



Australian Government
Australian Maritime Safety Authority

National Standard for Commercial Vessels

Part C Design and construction

Section 4 Fire Safety

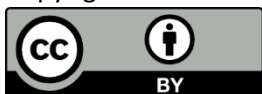
External consultation draft

This edition 3.0 of NSCV, Part C — Design and Construction, Section 4 – Fire Safety was prepared by the Australian Maritime Safety Authority on XX February 2026

Edition 3.0 was adopted by the Infrastructure and Transport Ministers on XX May 2026.

Edition 3.0 commences on 1 July 2026.

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Chapter 1 Preliminary

1.1 Scope

This Section provides the design, construction and installation standards for passive and active fire protection measures on domestic commercial vessels.

1.2 Application

This section applies to all domestic commercial vessels other than special vessels.

Note The standards for special vessels are provided for in NSCV Part F of this standard, unless NSCV Part F specifies otherwise. NSCV Part F includes standards for fast craft and leisure craft.

1.3 Reference documents

Each document mentioned **in this standard:**

- (a) is referenced in this Section; and
- (b) is the latest revision of the document, including amendments, unless stated otherwise.

Note Section 1.7 in NSCV Part B provides that national, regional or international standards adopted or incorporated by reference in the NSCV are adopted or incorporated by reference as in force from time to time.

Publisher	Document	Available
Australian Maritime Safety Authority	<p><i>Marine Order 15 (Construction —fire protection, fire detection and fire extinction) 2025 (Marine Order 15)</i></p> <p><i>Marine Order 503 (Certificate of survey) 2018 (Marine Order 503)</i></p> <p><i>Marine Order 504 (Certificates of operation and operation requirements — national law) 2018 (Marine Order 504)</i></p>	AMSA website at http://amsa.gov.au
Australian Maritime Safety Authority	<p><i>National Standard for Commercial Vessels (NSCV)</i></p> <p>Part B – <i>General requirements</i></p> <p>Part C, Section 1 – <i>Arrangement, accommodation and personal safety</i></p> <p>Part C, Section 2 – <i>Watertight & Weathertight Integrity</i></p> <p>Part C, Section 4 – <i>Fire Safety</i></p> <p>Part C, Subsection 5A – <i>Machinery</i></p> <p>Part C, Subsection 5B – <i>Electrical</i></p> <p>Part C, Subsection 7A – <i>Safety Equipment</i></p> <p>Part C, Section 7B – <i>Communications Equipment</i></p>	AMSA website at http://amsa.gov.au

Publisher	Document	Available
Standards Australia	<p>AS 1530.3:1999 — <i>Methods for fire tests on building materials, components and structures - Simultaneous determination of ignitability, flame propagation, heat release and smoke release</i> (AS 1530)</p> <p>AS 1603:1997 — <i>Automatic fire detection and alarm systems - Heat detectors</i> (AS1603)</p> <p>AS 1851:2012 — <i>Routine service of fire protection systems and equipment</i> (AS 1851)</p> <p>AS 2118:2006 — <i>Automatic fire sprinkler systems</i> (AS 2118)</p> <p>AS 2419.1 (2021) — <i>Fire hydrant installations – Part 1: System design, installation and commissioning</i> (AS 2419)</p> <p>AS 2792:1992 — <i>Fire hose - Delivery layflat</i> (AS 2792)</p> <p>AS 3786:2023 — <i>Smoke alarms using scattered light, transmitted light or ionization</i> (AS 3786)</p> <p>AS 4214:2018 — <i>Gaseous fire extinguishing systems</i> (AS 4214)</p> <p>AS 4487:2013 — <i>Condensed Aerosol Fire Extinguishing Systems</i> (AS 4487)</p> <p>AS 4587:2020 — <i>Water mist fire protection systems - System design, installation and commissioning</i> (AS 4587)</p> <p>AS 5601.2 (2020) — <i>Gas installations - LP Gas installations in caravans and boats for non-propulsive purposes</i> (AS 5601.2)</p> <p>HB 13-2007 — <i>Electrical equipment for hazardous areas</i> (HB13)</p>	SAI Global website at http://www.saiglobal.org
Australian and International Standards	<p>AS ISO 14520:2018 — <i>Gaseous fire-extinguishing systems - Physical properties and system design</i> (AS ISO 14520)</p> <p>AS ISO 9239-1:2003 — <i>Reaction to fire tests for floor coverings - Determination of the</i></p>	SAI Global website at http://www.saiglobal.org

Publisher	Document	Available
	<p><i>burning behaviour using a radiant heat source</i> (AS ISO 9239)</p> <p>AS ISO 9705:2003 — <i>Fire tests - Full-scale room test for surface products</i> (AS ISO 9705)</p>	
<p>Australian and New Zealand Standards</p>	<p>AS/NZS 1715:2009— <i>Selection, use and maintenance of respiratory protective equipment</i> (AS/NZS 1715)</p> <p>AS/NZS 1716:2012 — <i>Respiratory protective devices</i> (AS/NZS 1716)</p> <p>AS/NZS 1841:2007 — <i>Portable fire extinguishers</i> (AS/NZS 1841)</p> <p>AS/NZS 1850:2009 — <i>Portable fire extinguishers - Classification, rating and performance testing</i> (AS/NZS 1850)</p> <p>AS/NZS 3837:1998 — <i>Method of test for heat and smoke release rates for materials and products using an oxygen consumption calorimeter</i> (AS/NZS 3837)</p> <p>AS/NZS 5601:2022 — <i>Gas installations: General installations</i> (AS/NZS 5601)</p>	<p>SAI Global website at http://www.saiglobal.org</p>
<p>International Electrotechnical Commission standards</p>	<p>IEC 62619—<i>Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications</i></p> <p>IEC 62620—<i>Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for use in industrial applications</i></p> <p>IEC – 60079 - <i>Explosive atmospheres</i></p>	<p>SAI Global website at http://www.saiglobal.org</p>
<p>International Standards Organisation</p>	<p>ISO 15371:2024 — <i>Ships and marine technology - Fire-extinguishing systems for protection of galley cooking equipment</i> (ISO 15371)</p> <p>ISO 15779:2011 — <i>Condensed aerosol fire extinguishing systems - Requirements and test methods for components and system</i></p>	<p>ISO website at http://www.iso.org</p>

Publisher	Document	Available
	<p><i>design, installation and maintenance</i> (ISO 15779)</p> <p>ISO 1716:2018 — <i>Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value)</i> (ISO 1716)</p> <p>ISO 17631:2022 — <i>Ships and marine technology - Shipboard plans for fire control, damage control, life-saving appliances and means of escape</i> (ISO 17631)</p> <p>ISO 4589-3:2017 — <i>Plastics - Determination of burning behaviour by oxygen index - Part 3: Elevated-temperature test</i> (ISO 4589-3)</p>	
International Maritime Organisation	<p>FSS Code - <i>International Code for Fire Safety Systems</i> adopted by IMO Resolution MSC.98(73).</p> <p>FTP Code - <i>International Code for Application of Fire Test Procedures</i> adopted by IMO Resolution MSC.307(88)</p> <p>HSC Code - <i>International Code of Safety for High-Speed Craft</i> 2000 adopted by IMO Resolution MSC.97(73)</p> <p>IBC Code — <i>International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk</i></p> <p>IMDG Code — <i>IMO International Maritime Dangerous Goods Code</i></p> <p>IMSBC Code — <i>International Maritime Solid Bulk Cargoes Code</i></p> <p>IMO MSC.45(65):1995 — <i>Test Procedures for Fire-Resisting Divisions of High Speed Craft</i> (Resolution MSC.45 (65))</p> <p>IMO MSC/Circ.1270:2008 — <i>Revised Guidelines for the Approval of Fixed Aerosol Fire-Extinguishing Systems Equivalent to Fixed Gas Fire-Extinguishing Systems, as referred to in SOLAS 74, for Machinery Spaces</i></p> <p>IMO MSC/Circ.451:1986 — <i>Guidance Concerning the Location of Fire Control Plans</i></p>	IMO website at http://www.imo.org

Publisher	Document	Available
	<p><i>for the Assistance of Shoreside Fire-Fighting Personnel</i></p> <p>IMO MSC/Circ.849:1998 — <i>Guidelines for the performance, location, use and care of emergency escape breathing devices (EEBD's)</i></p> <p>SOLAS — <i>International Convention for the Safety of Life at Sea</i></p>	
UN Economic and Social Council	<p><i>UN Recommendations on the Transport of Dangerous Goods - Model Regulations – Twenty-third revised edition</i></p>	<p>https://www.unece.org</p>
Australian Building Codes Board	<p>NCC 2016 — <i>National Construction Code Volumes One, Two and Three (NCC)</i></p>	<p>ABCB website at http://www.abcb.gov.au/</p>
National Transport Commission	<p><i>Australian Code for the Transport of Dangerous Goods by Road & Rail Edition 7.9, 2024</i></p>	<p>The National Transport Commission at https://www.ntc.gov.au/codes-and-guidelines/australian-dangerous-goods-code</p>
National Fire Protection Association	<p>NFPA 15:2022 — <i>Water Spray Fixed Systems for Fire Protection (NFPA 15)</i></p> <p>NFPA 17:2024 — <i>Standard for Dry Chemical Extinguishing Systems (NFPA 17)</i></p> <p>NFPA 750:2023 — <i>Water mist fire protection systems (NFPA 750)</i></p>	<p>NFPA website at http://www.nfpa.org/</p>
United Laboratories	<p>UL 300:2005 — <i>Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment (UL 300)</i></p>	<p>UL website at http://www.ul.com/</p>
Sveriges Provnings Technical Research Institute of Sweden	<p>SP method 2377 - <i>Fire test procedures for water spray fire suppression systems in small machinery spaces (SP 2377)</i></p>	<p>SP website at http://www.sp.se/</p>

1.4 Definitions

(1) In this Section:

accommodation space means a category of space defined in Table 4 formed by the boundaries of decks, watertight bulkheads, smoke zones or a combination of these.

active fire protection measures means those elements of the design, construction and *fire equipment* of the vessel and emergency procedures that eliminate or control the risk of fire by active means i.e. they must be activated at the time of fire to be effective.

Examples Fire detection and fire alarm systems, fixed fire-extinguishing systems, fire appliances, fuel shut-offs and ventilation and electrical shutdowns.

ADG Code means the Australian Code for the Transport of Dangerous Goods by Road & Rail, Edition 7.9, 2024.

Assessed means type assessed and verified as meeting the applicable standard or specification or test mentioned within this subsection, in a manner that complies with 18.13.

atrium means a public space spanning three or more decks having openings or access ways between decks that cannot be sealed thus allowing smoke to move freely from one deck to the others.

Battery Management System (BMS) means a system that monitors and regulates battery performance to ensure safe and efficient operation.

categorised space means a space assigned a risk category in accordance with this standard.

central control station means a *control station* in which essential indicator and control functions are centralised.

Note Refer also to the definition of control station.

closed Ro-Ro spaces means *Ro-Ro spaces* that are neither *open Ro-Ro spaces* nor *weather decks*.

Note Refer also to the definitions of *Ro-Ro spaces*, *open Ro-Ro spaces* and *weather decks*. A special category space is a type of closed *Ro-Ro space*.

closed vehicle spaces means cargo spaces intended for the carriage of motor vehicles with fuel in their tanks for their own propulsion that:

- (a) are not *Ro-Ro spaces*; and
- (b) are not provided with adequate natural ventilation effective over their entire length through permanent openings distributed in the side plating or deckhead, or from above.

Note 1 A *closed vehicle space* contains vehicles loaded by means other than being driven on board the vessel.

Note 2 A vehicle space that would meet the ventilation characteristics specified for an *open Ro-Ro space* or a *Ro-Ro weather deck* is not a *closed vehicle space* for the purposes of this definition.

Note 3 Refer also to the definitions of Ro-Ro spaces, open Ro-Ro spaces and weather decks. A special category space is a type of closed Ro-Ro space.

combustible liquid means any liquid, other than a *flammable liquid*, that has:

- (a) a flashpoint **less than its boiling point**; and
- (b) a fire point less than its boiling point.

Note Refer also to the definition of flammable liquid.

combustible material means any material other than a *non-combustible material*.

Note Refer also to the definition of non-combustible material.

complete EES system means a self-contained battery system fitted in an enclosure complying with this Part.

control station means a category of space defined in Table 4.

dangerous goods means those packaged dangerous goods that fall within the definition of dangerous goods at clause 1.2.1 of the ADG Code.

Note 1 For the application of this standard, the definition of dangerous goods excludes fuels and oils used for the propulsion of the vessel. Dangerous goods carried in bulk are subject to standards applicable to *tankers* (see definition below) or are subject to the International Bulk Chemical Code.

Note 2 Cargo fuels, including those with a flash point > 60°C are typically considered to be dangerous goods under **ADG Code**.

EES Space means a compartment in which a battery system is physically installed.

EES System means an electrical energy storage system consisting of battery cells or cell groups, battery packs, electrical circuits and electronics providing system control and monitoring functions.

escape or evacuation route means a category of space defined in Table 4.

Note Includes external deck spaces, corridors, stairways etc. if used for escape or evacuation.

fire appliance means an item of *fire equipment* that requires an operator to deploy and control the item when manually fighting a fire.

Examples portable and wheeled fire extinguishers; fire hoses; fire buckets; water fog applicators; *portable foam applicators*.

Note Refer also to the definition of fire equipment.

fire damper means a device arranged to close a ventilation opening or ventilation duct for the purposes of maintaining the performance of the fire boundary through which the opening or duct passes.

fire detection and fire alarm system means those elements of the construction and equipment of the vessel, and any operational procedures, that detect the presence of fire or potential risk of fire and subsequently raise an alarm.

Examples fixed fire detection and fire alarm system; smoke alarms; fire patrols.

fire equipment includes fire detection and alarm systems, fire appliances, fixed fire-extinguishing systems and fire personal protective equipment.

fire flap means a device arranged to close off a ventilation opening or ventilation duct for the purposes of sealing a compartment to exclude oxygen and/or confine and contain extinguishing media.

fire-resisting division means a division formed by bulkheads and/or decks having insulation or inherent fire-resisting properties as shown by assessment in accordance with:

(a) FTP Code – Part 3 requirements for A Class Divisions ; or

(b) RINA Rules for the Classification of Yachts 2025

(c) HSC Code, clause 7.2 and FTP Code – Resolution MSC45(65) as applicable.

fire-restricting material means a material having properties that retard and/or reduce the hazardous effects of fire in accordance with the criteria specified in Table 10.

Fire Risk Category of vessel means a measure of the risk of fire determined by the category of vessel, number of passengers on board and number of berthed passengers on board, refer to Table 3.

fixed fire detection and fire alarm system means an integrated system of detectors, manual call points and alarms that are monitored and controlled through one or more central control panels.

fixed fire-extinguishing system means an arrangement of components forming a single system that when manually or automatically initiated, operates automatically to control, suppress or extinguish a fire without the need for further manual control.

Examples Total flooding systems, Local fire-extinguishing systems.

flammable liquid means liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (e.g. paints, varnishes, lacquers, etc., but not including substances otherwise classified on account of their dangerous characteristics) which give off a flammable vapour at temperatures of not more than 60.5°C, closed cup test, or not more than 65.6°C, open cup test, normally referred to as the flash point.

Flammable liquids include:

- (a) Liquids offered for transport at temperatures at or above their flash point; and
- (b) Substances that are transported or offered for transport at elevated temperatures in a liquid state and which give off a flammable vapour at a temperature at or below the maximum transport temperature.

FSS Code means the *International Code for Fire Safety Systems* adopted by IMO Resolution MSC.98(73).

FTP Code means the *International Code for Application of Fire Test Procedures* adopted by IMO Resolution MSC.307(88).

galley means an enclosed space containing:

- (a) equipment used for cooking food at temperatures exceeding 120°C including cooking equipment for deep fat frying;
- (b) equipment having an exposed flame or cooking element that might come into contact with and ignite fats or other *flammable liquids* during the course of normal or abnormal operation; or
- (c) any appliance of power more than 5 kW used for the cooking or heating of food.

Note Refer also to the definitions of large galley and small galley.

hazardous area means an area in which an explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment.

helideck means a purpose-built helicopter landing area located on a vessel. It includes all structures, fire-fighting appliances and other equipment necessary for the safe operation of helicopters.

high fire risk space means a category of space defined in Table 4.

hob means that part of a cooking appliance that supports the trivet. Usually constructed of enamelled steel, stainless steel or toughened glass.

HSC Code means the *International Code of Safety for High-Speed Craft*, 2000, adopted and published by the IMO, as in force from time to time.

IMDG Code means the International Maritime Dangerous Goods Code issued by the International Maritime Organization.

Interconnected photoelectric smoke alarm means a smoke alarm that detects smoke using a photoelectric (light-scattering) sensing method, and is interconnected, either by wired or wireless connection. When one alarm activates, all connected alarms sound simultaneously.

large galley means a *galley* that is not a *small galley*.

LEL means lower explosive limit, which is the lowest concentration required of a gas or vapour from which ignition or an explosion can occur.

low risk cargo space means cargo spaces on Class 2 or Class 3 vessels constructed and solely intended for the carriage of ore, grain, unseasoned timber, fish, *non-combustible* cargoes or cargoes that constitute a low fire risk.

low flame spread means a surface having properties that:

- (1) restrict the spread of flame when assessed in accordance with FTP Code – Part 5; or
- (2) when assessed in accordance AS 1530.3 is shown to meet either:
 - (a) Acceptance criteria 1:
 - (i) Spread of Flame Index not exceeding 3;
 - (ii) Ignitability Index plus Heat Evolved Index not exceeding 7 (in total);
 - (iii) Smoke Developed Index not exceeding 4; or
 - (b) Acceptance criteria 2:
 - (i) Spread of Flame Index not exceeding 1;
 - (ii) Ignitability Index plus Heat Evolved Index not exceeding 3 (in total);
 - (iii) Smoke Developed Index not exceeding 5.

Lm means measured length

machinery space means enclosed machinery spaces containing:

- (a) internal combustion machinery for main propulsion where the aggregate power

output of internal combustion machinery for all purposes within the space is 120 kW or more;

- (b) internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of 375 kW or more;
- (c) any oil-fired boiler;
- (d) any oil fuel unit.

medium machinery space means an enclosed machinery space that contains:

- (e) internal combustion machinery for main propulsion where the aggregate power output of internal combustion machinery for all purposes within the space is less than 120 kW
- (f) internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of the machinery within the space is less than 375 kW
- (g) Electrical equipment when such equipment within the space has a total aggregate power of 30 kVA or more
- (h) an oil fuel pump, oil fuel filter or oil fuel separator, not being an oil fuel unit
- (i) any solid fuel fired boiler.

minor fire risk space means a category of space defined in Table 4.

minor quantity of dangerous goods means packaged *dangerous goods* of quantity less than the placarding quantity specified under Table 5.3.1 of the *ADG Code*.

Examples For paints and kerosene, the placarding quantity is 1000 L. For petrol and aviation fuel, the placarding quantity is 250 L.

moderate fire risk space means a category of space defined in Table 4.

non-combustible material means a material that neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750°C in accordance with:

- (a) Fire Test Procedures Code or
- (b) AS 1530.1:1994.

oil fuel unit means the equipment used for the preparation of oil fuel for delivery to an oil-fired boiler, or equipment used for the preparation of heated oil for delivery to an internal combustion engine. Includes any oil pressure pumps, filters, heaters and piping dealing with oil at a pressure of more than 180 kPa.

Note The definition does not apply to equipment used for the preparation or delivery of diesel fuel that is not heated for use in an internal combustion engine.

open Ro-Ro spaces means those ro-ro spaces that are either open at both ends or have an opening at one end and, are provided with adequate natural ventilation effective over their entire length through permanent openings distributed in the side plating or deckhead or from above, having a total area of at least 10% of the total area of the space sides.

operating compartment means the enclosed area from which the navigation and control of the vessel is exercised.

pantry means a space, not being a *galley*, used for the preparation or distribution of food and beverages.

Examples Spaces containing; Microwave ovens for heating of food; Bain-marie appliances, each of 5 kW or less, for keeping food warm; or Appliances, each of 5 kW or less, used solely for boiling water or water-based beverages.

Note Refer to the definition of *galley* above.

passive fire protection measures means features of the design and construction of the vessel and fire-safe operational procedures that eliminate or control the risks of fire by passive means: i.e., they do not require activation at the time of fire to be effective.

Examples Fuel system design and installation requirements; electrical installation requirements; fire-resisting divisions; the use of *non-combustible* or *fire-restricting materials*; escape and evacuation requirements that limit the consequences of fire.

Portable foam applicator means a *fire appliance* that, when connected to the fire main water supply and inserted into a drum of foam concentrate, generates quantities of foam water mixture.

public spaces means those portions of the *Accommodation Space* that are public halls, dining rooms, lounges and similar enclosed spaces where persons are able to congregate.

Ro-Ro spaces means spaces intended primarily for carrying motor vehicles with fuel in their tanks for their own propulsion that are loaded and unloaded in a horizontal direction. Ro-Ro spaces extend either a substantial length or the entire length of the vessel, are not normally subdivided and may also contain goods that are loaded and unloaded by motor vehicles.

Note 1 Ro-Ro spaces are classified as open Ro-Ro spaces, closed Ro-Ro spaces or weather decks.

Note 2 Goods in *Ro-Ro spaces* may be packaged or in bulk, in or on rail or road cars, vehicles (including road or rail tankers), trailers, containers, pallets, demountable tanks or in or on similar stowage units or other receptacles.

small galley means a *galley* containing a single compact domestic range, consisting of burners or hotplates and oven, with total gas consumption less than 65 MJ/hr or total electricity consumption less than 9 kW.

small machinery space means a *medium machinery space* that is not capable of being occupied and has a volume of 10 m³ or less.

smoke alarm means a device that independently detects the presence of smoke, sounds an alarm and tests function status from the location of installation.

smoke-tight means a division capable of preventing the passage of smoke.

smoke-tight non-combustible means a *smoke-tight* division made of *non-combustible* or *fire-restricting materials*.

SOC (State of Charge) means available capacity as a percentage of rated capacity.

SOH (State of Health) reflects the general condition of an EES system and its ability to deliver the specified performance compared with a new EES system. (0-100%).

SOL (safe operating limits) means a set of voltage, temperature and other parameters, within which the battery is intended to be operated and which, if exceeded, initiates a battery management system response to correct the problem or to shut the battery down. (0-100%).

special category space means a *closed Ro-Ro space* to which passengers may have access.

steel or equivalent material means any non-combustible material which, by itself or due to insulation provided, has structural and integrity properties equivalent to steel at the end of the applicable exposure to the standard fire test.

Example aluminium alloy with appropriate insulation.

tanker means a Class 2 or Class 3 vessel carrying

- (a) crude oil or petroleum products in bulk with:
 - (i) a flashpoint of 60°C or less (closed cup test), as determined by an approved flashpoint apparatus;
 - (ii) and a Reid vapour pressure which is below the atmospheric pressure; or
- (b) other liquid products having a similar fire hazard.

Note Liquid cargoes with a flashpoint exceeding 60°C, other than oil products or liquid cargoes subject to the requirements of the IBC Code, are considered to constitute a low fire risk.

time rating means the minimum time period needed to ensure that a bulkhead; deckhead; closing appliance; penetration; or other fixture meets the requirements for a *fire-resisting division*.

thermal runaway means a rapidly accelerating, self-sustaining increase in temperature within a battery system.

trivet means a grid located over the open burners of a cooking range to support vessels being heated.

weather deck means a deck that is completely exposed to the weather from above and from at least two boundaries to the space.

- (2) In this Section, the following terms have the meaning given by the Dictionary in NSCV Part B:

certificate of survey	Class 1 vessel	Class 2 vessel
Class 3 vessel	domestic commercial vessel	fast craft
HSC Code	ISO	long
measured length	National Regulator	NSCV
operational area	partially smooth waters	passenger vessel
recognised organisation	restricted offshore operations	smooth waters
special vessel	unlimited domestic operations	vessel use category

Chapter 2 Requirements for fire safety

2.1 General requirements

The vessel must have fire safety measures designed, constructed, installed, maintained and serviced so that the required outcomes mentioned in Schedule 1 are met.

2.2 Meeting the required outcomes

The vessel will be taken to meet the required outcomes mentioned in Schedule 1 if the fire safety measures on the vessel comply with the deemed to satisfy solutions mentioned in Table 1 and Table 2.

Table 1 – Applicable standards

Kind of Vessel	Operational areas A & B Extended except tankers		Operational area B except tankers		Operational areas C, D or E except tankers	Tankers
	Lm ≥35m	Marine Order 15	Lm ≥35m	Marine Order 15		
Class 1 vessel	Lm <35m	Marine Order 15 (1) or NSCV Part C Section 4	Lm <35m	Marine Order 15 (1) or NSCV Part C Section 4	NSCV Part C Section 4	Not permitted
	Lm ≥35m	Marine Order 15	NSCV Part C Section 4			
Class 2 vessel	Lm <35m	NSCV Part C Section 4	NSCV Part C Section 4		NSCV Part C Section 4	Marine Order 15
	Lm ≥35m	Marine Order 15	NSCV Part C Section 4			
Class 3 vessel	NSCV Part C Section 4		NSCV Part C Section 4		NSCV Part C Section 4	Marine Order 15

Key:

NSCV Part C, Section 4 means that the vessel must comply with the deemed to satisfy solutions mentioned in Chapters 3 to 17 in this Section as applicable unless there is an equivalent means of compliance approved by the National Regulator in accordance with Marine Order 503.

(1) Marine Order 15 applies to Class 1 passenger vessels carrying more than 450 day passengers or more than 36 berthed passengers.

Table 2 – Applicable standards – EES Systems

Kind of Vessel	Operational areas A & B Extended except tankers		Operational area B except tankers		Operational areas C, D or E except tankers		Tankers
	All classes - EES systems	<i>Lm</i> ≥35m	Classed	<i>Lm</i> ≥35m	Classed	<i>Lm</i> ≥35m	
<i>Lm</i> <35m		C4 Ch.18	<i>Lm</i> <35m	C4 Ch.18	<i>Lm</i> <35m	C4 Ch.18	Not permitted

Key:

C4 Ch.18 means EES systems must comply with the deemed to satisfy solutions mentioned in Chapter 18 in this Section.

Classed means EES systems must be designed, constructed and maintained in accordance with the rules of a recognised organisation in addition to Table 1.

Chapter 3 Vessel categorisation

3.1 Vessel fire risk category

- (1) The vessel is to be assigned a *fire risk category* in accordance with Table 3.
- (2) There are four (4) fire risk categories, defined as follows:
 - (a) Fire Risk Category I (lowest risk).
 - (b) Fire Risk Category II (moderate risk).
 - (c) Fire Risk Category III (high risk).
 - (d) Fire Risk Category IV (highest risk).

Table 3 — Fire Risk Category

Kind of vessel	Operational area category (see NSCV Part B)				
	A and B Extended	B	C	D	E
Class 1 - Length of vessel	< 35 m (1)	<35 m (1)	All lengths	All lengths	All lengths
Class 1 - 13 to 36 day passengers	III	II	II	I	I
Class 1 - 37 to 200 day passengers	IV	III	II	II	II
Class 1: 201 to 450 day passengers	IV	IV	III	II	II
Class 1 - 451 or more day passengers	Marine Order 15 (2)	Marine Order 15 (2)	IV	IV	III
Class 1 - 13 to 36 berthed passengers	IV	III	II	II	II
Class 1 - 37 or more berthed passengers	Marine Order 15 (2)	Marine Order 15 (2)	IV	IV	IV
Class 2 – Length of vessel	< 35 m (1)	All lengths	All lengths	All lengths	All lengths
Fire Risk Category	II	II	I	I	I
Class 3 – Length of vessel	All lengths	All lengths	All lengths	All lengths	All lengths
Fire risk category	II	II	I	I	I

Key:

(1) Class 1A, 2A, 1B extended, 2B extended and 1B vessels $\geq 35\text{m}$ long are required to comply with the requirements specified in Marine Order 15 for SOLAS vessels. See Table 1

(2) 1A, 1B extended and 1B vessels carrying more than 450 day passengers or more than 36 berthed passengers are required to comply with the requirements specified in Marine Orders 15 for SOLAS vessels.

3.2 Categories of spaces

- (1) The spaces on a vessel are to be assigned a space category in accordance with Table 4, and
- (2) EES spaces must comply with the active and passive fire safety requirements prescribed in Chapter 18, and
- (3) Where there is any doubt as to the category of a space, the space is to be assigned and meet the higher space category standards.

3.3 Spaces of multiple classification

Where it is possible to assign two or more classifications to a space, it is to be provided with *active and passive fire protection measures* that satisfy the more stringent of the requirements specified for each applicable classification.

Table 4 - Categories of spaces

Space category	Description	Examples
High Fire Risk Spaces	<p>Spaces where, without appropriate controls, the likelihood and consequence of fire are high. Within such spaces, there is:</p> <p>(a) potential for the spillage or escape of potentially dangerous quantities of flammable liquid or explosive vapour, and</p> <p>(b) the presence of one or more sources of heat or other sources of ignition.</p>	<ul style="list-style-type: none"> • machinery spaces • ro-ro spaces • store spaces containing flammable liquids, including paint lockers • spaces containing dangerous goods • sales shops of deck area 50 m² or more containing packaged flammable liquids for sale and where no dedicated store is provided separately • spaces for storage and charging of portable lithium-ion batteries and/or lithium-ion battery powered equipment > 5kWh (1) • trunks in direct communication with the above spaces
Moderate Fire Risk Spaces	<p>Spaces that:</p> <p>(a) contain potentially dangerous quantities of flammable liquids but where the sources of ignition have relatively low frequency; or</p> <p>(b) contain heat sources or other sources of ignition but where the quantity or nature of material within the space to fuel a fire is such that the risk is significantly reduced.</p>	<ul style="list-style-type: none"> • small machinery spaces • medium machinery spaces • spaces for storage and charging of portable lithium-ion batteries and/or lithium-ion battery powered equipment > 500Wh and ≤ 5kWh (1) • galleys • sales shops of deck area less than 50 m² containing packaged flammable liquids for sale and where no dedicated store is provided separately
Accommodation Space	<p>Spaces that are likely to contain persons who:</p> <p>(a) are unfamiliar with the vessel,</p> <p>(b) may be asleep or disoriented at the time of an emergency, or</p> <p>(c) may inadvertently or deliberately initiate a fire.</p>	<ul style="list-style-type: none"> • sleeping rooms and cabins • mess rooms and cafe • pantries containing no cooking appliances • public spaces • toilets and washrooms • sales shops not containing flammable liquids for sale

Space category	Description	Examples
Minor Fire Risk Spaces	Spaces where the likelihood and/or consequence of fire is low.	<ul style="list-style-type: none"> spaces used for the carriage of cargo that is not dangerous goods closed spaces containing low flash point fuelled vessels and vehicles (e.g. transom Personal Watercraft /tender garages) spaces for storage and charging of portable lithium-ion batteries and/or lithium-ion battery powered equipment $\leq 500\text{Wh}$ (1) void spaces fuel tanks and spaces containing fuel tanks for fuel of flashpoint above 60°C storerooms including baggage or mail rooms not used for the storage of combustible or flammable liquids or dangerous goods
Control Stations	Spaces containing systems essential to the safety of persons, which, if destroyed or rendered unusable by fire, would substantially increase the risks to those on board.	<ul style="list-style-type: none"> operating compartment radio room central fire control station damage control station the emergency source of electrical power or the emergency switchboard fixed fire extinguishing control station, agent storage or machinery room
Escape or Evacuation Routes	Spaces essential for escape from spaces on board the vessel and for evacuation from the vessel, which if destroyed or rendered unusable by fire, would substantially increase the risks to those on board. Includes external deck spaces, corridors, stairways etc. if used for escape or evacuation.	<ul style="list-style-type: none"> corridors of length 14 m and over in accommodation spaces and corridors for escape and evacuation elsewhere enclosed stairways and stairway towers assembly stations survival craft stowage locations ship's side in way of survival craft stowage or embarkation point

Key:

(1) Storage capacity listed is the total cumulative total for all batteries stored in the space.

Note The title of each category is intended to be typical rather than restrictive.

Chapter 4 Passive fire protection measures

4.1 Storage of combustible or flammable oils

Storage for fuel oil, lubrication oil and other *combustible or flammable liquids* must not be located forward of the collision bulkhead.

Note On vessels not required to have a collision bulkhead, storage for fuel oil, lubrication oil and other combustible or flammable liquids should not be located in the forward extremity of the vessel.

4.2 Engine exhausts, boiler and galley uptakes

Internal combustion engine exhausts, boiler and *galley* uptakes and similar sources of ignition, must be:

- (a) kept clear of any *combustible materials*; and
- (b) insulated with *non-combustible* materials where the temperature of an exposed unprotected surface could exceed 93°C and either:
 - (i) persons, equipment, *flammable or combustible liquids* or other combustible items could come into contact with the exhaust system; or
 - (ii) the surface is within 230 mm of any combustible materials.

4.3 Ventilation systems

4.3.1 Ventilation closing appliances

- (1) The main inlets and outlets of all ventilation systems must be capable of being closed from outside the spaces being ventilated.
- (2) The controls must be easily accessible as well as prominently and permanently marked and must indicate whether the shut-off is open or closed.

Note there are specific requirements in addition to these for ducts passing through fire-resisting divisions including requirements for the fire dampers - see clause 4.6.3 & 4.6.4.

4.3.2 Separation of systems

The ventilation systems for *High Fire Risk Spaces*, *Moderate Fire Risk Spaces* and cargo must be separated from each other and from the ventilation systems serving other spaces.

4.4 Remote stops

- (1) All vessels must be provided with remote shutoffs for the fuel oil supply as well as for any ventilation and exhaust fans.
- (2) Remote shutoffs must be capable of operating when exposed to flame and heat from a fire within the space for the time specified in Table 5, Table 6 or Table 7.
- (3) Controls for remote shutoffs must be located in an easily accessible location outside the space which they service.

Note Where possible push-pull cables are not to be routed through high or moderate fire risk spaces. Where they are routed through such spaces, they are to be certified for exposure to flame or heat or suitably insulated to meet the requirements of this clause.

4.5 Containment of fire and control of smoke

4.5.1 Boundaries between categorised spaces

Depending upon the Fire Risk Category applicable to the vessel (as determined from Table 3), the boundaries of spaces must be protected to the extent required by Table 5, Table 6 or Table 7.

Note 1 When reading Table 5 to Table 7, the value above the diagonal line in a cell applies to the side of the bulkhead or deck exposed to the category of space corresponding to the vertical column. For steel divisions, the time rating above the diagonal line need not apply.

Note 2 When reading Table 5 to Table 7, the value below the diagonal line in a cell applies to the side of the bulkhead or deck exposed to the category of space corresponding to the horizontal row.

Table 5 — Requirements for Fire Risk Category I vessels

Category of space	High Fire Risk Spaces	Moderate Fire Risk Spaces	Accommodation Spaces	Minor Fire Risk Spaces	Control Stations	Escape or Evacuation Routes
	1	2	3	4	5	6
High Fire Risk Spaces	1	30(1)(2)(3)(4) ST	ST	ST	ST	ST
	2	30(1)(2)(3)(4)	30(1)(3)(4)	30(1)(4)	30(1)(3)(4)	30(1)(4)
Moderate Fire Risk Spaces	1	ST(2)(5)	Nil	Nil	Nil	Nil
	2	ST(2)(5)	Nil	Nil	Nil	Nil

Key:

ST means a *smoke-tight* division

30 means a 30-minute time rated *fire-resisting* division.

(1) the upper side of the decks of Ro-Ro spaces protected by an aqueous fixed fire-extinguishing system need not be insulated.

(2) a *fire-resisting* division or *smoke-tight* bulkhead or deck between such spaces need not be fitted if omitting the division would not materially affect the safety of the vessel. For example, a bulkhead may not be required between 2 storerooms. A fire-resisting division is required between a machinery space and a Ro-Ro space even though both spaces are in the same category.

(3) when steel construction is used, divisions need only be *smoke-tight non-combustible* without insulation.

(4) on class 2C, 2D, 2E, 3C, 3D or 3E vessels ≤25m, without accommodation for berthed persons, divisions need only be *smoke-tight* without insulation.

(5) *Small galleys* are not required to be separated from other spaces by a division. See 10.4.1.

Note 1 Whilst *fire-resisting* divisions may not be required on some fire risk category I vessels they are strongly recommended. Time rated *fire-resisting* divisions provide passive protection in the event of a fire. Construction with structural fire protection also ensures that the vessel can meet requirements for class or operational changes that will trigger retrofitting requirements e.g. changing from Class 2C or 3C to 2B or 3B.

Note 2 Escape and evacuation routes includes survival craft locations – see 12.3.

Note 3 The table keys do not apply for fuel tanks situated within a High Fire Risk machinery space, refer to Clause 7.3.2.2.

Table 6 — Requirements for Fire Risk Category II vessels

Category of space		High Fire Risk Spaces	Moderate Fire Risk Spaces	Accommodation Spaces	Minor Fire Risk Spaces	Control Stations	Escape or Evacuation Routes
		1	2	3	4	5	6
High Fire Risk Spaces	1	30 (1)(2)	15	ST	ST	ST (3)	ST
		30 (1)(2)	30 (1)	30 (1)	30 (1)(6)	30 (1)	30 (1)(4)
Moderate Fire Risk Spaces	2		15 (2)(5)	ST(5)	ST(5)	ST (3)(5)	ST(5)
			15 (2)(5)	15(5)	15 (5)(6)	15(5)	15 (4)(5)
Accommodation Spaces	3			ST (2)	ST	ST (3)(7)	ST
				ST (2)	ST	ST (7)	ST (4)
Minor Fire Risk Spaces	4				ST (2)	ST (3)	ST
					ST (2)	ST	ST (4)
Control Stations	5					ST (2)(3)	ST
						ST (2)(3)	ST (3)(4)
Escape or Evacuation Routes	6						Nil
							Nil

Key:

ST means a *smoke-tight* division

15 means a 15-minute time rated *fire-resisting* division.

30 means a 30-minute time rated *fire-resisting* division.

(1) means the upper side of the decks need not be insulated in Ro-Ro spaces and spaces of *Moderate Fire Risk* other than machinery spaces provided the entire space is protected by an aqueous fixed fire-extinguishing system complying with clause 4.4.

(2) a *fire-resisting* division or *smoke-tight* bulkhead or deck between spaces need not be fitted if omitting the division would not materially affect the safety of the vessel. For example, a bulkhead may not be required between 2 storerooms. A fire-resisting division is required between a machinery space and a Ro-Ro space even though both spaces are in the same category.

(3) *control stations* that contain auxiliary machinery for emergency purposes are to be provided with a 15-minute *fire-resisting* division.

(4) refer to clause 9.7.3 & 12.1 for requirements for stairways penetrating decks.

(5) *Small galleys* are not required to be separated from other spaces by a division on a vessels carrying ≤ 36 passengers. See 10.4.1.

(6) when steel construction is used, divisions adjacent to minor risk spaces need only be *smoke-tight* without insulation.

(7) not required for an operating compartment on a vessel carrying less than 200 passengers.

Note 1 Escape and evacuation routes includes survival craft locations – see 12.3.

Note 2 The table keys do not apply for fuel tanks situated within a High Fire Risk machinery space, refer to Clause 7.3.2.2

Table 7 – Requirements for Fire Risk Category III and IV vessels

Category of space		High Fire Risk Spaces	Moderate Fire Risk Spaces	Accommodation Spaces	Minor Fire Risk Spaces	Control Stations	Escape or Evacuation Routes
		1	2	3	4	5	6
High Fire Risk Spaces	1	60 (2)	30	STNC	STNC	STNC (3)	STNC
		60 (1)(2)	60 (1)	60 (1)	60 (1)(5)	60 (1)	60 (1)(4)
Moderate Fire Risk Spaces	2		30 (2)	STNC	STNC	STNC (3)	STNC
			30 (2)	30	30 (5)	60	30 (4)
Accommodation Spaces	3			STNC (2)	STNC	STNC (3),(7)	STNC
				STNC (2)	STNC	30 (7)	30 (4)(6)
Minor Fire Risk Spaces	4				STNC (2)	STNC (3)	STNC
					STNC (2)	30 (5)	STNC (4)
Control Stations	5					STNC (2)(3)	STNC
						STNC (2)(3)	STNC (3)(4)
Escape or Evacuation Routes	6						Nil
							Nil

Key:

STNC means a *smoke-tight* division made of *non-combustible* or *fire-restricting materials*.

30 means a 30-minute time rated *fire-resisting division*.

60 means a 60-minute time rated *fire-resisting division*.

(1) the upper side of the decks need not be insulated in Ro-Ro spaces and spaces of Moderate Fire Risk other than machinery spaces provided the entire space is protected by an aqueous fixed fire-extinguishing system complying with clause 4.4.

(2) a *fire-resisting division* or *smoke-tight non-combustible* bulkhead or deck between such spaces need not be fitted if omitting the division would not materially affect the safety of the vessel. For example, a bulkhead may not be required between 2 storerooms. A fire-resisting division is required between a machinery space and a Ro-Ro space even though both spaces are in the same category.

(3) *control stations* that contain auxiliary machinery for emergency purposes are to be provided with a 30 minute fire-resisting division.

(4) refer to clauses 9.7.3 & 12.1 for requirements for stairways penetrating decks.

(5) when steel construction is used, fire-resisting divisions adjacent to minor risk spaces need only be *smoke-tight non-combustible* without insulation.

(6) division can be reduced to *smoke-tight non-combustible* where the accommodation space does not include sleeping rooms.

(7) not required for an operating compartment on a vessel of Fire Risk Category III carrying less than 200 passengers.

Note 1 Escape and evacuation routes includes survival craft locations – see 12.3.

Note 2 The table keys do not apply for fuel tanks situated within a High Fire Risk machinery space, refer to Clause 7.3.2.2

4.5.2 Maintenance of structural integrity

In addition to the protection specified in clause 4.5.1, hull, deck, sides and other structural members that are either bounding or within *high, moderate, control, escape or evacuation spaces* must be constructed or protected so that, when exposed to fire for the period specified in Table 5, Table 6 or Table 7, as modified by the keys, structural integrity is maintained. This integrity must be sufficient to avoid:

- (a) a loss of watertight integrity of the vessel that could endanger persons on the vessel; or
- (b) a partial or total collapse of the vessel's structure that could endanger persons on the vessel.

Example 1 Unprotected structural pillars supporting decks carrying survival craft above a space.

Example 2 Unprotected side structure of an aluminium hull above the waterline within a *High Fire Risk* or *Moderate Fire Risk* space.

Note 1 Uninsulated structures of steel satisfy this clause – see clause 4.5.2.2.

Note 2 For 4.5.2 the period is the period specified in Table 5, Table 6 or Table 7 as modified by any items in the key of these tables. E.g. Table 5, key item (4).

4.5.2.2 Structures of steel

If the structures mentioned in clause 4.5.2 are made of steel, they satisfy clause 4.5.2 without insulation.

4.5.2.3 Structures of aluminum alloy, fibre reinforced plastic or other materials

If the structures mentioned in clause 4.5.2 are made of aluminium alloy, fibre reinforced plastic or other material, they must be insulated with structural fire protection to the extent required to meet the requirements for *fire-resisting divisions* for the period mentioned in Clause 4.5.2 – see also Figure 1b).

Note 1 Resolution MSC.45 (65) requires the structural core of load bearing fire-resisting divisions made of aluminium to not rise more than 200C above the initial temperature at any time within the classification period.

Note 2 Resolution MSC.45 (65) requires load bearing fire-resisting divisions not made of aluminium or steel to meet additional load and deformation criteria at all times within the classification period.

4.5.2.4 Structures in contact with water

Where for clause 4.5.2 the proximity of the structure to seawater is taken to provide sufficient protection against the effects of exposure of hull structure to the heat of a fire, the arrangement of the *fire-resisting division* protection must:

- (a) provide protection at all normal conditions of loading including the lightweight condition; and
- (b) take into account the effect of temperature on the hull and hull stiffening in contact with water and heat transfer from any uninsulated structure in contact with water to insulated structure above the water.

Note Insulation of hull sides to a level 300mm below the design lightweight waterline provides a factor of safety should a discrepancy arise once the vessel is constructed, see [Figure 1b](#)).

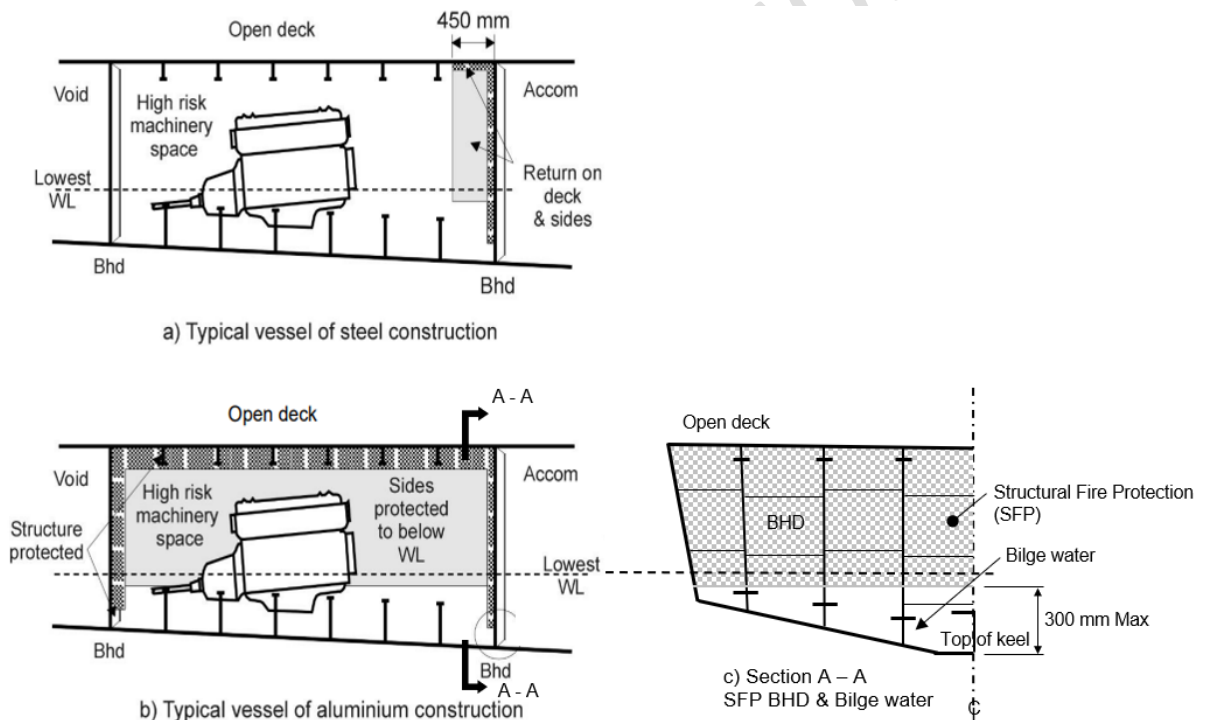
4.5.3 Returns on structural fire protection at the edges of fire-resisting divisions

- (1) The structural fire protection of a deck, bulkhead or structural member must be carried past a penetration, intersection or terminal point for the distance necessary to prevent the transmission of excessive levels of heat into the adjacent structure.
- (2) Where there is an intersection by a deck or bulkhead of different values, the structural fire protection with the higher value must continue on the deck or bulkhead with the insulation of the lesser value for the required distance.
- (3) For clause (1) & (2) the distance on the return must be $\geq 450\text{mm}$ – see Figure 1(a).

4.5.4 Arrangements of structural fire protection to accommodate drainage

- (1) Where the lower end of structural fire protection terminates on the immersed bottom shell in the bilge, the structural fire protection may be terminated a distance not exceeding 300mm above the top of keel as shown in Figure 1(c).
- (2) Structural fire protection fitted to bulkheads of EES Spaces must cover bulkheads completely and are not permitted to terminate 300mm above the top of keel as shown in Figure 1(c).

Figure 1 - Structural fire protection details



4.6 Penetrations through fire-resisting divisions

Penetrations through *fire-resisting divisions* are to be designed and installed to prevent the transmission of fire, heat and smoke through the division.

4.6.1 Pipe penetrations

4.6.1.1 Pipe fire endurance

- (1) Pipes and fittings in *High Fire Risk Spaces* or *Moderate Fire Risk Spaces* that are used in systems essential to the safe operation of the vessel or contain *combustible liquid* or outboard water where leakage or failure could result in fire or in flooding of watertight compartments, must:
 - (a) be of a type that have been *assessed* in accordance with the fire endurance requirements of IMO Resolution A.753(18); or
 - (b) have a minimum melting temperature in accordance with Table 8.
 - (i) For Table 8 the time rating of the fire-resisting division is the time specified in Table 5, Table 6 or Table 7 as applicable, without modification by the table key.

Table 8 Minimum melting temperatures of uninsulated pipes in *High Fire Risk* or *Moderate Fire Risk* spaces that penetrate time rated fire-resisting divisions

Time rating of fire-resisting division Min.	Minimum melting temperature of pipe material Degrees C	
	High Fire Risk Spaces	Moderate Fire Risk Spaces
15	No application	650°C
30	850°C	850°C
60	950°C	No application

4.6.1.2 Assessment of pipe penetrations

- (1) Except as provided in clause (2), all pipe penetrations through *fire-resisting divisions* must have been assessed in accordance with *FTP Code*, Annex 1, Part 3, A class division requirements.
- (2) A pipe penetration made of *steel or equivalent material* is deemed-to-satisfy the requirements mentioned in clause (1) without being *assessed* provided the pipe:
 - (a) has a thickness of 3 mm or greater;
 - (b) has a length of not less than 900 mm (preferable 450mm on each side of the division);
 - (c) has no openings; and
 - (d) is suitably insulated by extension of the insulation of the same time rating as the division.

4.6.2 Electrical penetrations

Electrical penetrations through fire-resisting divisions must be *assessed* in accordance with *FTP Code*, Annex 1, Part 3, A class division requirements.

4.6.3 Ventilation ducts

4.6.3.1 Construction and installation

- (1) Ventilation ducts must be arranged, constructed and installed to maintain the effectiveness of *fire-resisting divisions* within the vessel.

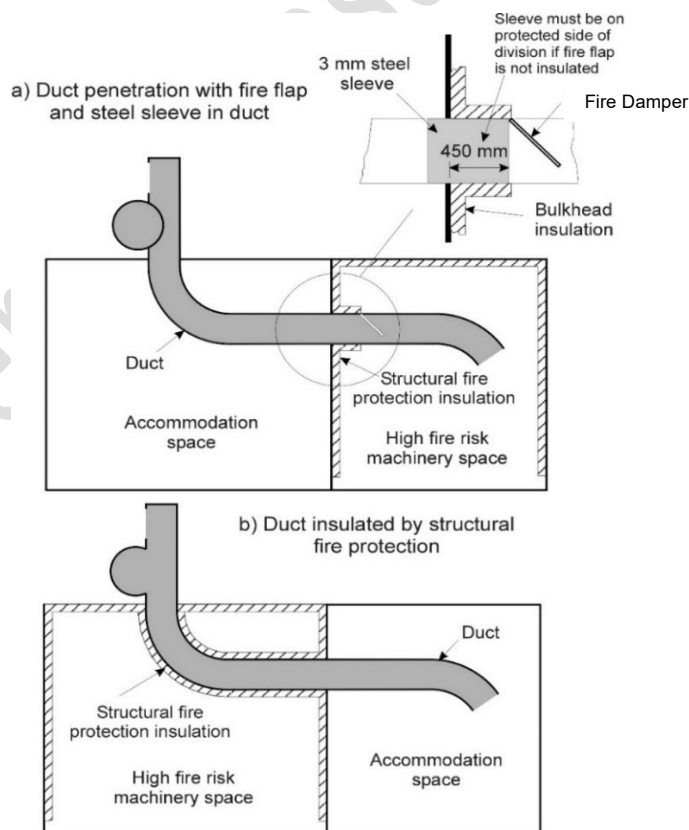
4.6.3.2 Assessment of ducts

- (1) A duct which penetrates a *fire-resisting division* between two *categorised spaces* must be *assessed* in accordance with *FTP Code*, Annex 1, Part 3, A class division requirements.
- (2) However, the portion after a fire damper need not be *assessed*, provided the duct between the *fire-resisting division* and the damper is made of *steel or equivalent material* and insulated to the same standard as required for the *fire-resisting division*. See Figure 2(a)
- (3) For (2), a duct penetration made of or lined with a steel sleeve directly joined to the duct by means of riveted or screw flanges or by welding; and having a thickness of not less than 3 mm, and extending not less than 450mm on the insulated side of the division is deemed to satisfy this requirement. See Figure 2(a)

4.6.4 Fire dampers

- (1) Where a ventilation duct passes through a *fire-resisting division*, a closing *fire damper* must be fitted adjacent to the division. See Figure 2(a)
- (2) The *fire damper* mentioned in clause (1) can be omitted where a ducts pass through spaces surrounded by *fire-resisting divisions* without serving those spaces, providing that the duct is constructed or protected so as to provide the same fire resistance as the divisions it penetrates. See Figure 2(b)

Figure 2 - Ducts, duct penetrations and fire dampers



4.6.4.2 Assessment of fire dampers

- (1) Fire dampers on ducts which penetrate a *fire-resisting division* between *categorised spaces* must be *assessed* in accordance with *FTP Code*, Annex 1, Part 3, A class division requirements, including assessment of the:
 - (a) fire dampers; and
 - (b) their relevant means of operation.
- (2) However the assessment in (1) is not required if the damper is made from steel of thickness of not less than 3mm and it is capable of operation after exposure to heat or flame or automatically fail safes to the closed position in the event of a fire.
- (3) Fire dampers on ducts that penetrate other boundaries or divisions of high or moderate risk spaces must be constructed or protected so that, when exposed to fire for the time specified in Table 5, Table 6 or Table 7, without modification by the table keys, their integrity is maintained and they can continue to operate.

Example an engine room air in duct penetrating an open deck.

Note an uninsulated aluminium or fibre reinforced plastic damper does not satisfy clause (3).

4.6.4.3 Manual operation

- (1) All *fire dampers* must be capable of being manually closed.
- (2) *Fire dampers* fitted on ducts serving spaces not normally manned such as stores and toilets must be capable of manual operation from outside the served spaces.
- (3) For other *fire dampers*, the arrangements for manual closure must allow manual operation from each side of the division in which they are fitted.
- (4) On passenger vessels required to have centralised fire control functions by clause 5.5 *fire dampers on fire-resisting divisions* must also to be capable of being remotely closed from a normally continuously manned central control station.

4.6.4.4 Automatic operation

For vessels of *Fire Risk Category IV*, the *fire damper on fire-resisting divisions* must be of a fail-safe, automatic closing type that is also capable of manual closure.

4.6.4.5 Ducts passing through smoke tight divisions

- (1) Where a ventilation duct serves an *Accommodation Space*, *Escape or Evacuation Route*, or *Control Station*, and that ventilation duct passes through a *smoke-tight* division; a manually operated smoke damper must be fitted at the penetration of the ventilation duct through the *smoke-tight* division.
- (2) The smoke damper must be operable from the space served by the ventilation duct.

4.6.5 Doors, hatches and other openings in fire-resisting divisions

Openings in *fire-resisting divisions* must be provided with a permanently attached means of closing and are to be at least as effective for resisting fires as the divisions in which they are fitted.

4.6.5.1 Performance of doors

- (1) Doors and door frames in *fire-resisting divisions*, with the means of securing them when closed, must provide resistance to fire as well as to the passage of smoke and flame equivalent to that of the bulkheads in which the doors are situated.
- (2) The resistance to fire mentioned in (1) must be *assessed* in accordance with *FTP Code*, Annex 1, Part 3, A class division requirements.

- (3) However, the assessment in (2) is not required for those doors being *steel or equivalent* watertight doors fitted in watertight bulkheads.

4.6.5.2 Operation of doors

Each door is to be able to be opened and closed from each side of the bulkhead by one person only.

4.6.5.3 Ventilation openings

- (1) Ventilation openings must not be included in doors passing through *fire-resisting divisions*.
- (2) Doors not passing through *fire-resisting divisions* may have ventilation openings in the lower portion. The total net area of any such opening or openings are not to exceed 0.05 m² and are to be fitted with a grille of non-combustible material.

4.6.6 Windows, portlights and side-scuttles within High Fire Risk space

Windows, portlights and side-scuttles in *fire-resisting divisions* within a *High Fire Risk space*, must be constructed to preserve the fire integrity requirements of the type of division into which they are fitted. Fire integrity is to be *assessed* in accordance with *FTP Code*, Annex 1, Part 3, A class division requirements.

4.6.7 Penetrations through divisions on outer boundaries of a vessel

For spaces other than *High Fire Risk Spaces* the requirements for *fire-resisting divisions* on the outer boundaries of a vessel does not apply to doors, glass partitions, windows and side-scuttles, except for those in superstructures and deckhouses facing lifesaving appliances, embarkation and external assembly station areas, external stairs and open decks used for escape routes, and windows situated below a survival craft or marine evacuation system (MES) embarkation area.

4.6.8 Materials for overboard fittings

Overboard scuppers, sanitary discharges, and other outlets within spaces of *High Fire Risk* or *Moderate Fire Risk* that are 230 mm or less above the deepest load waterline must be constructed of materials resistant to exposure to heat where the failure of the material in the event of fire would give rise to unacceptable risks associated with flooding.

4.6.9 Lifts and dumb-waiters

- (1) Trunks for lifts and dumb-waiters must be:
 - (a) constructed to maintain the fire integrity of boundaries; and
 - (b) provided with a means of closing that permits the control of draught and smoke.
- (2) Where the machinery for lifts and dumb-waiters falls within the criteria for a space of *small machinery space*, the machinery must be arranged in a separate room, to be considered as a space of *Moderate Fire Risk*, except that small openings for lift cables are permitted.

4.7 Materials used in fit out

4.7.1 Certain highly flammable materials prohibited

- (1) Paints, varnishes, or any similar preparations must not be used if they contain a nitro-cellulose or other highly flammable base.
- (2) Fabrics containing nitro-cellulose must not be fitted.

4.7.2 Insulation materials

- (1) Insulation for sound control or control of ambient temperature must comply with Table 9.
- (2) All other insulating materials must be *non-combustible*.
- (3) Vapour barriers and adhesives used in conjunction with insulation, as well as the insulation of pipe and fittings for cold service systems, need not be of *non-combustible* materials and are to be kept to the minimum quantity practicable.

Table 9 Fire characteristics of insulation for sound control or control of ambient temperature

	High Fire Risk Space	Moderate Fire Risk Space	Minor Fire Risk Space	Other spaces
Fire Risk Category I	ISO 4589-3	ISO 4589-3	No Nitro-Cellulose	ISO 4589-3
Fire Risk Category II	NC or LFS	ISO 4589-3 (2)	No Nitro-Cellulose	ISO 4589-3
Fire Risk Category III	NC or LFS	NC or LFS	ISO 4589-3	ISO 4589-3 (2)
Fire Risk Category IV	NC or LFS	NC or LFS	ISO 4589-3	NC or LFS

Key:

NC means a *non-combustible* material

LFS means *low flame spread* surface.

ISO 4589-3 means the material must have an oxygen index of at least 21 when assessed in accordance with ISO 4589-3, at an ambient temperature of 60°C.

No Nitro-Cellulose means paints, varnishes, or any similar preparations must not be used if they contain a nitro-cellulose or other highly flammable base and fabrics containing nitro-cellulose must not be fitted.

(1) Includes insulation for air-conditioning, environmental comfort or refrigeration.

(2) ISO 4589-3 compliant materials used in conjunction with *fire-resisting divisions* must either comply with the requirements for *fire-resisting divisions* or satisfy the requirements for *low flame spread* surfaces.

4.7.2.2 Protection of insulation surfaces against oil penetration

In spaces where penetration of oil products is possible:

- (a) the surface of insulation, including structural fire protection insulation, must not absorb oil or oil vapours, and
- (b) the insulation must have protection where the insulation is vulnerable to damage.

Note Insulation of the type provided with an impervious outside layer is suitable. Where the insulation is cut, the edges could be protected against impregnation by use of tape having comparable fire characteristics.

4.7.3 Ceilings, linings, furniture, draperies, curtains, upholstery, bedding and deck finish materials

Ceilings and linings, furniture, draperies and curtains, upholstery, bedding and deck finish materials must comply with Table 10.

Table 10 – Fit-out material limitations

Space without aqueous fixed fire-extinguishing system	Fire Risk Category I	Fire Risk Category II	Fire Risk Category III	Fire Risk Category IV
Space with aqueous fixed fire-extinguishing system	Fire Risk Category I or II (1)	Fire Risk Category III (1)	Fire Risk Category IV	
Linings, ceilings and doors	No Nitro-Cellulose	Group 1, 2 or 3	Group 1 or 2	Group 1 or non-combustible or FTP Code (2)
Furniture	No Nitro-Cellulose	No Nitro-Cellulose	No Nitro-Cellulose	FTP Code
Draperies & curtains	No Nitro-Cellulose	No Nitro-Cellulose	No Nitro-Cellulose	FTP Code
Upholstery	No Nitro-Cellulose	No Nitro-Cellulose	No Nitro-Cellulose	FTP Code
Bedding	No Nitro-Cellulose	No Nitro-Cellulose	No Nitro-Cellulose	FTP Code or BS 7176 low hazard rating
Deck finish materials	No Nitro-Cellulose	Level 1, 2 or 3	Level 1 or 2	Level 1 or non-combustible or FTP Code (2)

Key

Group 1, Group 2 and **Group 3** means lining, ceiling and door materials classified as Group 1, 2 & 3 in accordance with the National Construction Code (NCC) 2016, when *assessed* in accordance with ISO 9705; or AS/NZS 3837 where applicable;

Level 1, Level 2 and **Level 3** means floor surface materials, when *assessed* in accordance with AS ISO 9239-1, has a critical radiant flux not less than;

- Level 1 – 4.5 kW/m²
- Level 2 – 2.2 kW/m²
- Level 3 – 1.2 kW/m².

FTP Code means materials that comply with the appropriate sections of Fire Test Procedures Code.

No Nitro-Cellulose means paints, varnishes, or any similar preparations are not to be used if they contain a nitro-cellulose or other highly flammable base. Fabrics containing nitro-cellulose are not to be fitted.

(1) means the fitting of an aqueous fixed fire-extinguishing system is not required under on vessels of Fire Risk Category I, II or III. However, optional fitting of such systems allows a reduction in fire-restricting materials on vessels of Fire Risk Category II and III.

(2) materials used in spaces not fitted with an aqueous fixed fire extinguishing system complying with the requirements of this section, must also have a maximum smoke development rate of 750 percent-minutes.

4.7.4 Exposed surfaces in accommodation spaces

For areas within *accommodation spaces*, where a material limitation other than *No Nitro-Cellulose* is specified in Table 10 exists, exposed portions of bulkheads, deckheads or decks including any partial bulkheads or decks, must:

- (a) be non-combustible; or
- (b) be enclosed with linings, ceiling or floor coverings complying with the applicable standards in mentioned in Table 10.

4.7.5 Facings, mouldings, decorations and veneers

4.7.5.1 Within accommodation spaces

- (1) On vessels of vessels of *Fire Risk Category II, III & IV*, *accommodation space* boundaries with facings, mouldings, decorations and veneers made of *combustible materials*, the facings, mouldings, decorations and veneers must:
 - (a) have a calorific value¹ not exceeding 45 MJ/m² of the area for the thickness used; and
 - (b) not have a total volume exceeding the volume equivalent to a 2.5 mm veneer on the combined area of the walls and ceiling.
- (2) Clause (1) does not apply if the space is fitted with an *Aqueous fixed fire-extinguishing system* complying with this section.

Note The requirements of this clause do not apply to furniture fixed to linings or bulkheads.

4.7.5.2 In other spaces

Combustible veneers are permitted on non-combustible and fire-resisting divisions, provided that they satisfy the requirements for a low flame spread surface.

4.7.5.3 Smoke generation potential and toxicity

- (1) For vessels in *Fire Risk Category IV*, paints, varnishes and other finishes used on exposed interior surfaces in all spaces other than *Minor Fire Risk Spaces* must not be capable of producing excessive quantities of smoke and toxic products.
- (2) Such finishes are to comply with *FTP Code – Part 2* or *Annex 2*.

¹ * Refer to the recommendations published by the International Standards Organisation, in particular, Publication ISO 1716 on Determination of calorific potential.

Chapter 5 Active fire protection measures

5.1 Fire detection and alarm

5.1.1 Application

A fixed *fire detection and fire alarm system* must be provided to monitor spaces on vessels in accordance with Table 11.

Note Not all vessels are required to be fitted with fire detection and fire alarm system, for example, some dumb barges and other vessels of relatively low fire risk.

Table 11 Spaces requiring a fire detection system

Location	Required on
Machinery Spaces	All vessels
Medium Machinery Spaces	All vessels
EES Spaces	All vessels Refer to Ch 18
Small Machinery Spaces	Vessels of fire risk category II, III and IV
Control Stations	All vessels of fire risk category III, IV; and Vessels of fire risk category II carrying more than 200 passengers
Ro-Ro Spaces	All vessels
Accommodation Spaces	All vessels of fire risk category III, IV; and Vessels of fire risk category II carrying more than 200 passengers
Closed escape and evacuation spaces	All vessels of fire risk category III, IV; and Vessels of fire risk category II carrying more than 200 passengers
Closed vehicle spaces	Class 1 vessels
Cargo Spaces	Vessels of fire risk categories III and IV

5.1.2 System to be suited to application

The *fire detection and fire alarm system* must be suited to the nature of the spaces, the fire growth potential in the spaces and the potential generation of smoke and gases within the spaces.

5.1.3 Standards for fire detection and alarm systems

The fire detection and fire alarm systems must comply with:

- (a) *FSS Code* – Chapter 9; or
- (b) *HSC Code*, clause 7.7; or
- (c) AS 1603.

5.1.4 Limitations on the use of thermal detectors

Detection systems using only thermal detectors must not be used in spaces higher than 5m.

Note Dual spectrum flame detectors are more effective than thermal detectors in spaces of restricted height of less than 5m.

5.1.5 Fire alarms

- (1) A fixed fire detection and fire alarm system must provide audible and visual alarms.
- (2) Fire alarms must be easily distinguished from other alarms that do not indicate fire.

- (3) Fire alarms must be located so that they can be monitored from the operating compartment and in such other places to ensure a responsible member of the crew hears them when the operating compartment is unmanned.

5.1.6 Class 1 passenger vessels

For Class 1 vessels of *Fire Risk Category* II, III or IV, the *fixed fire detection and fire alarm system* must be of the self-monitored type.

Note A self-monitored system is designed on the fail-safe principle to self-check for loss of system functionality (i.e. an open detector circuit triggers an alarm).

5.2 Manual call points

Manual call points must be provided as specified in Table 12;

- (a) within 20m of any point; and
- (b) integrated into a *fixed fire detection and fire alarm system*.

Table 12 — Spaces requiring manual call points

Location	Required on
Ro-Ro Space	All vessels - within 20m of any point & close to each escape exit
Accommodation & Control station spaces	Vessels of fire risk category IV; Vessels of fire risk category III; and Vessels of fire risk category II carrying more than 200 passengers

Note Manually operated call points need not be provided in the *operating compartment* of a vessel where the fire detector control panel is located within the *operating compartment*.

5.3 Smoke alarms

Vessel *accommodation spaces* that are not required to be fitted with, or have not elected to be fitted with, a *fixed fire detection and fire alarm system* in accordance clause 5.1.1 must be provided with *interconnected photoelectric smoke alarms* as specified in Table 13.

Note Most vessels will be required to have a *fixed fire detection system* fitted to machinery spaces in accordance with clause 5.1.1. This system may be designed and installed to provide smoke detection to accommodation spaces to meet the requirement at clause 5.3 in lieu of utilising *interconnected photoelectric smoke alarms*.

Table 13 — Spaces requiring smoke alarms

Location	Required in
<i>Accommodation Spaces</i>	Vessels of fire risk category II carrying less than 200 passengers or that have berthed accommodation, smoke alarms must be installed in all accommodation spaces and all stairways, corridors and escape routes

5.3.1 Standard for smoke alarms

The smoke alarms specified in clause 5.3 must be *interconnected* photoelectric smoke alarms complying with AS 3786 and audible from a control station.

5.3.2 Positioning of alarms

- (1) Alarms must be located:
 - (a) for optimum performance, and
 - (b) so as to avoid positions:
 - (i) near beams and ventilation ducts or other positions where patterns of air flow could

- adversely affect performance, and
 - (ii) where impact or physical damage is likely
 - (c) in accordance with spacing requirements as tested, approved and recommended by the manufacturer
- (2) Detectors located in overhead positions should be at least 0.5 metres away from bulkheads.

External consultation draft

5.4 Fixed fire-extinguishing systems

5.4.1 Application

A *Fixed fire-extinguishing system* must be provided in spaces on vessels to the extent specified in Table 14.

Table 14 — Spaces requiring *fixed fire-extinguishing systems*

Location	Requirement
High fire risk machinery spaces	Required
Medium Machinery Spaces	Required
EES Spaces	Required – refer to Chapter 18
Closed Ro-Ro spaces	Fixed gas, high-expansion foam or water-spraying system required
Open Ro-Ro spaces	Water-spraying system required for each open Ro-Ro spaces having a deck above
Cargo spaces containing dangerous goods	Required
Store spaces containing flammable liquid	Required
Galleys	Galley automatic local fire extinguishing systems required for each deep fat cooker on any vessel and each cooking range or similar appliance in Fire Risk Category III or IV vessels carrying more than 36 passengers.
Accommodation spaces	Aqueous system required on Fire risk category IV with more than 200 day passengers, or more than 36 berthed passengers.
Closed vehicle spaces	All vessels
Cargo spaces (other than <i>low risk cargo spaces</i>)	Required for Fire Risk Category II and III vessels $\geq 55\text{m}$; and Fire risk category IV vessels $\geq 45\text{m}$

5.4.2 System to be suited to application

A *fixed fire-extinguishing system* fitted to protect a space or an item of equipment must be suited to:

- (a) the likely types of fire hazards within the space or associated with the item of equipment;
- (b) the characteristics of the space including the dimensions of the space, movement of air within the space and whether the space can be effectively sealed; and
- (c) special risks associated with the space or item of equipment such as the presence of:
 - (i) essential equipment;
 - (ii) electrical equipment; or
 - (iii) persons that might be within the space including:
 - (A) persons that could be exposed to an accidental discharge; and
 - (B) fire-fighting personnel.

5.4.3 Standards for fixed fire-extinguishing systems

The *fixed fire-extinguishing system* must be of a type designed, *assessed*, manufactured, installed and tested in accordance with a standard listed in Table 15 or another standard determined by the national regulator.

Table 15 — Acceptable standards for fixed fire-extinguishing systems

Type	Standard
Gaseous fixed fire-extinguishing systems	FSS Code – Chapter 5; AS 4214; or AS ISO 14520
Foam fixed fire-extinguishing systems	FSS Code – Chapter 6
Aerosol fixed fire-extinguishing systems	IMO MSC/Circ. 1270; AS 4487; or ISO 15779
Pressure water fixed fire-extinguishing systems (including automatic fire sprinkler systems)	FSS Code – Chapter 7 & 8; IMO MSC/Circ.1165, as amended by MSC.1/Circ.1269 and MSC.1/Circ.1386 NFPA 15; NFPA 750; AS 2118; AS 4587; or SP-method 2377
Dry chemical fixed fire-extinguishing systems	NFPA 17
Galley automatic local fire extinguishing systems	UL 300 (4); ISO 15371; or NFPA 17

Note The relevant standard contains provisions for determining the quantity of extinguishing agent, arrangements for discharge, and the means for protecting personnel from accidental discharge.

5.4.4 Closing appliances for fixed gas, water mist or aerosol fire-extinguishing systems

Where a fixed gas, water mist or aerosol fire-extinguishing system is used, openings that may admit air to, or allow gas, aerosol or mist to escape from, a protected space must be capable of being effectively sealed from outside the protected space.

Note Other clauses within this Section may also require that a space be effectively sealed. The closing down of a space also serves to suppress a fire by starving it of oxygen, independent of the presence or type of extinguishing system.

5.4.5 Protection of components of the fixed fire-extinguishing system

Components of a *fixed fire-extinguishing system*, including pumps and storage containers, must be located:

- (a) in a space behind the collision bulkhead; and
- (b) outside the space protected by the *fixed fire-extinguishing system*; to the extent necessary to isolate any components of the system that would be vulnerable to exposure to a fire within the protected space.

5.4.6 Storage of gaseous fire-extinguishing agent

- (1) Where containers for gaseous extinguishing agent are located outside the protected space, the room for storage of these containers must:
 - (a) not be used for any other purpose;
 - (b) be situated in a safe and readily accessible position;
 - (c) be effectively ventilated;
 - (d) have an entrance from the open deck that is independent from spaces that are protected by the system;
 - (e) have access doors that open outwards; and
 - (f) have gastight boundaries (bulkheads and decks).
- (2) Carbon dioxide storage must be located at deck level to minimise the risks to persons in the event of leakage.

5.4.7 Pre-release alarm

- (1) An automatic audible and visual warning must be given of the impending release of fire-extinguishing agent into any space in which personnel normally work, or to which they have access. The alarm permits the orderly evacuation of the space and provides time to shut down machinery and seal the space.
- (2) The alarm must operate for a suitable period before the agent is released, but not less than 20 seconds.
- (3) The evacuation alarm must be separate and distinct from any fire alarm, including a different sound, separate warning lights and wiring.
- (4) The time delay before release of agent must be either engineered into the system or achieved by delaying the manual operation of the release in accordance with appropriate instructions posted adjacent to the release mechanism.

5.4.8 Limitations on automatic activation

- (1) *Fixed fire-extinguishing systems* must be provided with a means of manual activation.
- (2) Automatic release of fire-extinguishing medium must not occur, except for:
 - (a) aqueous fixed fire-extinguishing systems in **accommodation spaces**
 - (b) pressure water-spraying systems in *Ro-Ro spaces*, or
 - (c) automatic local-fire extinguishing systems in galley spaces.

Note Water-mist systems in *Ro-Ro spaces* may require the space to be sealed before discharge of the fire-extinguishing agent.

5.4.9 Controls

- (1) Controls for the *fixed fire-extinguishing system* must be readily accessible and simple to operate.
- (2) Controls must be grouped together in as few locations as possible at positions not likely to be cut off by a fire in the protected space.
- (3) Controls must be capable of operating when exposed to flame and heat from a fire within the space for the time specified in Table 5, Table 6 or Table 7 without modification by the table keys.

Note Where possible push-pull cables are not to be routed through spaces of high or moderate fire risk. Where they are routed through such spaces, they are to be suitably insulated to meet the requirements of this clause.

5.4.10 Instructions

- (1) At each control location there must be clear instructions on the use and operation of the *fixed fire-extinguishing system*.
- (2) The instructions must include all prerequisite tasks and possible effects on the safety of personnel.
- (3) Where appropriate, a warning should be displayed highlighting potential risks of premature release or re-entry such as toxicity, asphyxiation and/or reduced visibility.

5.4.11 Systems that serve more than one space

Where the extinguishing agent is required to protect more than one space, the quantity of agent available need not be more than the largest quantity required for protecting any one space.

5.4.12 Over-pressure or under-pressure in space protected

If the release of a fire-extinguishing agent produces significant over- or under-pressurisation in the protected space, means must be provided to limit the induced pressures to acceptable limits to avoid structural damage.

5.5 Centralised fire control functions on passenger vessels

- (1) Vessels with a fire risk category specified in Table 16, must be arranged with a *central control station* in the *operating compartment* or another normally continuously manned *Control Station* having a safe access from the open deck.
- (2) The *central control station* must contain remote indicators and controls for monitoring and operating the equipment listed in Table 17, to the extent that such equipment is fitted on the particular vessel.
- (3) The control panels must be continuously powered and are to have an automatic changeover to standby power supply in case of loss of normal power.

Note IMO Resolution A.830(19) specifies types of alarms and indicators for various functions and may be used as guidance.

Table 16 — Grouping of remote shut-downs and controls

Category	Application
Fire Risk Category I	Not required
Fire Risk Category II	Not required
Fire Risk Category III	Applies to vessels carrying more than 450 passengers.
Fire Risk Category IV	Applies

Table 17 — Functions centralized in a central control station

Equipment	Functions
Fixed fire detection and fire alarm systems	Indicators and controls
Fixed fire extinguishing systems	Indicators and controls
General and evacuation alarms	Controls
Main fire pumps	Controls
Fire doors	Indicators and closures
Machinery space and other High Fire Risk Space fire flaps and fire dampers	Indicators and closures
Watertight doors	Indicators and closures
Ventilation fans	Indicators and controls
Fuel transfer pumps, fuel pumps, lubricating oil service pumps, thermal oil circulating pumps, oil separators	Remote stops
Communication systems including telephones	Operation and controls
Public address systems	Operation and controls

5.6 Portable fire extinguishers & fire blankets

Vessels must be provided with portable fire extinguishers and where specified fire blankets, of a type and quantity appropriate to the potential fire hazards within the space as specified in accordance with this section.

5.6.1 Quantity

- (1) Each space must be provided with the number of fire extinguishers specified for that type of space mentioned in Table 19.
- (2) Each space must be provided with the number of fire blankets specified for that type of space mentioned in Table 18.
- (3) The total number of portable fire extinguishers provided on a vessel is to be the sum of the number specified for individual spaces mentioned in Table 19.
- (4) Where no extinguishers are specified in Table 19, at least one extinguisher may still be required, see clause 5.6.1.2.

Table 18 — Fire blankets by space

Type of Space	Vessel	Number	Location
Large Galley	Fire Risk Category I & II Vessels	1	Within the space
	Fire Risk Category III & IV Vessels	2	Within the space
Small Galley	All	1	Within the space

Table 19 —Portable fire extinguishers by space

Type of Space	Vessel	Number
Machinery and Medium Machinery space	All Fire Category I vessels; and Fire Category II, III & IV vessels less than 10m	1
	Fire Category II, III & IV vessels 10m or longer	2 (A)
Small Machinery space	All	1 See clause 8.1
Accommodation space	Fire Category I Vessels	1
	All other vessels	2
Small Galley	Fire Risk Category I & II Vessels	0 (B)
	All other vessels	1
Large Galeys	All	2
Control stations	All	1(C)
Vessel's stores locker	All	1 (as an option see 14.2.3)
Ro-Ro space	All	1 at each access/entrance (D)
Helicopter facility	All	3

Key

(A) means additional as required to ensure one is within 10m walking distance of any point.

(B) means at least one accommodation space extinguisher rated for Class B fires is to be located in a place readily accessible from the galley.

(C) means and extinguisher is not required on Fire Risk Category I or II vessels provided at least one accommodation or machinery space suited to the hazards likely to arise within the control station, is located within close proximity.

(D) means additional as required to ensure one is within 15m walking distance from any point.

5.6.1.2 Vessels with no extinguishers specified in Table 19

Even though no portable extinguishers may be specified in Table 19, the following vessels must be provided with at least one portable fire extinguisher:

- (a) any mechanically powered vessel;
- (b) any non-mechanically powered vessel that has:
 - (i) open flame devices, (e.g. cooking appliances and heaters, including those on an open deck); or
 - (ii) deck mounted internal combustion machinery, enclosed petrol tanks or other potential sources of fire such as incinerators or boilers.

5.6.2 Type

5.6.2.1 Extinguishers to be suited to hazard

- (1) Portable and wheeled fire extinguishers must be suited to the type of fire likely within the space to be protected and are to comply with AS/NZS 1841 component standards.
- (2) Portable and wheeled fire extinguishers must be fitted with a hose to enable access to awkward locations and facilitate the effective application of the extinguishing agent.

Note On small vessels carrying a limited number of fire extinguishers that must be used for a range of hazards including electrical hazards, a combination of BE powder, ABE powder or carbon dioxide extinguishers provide the best compromise.
- (3) Portable fire extinguishers for spaces containing electrical or electronic equipment or appliances essential for the safety of the vessel (such as *control stations*) must use an extinguishing agent that is not harmful to the equipment and appliances.
- (4) Portable and wheeled fire extinguishers for spaces containing electrical equipment must use an extinguishing agent that is not electrically conductive.

5.6.3 Size and rating

- (1) For a helideck at least two dry powder extinguishers with total capacity $\geq 45\text{kg}$ and one CO₂ with capacity $\geq 18\text{kg}$ must be supplied.
- (2) For other spaces, the minimum size and rating (the rating in accordance with AS/NZS 1850) of portable fire extinguishers must not be less than that mentioned in Table 20.
- (3) Where a single extinguisher is used for multiple classes of fire, the extinguisher must be of a size and rating to satisfy the minimum requirements of each of the relevant classes of fire.

Table 20 — Minimum size and rating of portable fire extinguishers

Fire Class	Risk criterion	Extinguisher Characteristic	Type of portable extinguisher				
			Water	Foam	Dry Powder	Wet Chemical	CO ₂
Class A	Vessel $\geq 10\text{m}$	Min. size (1)	9 L	9 L	4.5 kg	7 L	NDTS
		Min. rating (5)	3A	3A	3A	3A	NDTS
	Vessel $< 10\text{m}$	Min. size (1)	4.5 L	4.5 L	2 kg	7 L	NDTS
		Min. rating (5)	2A	2A	2A	2A	NDTS
Class B	Machinery (4) $\geq 750\text{ kW}$	Min. size (1)	NDTS	2 x 9 L (2)	4.5 kg	NDTS	NDTS
		Min. rating (5)	NDTS	20B	60B	NDTS	NDTS
	Machinery (4) $\geq 25\text{ kW}$ & $< 750\text{ kW}$, Ro-Ro spaces, helidecks	Min. size (1)	NDTS	9 L	4.5 kg	NDTS	NDTS
		Min. rating (5)	NDTS	20B	20B	NDTS	NDTS
	Machinery (4) $< 25\text{ kW}$	Min. size (1)	NDTS	4.5 L	2 kg	NDTS	5 kg
		Min. rating (5)	NDTS	10B	10B	NDTS	10B

Fire Class	Risk criterion	Extinguisher Characteristic	Type of portable extinguisher				
			Water	Foam	Dry Powder	Wet Chemical	CO2
Class E	Electrical system \geq 25 kW electrical power	Min. size (1)	NDTS	NDTS	4.5 kg	NDTS	5 kg
		Min. rating (5)	NDTS	NDTS	E	NDTS	E
	Electrical system < 25 kW electrical power	Min. size (1)	NDTS	NDTS	2 kg	NDTS	3 kg
		Min. rating (5)	NDTS	NDTS	E	NDTS	E
Class F	Large galleys	Min. size (1)	NDTS	NDTS	4.5 kg	3.5 L	NDTS
		Min. rating (5)	NDTS	NDTS	30B (3)	4F	NDTS
	Small galleys	Min. size (1)	NDTS	NDTS	2 kg	2 L	NDTS
		Min. rating (5)	NDTS	NDTS	20B (3)	2F	NDTS

Key:

(1) While some fire extinguishers of lesser size may achieve the required fire rating, a minimum size has been specified to allow for conditions of use and the possible inexperience of the user.

(2) Two 9 L 20B foam extinguishers may be substituted for one 4.5 kg 60B dry powder extinguisher.

(3) Must be of BE type dry powder.

(4) Machinery includes internal combustion machinery, steam boilers using oil fuel, pumps and other equipment for pumping or processing flammable or combustible liquids, or containing lubricating or hydraulic oil.

(5) The rating is to be in accordance with AS 1850.

NDTS means 'not deemed-to-satisfy' the required outcomes in this section.

Note 1 An extinguisher matching the exact combination of minimum size and minimum rating listed in the table may not be commercially available, in which case a larger size or higher rating may have to be used.

Note 2 There are benefits associated with carrying a combination of both dry powder and foam extinguishers for Class B fires. Dry powder extinguishers are suited to fires originating from liquids under pressure or on non-horizontal surfaces, foam extinguishers are more suited to fires in bilge spaces and to prevent re-flash.

5.6.4 Location

- (1) Fire extinguishers must be situated ready for use at easily visible places so they can be reached quickly and easily in the event of a fire.
- (2) They are to be mounted so that their serviceability is not impaired by the weather, vibration or other external factors.
- (3) One of the portable fire extinguishers intended for use in a *High Fire Risk Space* or *Moderate Fire Risk Space* must be stowed near the entrance to that space.
- (4) Where a high or *Moderate Fire Risk Space* is unlikely to be manned, the portable extinguisher stowed near the entrance to that space may be mounted externally and adjacent to the entrance of the space.
- (5) For a helideck, the extinguishers must be located near the means of access to the helideck.
- (6) For a Ro-Ro space the extinguishers must be located at each access to the space for fire control and at locations such that no point in the space is more than approximately 15m walking distance from an extinguisher.

5.6.5 Marking

If an extinguisher is stowed within a locker or other enclosed space, the door to the locker or enclosed space must carry a symbol or notice that gives a clear indication that the space contains a portable extinguisher.

5.6.6 Indication of previous use

Portable and wheeled fire extinguishers must be provided with devices that indicate whether they have been used.

Note The loss of the extinguisher tamper seal is considered sufficient indication of use.

5.6.7 Replenishment in the event of use

- (1) Vessels in Class A or B Extended must have provision to replenish discharged portable extinguishers at sea.
- (2) Replenishment may be by replacement of discharged extinguishers with extinguishers of the same quantity, type and capacity, or by recharging discharged extinguishers.
- (3) Replacement extinguishers or spare charges must be provided for the first 10 and half of the remaining extinguishers. However, not more than 60 spare extinguishers and charges are required.
- (4) Where replenishment is by recharging, instructions for recharging must be carried on board.

Note For the obligations of crew that undertake the recharging of portable fire extinguishers, refer to Marine Order 504.

5.7 Personal fire fighting equipment

5.7.1 Emergency escape breathing devices

5.7.1.1 Number

Emergency escape breathing devices must be provided on vessels in accordance with Table 21.

Table 21 — Emergency escape breathing devices required

Category	Vessels of less than 35 m measured length	Vessels of 35 m or more and less than 80 m measured length	Vessels of 80 m measured length & more	
		Within High Fire Risk machinery spaces: manned or with a machinery Control Station	Within High Fire Risk machinery space	Within Accommodation spaces
Fire Risk Category I	Not required	2	2	2
Fire Risk Category II	Not required	2	2	2
Fire Risk Category III	Not required	2	2	2
Fire Risk Category IV	Not required	2	As per SOLAS	As per SOLAS

5.7.1.2 Type

Emergency escape breathing devices must comply with either:

- (a) *FSS Code* – Chapter 3; or
- (b) AS/NZS 1716 where applicable.

5.7.1.3 Storage

- (1) Where emergency escape breathing devices are provided they must be situated ready for use at easily visible places so they can be reached quickly and easily at any time.
- (2) Emergency escape breathing devices must be located along the escape routes, at the foot of escape ladders or in control spaces or workshops located within the space, taking into account the layout of the space and the location of persons normally within the space.

Note Guidelines for the performance, location, use and care of emergency escape breathing devices are published as MSC/Circ.849.

5.7.2 Fire-fighters' outfits

5.7.2.1 Type

Fire-fighters' outfits must comply with *FSS Code* – Chapter 3.

5.7.2.2 Number

Fire-fighters' outfits must be provided on seagoing (operational areas A, B Extended, B, C or C Restricted) vessels in accordance with Table 22.

Table 22 — Fire-fighters' outfits for sea-going vessels

Category	Class A, B and C vessels	
	Minimum number of outfits	Minimum number of spare charges
Fire Risk Category I, II, III	Not required	Not required
Fire Risk Category IV	4 (A)	2

Key

(A) two sets are for the use of a rescue or fire-fighting party. The other two are available for a backup team should the rescue or fire-fighting party get into difficulties.

5.7.2.3 Storage

Each set of fire-fighters' outfits and spare charges must be kept:

- (a) ready for use;
- (b) in an easily accessible location that is permanently and clearly marked; and
- (c) in widely separated positions from other sets.

5.8 Fire hose appliances

- (1) Table 23 specifies those vessels that must be provided with fire hose appliances supplied by fire pumps.
- (2) Vessels not required to be fitted with fire hose appliances must carry fire buckets in accordance with the fire bucket requirements.

Table 23 — Application of fire hose appliance requirements

Category	Application
Fire Risk Category I (1)	Required if the Measured length x breadth $\geq 66 \text{ m}^2$
Fire Risk Category II (1)	Required if the Measured length x breadth $\geq 66 \text{ m}^2$
Fire Risk Category III	Required
Fire Risk Category IV	Required

Key

(1) vessels of Fire Risk Category I or II that have no High Fire Risk or Moderate Fire Risk spaces and no enclosed accommodation spaces need not be provided with fire hose appliances.

5.8.1 Performance

When attached to any fire hydrant on a vessel, each fire hose appliance must achieve and maintain a flow rate and inclined jet throw not less than the values specified in Table 24.

Note Rigid cross-section hoses have improved flow and throw performance over lay flat hoses.

Table 24 — Fire hose appliance performance

Vessel measured length x breadth in m^2	Single orifice nozzle diameter mm	Minimum throw of inclined water jet m	Assumed hydrant pressure kPa	Minimum fire hose nozzle flow rate m^3/hr	Minimum pump capacity per fire hose appliance per fire pump m^3/hr
< 100	10	6	Not specified	Not specified	5.5
≥ 100 and < 1900	12	11	150	6.5	7.0
≥ 1900 and < 3400	16	14	150	10.5	12.5
≥ 3400	19	19	200	17.0	20.4

5.8.2 Main fire pumps power source

The source of power of main fire pumps must be as specified in Table 25.

Table 25 — Source of power of main fire pumps

Vessel measured length x breadth m^2	Fire Risk Category I or II	Fire Risk Category III or IV
< 100	Manually operated or power driven	Power driven
≥ 100	Power driven	Power driven

5.8.3 Number of pumps

- (1) The number of main fire pumps provided on a vessel must be as specified in Table 26.
- (2) Where a single main fire pump is fitted the fire pump must be operated by a means other than the vessel's propulsion engines.

Note Multiple main fire pumps are intended to provide redundancy in the event of one pump failing. The capacity of each main fire pump is sized to fulfil the required performance for fire hose appliances.

Table 26— Jets and pumps for fire hose appliances

Category	Number of water jets	Number of main fire pumps
Fire Risk Category I	1 (A)(D)	1 (B)
Fire Risk Category II	1 (A)(D)	1 (B)(C)
Fire Risk Category III	1 (A)(D)	2
Fire Risk Category IV	2 (D)	2 (E)

Key:

- (A) The fire hose appliances are to be capable of supplying 2 water jets on vessels fitted with Ro-Ro spaces or helidecks.
- (B) Fire Risk Category I and II vessels that have no spaces of High Fire Risk or Moderate Fire Risk and no enclosed Accommodation Spaces need not be provided with fire hose appliances.
- (C) An emergency fire pump is to be fitted on vessels where the single main fire pump or its source of power is located in a machinery space of High Fire Risk, see clause 5.8.11.
- (D) Vessels that carry dangerous goods are to refer to clause 15.4.
- (E) Each main fire pump is to be sized to simultaneously supply both jet specified, while maintaining the performance of fire hose appliances specified in Table 24.

5.8.4 Period of operation for main fire pumps

- (1) The main fire pumps and their source of power must be capable of continuous operation for a period not less than that specified for continuous operation of emergency electrical installations under NSCV Part C, Subsection 5B.
- (2) For vessels fitted with multiple main fire pumps, this requirement applies to any one of the main fire pumps that may be called upon to supply fire hydrant appliances.

5.8.5 Non-dedicated main fire pumps

Pumps used for other purposes may also serve as main fire pumps provided they are not pumps normally used for pumping oil or other *combustible* or *flammable liquids*.

Example Sanitary, ballast, bilge or general service pumps may also serve as main fire pumps provided that they are not normally used for pumping of oil and that if they are subject to occasional duty for the transfer or pumping of fuel, suitable change-over arrangements are fitted

5.8.6 Multiple main fire pumps—requirements for redundancy

Where two main fire pumps are specified in Table 26, they must:

- (a) be driven independently from one another so that a failure in the source of power for one main fire pump, including any switchboard, will not prevent the starting and use of the other;
- (b) be arranged so that in the event of fire in any one space at least one main fire pump is to continue to be functional; i.e., they are to be located in different spaces;
- (c) where one of the main fire pumps is located in a machinery space of *High Fire Risk*, it must be provided with valves that isolate the fire hose appliance piping from the machinery space and are operable from an easily accessible position outside the machinery space (see requirements for isolating valves clause 5.8.12.8).
- (d) each have capacity sufficient to provide water of the quantity and pressure required in Table 24.

5.8.7 Sea suction

The sea suction inlet to each main fire pump must be:

- (a) located to draw water without interruption under all conditions of loading and trim of the vessel, and under weather conditions liable to be encountered in service; and
- (b) arranged to prevent the entry of objects that would block the pump.

5.8.8 Priming of main fire pumps

- (1) Unless otherwise specified in this section, main fire pumps must be self-priming or capable of holding prime.
- (2) Main fire pumps that are required in 5.8.9 to have automatic or remote starting must be self-priming.

5.8.9 Automatic or remote starting of main fire pumps

Vessels of *Fire Risk Category III* carrying more than 36 berthed passengers, or 450 day passengers, and all vessels of *Fire Risk Category IV* must have at least one main fire pump arranged so that it will start either:

- (a) automatically; or
- (b) remotely from a *central control station*.

5.8.10 Manually operated fire pumps

Where a manually operated fire pump is installed, it must meet the requirements of Table 24 when using the rate of pumping specified in Table 27.

Note The application of manually operated fire pumps is limited to smaller vessels because of the difficulties likely to be encountered achieving the required performance on large vessels, especially where there is a significant head to the highest hydrant.

Table 27 — Pumping rates for manually operated fire pumps

Manual pump type	Pumping actions per minute
Full rotary	60 turns
Horizontal reciprocating or diaphragm—double acting	80 single strokes
Horizontal reciprocating or diaphragm—single acting	60 double strokes

5.8.10.1 Priming of manually operated fire pumps

A manually operated fire pump need not be self-priming. However, if the manually operated fire pump will not self-prime from a dry suction, it must be constructed so that it can be quickly and effectively primed.

5.8.11 Emergency fire pump

5.8.11.1 Application

An emergency fire pump or fire buckets must be provided in accordance with Table 28 on all vessels of *Fire Risk Category II* and *Fire Risk Category I*, where a fire in a *High Fire Risk Space* could render the main fire pump inoperative.

Note For *Fire Risk Category III* and *IV* vessels, the two main fire pumps are arranged so that one is capable of acting as the emergency pump for the other.

Table 28 — Emergency fire pump on vessels of Fire Risk Category I & II

Measured length x breadth m ²	Source of power for emergency fire pump	Minimum emergency fire pump capacity per fire hose appliance m ³ /hr
< 100	Fire buckets to be provided in lieu	Buckets as specified in clause 5.9
≥ 100 and < 1900	Manual (A) or Power	5.5
≥ 1900 and < 3400	Power	7.5
≥ 3400	Power	12.0

Key

(A) means manually operated emergency fire pumps are to comply with clause 5.8.10.

5.8.11.2 Type

- (1) The emergency fire pump must be independently driven.
- (2) The pump may be of fixed or portable type.
- (3) Where permitted in Table 28 the emergency fire pump may be manually operated provided:
 - (a) the vessel does not have a *Ro-Ro space* or *helideck* and does not carry *dangerous goods*; and
 - (b) the water jet from the fire hose appliance achieves a throw of not less than 6 m when supplied with water from the emergency fire pump at the most hydraulically disadvantaged location.

5.8.11.3 Priming of emergency fire pumps

An emergency fire pump need not be self-priming. However, if the emergency fire pump will not self-prime from a dry suction, it is to be constructed so that it can be quickly and effectively primed.

5.8.11.4 Period of operation

The emergency fire pump and its source of power is to be capable of continuous operation for a period not less than that specified for continuous operation of emergency electrical installations under NSCV Part C, Subsection 5B.

5.8.11.5 Location

- (1) The location of the emergency fire pump and ancillary items associated with the pump, e.g. sea suctions, sources of power and fuel tanks, must be in a place remote from the *High Fire Risk Space* containing the main fire pump.
- (2) Access to the emergency fire pump is not to be via the space containing the main fire pump.

5.8.11.6 Emergency fire pump suction

- (1) The sea suction of emergency fire pumps must comply with clause 5.8.7.
- (2) Where a portable suction hose is used, the hose must be:
 - (a) of length necessary to maintain immersion under all conditions of loading and trim of the vessel, and under weather conditions liable to be encountered in service;
 - (b) weighted to maintain immersion;
 - (c) provided with fittings sufficiently robust to withstand emergency usage;
 - (d) provided with a foot valve; and
 - (e) constructed so that it will not collapse under the effect of the pump suction.

5.8.12 Fire Main

5.8.12.1 Dedicated purpose

The fire main for fire hose appliances must not be used for supplying water for any purpose other than extinguishing fire, testing fire hose appliances or washing decks. The fire main may have no connections other than those necessary for fire-fighting and washing decks.

Note The above clause does not preclude the use of fire hose appliances for washing down anchors or decks on the basis that such activities serve as a periodic practical test of these appliances. However, procedures should be adopted that maintain the readiness of the fire hose appliances during and after such activities.

5.8.12.2 Materials

Materials readily rendered ineffective by heat are not to be used for the fire main piping and hydrants unless protected or otherwise isolated to prevent failure of water supply for a period of not less than that specified:

- (a) for the *time rating* of *High Fire Risk* machinery spaces under Table 5 to Table 7, as applicable, assuming the fire main is dry; and
- (b) in clause 5.8.4, assuming the fire main is filled with water.

5.8.12.3 Hydrant arrangement

- (1) Where two water jets are specified in Table 26, the water jets from two fire hoses from two different hydrants must be able to reach any location on the vessel normally accessible to persons, one of the jets being from a single length of hose and the other from no more than two lengths of hose.
- (2) Where a single water jet is specified in Table 26, the water jet from a hydrant using a single length of hose must reach any location on the vessel normally accessible to persons.
- (3) The assumed length of hose for the purposes of this clause is not to exceed the maximum length specified in clause 5.8.14.

Note Additional requirements for the arrangement of hydrants are specified in clause 16.9 for *Ro-Ro spaces*, clause 15.4 for spaces containing *dangerous goods* and clause 17.7 for *helidecks*.

5.8.12.4 Hydrant accessibility

- (1) Hydrants must be placed so that the fire hoses may be easily and quickly coupled to them.
- (2) Where deck cargo or vehicles may be carried
 - (a) the positions of the hydrants are to be such that they are always readily accessible; and
 - (b) the fire main is to be arranged to avoid damage by the deck cargo or vehicles.

5.8.12.5 Valves and fittings at hydrants

- (1) A valve must be fitted to each fire hydrant so that the fire hose may be readily removed while the fire pump is in operation.
- (2) Fire hydrants must have the same end fitting so that hoses can be interchanged or used at all different hydrants on the vessel.
- (3) Fire hydrant valves and fire main isolating valves must not be one-way (non-return) valves.

5.8.12.6 Maximum permissible pressure

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

Note AS 2419 specifies a maximum pressure of 500 kPa for fire hoses 65 mm in diameter.

5.8.12.7 Prevention of over-pressure

Relief valves are to be incorporated in the fire main to prevent excessive pressure in any part of the system. This clause does not apply if the fire pumps are incapable of developing a pressure exceeding the design pressure of the piping, hydrants and hoses.

5.8.12.8 Isolating valves

- (1) On vessels fitted with more than one fire pump (main or emergency) connected to the fire main, those portions of the fire main that pass through a machinery space of *High Fire Risk Space* containing a fire pump must be capable of being isolated from the rest of the piping by a valve external to the machinery space.
- (2) The piping must be so arranged that when the isolating valves are shut, all the hydrants on the vessel, except those in the machinery space referred to above, can be supplied with water by the other main fire pump or the emergency fire pump.
- (3) All isolating valves in the piping must be clearly marked.

5.8.12.9 International shore connection

- (1) The fire main on all vessels of 35 m or more in measured length must be provided with at least one international shore connection complying with Figure 3.
- (2) The shore connection facility must be arranged to enable ready connection from either side of the vessel.

Note The fitting may be of a portable type stowed in a location ready to use in time of emergency.

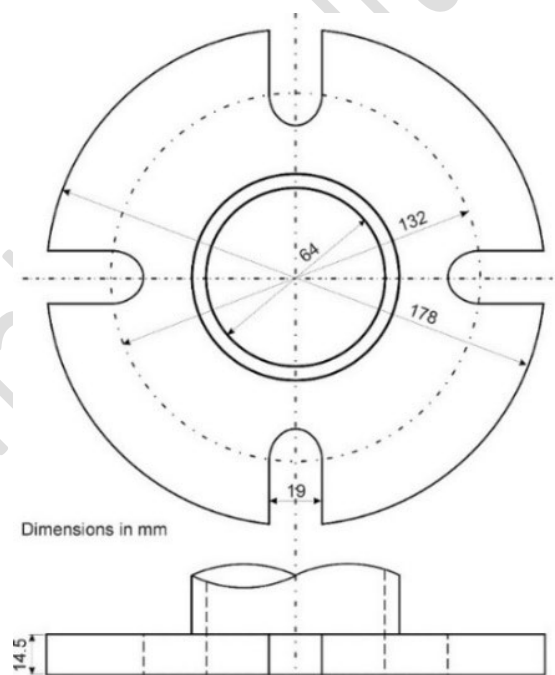


Figure 3 - International shore connection

5.8.13 Fire hoses and nozzles

5.8.13.1 General

The following items must be kept ready for use and located in a conspicuous position near each hydrant:

- (a) A fire hose that is in accordance with clause 5.8.14.
- (b) A nozzle that is in accordance with clause 5.8.15.
- (c) Any necessary fittings and tools.
- (d) Fire hoses and nozzles in interior locations should be arranged to enable them to remain connected to the hydrants at all times.

Note See clause 5.8.12.3 for the location of hydrants.

5.8.14 Hose

5.8.14.1 Fire hose Length

Fire hoses must have a length of at least 10 m, but not more than:

- (a) 15 m in machinery spaces;
- (b) 20 m in other spaces and open decks; and
- (c) 25 m for open decks on vessels with a maximum breadth in excess of 30 m.

5.8.14.2 Fire hose diameter

The internal diameter of fire hoses must not be less than:

- (a) 19 mm for reinforced elastomeric fire hose; or
- (b) 38 mm for lay-flat fire hose.

5.8.14.3 Lay-flat hose specification

Lay-flat fire hoses must comply with AS 2792.

5.8.15 Nozzles

5.8.15.1 Nozzle size

- (1) Single orifice nozzles must have an orifice diameter not less than that specified in Table 24.
- (2) Other types of nozzles must have a minimum flow rate not less than the minimum flow rate specified in Table 24.

Note Some appliances such as dual-purpose nozzles or *portable foam applicators* may require a specified minimum pressure higher than that assumed in the table to operate correctly.

5.8.15.2 Nozzle type

- (1) Nozzles having a flow rate of 6.5 m³/hr or more must be of dual-purpose type (i.e. spray / jet) incorporating a shutoff.
- (2) The nozzle must be suited to the application, taking into account the design pressure at the hydrant and the corrosive effects of long-term stowage in a maritime environment (i.e. robust, corrosion resistant).

5.9 Fire buckets

5.9.1 Application

Fire buckets must be provided on a vessel that:

- (a) is not required to be fitted with fire hose appliances under clause 5.8; or
- (b) must have fire buckets in lieu of an emergency fire pump under clause 5.8.11.1.

5.9.2 Number of fire buckets

Where fire buckets are required, the number of fire buckets must be as specified in Table 29.

Table 29 — Fire buckets on vessels of Fire Risk Category I or II

Measured length of vessel	Number of fire buckets
< 10 m	1 (A)
≥ 10 m	2

Key

(A) a fire bucket need not be provided on Fire Risk Category I or II vessels not having High Fire Risk or Moderate Fire Risk spaces or enclosed Accommodation Spaces.

5.9.3 Standard

A fire bucket must be:

- (a) of minimum 4 L capacity;
- (b) fitted with a handle;
- (c) manufactured from waterproof and robust material;
- (d) designed so as not to collapse, distort or lose the handle when full of water; and
- (e) fitted with a lanyard of sufficient length to allow the bucket to be cast over the side and retrieved full of water.

Chapter 6 Fire safety preparedness documentation

6.1 Application

Where specified in Table 30, a vessel must be provided with a fire control plan, a fire training manual, and a fire safety operational booklet.

Note The fire control plan, fire training manual and fire safety operational booklet provide vital information needed for an operator to comply with Marine Order 504. Notwithstanding the requirements of this standard, a vessel may be obliged to carry information pertaining to fire safety to comply with WH&S and other legislation.

Table 30 — Fire control plan, fire training manual and fire safety operational booklet

Category	Application
Fire Risk Category I	Required if measured length \geq 25 m (1) (2) (3)
Fire Risk Category II	Required if measured length \geq 25 m (1) (2) (3)
Fire Risk Category III	Required for all vessels (2) (3)
Fire Risk Category IV	Required for all vessels (2) (3)

Key

(1) vessels of any length that carry dangerous goods in cargo spaces of the type described in clause 15.1 are to be provided with a fire control plan, fire training manual and fire safety operational booklet.

(2) vessels of any length and fire risk category that have an EES space in accordance with clause 18.2 must be provided with a fire control plan, fire training manual and fire safety operational booklet.

(3) vessels of any length and fire risk category that carry fuel on the open deck in accordance with Clause 15.1(d) must be provided with a fire control plan, fire training manual and fire safety operational booklet

6.2 Fire control plan

The fire control plan complying with ISO 17631 must show clearly for each deck the following positions, as applicable:

- (a) control stations;
- (b) sections of the craft which are enclosed by *fire-resisting divisions*;
- (c) smoke zones;
- (d) evacuation alarms;
- (e) fixed fire detection and fire alarm systems;
- (f) fixed fire-extinguishing systems;
- (g) fire appliances;
- (h) personal protective equipment including fire-fighters' outfits and emergency escape breathing devices;
- (i) the means of access to the various compartments and decks in the vessel;
- (j) the ventilating system (inc. location of fan controls, smoke flaps and *fire dampers*);
- (k) the location of the international shore connection, if fitted; and
- (l) the position of all means to control the fuel shut-off valves, ventilation shutdown, *fixed fire detection and fire alarm systems* and *fixed fire-extinguishing systems*.

6.2.2 Location

The vessel must have a fire control plan permanently exhibited in a location suitable for ready reference by the crew.

6.2.3 Duplicate set of fire control plans

Vessels of measured length 35 m or more must have a duplicate set of fire control plans or a booklet containing such plans permanently stored in a prominently marked weathertight enclosure outside the deckhouse for the assistance of shore-side fire-fighting personnel

Note Refer to the MSC/Circ.451 for guidance concerning the location of fire control plans for assistance of shore-side fire-fighting personnel

6.3 Training manual

The training manual must explain the following in detail, using easily understood terms and illustrated wherever possible:

- (a) general fire safety practice and precautions related to the dangers of smoking, electrical hazards, *flammable liquids*, *dangerous goods* and similar common shipboard hazards;
- (b) general instructions on fire-fighting activities and fire-fighting procedures including procedures for notification of a fire and use of manually operated call points;
- (c) meanings of the vessel's alarms;
- (d) operation and use of *fire equipment*;
- (e) operation and use of fire doors;
- (f) operation and use of ventilation shutdowns, *fire flaps*, smoke flaps, *fire dampers* and fuel shut-offs; and
- (g) escape systems and appliances.

6.3.2 Location

A training manual must be located in each crew mess room or in each crew cabin.

6.4 Fire safety operational booklet

- (1) The fire safety operational booklet must contain the necessary information and instructions for the safe operation of the vessel and cargo handling operations with respect to fire safety.
- (2) The fire safety operational booklet may be combined with the training manual.
- (3) The booklet must include information concerning:
 - (a) the crew's responsibilities for the general fire safety of the vessel while loading and discharging cargo and while underway.
 - (b) an explanation of necessary fire safety precautions for handling general cargoes.
 - (c) for vessels carrying *dangerous goods*, relevant stowage and segregation information for the *dangerous goods* to be carried.
 - (d) for vessels carrying *dangerous goods*, the applicable references to the pertinent fire-fighting and emergency cargo handling instructions contained in:
 - (i) the *IMSBC Code*; and
 - (ii) the *IMDG Code*.

6.4.2 Location

A fire safety operational booklet must be located in each crew mess room or in each crew cabin.

Chapter 7 Additional measures for machinery and medium machinery spaces

7.1 Application

- (1) Clauses 7.2 to 7.6 apply to *Machinery Spaces*
- (2) Clauses 7.2, 7.3.1, 7.3.2.1, 7.3.3, 7.3.6 to 7.3.8 and 7.4 apply to *Medium Machinery Spaces*

7.2 Signage

“No smoking” or “No naked light” notices must be displayed in a prominent position at points of entry into and, where appropriate, within **the space**.

7.3 Fire growth potential

7.3.1 Primary deck materials and coverings

Primary deck materials, floor plates, floor plate supporting structures and deck coverings within *Machinery Spaces* and *Medium Machinery Spaces* must:

- (a) be of non-combustible material unless, in the case of deck materials or floor plate supporting structures, they form part of the primary hull structure of a vessel constructed of *combustible materials*; and
- (b) not absorb oil or other *combustible* or *flammable liquids*.

7.3.2 Fuel and lubricating oil tanks

7.3.2.1 Location

- (1) The following fuel tanks must not be situated within machinery spaces:
 - (a) Fuel tanks not complying with clause **7.3.2.2**.
 - (b) Fuel tanks containing fuel of flashpoint less than 60°C.
- (2) Fuel and lubricating oil tanks must be located to ensure that any spillage or leakage cannot constitute a fire or explosion hazard by falling on heated surfaces.

7.3.2.2 Fire-resistance of fuel tanks

- (1) Fuel tanks situated within a machinery space of *High Fire Risk* must be constructed of a material, or suitably insulated, so that when exposed to the standard fire test the tank remains structurally intact.
- (2) The time period for exposure to the standard fire test mentioned in (1) is to be no less than the *time rating* of the *fire-resisting division* required for the machinery space specified in Table 5, Table 6 or Table 7 without modification by the table keys.

7.3.2.3 Freestanding fuel tanks

Freestanding fuel tanks are not to be fitted in machinery spaces of *High Fire Risk* on vessels of *Fire Risk Category III* or *IV*.

7.3.3 Fuel piping

- (1) Fuel piping must not be located immediately above or near units of high temperature including boilers, steam pipelines, exhaust manifolds, turbo-chargers or silencers.
- (2) As far as practicable, fuel piping must be located away from hot surfaces, electrical installations or other sources of ignition.

- (3) Fuel piping must be screened or otherwise suitably protected to avoid oil spray or oil leakage onto possible sources of ignition.
- (4) The number of joints in fuel oil piping systems must be kept to the necessary minimum.

7.3.4 Provision for inspection of oil fuel units

- (1) To facilitate the early observation of defects and leakage, components of an *oil fuel unit* containing heated oil under pressure exceeding 180 kPa must not be placed in a concealed position.
- (2) Such components within a machinery space must be adequately illuminated.

7.3.5 Jacketing of high-pressure fuel delivery lines

- (1) For vessels of *Fire Risk Category III or IV*, external high-pressure fuel delivery lines between the high-pressure fuel pumps and fuel injectors must be protected with a jacketed piping system capable of containing fuel from a high-pressure line failure.
- (2) The jacketed piping system must include a means for collecting leaked fuel.
- (3) An alarm must be provided to indicate a fuel line failure.

Note 1 A jacketed pipe incorporates an outer pipe into which the high-pressure fuel pipe is placed, forming a permanent assembly.

Note 2 Jacketing may also apply to machinery on vessels of *Fire Risk Category I or II* if required by the relevant Recognised Organisations class rules for vessels greater than or equal to 35 m long, see NSCV Part C, Subsection 5A.

7.3.6 Containment of spillage

Precautions must be taken to prevent any oil that may escape under pressure from any pump, filter or heater from coming into contact with heated surfaces.

7.3.7 Insulation of high temperature surfaces

Surfaces with temperatures above 220°C that may come into contact with fuel or fuel vapour because of a fuel system failure must be effectively protected to prevent ignition.

7.3.8 Prevention of accumulated oil vapours

The ventilation of machinery spaces must be sufficient under normal conditions to prevent accumulation of oil vapour.

7.4 Protected escape from machinery spaces

Machinery spaces below the *weather deck* on vessels of 45 m measured length or more must be fitted with one of the following:

- (a) two sets of steel ladders as widely separated as possible, leading to similarly separated doors in the upper part of the space. For this option:
 - (i) each of the doors must provide access to an appropriate survival craft embarkation location; and
 - (ii) one of these ladders must be located within a protected enclosure from the lower part of the space it serves to a safe position outside the space; and
 - (iii) the enclosure must satisfy the fire protection requirements of clause 4.5; and
 - (iv) self-closing fire doors of the same fire integrity standards must be fitted in the lower end of the enclosure; and
 - (v) the ladder must be fixed in such a way that heat is not transferred into the enclosure through non-insulated fixing points; and

- (vi) the protected enclosure is to have minimum internal dimensions of 800 mm x 800 mm, and is to be provided with emergency lighting; or
- (b) one steel ladder leading to a door in the upper part of the space from which access is provided to the embarkation deck; and a separate door in the lower part of the space well separated from the ladder. For this option:
 - (i) the lower door must be of fire-resisting construction, capable of being operated from each side, and is to provide access to a safe escape route from the lower part of the space to the embarkation deck.

7.5 Additional fire appliances

- (1) A *High Fire Risk* machinery space containing internal combustion machinery of aggregate power greater than 750 kW or an oil-fired boiler must be provided with wheeled fire extinguishers, *portable foam applicators* or portable fire extinguishers in accordance with Table 31. This requirement is in addition to any portable fire extinguishers specified in Table 19.
- (2) The wheeled and portable fire extinguishers and *portable foam applicators* must comply with relevant provisions for portable fire extinguishers.

Table 31 — Wheeled fire extinguishers, *portable foam applicators* or additional portable fire extinguishers for High Fire Risk machinery spaces

Space containing	Internal combustion machinery ≥ 750 kW in aggregate	Oil-fired boiler ≥ 175 kW	Oil-fired boiler < 175 kW
Fire Risk Category I	Not required	Not required	Not required
Fire Risk Category II	Two additional 9 L foam portable fire extinguishers for Class B fires (1)	One additional 9 L foam portable fire extinguisher for Class B fires (1)	Not required
Fire Risk Category III	Two additional 9 L foam portable fire extinguishers for Class B fires (1)	Two additional 9 L foam portable fire extinguishers for Class B fires (1)	One additional 9 L foam portable fire extinguisher for Class B fires (1)
Fire Risk Category IV	One 90 L foam-type wheeled extinguisher (2) or one <i>portable foam applicator</i> with foam concentrate (3)	One 90 L foam-type wheeled extinguisher (2) or one <i>portable foam applicator</i> with foam concentrate (3)	One additional 9 L foam portable fire extinguisher for Class B fires (1)

Key

(1) rating to be as specified in Table 20.

(2) with hose or hoses on reel suitable for reaching any part of the space.

(3) the *portable foam applicator* is to comply with 16.10(b)

7.6 Sand

- (1) Spaces that contain an oil-fired boiler must be provided with 0.1 m³ of sand or sawdust impregnated with soda.
- (2) The sand or soda impregnated sawdust must be stored in a suitable receptacle with a scoop.
- (3) An additional portable extinguisher suitable for Class B fires, complying with clause 5.6, may be substituted as an alternative.

Chapter 8 Additional measures for small machinery spaces

8.1 Portable fire extinguisher

The portable fire extinguisher provided for a *small machinery space* must comply with the following:

- (a) The extinguishing agent must be discharged into the small machinery space from outside the space without having to open the primary access.
- (b) The portable extinguisher must be stowed outside the small machinery space.
- (c) The extinguishing agent of the portable fire extinguisher must be able to flood the entire space and extinguish a fire within the small machinery space.
- (d) The extinguishing capacity of the portable extinguisher must be sufficient for the volume of the small machinery space.

Note 1 A 5kg carbon dioxide fire extinguisher is needed to flood a space having a volume of 4.7 m³.

Note 2 A 4.5kg dry powder extinguisher is needed to flood a space having a volume of 5 m³.

Note 3 A 9kg dry powder extinguisher is needed to flood a space having a volume of 10 m³.

8.1.1 Discharge opening

The discharge opening must be:

- (a) readily identifiable;
- (b) sized to accept the discharge nozzle;
- (c) open or able to be opened to provide ready access for discharge of the agent into the engine space; and
- (d) located so the required size of extinguisher can be operated in a position that will allow discharge of the extinguishing agent.

Chapter 9 Additional measures for accommodation spaces

9.1 Smoking

- (1) For the purposes of this standard, smoking is prohibited in *Accommodation Spaces* for berthed persons.
- (2) Adequate non-smoking notices must be displayed in compartments where smoking is not allowed.
- (3) Suitable *non-combustible* ash containers must be provided in compartments where smoking is allowed.

9.2 Heating appliances

- (1) Electric radiators or other heating appliances, if used, must be fixed in position and so constructed as to reduce fire risks to a minimum.
- (2) Heaters with exposed heating elements, open flames, or those using solid fuel combustion must not be fitted.

9.3 Waste receptacles

Waste receptacles must be constructed of *non-combustible* materials with no openings in the sides or bottom.

9.4 Piping in Accommodation spaces

Pipes conveying oil or other *combustible liquids* through *Accommodation Spaces* must be of a material, or otherwise arranged, to ensure that their integrity is unaffected by fire within the accommodation space.

9.5 Grouping of means for controlling power ventilation

- (1) In vessels of *Fire Risk Category* III and IV, power ventilation for *Accommodation Spaces* must be fitted with controls grouped so that all fans within a space may be stopped from either of two separate positions.
- (2) These positions are to be situated as far apart as practicable.

9.6 Control of smoke spread

Where specified in Table 32, *Accommodation Spaces* on Class 1 passenger vessels must be divided by *smoke-tight* divisions into at least two smoke zones.

Table 32 — Smoke zones and alternative safe areas on Class 1 passenger vessels

Day passengers	≤ 200	> 200 and ≤ 450	> 450 and ≤ 800	> 800
Berthed passengers		> 12 and ≤ 36	> 36	
Fire Risk Category I	Not required	No application	No application	No application
Fire Risk Category II	Not required	Smoke or ASA or FFE	No application	No application
Fire Risk Category III	Not required	Smoke or ASA or FFE	Smoke or ASA or FFE	Smoke and ASA, or FFE
Fire Risk Category IV	Not required	Smoke or ASA (1) (2)	Smoke and ASA (1)	Smoke and ASA (1)

Key

No application means that the number of passengers falls outside the definition of the particular Fire Risk Category.

Smoke means the vessel is to have smoke zones complying with clause 9.6.1.

ASA means the vessel is to have an alternative safe area complying with clause 9.7.2.

FFE means the Accommodation Spaces may, as an alternative to smoke zones and/or alternative safe areas, be protected by an aqueous fixed fire-extinguishing system complying with clause 0.

(1) FFE is required if more than 200 day passengers or more than 36 berthed passengers, see Table 15

(2) FFE is also an alternate to smoke zones or alternative safe areas if 200 day passengers or less and 36 berthed passengers or less.

9.6.1 Smoke zones

Where required in Table 32, smoke zones must comply with the following:

- (a) The mean length of each zone must not exceed 40 m.
- (b) Divisions separating smoke zones must:
 - (i) be smoke-tight;
 - (ii) be constructed of *non-combustible* or *fire-restricting materials* complying with 4.7; and
 - (iii) extend from deck to deck.

Note Smoke zones may also be required to serve as alternative safe areas, see clause 9.7.1 below.

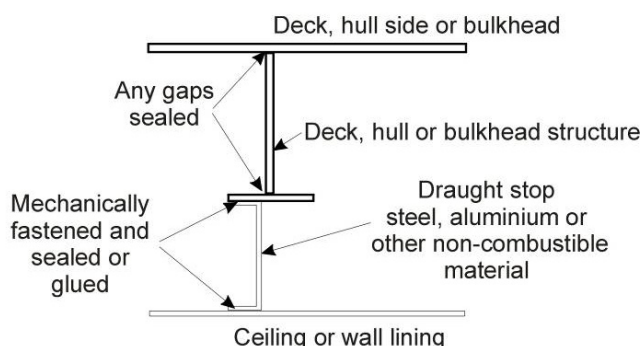
9.6.2 Draught stops

- (1) Where required in Table 33, air spaces enclosed behind ceilings, panelling or linings must be divided by close-fitting draught stops spaced not more than 14 m apart.
- (2) Vertically, such enclosed air spaces, including those behind linings of stairways and trunks must closed at each deck.

Note See Figure 4.

Table 33 — Draught stops in Accommodation Spaces

Category	Application
Fire Risk Category I	Not required
Fire Risk Category II	Required if smoke zones in clause 9.6 fitted
Fire Risk Category III	Required if smoke zones in clause 9.6 fitted
Fire Risk Category IV	Required

Figure 4 - Draught Stop

b) Typical detail of draught stop

9.6.3 Smoke extraction systems in atriums of passenger vessels

- (1) *Atriums* must be equipped with a smoke extraction system.
- (2) The smoke extraction system must be automatically activated by the required smoke detection system and also be capable of manual control.
- (3) The fans must be sized such that the entire volume within the space can be exhausted in 10 minutes or less.

9.7 Means of escape

9.7.1 Blind corridors

Where the total length of any blind corridor, including any stairway, exceeds 5 m the corridor bulkheads, doors opening on to the corridor and stairway bulkheads must be of *non-combustible* material.

Note Refer to NSCV Part C, Section 1 for details of the location and size of exits from spaces.

9.7.2 Alternative safe areas

- (1) Where specified in Table 32, Class 1 vessels must have a minimum of two safe areas to provide for the alternative assembly of passengers and crew should smoke enter or be generated within any part of the *Accommodation Space*.
 - (2) A safe area must be:
 - (a) one of two or more smoke zones complying with the smoke zone requirements;
 - (b) a passenger space separated from other safe areas by *smoke-tight* or *fire-resisting divisions*; or
 - (c) an open space on deck that does not expose persons to other hazards.
- Note* The exposed bow area of a seagoing vessel may not provide a suitable alternative safe area.
- (3) The capacity of a safe area must be determined by allowing for one person for each seat within the space and 0.35 m² per person of the net remaining deck area.
 - (4) The total capacity of safe areas on the vessel must be sufficient to accommodate the maximum number of persons carried on the vessel assuming any one area of the *Accommodation Space* is rendered unusable in an emergency.
 - (5) A safe area must be, as far as practicable, located adjacent to the smoke zone or *Accommodation Space* it is intended to serve.
 - (6) There must be at least two exits from each smoke zone or *Accommodation Space*, located as far away from each other as possible, leading to the safe area.
 - (7) Each safe area must incorporate evacuation routes to survival craft to enable all passengers and crew to be safely evacuated.

9.7.3 Internal stairways

- (1) Table 34 specifies enclosures required on internal stairways between accommodation decks.
- (2) These enclosures must prevent the passage of smoke between decks and facilitate the escape and evacuation of persons.

Note Refer also to Chapter 12 for fire safety measures applicable to *Escape or Evacuation Routes*.

Table 34 — Fire and smoke integrity of internal stairways

Category	2 decks	3 or more decks (A)
Fire Risk Category I	Not required	Not required
Fire Risk Category II	Required (B)	Required
Fire Risk Category III	Required	Required
Fire Risk Category IV	Required	Required

Key

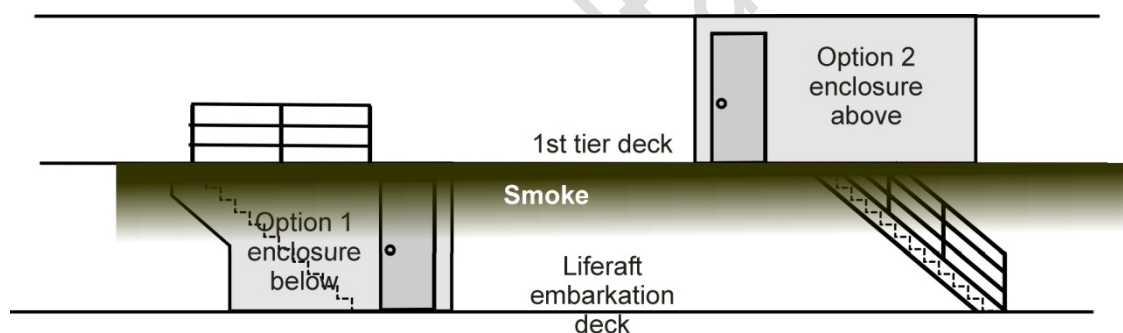
(A) includes open decks intended for more than 36 passengers that lie above the accommodation deck.

(B) to the extent required to satisfy the smoke zone and alternate safe area requirements.

9.7.3.2 Two decks of accommodation

- (1) Where required by Table 34, internal stairways that serve only two decks of accommodation must be enclosed on at least one level with a *smoke-tight* division of *non-combustible* or *fire-restricting materials*, see Figure 5.
- (2) Where one or both of the decks contain accommodation for berthed passengers, the doors is to be self-closing.

Note Option 1 is preferable to option 2 as the enclosure does not trap smoke, reducing the potential for exposure of persons to smoke. Hence, option 1 provides the better solution where there is no alternative route for escape other than through the smoke filled lower level.

Figure 5 - Stairs penetrating 2 decks**9.7.3.3 Exception for stairways in public spaces**

Unless required to be *smoke-tight* to satisfy the smoke zone or alternate safe area requirements, internal stairways that serve only two decks of accommodation may be fitted in the open in a *public space*, provided they lie wholly within the *public space* and the *public space* is provided with smoke detectors complying with clause 5.1 or clause 5.3.

9.7.3.4 Three or more decks of accommodation

- (1) Where a vessel has three or more decks of accommodation, arrangements must be provided to permit the escape of persons past a smoke filled intermediate deck if this path is required for evacuation into survival craft.
- (2) An open deck above enclosed accommodation that is capable of accommodating more than 36 passengers is to be considered a deck of accommodation for the purposes of this clause.

Note See Figure 6.

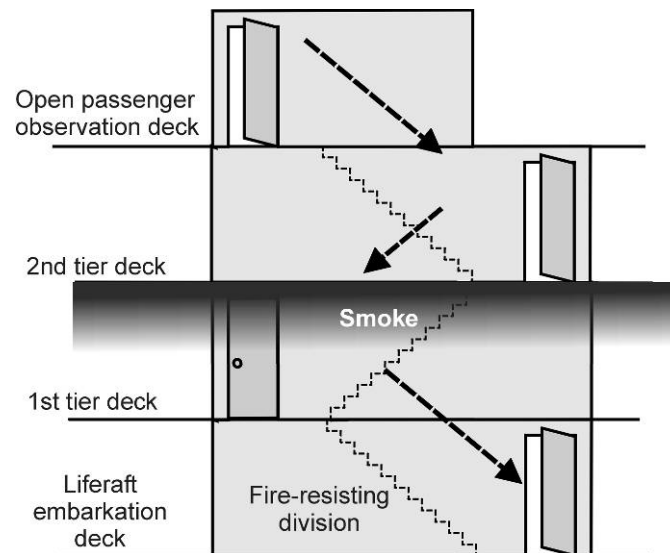


Figure 6 - Stairway tower penetrating 3 or more decks

9.8 Inspection hatches

- (1) On vessels of *Fire Risk Category IV* carrying more than 36 berthed passengers, the ceilings and linings must incorporate inspection hatches or other means to enable inspection of concealed and inaccessible places.
- (2) Inspection hatches are not required in locations where there is no risk of fire originating.
- (3) The hatches or other means of inspection must not impair the efficiency of the fire protection.

Note For vessels carrying more than 36 berthed passengers, the requirements of this Section have been developed on the assumption that an efficient patrol system will be maintained so that an outbreak of fire may be promptly detected. Compliance with this clause enables the fire patrol to investigate any smoke originating in concealed and inaccessible places.

Chapter 10 Additional measures for galleys

10.1 Restraint of cooking utensils

Means must be provided on the top surfaces of cooking ranges to prevent both deep and shallow cooking utensils from sliding across or off the range, at pitch or roll angles up to 30° from the horizontal in any direction.

Note Fiddle bars on the top of marine cooking ranges are usually provided to restrain cooking utensils, see Figure 7.

10.2 Fire protection in way of cooking appliances

10.2.1 General

Cooking appliances must be installed to reduce the risks of fire caused by heat radiated from the cooking element or flame; and ignition of cooking fats and oils.

10.2.2 Adjacent fittings in galleys

- (1) Materials, shelves, range hoods and exhaust fans adjacent to a cooking appliance in a *large galley* within 250 mm of the perimeter must be protected by *non-combustible* surfaces.
- (2) This protection must extend from 100 mm below the cooking surface of the appliance to a distance E above the cooking surface determined from Table 35. See Figure 7(a).

Table 35 — Dimension E in large galleys

Appliance	Dimension E mm
Solid grill plate, deep fryer (top of pan)	600
Open flame appliance (i.e. hotplate burner)	1050
Chinese cooking table, griddle, barbecue, char grill or open top flame grill	1350

10.2.3 Adjacent fittings - requirements applicable to small galleys

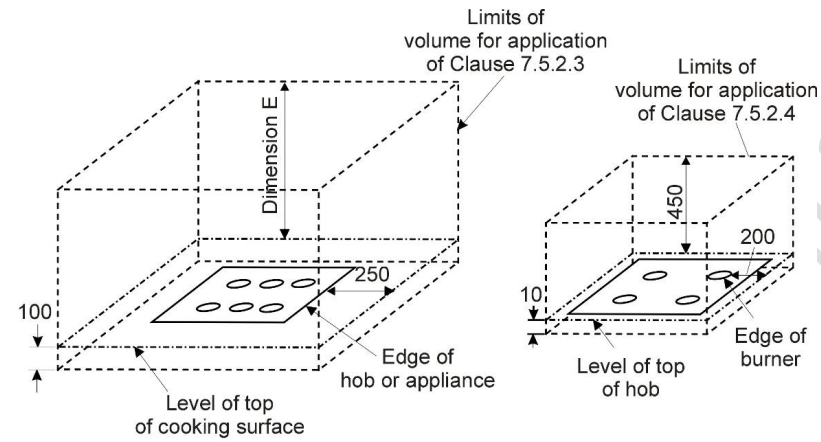
Materials adjacent to a domestic cooking appliance in a *small galley* must comply with the AS 5601.2 as modified below:

- (a) In addition to the protection of combustible surfaces near a domestic cooking appliance required in clause 5.12.1 in AS 5601.2, bulkheads, linings and cabinets not so protected but within 200 mm of the periphery of a burner of a cooking appliance must be constructed of materials complying with Table 36.
- (b) These materials must extend from 10 mm below the lowest point of the hob to 450 mm above the highest point of the hob of the appliance. See Figure 7(b).
- (c) Where a gimbaled cooking range is fitted, the enclosure must comply with Table 36 and dimensions A, B, C, D defining the extent of protection of combustible surfaces in clause 5.12.1 of AS 5601.2 must take into account the extreme limits of movement of the cooking surface. See Figure 7(c).

Table 36 - Fire properties of adjacent bulkheads, linings and cabinets in *small galleys*

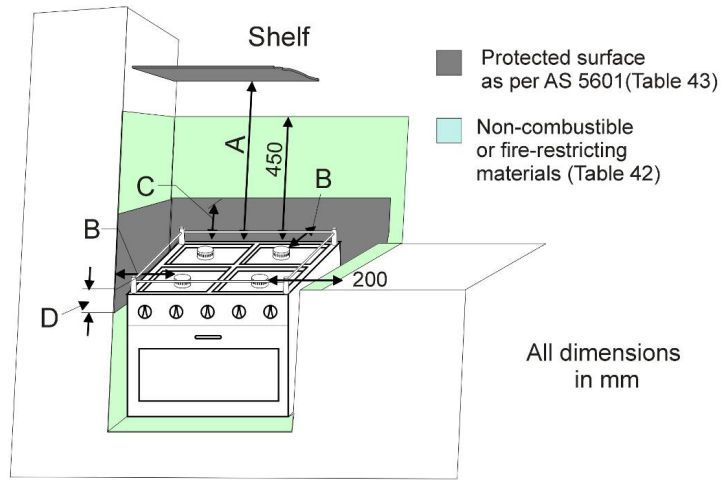
Category	Properties of adjacent bulkheads, linings and cabinets
Fire Risk Category I	Non-combustible or low flame spread
Fire Risk Category II	Non-combustible or low flame spread
Fire Risk Category III	Non-combustible or low flame spread
Fire Risk Category IV	Non-combustible

Figure 7 - Protection in vicinity of a cooking range



a) Commercial cooking appliance

b) Domestic cooking range



c) Small galley gimbaled cooking range

Table 37 — Key to Figure 7(c)

Measurement	Key in Figure 4	Description of surfaces to be protected by non-combustible materials
Overhead clearance	A	Downward facing combustible surfaces between the highest part of the <i>hob</i> and a line not less than 600 mm above the highest part of the <i>hob</i> ; see clause 10.2.4. Downward facing surfaces must not be fitted less than 450 mm above the highest part of the <i>hob</i> .
Upper vertical clearance	B & C	Vertical combustible surfaces between the periphery of the nearest burner to a point 200 mm horizontally from the periphery of the burner, and between the highest part of the <i>hob</i> and a line 150 mm above the highest part of the <i>hob</i> ; see clause 10.2.4.
Lower vertical clearance	B & D	Vertical combustible surfaces between the periphery of the nearest burner to a point 200 mm horizontally from the periphery of the burner, and between the highest part of the <i>trivet</i> and a line 10 mm below the highest part of the <i>hob</i> ; see clause 10.2.4.

10.2.4 Protection of a substrate near a cooking appliance

- (1) If, when complying with the requirements for a protected surface in clause 12.1 of AS 5601.2, a *non-combustible* surface is applied over a *combustible* substrate, additional protection must be provided for the *combustible material* to ensure that its temperature does not exceed 65° C above ambient after a period of prolonged normal operation.
- (2) Protection of the *combustible* substrate may be by:
 - (a) covering the substrate with sheet metal having a minimum thickness of 0.4 mm; thermally insulated from the supporting substrate to prevent combustion of the substrate;
Note The thermal insulation may be achieved by an air gap or the use of a suitable material. Refer to AS 5601 Appendix C.
 - (b) an integral splash-back on the appliance; or
 - (c) the fixing of 5 mm thick ceramic tiles to the surface of the *combustible* substrate.

10.2.5 Curtains and fabrics in galley spaces

- (1) Free hanging curtains or other fabrics must not be fitted in *large galleys*.
- (2) In *small galleys*, free hanging curtains or other fabrics must not be fitted within 300 mm of the perimeter of a cooking range.
- (3) The curtains and fabrics mentioned in (2) must not come closer than 700 mm above the highest point of the *hob* of the cooking range.

10.3 Exhaust hoods and ducts

- (1) A *large galley* must be provided with an exhaust hood and duct serving each *galley* range, deep fat cooker, or similar appliance.
- (2) The exhaust hood and duct must be:
 - (a) constructed of steel or similar metal;
 - (b) insulated in accordance with the requirements of clause 4.2;
 - (c) fitted with a grease trap that is readily removable for cleaning;

- (d) fitted with suitably located hatches for inspection and cleaning;
- (e) fitted with a *fire flap* located in the lower end of the duct; and
- (f) provided with remote-control arrangements near the entrance to the *galley* for:
 - (i) operating the *fire flap* in the lower end of the duct; and
 - (ii) shutting off the exhaust fans.

Note The regular cleaning of grease traps is an activity that should be addressed as part of operational preparedness required in Marine Order 504.

10.4 Control of smoke spread

10.4.1 Separation of galley spaces

Unless otherwise specified in Table 38, a galley space must be separated from other spaces by boundaries as specified in Table 5, Table 6 or Table 7.

Table 38 — Separation of galleys from other spaces

Category	Large galleys	Small galleys
Fire Risk Category I	Required	Not required
Fire Risk Category II	Required	Required if > 36 passengers
Fire Risk Category III	Required	Required
Fire Risk Category IV	Required	Required

10.4.2 Fire flaps in ventilation ducts

Where a galley is required to be separated under Table 38, an automatically operated *fire flap* must be fitted in the *galley* ventilation duct near its opening into the *galley*.

10.4.3 Separation of ventilation ducts

- (1) Ventilation ducts to and from *galley* spaces on vessels of *Fire Risk Category* III or IV must be separated from each other and from the ventilation systems serving other spaces.
- (2) On other vessels having *galleys* that are required to be separated under Table 38, the ventilation systems need not be completely separated, but must have separate ducts if served from a ventilation unit that serves other spaces.

10.5 Additional requirement for deep fat cookers

Deep fat cookers must be provided a primary and backup thermostat with an alarm to alert the operator in the event of failure of either thermostat.

Chapter 11 Additional measures for control stations

11.1 Concealed or inaccessible spaces

Surfaces in concealed or inaccessible spaces adjacent to electrical or other fire hazards in *Control Stations* must be faced with *low flame spread* materials.

11.2 Ventilation of control stations

- (1) The ventilation of *Control Stations* on vessels carrying more than 200 passengers or vessels of fire risk category IV must be:
 - (a) designed so that, in the event of fire, personnel can continue to carry out essential safety functions within the Control Station.
 - (b) separate from the ventilation of spaces required to have smoke-tight divisions (including fire-resisting divisions) in Table 5, Table 6 and Table 7; and
 - (c) for *Control Stations* not opening to open decks, two separate air supplies must be provided. The air inlets of the two sources of supply must be positioned so that the risk of both inlets drawing in smoke simultaneously is minimised.

Note This clause effectively requires the operating compartment to be separated from the accommodation space.

Chapter 12 Additional measures for escape and evacuation routes

12.1 Stairway towers

- (1) Stairway towers that serve three or more decks of accommodation must be enclosed at all levels by *fire-resisting divisions*.
- (2) The *time rating* of such *fire-resisting divisions* are to be the applicable time specified in Table 5, Table 6, Table 7 or 15 minutes, whichever is greater.

12.1.2 Doors on stairway towers

- (1) Doors to stairway towers must be self-closing and must comply with the requirements of *Fire Test Procedures Code*, Annex 1, Part 3, A class division requirements.
- (2) Where none of the decks served by the stairway tower contain accommodation for berthed persons, the self-closing doors may be arranged with catches to keep them open under normal conditions.

12.1.3 Limitations on spaces having access to stairway towers

Direct access to stairway towers must be limited to the following spaces:

- (a) public spaces;
- (b) corridors;
- (c) lifts;
- (d) public toilets;
- (e) *special category spaces* and *open Ro-Ro spaces* to which passengers can have access; and
- (f) external areas.

12.1.4 Ventilation of stairway towers

On vessels of *Fire Risk Category* III and IV carrying more than 36 passengers, the ventilation of stairway towers must be independent of the spaces they serve.

12.2 External open stairways

Boundaries facing external open stairways and passageways forming part of an escape route and boundaries in such a position that their failure during a fire would impede movement to the embarkation deck must be *fire-resisting divisions* of *time rating* specified in Table 5, Table 6 or Table 7.

12.3 Protection of survival craft

- (1) Survival craft must be protected from spaces of *High Fire Risk* or *Moderate Fire Risk* by *fire-resisting divisions* of *time rating* specified in Table 5, Table 6 or Table 7.
- (2) For (1) the time rating is the time specified in Table 5, Table 6 or Table 7 without modification by the table keys.

Note Refer to Part C, Section 7A for the definition of survival craft.

Chapter 13 Additional measures for cargo spaces

13.1 Application

This chapter applies to cargo spaces that are not *Ro-Ro spaces* and do not contain *dangerous goods*.

13.2 Separation of ventilation systems

The ventilation systems for cargo spaces must be separated from each other and from the ventilation systems serving other spaces.

13.3 Closing down and sealing of cargo spaces

- (1) Vessels specified in Table 39 must be provided with effective means for closing all ventilators and other openings leading to the cargo spaces.
- (2) Where specified in Table 39 cargo spaces must be provided with hatch covers of *steel or equivalent material*.

Note Refer also to NSCV Part C, Section 2 for additional requirements pertaining to weathertight integrity of openings to cargo spaces.

Table 39 — Closing appliances for cargo spaces for fire safety (1)

Categories	Sealing of cargo spaces	Steel or equivalent hatch covers
Fire Risk Category I	Required (2)	Not required
Fire Risk Category II	Required (2)	Required (2)
Fire Risk Category III	Required	Required
Fire Risk Category IV	Required	Required

Key:

(1) refer to NSCV Part C, Section 2 for additional requirements pertaining to weathertight integrity.

(2) does not apply to *low risk cargo spaces*.

Chapter 14 Additional measures for combustible stores spaces

14.1 Small combustible liquids stores

14.1.1 Application

- (1) Subsection 14.1 applies to store spaces containing no more than 1000 L of *flammable* or *combustible liquids*, except:
 - (a) store spaces that contain *flammable* or *combustible liquids* that are classified as dangerous goods in accordance with the **ADG Code** in a quantity that exceeds the applicable *minor quantity of dangerous goods*;
 - (b) spaces containing freestanding non-portable tanks for fuel that comply with Part C Subsection 5A Chapter 4;
 - (c) open Deck Storage spaces; and
 - (d) stores lockers.
- (2) For (1)(a), spaces that **contain flammable or combustible liquids that** are classified as dangerous goods in accordance with the **ADG Code in excess of the minor quantities of dangerous goods** are to comply with the additional requirements for dangerous goods vessels in Chapter 15.

14.1.2 Prevention of accumulated vapours and gases

- (1) Storage spaces containing *flammable liquids* or gases must have direct access from open decks only.
- (2) Pressure-adjusting devices and relief valves must exhaust within the compartment.
- (3) The ventilation of store spaces must be sufficient under normal conditions to prevent accumulation of flammable or explosive vapours or dangerous gases.
- (4) The ventilation arrangements must be kept separate from other spaces on the vessel.

14.1.3 Electrical equipment

- (1) Except as necessary for service within the space, electrical wiring and fittings must not be permitted within compartments used for the storage of packaged *flammable* or *combustible liquids*.
- (2) Any electrical equipment and wiring that is fitted within such compartments is to be installed at least 450 mm above the deck.
- (3) The electrical installation in such spaces, and in any ventilation ducting serving such spaces, must be designed, manufactured and installed to operate safely in hazardous conditions that may arise from spilt *flammable* or *combustible liquids* or explosive mixtures of vapour or gas.

Note Refer to NSCV Part C, Section 7B for the requirements applicable to electrical installations in hazardous conditions. Guidance on the installation of electrical equipment in hazardous areas is available in Standards Australia Handbook HB13: *Electrical equipment for hazardous areas*.

14.1.4 Information to reduce the likelihood and consequences of fire

Where required in Chapter 6, the fire training manual and fire safety operational booklet must include:

- (a) appropriate directions and information on packaging, containment and stowage of *flammable* or *combustible liquids* to promote and facilitate compliance with the **ADG Code**, see clause 15.3; and
- (b) instructions requiring *flammable* or *combustible liquids* to be stored only in spaces specified.

14.1.5 Separation from other spaces

Store spaces containing *flammable liquids* must be separated from other spaces on the vessel by gas-tight bulkheads or enclosures to enable the space to be sealed in the event of a fire.

14.1.6 Fire detection

Spaces containing *flammable liquids* must be provided with a fixed fire detection and fire alarm system.

14.1.7 Fire fighting

Spaces containing *flammable liquids* must be protected by a *fixed fire-extinguishing system*. The *fixed fire-extinguishing system* is to be operable from outside the protected space.

14.2 Stores lockers

14.2.1 Application

Clause 14.2 applies to stores lockers for paints, *flammable liquids* and other stores of *flammable or combustible liquids* that are used in the operation and maintenance of the vessel, have a total volume not greater than 10 m³ and are remote from *Accommodation Spaces*.

Note stores lockers may include fuel stored for use in the outboard engines of tenders carried on the vessel.

14.2.2 General

Stores lockers must comply with the requirements of clause 14.1, except that the requirement for a *fixed fire-extinguishing system* in Table 14 may be replaced by the requirements listed in clause 14.2.3.

14.2.3 Fire extinguishing

Stores lockers must be provided with one of the following:

- (a) a portable fire extinguisher and discharge opening complying with clause 8.1; or
- (b) the required portable fire extinguisher is to be stowed adjacent to the discharge opening; or
- (c) a fire hydrant adjacent to the space and a port leading into the space arranged to facilitate the use of a fire hose appliance fitted with a fog spray nozzle without having to enter the protected space; or
- (d) a fixed branch connection and valve from the fire main to a fog spray nozzle located within the protected space; or
- (e) a dry powder *fixed fire-extinguishing system* complying with clause 5.4, designed to deliver a quantity of powder at least 0.5 kg/m² of deck area.

14.3 Storage of gas cylinders for compressed, liquefied or dissolved gases for the vessel's use

14.3.1 Gas cylinders

14.3.1.1 Gas cylinder marking

Gas cylinders for the vessel's use must be clearly marked by means of:

- (a) prescribed identifying colours;
- (b) a clearly legible identification of the name; and
- (c) chemical formula of their contents.

14.3.1.2 Gas cylinder storage location

- (1) Cylinders containing gases and expended cylinders of the same must be stored on open decks or in lockers located above the weather deck.
 - (a) Storage for gas cylinders on open decks must comply with clause 14.4.
 - (b) Lockers for cylinders of flammable gases must comply with clause 14.2.
 - (c) Lockers for cylinders of gases that are not flammable must comply with clauses 14.1.2 and 14.1.5 above.
- (2) Separate storage must be provided for each type of gas.
- (3) Lockers used for the storage of gases must not be used for storage of other combustible products nor for tools or objects not part of the gas distribution system.

14.3.1.3 Protection of cylinders and piping

- (1) Cylinders must be secured against movement and are to be protected against excessive variations in temperature and the direct rays of the sun.
- (2) All valves, pressure regulators and pipes leading from gas cylinders must be protected against damage.

14.4 Open deck storage

- (1) *Flammable or combustible liquids* stored on the open deck must be stowed in the weather and located so that they may be readily jettisoned overboard in the event of a fire.
- (2) Stowage locations must not be in the vicinity of hatches and doors, *galleys*, locations where hot work is performed, ventilation intakes or exhausts, or in locations where helicopter engine exhaust could impinge on such storage.
- (3) Stowage must be aft, if possible, and in the location that poses the least threat to the vessel in the event of fire or explosion of the *flammable or combustible liquids*.

Chapter 15 Additional measures for dangerous goods vessels

15.1 Application

The requirements of Chapter 15 apply to vessels and cargo spaces used for the carriage of *dangerous goods*. It excludes:

- (a) spaces containing limited quantities of packaged dangerous goods as defined in the current *IMDG Code* or the current *UN Recommendations on the Transport of Dangerous Goods Model Regulations* for which the Dangerous Goods Code provisions do not apply.

Note Limited quantities of dangerous goods amount to quite small quantities, for example, one (1) litre of petrol.

- (b) store spaces containing *minor quantities of dangerous goods of flammable or combustible liquids* that comply with clause 14.1; and
- (c) spaces containing paints, *flammable liquids* and other stores of *flammable or combustible liquids* that comply with clause 14.2.

Note Chapter 15 is intended to be complementary to any specific laws within a State or Territory pertaining to the carriage of dangerous goods. Where there is any conflict, the laws pertaining to the carriage of dangerous goods **under this standard** have precedence **to the extent that they do not conflict with the laws of the State or Territory.**

- (d) **fuel carried on the open deck of the vessel that forms part of the stores required for the navigation, safety or the intended operation of the vessel's tenders or other small vessels operated in conjunction with the vessel's operation, provided:**
 - (i) **the fuel is carried in fuel tanks that are designed, constructed and maintained in accordance with NSCV Part C, Sub-section 5A, and**
 - (ii) **the vessel has fire safety preparedness documentation that complies with Chapter 6 and includes fire safety precautions, stowage, segregation and handling instructions relating to the fuel carried for the vessel's tenders, or other small vessels, and**
 - (iii) **the vessel's safety management system includes procedures for refuelling and fuel transfer operations, including measures for preventing and combating any fire or pollution.**

15.2 Classes of dangerous goods voyages

For the purposes of Chapter 15, there are two classes of *dangerous goods* voyages:

- (a) DGV 1; and
- (b) DGV 2.

15.2.2 DGV 1

DGV 1 is a voyage where *dangerous goods* are carried not meeting the voyage criteria specified for DGV 2.

15.2.3 DGV 2

DGV 2 is a voyage that is:

- (a) made by a Class 2 or Class 3; and
- (b) within operational area B geographical limits; and
- (c) carrying *dangerous goods* on the *weather deck*; and
- (d) where the total quantity of *dangerous goods* carried does not exceed:

- (i) 5000 kg of packaged *dangerous goods*; or
- (ii) 2000 kg of *flammable liquids* or gases.

15.3 Packaging, containment and stowage

- (1) The requirements for *dangerous goods* in this Section are predicated on the assumption that the packaging, containment, stowage, segregation, marking of, and declarations for *dangerous goods* on vessels comply with the **ADG Code**.
- (2) The fire training manual and fire safety operational booklet required in Chapter 6 must include appropriate directions and information to promote and facilitate such compliance by those operating the vessel.

Note Each State and Territory has specific legislation pertaining to the carriage and storage of dangerous goods that must be met.

15.4 Additional requirements for fire hose appliances

Vessels carrying *dangerous goods* are, except where specifically stated in SOLAS Chapter II-2 Regulation 19, or clause 7.17 of the *HSC Code*, must be provided with fire hose appliances that comply with all the following:

- (a) Pumps and piping must provide water of sufficient pressure and quantity to simultaneously supply the number of water jets specified in Table 40.
- (b) The performance of each water jet must comply with the requirements of Table 24.
- (c) Hydrants must be located to enable the required number of water jets to be simultaneously trained on any part of the *dangerous goods* cargo space when empty.
- (d) Two water jets must be supplied by a single length of fire hose and the remainder may be supplied by two lengths of fire hose.

Table 40 — Number of simultaneous water jets to be trained on any part of a cargo space for dangerous goods

Category	DGV 1	DGV 2
Fire Risk Category I	3	2
Fire Risk Category II	3	2
Fire Risk Category III	3	Not permitted
Fire Risk Category IV	4	Not permitted

15.4.1 DGV 1 vessels

On a DGV 1 vessel there must be an immediate availability of water for the fire hose appliances.

Note This can be achieved either by permanent pressurisation to effect automatic starting of the pump, or by suitably placed remote starting arrangements for the pump.

15.4.2 DGV 2 vessels

On a DGV 2 vessel there must be ready availability of water for the fire hose appliances.

Note Additional pumping capacity may be needed on a vessel in order to comply with this requirement. This additional capacity may be provided by a powered fixed or portable pump complying with clause 5.8.11 of capacity to provide the aggregate water supply required by clause 15.4.

15.5 Other fire safety requirements

A vessel engaged in the carriage of *dangerous goods* must be provided with fire safety measures specified in SOLAS Chapter II-2 Regulation 19, or clause 7.17 in the *HSC Code* to the extent specified in Table 41, as applicable to the particular class of *dangerous goods*, mode of carriage and type of *dangerous goods* voyage.

Table 41 — Additional dangerous goods fire safety requirements

Requirement	DGV 1	DGV 2
Cooling or flooding of under deck cargo space	As per SOLAS or HSC Code	Not required
Sources of ignition (1)	As per SOLAS or HSC Code	Not required
Fixed fire detection and fire alarm system	As per SOLAS or HSC Code	Visual monitoring or fire patrol
Ventilation	As per SOLAS or HSC Code	Not required
Bilge pumping	As per SOLAS or HSC Code	Not required
Personal protection	As per SOLAS or HSC Code	Protective clothing as per SOLAS or HSC Code one set
Portable fire extinguishers	As per SOLAS or HSC Code	1 x 9kg dry powder extinguisher or 2 x 9L foam extinguishers
Fixed fire-extinguishing system	As per SOLAS or HSC Code	Not required
Separation of Ro-Ro spaces	As per SOLAS or HSC Code	Not required
Separation between Ro-Ro space and weather deck	As per SOLAS or HSC Code	As per SOLAS or HSC Code

Key

(1) The electrical installation is to be designed, manufactured and installed to operate safely in hazardous conditions applicable to the particular class of dangerous goods, refer to NSCV Part C, Section 5B.

15.6 Document of compliance

- (1) A special service notation (DG) must be recorded on the vessels Certificate of Survey to document the compliance of a vessel with the requirements of this chapter for construction and equipment.
- (2) The allowable class or classes of *dangerous goods* are also to be recorded as a condition on the Certificate of Survey.

Chapter 16 Additional measures for Ro-Ro spaces

16.1 Ventilation system

16.1.1 Ventilation design and construction

The ventilation system must be designed and constructed to:

- (a) give at least 10 air changes per hour while underway and 20 air changes per hour when stationary at the quayside during vehicle loading and unloading operations;
- (b) operate at all times when vehicles are in such spaces;
- (c) prevent air stratification and the formation of air pockets;
- (d) be entirely separated from other ventilation systems;
- (e) have ventilation ducts separated for each such space, where the *Ro-Ro space* is capable of being effectively sealed;
- (f) locate the outlet from any exhaust duct in a safe position, having regard to other possible sources of ignition; and
- (g) have ventilation ducts, including fire flaps and fire dampers made of steel, non-combustible or fire-restricting materials.

16.1.2 Open Ro-Ro spaces

16.1.2.1 Minimum area of ventilation openings

The minimum area of permanent ventilation openings to an *open Ro-Ro space* must not be less than:

$$A_V = H_{RR} (0.8 W_{RR} + 0.2 L_{RR})$$

where:

A_V	=	total required area of ventilation openings, in square metres
H_{RR}	=	mean height of the <i>open Ro-Ro space</i> , in metres
W_{RR}	=	mean width of the <i>open Ro-Ro space</i> , in metres
L_{RR}	=	mean length of the <i>open Ro-Ro space</i> , in metres

16.1.2.2 Distribution of openings

- (1) Ventilation openings must be arranged to promote natural ventilation throughout the open vehicle space without leaving pockets of un-circulating air where explosive fumes could form.
- (2) The required area of permanent openings specified above must be provided by:
 - (a) arranging the space to be open at both ends; or
 - (b) providing the space with an opening at one end and openings distributed in the side plating, deckhead or from above.

Note Arrangements for power ventilation may be required to supplement natural ventilation of an open Ro-Ro space if the air flow is inadequate to clear the accumulation of explosive gases or fumes that arise while loading or unloading vehicles in port.

16.1.3 Power ventilation

Closed Ro-Ro spaces must be provided with an effective power ventilation system.

16.1.3.1 Ventilation monitoring and control

A power ventilation system must be:

- (a) provided with means to indicate in the *operating compartment* any loss or reduction of the required ventilating capacity;
- (b) provided with arrangements to permit a rapid shutdown and effective closure of the ventilation system in case of fire; and
- (c) capable of being controlled from a position outside the space served by the ventilation system.

16.2 Electrical equipment suited for hazardous conditions

Electrical equipment located in the following positions must be designed, manufactured and installed for operation in hazardous mixtures of petrol vapour and air:

- (a) any closed or open Ro-Ro deck, or vehicle platform if fitted, on which such explosive vapours might be expected to accumulate. This does not apply to vehicle platforms having openings of sufficient size and distribution to permit the downward escape of petrol gases.
- (b) in an exhaust ventilation duct that serves a *closed or open Ro-Ro spaces*.

Note 1 Refer to NSCV Part C, Section 7B for the requirements applicable to electrical installations in hazardous conditions.

Note 2 Guidance on the installation of electrical equipment in hazardous areas is available in Standards Australia Handbook HB13 *Electrical equipment for hazardous areas*.

16.2.2 Location of electrical equipment

Electrical equipment and wiring that may constitute a source of ignition of flammable vapours must be installed at least 450 mm above the deck or platform, unless the installation of electrical equipment and wiring at less than 450 mm above the deck or platform is necessary and unavoidable for the safe operation of the vessel.

16.3 Limitations on height of special category spaces

The height of a *special category space* may extend more than one deck provided the total overall clear height does not exceed 10 m.

16.4 Fire doors in boundaries

16.4.1 Coamings

Fire doors in boundaries of *Ro-Ro spaces* leading to spaces below the deck must be arranged with coamings of a height of at least 100 mm.

16.5 Indicators

In Class 1 vessels, indicators must be provided in the *operating compartment* to indicate when any fire door leading to or from a *Ro-Ro space* is closed.

16.6 Means of escape

- (1) At least two means of escape must be provided from *Ro-Ro spaces*.
- (2) The escape routes must provide a safe route to the survival craft embarkation deck and are to be located at the fore and aft ends of the space.

16.7 Video surveillance

- (1) A video surveillance system must be provided in *special category spaces*.
- (2) Alternatively, a fire patrol may be substituted where the vessel has sufficient crew and a documented Safety Management System.

Note Marine Order 504 specifies requirements for operational procedures and Safety Management Systems.

16.8 Open Ro-Ro spaces and Ro-Ro spaces on weather decks

The fire detectors specified in Table 11 may be omitted in *open Ro-Ro spaces* and *Ro-Ro spaces* on *weather decks* provided a television surveillance system is fitted and maintained.

16.9 Fire hose appliances

Within any *Ro-Ro space*, hydrants must be arranged so that the water jets from two different hydrants can reach any location within the space, each jet being supplied by a single length of hose.

16.10 Other fire appliances

Each *Ro-Ro space* must be provided with the following *fire appliances*:

- (a) *Water fog applicators* to the extent specified in Table 42; and
- (b) *Portable foam applicators* and foam concentrate to the extent specified in Table 42, complying with:
 - (i) *FSS Code* – Chapter 4 (Portable foam applicator unit); and
 - (ii) capable of producing a solution rate of not less than 200 L/min and sufficient foam concentrate to operate for not less than 5 minutes; and
 - (iii) capable of producing finished foam with a minimum expansion ratio of 7.5:1 suitable for extinguishing a B-class fire.

Note A water fog applicator may consist of a metal L-shaped pipe, the long limb being about 2 m in length capable of being fitted to a fire hose and the short limb being about 250 mm in length fitted with a fixed water fog nozzle or capable of being fitted with a water spray nozzle.

Table 42 — portable foam applicators and water fog applicators in Ro-Ro spaces

Category	Portable foam applicators	Water fog applicators
Fire Risk Category I	Not required	1
Fire Risk Category II	1	2
Fire Risk Category III	1	3
Fire Risk Category IV	2	3

16.11 Scuppers and drainage

- (1) Where the *fixed fire-extinguishing system* fitted in a *Ro-Ro space* is a fixed pressure water-spraying system, the *Ro-Ro space* must be provided with scuppers or drainage and pumping facilities to ensure that water discharged from the system is rapidly discharged overboard.
- (2) If the scuppers are normally kept closed to maintain watertight or weathertight integrity, they must be capable of being opened from a place outside the protected space.

Note The accumulation of quantities of water on the deck or decks consequent to the operation of the fixed pressure water-spraying system could lead to a serious loss of stability and possible capsize of the vessel.

Chapter 17 Additional measures for helidecks

17.1 Application

The provisions of this chapter apply to vessels equipped with *helidecks*.

Note Where helicopters land or conduct winching operations on an occasional or emergency basis on vessels without helidecks, the fire-fighting equipment specified elsewhere in this Section would normally be utilised.

17.2 Structure Construction

- (1) *Helidecks* must be of steel or other *non-combustible* material.
- (2) If the *helideck* forms the deckhead of a deckhouse or superstructure, it is to be insulated in accordance with Table 5, Table 6 or Table 7.

Note The heat of a fire may adversely affect the strength of platforms of aluminium or other low melting point metal. Upon exposure to fire, the structure of such platforms would normally be subject to structural analysis to determine its suitability for further use.

17.3 Protection of spaces beneath the helideck

Where the *helideck* platform is located above a deckhouse:

- (a) the deckhouse top must have no openings;
- (b) the bulkheads forming exposed boundaries of the deckhouse under the platform must have no openings; and
- (c) windows under the platform must be provided with shutters of *non-combustible material*.
- (d) subclauses (b) and (c) need not apply where the *helideck* overhangs the deckhouse beneath not less than 1m beyond the boundary of the deckhouse and the overhang:
 - (i) is of steel; or
 - (ii) is of non-combustible material protected to the level of a *fire-resisting division*.

17.4 Drainage

Drainage systems for *helidecks* must:

- (a) be constructed of steel;
- (b) lead directly overboard independent of any other system; and
- (c) be designed so that drainage does not fall onto any part of the vessel.

17.5 Means of escape

- (1) A *helideck* must be provided with at least two points of access, each capable of serving as both a means of escape and access for fire-fighting and rescue personnel.
- (2) The access points must be located as far apart from each other as practicable, preferably on opposite sides of the *helideck*.

17.6 Emergency equipment

The following equipment must be stored in a location that both provides protection from the elements and facilitates the immediate use of the equipment:

- (a) adjustable wrench, 300 mm;
- (b) blanket, woollen or similar fire-resistant type;

- (c) cutters, bolt 600 mm;
- (d) hook, grab or salving;
- (e) hacksaw, heavy duty complete with 6 spare blades;
- (f) knife (harness type, complete with sheath);
- (g) ladder, 3 m in length;
- (h) life line 5 mm diameter x 15 m in length;
- (i) pliers, side cutting;
- (j) screwdrivers (set of assorted).

17.7 Fire hose appliances

- (1) Each fire main pump and the fire main piping must provide water of sufficient pressure and quantity to simultaneously supply at least two water jets from nozzles of dual-purpose type.
- (2) The performance of each of the water jet must comply with clause 5.8.1.
- (3) The hydrants must be located to enable the two water jets to reach any part of the *helideck* using a single length of fire hose.

17.7.1.2 Foam application system

- (4) A foam application system must be provided and stored near a means of access to the *helideck*.
- (5) The foam application system must consist of a fire monitor or *portable foam applicator* capable of delivering foam to all parts of the *helideck* in all weather conditions in which helicopters can operate.
- (6) The foam application system must:
 - (a) be capable of delivering the discharge rate specified in Table 43 for at least five minutes; and
 - (b) have a principal agent suitable for use with salt water; and
 - (c) a *portable foam applicator*, where provided, must comply with:
 - (i) *FSS Code* – Chapter 4 (Portable foam applicator unit); and
 - (ii) be capable of producing a solution rate of not less than 200 L/min and sufficient foam concentrate to operate for not less than 5 minutes; and
 - (iii) be capable of producing finished foam with a minimum expansion ratio of 7.5:1 suitable for extinguishing a B-class fire.

Table 43 — Helideck foam applicator system discharge rates

Helicopter overall length	Discharge rate of foam solution (L/min)
< 15 m	250
≥ 15 m and > 24 m	500
≥ 24 m and > 35 m	800

17.8 Fire-fighters' outfits

In addition to those that might be specified in Table 22, two sets of fire-fighters' outfits must be stored in close proximity to the *helideck*.

17.9 Helicopter refuelling and hangar facilities

Where provided on a vessel, helicopter refuelling and hangar facilities must comply with the requirements of SOLAS Chapter II-2 Regulation 18.7.

Chapter 18 Additional measures for EES systems

18.1 Objectives

EES systems with lithium-ion cells must be designed to minimise the likelihood of thermal runaway occurring and mitigate associated hazards, including toxic gases, explosion, and fire.

The deemed to satisfy engineering controls necessary to reduce risks associated with these hazards include battery monitoring and alarm systems, off-gas and fire detection, fire suppression, fire containment, battery space ventilation and off gas ducting are specified in this chapter.

18.2 Application

- (1) This chapter applies to domestic commercial vessels less than 35 m with installed Electric Energy Storage (EES) Systems utilizing Lithium-ion cells for electrical propulsion and general electrical loads, except:
 - (a) novel vessels.
 - (b) spaces containing portable Lithium-ion battery powered devices and equipment; and
 - (c) lead-acid based EES systems.

Note Refer to NSCV Part C Section 5, Subsection 5B for additional requirements pertaining to electrical installations.

18.3 Standards for EES spaces and complete EES systems

- (1) Vessels with EES spaces or complete EES systems must be designed and constructed in accordance with requirements specified in Table 44.
- (2) Storage capacity categories specified in Table 44 are for the total cumulative electrical energy storage capacity of all Lithium-ion batteries installed onboard the vessel.

Table 44 — Application of Requirements to EES Spaces and Complete EES Systems

Clause	Installation Type			
	EES Spaces			Complete EES Systems
	≤ 5 kWh	> 5 kWh & < 20 kWh	≥ 20 kWh	Any Capacity
18.4 General requirements	Applies	Applies	Applies	Applies
18.5 EES Systems with storage capacity less than 5kWh	Applies			
18.6 Battery Management System		Applies	Applies	Applies
18.7 Battery Standards		Applies	Applies	Applies
18.8 Boundaries of EES space ≥ 5kWh		Applies	Applies	Applies
18.9 Monitoring and Alarms		Applies	Applies	Applies
18.10 Fixed Fire Extinguishing Systems		Applies	Applies	Applies
18.11 Ventilation		Applies	Applies	Applies

18.12 Integrated Off-gas ventilation		Applies	Applies	Applies
18.13 complete EES system				Applies

18.4 General requirements

- (1) Lithium batteries installed in EES spaces or complete EES systems must:
 - (a) be installed in accordance with the battery manufacturers' recommendations, including to withstand the most adverse combination of
 - (i) maximum local temperature and humidity, and
 - (ii) electrical load or charging current that may occur simultaneously
 - (b) be maintained within battery manufacturers specified SOL
 - (c) be installed aft of the collision bulkhead. On vessels not required to have a collision bulkhead, not positioned further forward than 5% of the sub-division length from the bow
 - (d) be protected from water exposure or ingress during normal operations
 - (e) for power vessels - be secured against movement to withstand heeling to 22.5 degrees, a trim of 10 degrees, or any combination of these angles – for sailing vessels – be secured against inversion
 - (f) be located in areas protected from vibration and impact with minimal risk of mechanical damage.
- (2) EES systems ≥ 5 kWh must not be installed in-way-of:
 - (a) accommodation spaces
 - (b) control stations
 - (c) escape and evacuation routes
 - (d) machinery spaces (of any kind) containing internal combustion engines or oil fuelled boilers, except Complete EES systems complying with Clause 18.13.
- (3) Minimum ingress protection rating of an ESS system and its electrical connections must not be lower than IP 44 in an enclosed space and IP 66 and 67 on an open deck.
- (4) EES spaces must only contain equipment associated with the EES system and not be used for any other purpose.
- (5) Liquid-filled pipes that are not part of the EES system or fire-extinguishing system should not have flanged or screwed connections in the EES space. Where the installation of pipes with flanged or screwed connections in the EES system is unavoidable, risks to EES systems from leakage of the connections must be controlled.
- (6) Fire hydrants must not be installed in an EES space.
- (7) Directions and information necessary to manage EES fire safety risks must be provided in the fire safety preparedness documentation required by Chapter 6.

18.5 EES Systems with storage capacity less than 5kWh

- (1) EES systems less than 5kWh must comply with the requirements of ISO 23625 Small Craft – Lithium-Ion Batteries.
- (2) Batteries must be contained within a gas-tight steel enclosure with steel ventilation ducting that directs vented gases and smoke away from ignition sources and occupied areas.

18.6 Battery Management System

18.6.1 Below 20 kWh

- (1) The EES system must have an integrated BMS that meets the requirements of AS3004.2.

18.6.2 Above 20kWh

- (1) The EES system must have a BMS and any associated battery system control functionality that meets the requirements of the Type Approval certificate issued for the EES system.

18.7 Battery standards

Lithium battery modules must be designed, type tested and certified to:

- (1) prevent propagation of a thermal event from any cell to another cell, where module storage capacity is greater than 11kWh.
- (2) prevent propagation between modules, where propagation between cells may occur. Option (2) can only be adopted where module storage capacity is no greater than 11kWh.

18.7.2 Below 20kWh

- (1) Batteries and battery cells must be designed, type tested and certified against the requirements of:
 - (a) IEC 62619: Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Safety Requirements for Secondary Lithium Cells and Batteries For Use in Industrial Applications
 - (b) IEC 62620: Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Secondary Lithium Cells and Batteries for Use in Industrial Applications

18.7.3 Above 20kWh

- (1) EES systems must be type approved by a recognised organisation.

18.8 Boundaries of EES spaces \geq 5kWh

- (1) The boundaries of spaces containing EES systems containing lithium batteries must be protected to the extent required by Table 45.
- (2) Table 45 must be read in conjunction with Table 5, Table 6 and Table 7 for EES spaces sharing boundaries with moderate and high fires risk spaces. Requirements for EES space fire resisting divisions must not be omitted for steel construction.

Note 1 When reading Table 45 Requirements for EES space boundaries, the value above the diagonal line in a cell applies to the side of the bulkhead or deck exposed to the category of space corresponding to the vertical column. For steel divisions, the time rating above the diagonal line need not apply.

Note 2 When reading Table 43 for EES spaces, the value below the diagonal line in a cell applies to the side of the bulkhead or deck exposed to the category of space corresponding to the horizontal row.

Note 3 On GRP vessels the required SFP must extend to the bottom any bulkheads refer to Clause 4.5.4(2).

Table 45 Requirements for EES space boundaries

Category of space	High Fire Risk Spaces	Moderate Fire Risk Spaces	Accommodation Fire Risk Spaces	Minor Fire Risk Spaces	Control Stations Spaces	Escape or Evacuation Routes
	1	2	3	4	5	6
EES space steel / aluminum construction 1	30 30 (1)	30 30 (1)	ST 30 (1)	ST 30 (1)	ST 30 (1)	ST 30 (1)
EES space fibre-reinforced plastic construction 2	30 60 (1)	30 60 (1)	ST 60 (1)	ST 60 (1)	ST 60 (1)	ST 60 (1)

Key:

30 means a 30-minute time rated fire-resisting division.

1) Time rated fire resisting division may be omitted from spaces containing complete EES systems complying with Clause 18.13.

18.8.2 Openings & penetrations

- (1) Openings and penetrations within EES space boundaries must comply with clause 4.6.
- (2) Doors providing access to the battery room must be self-closing.
- (3) Liquid filled pipes that are not part of the battery system or the fire-extinguishing system must not have flanged or screwed connections in the battery compartment.

18.9 Monitoring and alarm of EES systems

- (1) Monitoring and alarms for EES installations must be provided at a continuously manned control station.
- (2) The ambient temperature in the EES space must be continuously monitored. An alarm must be provided where EES space temperature exceeds manufacturers SOL.
- (3) Doors to EES spaces must be continuously monitored. An alarm must be provided when a EES space a door is opened.
- (4) EES spaces located below the weather deck must be fitted with a bilge level alarm.

Table 46— EES monitoring and alarm requirements

	Monitoring	Alarm
Space ambient temperature	X	X
Fire detection	X	X
Off gas detection	X	X
Space and off gas ventilation system operating		X
Space access door		X
Bilge level alarm	X	X
Charging system	X	X
BMS fault conditions	X	X

18.9.2 Fire detection & alarm

- (1) EES spaces must be fitted with fire detection and alarm system as required by clause 5.1.1 to 5.1.5.
- (2) Combined smoke and heat detectors or a combination of smoke and heat detectors must be installed.

18.9.3 Gas detection system

- (1) Gas detection systems must be capable of detecting the gases emitted by the EES system in the early stages of a thermal runaway event.
- (2) A minimum of two detectors must be fitted:
 - (a) EES systems without integrated off-gas ducting; one detector located high and one low in the EES space.
 - (b) EES systems with integrated off-gas ducting; one gas detector must be fitted inside the integrated ducting and one in the EES space.

Note Gas detectors capable of detecting carbon monoxide or hydrogen gas may be suitable for detecting early-stage thermal runaway in common lithium-ion battery chemistries. EES off-gas may be both lighter and heavier than air depending on the type and temperature of the off-gas products.

- (3) Gas detection must occur at a level of no more than 30% LEL. When gas is detected:
 - (a) audible and visible alarms must be provided at a continuously manned control station
 - (b) the EES system must be automatically disconnected from electrical loads, or where recommended by battery manufacturers, have battery load automatically reduced
 - (c) the EES space exhaust fans and integrated off-gas ventilation duct fans (where fitted) must be automatically activated.
- (4) The gas detection system must be continually monitored and any fault condition indicated as an audible and visual alarm at a continuously manned control station.
- (5) The gas detection system must have an emergency source of power with an automatic changeover in case of failure of the main supply.

18.10 Fixed fire extinguishing systems

- (1) Fixed fire-extinguishing systems for EES spaces must comply with clauses 5.4.2 to 5.4.10 and 5.5.
- (2) EES spaces on Class 2 and 3 vessels up to 15m in length must have a fixed fire-extinguishing system as required by Table 15 and in accordance with EES system manufacturers recommendations.
- (3) EES Spaces on Class 2 and 3 vessels greater than 15 m, and all Class 1 vessels must have a fixed fire extinguishing system compliant with the requirements of Table 14, but limited to the following types:
 - (a) Pressurised water system
 - (b) Gaseous system:
 - (i) a CO₂ system
 - (ii) Inert Gas system
- (4) Any gaseous systems must be provided with a second, independent charge with same capacity as the first charge.
- (5) Where a water-based system is used:
 - (a) the system must be designed to discharge fresh water for 30 minutes operation
 - (b) the system must be served by dedicated fresh-water tank(s) or from utility service tanks

with low-level alarms

- (c) suitable arrangements must be made for the removal of water discharged by the system.
- (6) Fixed fire extinguishing systems must be protected against the accumulation of static electricity within the nozzles during discharge.

18.11 Ventilation of EES spaces

The ventilation system shall be designed to:

- (1) prevent the spread of gases into accommodation spaces, and
- (2) direct smoke and gases outboard to a safe location, and
- (3) control risk of ignition or explosion, and
- (4) ensure the environment within EES spaces are maintained within manufactures specifications.

Note (4) includes but is not limited to the management of salt, humidity, water & temperature.

18.11.2 EES ventilation ducts

- (1) EES ventilation ducts must be constructed and assessed in accordance with clause 4.6.3

18.11.3 EES space ventilation

- (1) Each EES space must be provided with a dedicated mechanical ventilation system.
- (2) Ventilation fans must be of a non-sparking type in accordance with IEC 60079-15 and must be arranged, constructed and installed to maintain the effectiveness of the fire-resisting divisions of the duct.
- (3) The ventilation system must provide a minimum capacity of six (6) air changes per hour (ACH). An increase to the ventilation system capacity may be necessary for EES spaces with complex forms to control the buildup of heat or explosive atmospheres.
- (4) Mechanical ventilation systems must:
 - (a) For EES systems without integrated off gas ducting – maintain under pressure within the space through extraction fans.
 - (b) For EES systems with integrated off gas ducting – maintain a positive pressure within the EES space relative to the pressure in the integrated off-gas ventilation duct.
- (5) The ventilation system must be automatically activated where:
 - (a) Gas is detected in the EES space
 - (b) high temperature is detected in a battery cell and the EES is not fitted with integrated off gas ducting-
- (6) Manual control of the ventilation system must be located alongside the monitoring and alarm functions at the control station.
- (7) In the event of a failure of the remote or automatic ventilation control system, it must be possible to start and stop the EES space ventilation locally, without entering the space.

18.11.4 Inlet and exhaust

- (1) Exhaust outlets must discharge directly to open air and be independent of accommodation ventilation systems.
- (2) Where ventilators are fitted with closing devices, a notice must be displayed that warns against inadvertent closure.
- (3) Ventilation exhaust outlets must be located within 0.4 m of the top of the EES space.
- (4) Ventilation inlets must be located as close to the deck as practicable to ensure effective air circulation.

18.11.5 Hazardous areas

- (1) The EES space and areas within 1.5 m of the ventilation inlet and outlet openings (including integrated off gas ducting) are classified as hazardous area zone 2 in accordance with IEC 60079.
- (2) Electrical equipment and other potential sources of ignition located in the hazardous zone must comply with requirements for hazardous area zone 2 in IEC 60079.
- (3) Areas within 3.0 m of ventilation inlet and outlet openings, in open air, must be considered toxic zones.
- (4) Air intakes, air outlets, or openings to other enclosed spaces must not be located within a toxic zone.
- (5) The following must not be located within the toxic zone:
 - (a) Muster Stations
 - (b) Escape or Evacuation Routes
 - (c) Life Saving Appliances

18.12 Integrated off-gas ventilation

- (1) EES systems with integrated off-gas ventilation ducts must:
 - (a) be constructed to "A-0" - standard
 - (b) must be provided with non-return valves/flaps in intake ducts where used
 - (c) must not be fitted with fire dampers
 - (d) not pass through accommodation spaces, service spaces or control stations
 - (e) be protected against water ingress, with any inlets and outlets positioned above the threshold at which watertight closures are required
 - (f) have grilles on inlets and outlets, with openings not exceeding 13 mm.
- (2) For vessels with EES as the sole source of power - ventilation dampers must be provided to enable the EES space to be closed in the event of power failure to retain overpressure in the space.
- (3) Where batteries are designed to permit cell to cell thermal propagation, off gas ducts must be fitted with mechanical ventilation complying with clause 18.11.3(2), 18.11.3(3) and 18.11.3(5).

18.13 Complete EES system

18.13.1 General requirements

- (1) Complete EES systems must be designed, constructed and installed to meet the requirements in Table 44.
- (2) Clause 18.4 requirements for EES spaces apply to the internal volume of the complete EES enclosure.
- (3) Spaces containing complete EES systems must be provided with a continuously operating mechanical ventilation system, with a minimum capacity of six (6) air changes per hour.
- (4) Clause 18.10 requirements for fixed fire-extinguishing systems is met if the complete EES system is installed in an area protected by a water-based fixed fire-extinguishing system, or if it is installed on an open deck.
- (5) Complete EES systems must be designed, constructed and installed to ensure that no single failure in the system will result in an unsafe condition.

Example if a single failure of space ventilation fan or air-conditioning could result in the temperature inside the complete EES exceeding the safe maximum temp for the batteries then redundancy in space ventilation would be reasonably practicable to control this risk.

18.13.2 Complete EES system enclosures

(1) Complete EES system enclosures must:

- (a) be constructed to A0 standard complying with the FTP Code – Part 3 requirements for A Class Divisions
- (b) be fitted with the fire resisting division required by Table 45 to all external or internal surfaces

Note Fire resisting divisions installed to external surfaces of complete EES systems must be protected from degradation, for example where installed above the weather deck.

- (c) be designed and installed to prevent the transmission of fire and heat to the supporting structure
- (d) be provided with ventilation complying with clause 18.9
- (e) have a minimum ingress protection rating of IP 66 and 67. The ingress protection rating must be retained during a thermal runaway event.

Chapter 19 Assessment, installation and servicing of fire equipment

Fire equipment must be *assessed*, installed and serviced in accordance with this chapter.

Note An arrangement for the servicing of fire equipment that gives a servicing warranty provides evidence of compliance with the required outcomes.

19.1 Assessment

Each component, system or installation of *active or passive fire protection measures* must be type assessed and verified as meeting the applicable standard or specification or test mentioned within this subsection. To be deemed to satisfy this requirement they must be:

- (a) tested and specifically listed for the purpose specified in this section by a recognised testing and listing Organisation in Australia, such as a NATA accredited laboratory, or a specialised laboratory such as the Scientific Service Laboratory (SSL);
- (b) certified by a JAS-ANZ accredited product certification body;
- (c) type approved by a recognised organisation; or
- (d) certified by a Notified Body, recognised by the National Regulator, in accordance with the EU Marine Equipment Directive, Module B (MED-B).

19.2 Installation and testing

Components and systems of *active and passive fire protection measures* must be installed on the vessel and tested by competent persons in accordance with:

- (a) The specifications for installation that may form part of the applicable standard specified within this subsection; and
- (b) Any relevant approval documentation arising from the component or system being Assessed as required by this subsection

19.3 Servicing scope and frequency

- (1) Items of fire equipment must be serviced in accordance with AS 1851.
- (2) Emergency escape breathing devices and breathing apparatus on firefighters' outfits must be serviced in accordance with AS/NZS 1715.

19.4 Competence

A competent person or organisation must undertake the installation and servicing of fire safety equipment. Competence must be relevant to the particular type of equipment. Competent persons or organisations must be one of the following:

- (a) A member of the vessel's crew, to the extent that the service functions specified in AS 1851 fall within the crew member's level of competence; or
- (b) Accredited or licensed by an appropriate Authority or fire administration within the state or Territory; or
- (c) The manufacturer, an agent of the manufacturer or a service station approved by the manufacturer; or
- (d) Accredited or licensed by a Recognised Organisation.

Schedule 1 Required outcomes

Division A General

A.1 Prevention of explosive combustion

A vessel must be designed, constructed and operated to reduce to acceptable levels, or where practicable eliminate, the risks of uncontrolled explosive combustion of vapours, gases, liquids or other substances on board the vessel.

A.2 Control of risks of spillage of flammable liquids

A vessel must be designed, constructed and operated to reduce to acceptable levels, or where practicable eliminate, the risks associated with the spillage of *flammable liquids* on board the vessel.

A.3 Control risks of ignition by sources of heat or sparks

A vessel must be designed, constructed and operated to reduce to acceptable levels, or where practicable eliminate, the risks associated with the sources of heat or sparks on board the vessel.

Note Sources of heat include substances that might be subject to spontaneous combustion under the conditions of loading, storage and use that may exist on board the vessel.

A.4 Prevention of exposure to the smoke and heat of fire

A vessel must be designed, constructed and operated to reduce to acceptable levels, or where practicable eliminate, the exposure of persons to the smoke and heat of a fire that might occur on board the vessel.

A.5 Prevent or delay the spread of fire

A vessel must be designed, constructed and operated to reduce to acceptable levels, or where practicable eliminate, the rapid spread of fire on board the vessel.

A.6 Protection of essential systems

A vessel must be designed, constructed and operated to reduce to acceptable risk, or where practicable eliminate, the possible disruption or destruction by fire of essential safety systems.

Examples Essential safety systems include: Escape and evacuation Emergency electrical systems Fire equipment Lifesaving equipment Evacuation paths Communications equipment.

A.7 Redundancy

The combination of fire safety measures on a vessel must have sufficient redundancy, diversity and independence to avoid vulnerability arising from over-reliance on a single measure.

Note See also clause 1.6.2.

A.8 Prevention of exposure to explosive and toxic products of EES system thermal runaway products

An EES installation must be designed, constructed and operated to reduce to acceptable levels, or where practical eliminate, the exposure of persons to explosive and toxic products of EES system thermal runaway.

A.9 Control of EES systems safety

An EES system must be designed, constructed and operated to ensure safety and efficiency and reduce to acceptable levels, or where practical eliminate, the risks of thermal runaway occurring.

Note examples of measures to ensure safe operation of EES systems include battery management systems, control of battery environment, control of battery charging and discharging.

Division B Design, construction and installation**B.1 Type**

Components, systems and installations that comprise the active and passive fire protection measures on a vessel, including materials and fire equipment, must be of a type appropriate to control to acceptable levels the risks associated with potential or actual fire on the vessel.

B.2 Performance

Each component and system of the active and passive fire protection measures must be designed, constructed and arranged to significantly enhance the probability of survival by:

- (a) preventing the occurrence of fire;
- (b) reducing the consequences in the event of a fire incident; or
- (c) both a) and b).

B.3 Safety of personnel

Each component and system of the active and passive fire protection measures must be designed, constructed and arranged to avoid unacceptable risks to personnel associated with their presence, intentional operation or accidental operation.

B.4 Availability

All fire equipment must be readily available in the event of a fire incident.

B.5 Reliability

All components, systems and installations of active and passive fire protection measures must be designed, constructed, arranged and maintained to function reliably at time of need.

B.6 Operating Instructions

Persons must have access to all relevant information that may be needed to prepare for and facilitate the effective use of all available active and passive fire protection measures in an emergency.

Division C Material requirements**C.1 Non-combustible materials**

Non-combustible materials designated as non-combustible must not add to the fire growth potential within a space.

C.2 Low flame spread materials

Surfaces designated as low flame spread must inhibit fire growth potential, heat production and smoke production within a space.

C.3 Fire restricting materials

Exposed bulkhead and ceiling materials and linings designated fire restricting materials must inhibit fire growth potential and smoke production within a space.

C.4 Floor materials and coverings

Exposed floor materials and coverings designated as must inhibit fire growth potential and smoke production within a space.

C.5 Furniture

Furniture must inhibit fire growth potential, heat flux, heat release and smoke production within a space.

C.6 Sound and thermal insulation

Sound and thermal insulation fitted within a space must not materially add to the fire risk within a space.

Division D Servicing of fire equipment**D.1 Maintenance of function**

The effectiveness of all fire equipment must be maintained over the life of the vessel.

D.2 Reliability

The reliability of items of fire equipment must not reduce over time.

D.3 Quality

Persons or organisations engaged in the servicing of fire equipment must establish and apply appropriate management processes to control the quality of servicing outcomes and allow these outcomes to be verified.