

16.3 Structure

16.3.1 Flight decks constructed of steel or other equivalent material

16.3.1.1 In general, the construction of the flight deck shall be of steel or other equivalent materials. If the flight deck forms the deckhead of a deckhouse, superstructure or weather deck, it shall be insulated to "A-60" class standard.

16.3.2 Flight decks constructed of aluminium or other low melting point metals

16.3.2.1 If the ANC Authority permits aluminium or other low melting point metal for construction of the flight deck that is insulated equivalent to steel, the following provisions shall be satisfied:

a. If the flight deck is cantilevered over the side of the ship, after each fire on the ship or on the flight deck, the flight deck shall undergo a structural analysis to determine its suitability for further use;

b. If the flight deck is located above the ship's deckhouse or similar structure, the following conditions shall be satisfied:

(1) The deckhouse top and bulkheads under the platform shall have no openings;

(2) Windows under the flight deck shall be provided with steel shutters;

(3) After each fire on the flight deck or in close proximity, the flight deck shall undergo a structural analysis to determine its suitability for further use.

16.4 Means of escape

16.4.1 A flight deck shall be provided with both a main and an emergency means of escape and access for fire fighting and rescue personnel. These shall be located as far apart from each other as is practicable and preferably on opposite sides of the flight deck.

16.4.2 For a flight deck with multiple landing spots, both a main and an emergency means of escape is to be provided for every landing spot.

16.5 Fire-fighting appliances

16.5.1 In close proximity to the flight deck, the following fire-fighting appliances shall be provided and stored near the means of access to that flight deck:

16.5.1.1 At least two dry powder extinguishers having a total capacity of not less than 45 kg;

16.5.1.2 Carbon dioxide extinguishers of a total capacity of not less than 18 kg or equivalent;

16.5.1.3 A suitable foam application system consisting of monitors or foam making branch pipes capable of delivering foam to all parts of the flight deck in all weather conditions in which aircraft can operate. The system shall comply with:

a. the FSS Code, as amended, Chapter 17 *Helicopter Facility Foam Firefighting Appliances*. For ships with multiple landing spots, the quantity of foam is to be delivered for each landing spot and aircraft storage position; or

b. STANAG 7183 *The Minimum Crash, Fire Fighting and Rescue (CFR) Equipment Standards for Aviation Capable Vessels*, as amended.

16.5.1.4 The principle agent shall be suitable for use with salt water and comply with MSC.1/Circ.1312 *Revised Guidelines for the Performance and Testing Criteria, and Surveys of Foam Concentrates for Fixed Fire-Extinguishing Systems* and USN MIL-F-24385F *Military Specification: Fire extinguishing agent, aqueous film forming foam (AFFF) liquid concentrate, for fresh and seawater*;

16.5.1.5 At least two nozzles of an approved dual-purpose type (jet/spray) and hoses sufficient to reach any part of the flight deck; For ships with multiple landing spots, two hoses are to be simultaneously applied for each landing spot and aircraft storage position.

16.5.1.6 In addition to the requirements of Rule 9 *Fire Fighting*, two sets of fire fighter's outfits; For ships with multiple landing spots, two fire fighter's outfits are to be carried for each landing spot and aircraft storage position.

16.5.1.7 At least the following equipment shall be stored in a manner that provides for immediate use and protection from the elements adjacent to each landing spot:

a. Adjustable wrench;

b. Blanket, fire resistant;

c. Cutters, bolt, 60 cm;

d. Hook, grab or salving;

e. Hacksaw, heavy duty complete with 6 spare blades;

f. Ladder;

g. Life line 5 mm diameter × 15 m in length;

h. Pliers, side-cutting;

i. Set of assorted screwdrivers;

j. Harness knife complete with sheath.

16.6 Drainage facilities

16.6.1 Drainage facilities in way of flight deck shall be constructed of steel and shall lead directly overboard independent of any other system and shall be designed so that drainage does not fall onto any part of the ship. Means shall be provided to prevent accidental discharge of oil spills.

Note: Small raised sills or temporary arrangements to provide an oil spill barrier may be used provided these comply with flight deck protuberance requirements.

16.7 Bulk storage

16.7.1 Arrangements for the storage area of aircraft fuels shall comply with Rule 3 *Risk of Ignition* and where low-flash point fuels are used, Rule 14 *Carriage of Low Flash Point Fuels*.

Aircraft storage, refuelling and maintenance facilities

16.8 Application

16.8.1 Enclosed spaces for a single aircraft or containing refuelling facilities shall comply with the requirements of this section of this Rule. The requirements of Rule 15 *Special Requirements for Vehicle, Well dock and Ro-ro spaces and Small craft bays* may be applied to large multipurpose spaces that include the storage of aircraft. For such spaces, a fire risk assessment is to be carried out to determine the appropriate prevention, detection, containment and firefighting measures.

16.9 Aircraft storage, refuelling and maintenance facilities shall be treated as Category 'A' machinery spaces with regard to structural fire protection, fixed fire-extinguishing and detection system requirements;

Note: For fixed fire-extinguishing systems refer to the Revised Guidelines for the Approval of Equivalent Water-Based Fire-Extinguishing Systems for Machinery Spaces and Cargo Pump-Rooms (IMO MSC/Circ.1165 as amended;).

16.10 Enclosed spaces containing refuelling installations shall be provided with mechanical ventilation, as required by Rule 15 *Special Requirements for Vehicle, Well dock and Ro-ro spaces and Small craft bays* paragraphs 15.3.1 to 15.3.3.1 for closed ro-ro spaces. Ventilation fans shall be of non-sparking type;

16.11 Electric equipment and wiring in enclosed spaces containing refuelling installations shall comply with Rule 15 *Special Requirements for Vehicle, Well dock and Ro-ro spaces and Small craft bays* paragraphs 15.3.2 to 15.3.4;

16.12 Pump rooms for the treatment, transfer and discharge of aircraft fuel shall be fitted with a fixed hydrocarbon detection system that complies with the FSS code as amended and which alarms at the continuously manned control station.

Note: Equipment used for aircraft maintenance and repair should be suitable for use in an explosive gas atmosphere.

16.13 Where portable fuel storage tanks are used, special attention shall be given to:

16.13.1 Provision of a designated area for the storage of fuel tanks which shall be as remote as is practicable from accommodation spaces, escape routes, muster stations and evacuation stations;

16.13.2 Design of the tank for its intended purpose;

16.13.3 Mounting and securing arrangements;

16.13.4 Electric bonding;

16.13.5 Inspection procedures;

16.13.6 Isolation from areas containing a source of vapour ignition;

16.13.7 Provision of arrangements whereby fuel spillage may be collected and drained to a safe location.

16.14 Fuelling pumps shall be provided with means which permit shutdown from a safe remote location in the event of a fire. Where a gravity fuelling system is installed, equivalent closing arrangements shall be provided to isolate the fuel source;

16.15 The fuelling unit shall be connected to one tank at a time. The piping between the tank and the fuelling unit shall be of steel or equivalent material, as short as possible, and protected against damage;

16.16 Electrical fuelling units and associated control equipment shall be of a type suitable for the location and potential hazards;

16.17 Fuelling units shall incorporate a device which will prevent over-pressurisation of the delivery or filling hose;

16.18 Equipment used in refuelling operations shall be electrically bonded;

16.19 "NO SMOKING" signs shall be displayed at appropriate locations;

16.20 The procedures and precautions to be followed during refuelling operations shall be in accordance with recognised safe practices and contained in the operations manual.

16.21 Where low flash point fuels are used, the de-fuelling and refuelling the equipment and arrangements are to comply with the requirements of Rule 14 *Carriage of Low Flash Point Fuels*. Stowage of other fuels shall comply with the Special Function of Bulk Fuel Carriage, see Rule 1 *General* paragraph 1.4.

Note: Land based aircraft and UAVs often use low flash point fuels.