

Australian Transport Advisory Council

Uniform Shipping Laws Code

Section 5: Construction

Sub-Section F: Structural Fire Protection

ISBN 0 644 10231 4



9 780644 102315

88/21 754 Cat. No. 89 0834 4

© Commonwealth of Australia 1989
ISBN 0 644 10231 4

Published for the Department of Transport and Communications by the Australian
Government Publishing Service, Canberra 1989

Charts and diagrams prepared by Michael Thorne Enterprises.

Printed by R. D. RUBIE, Commonwealth Government Printer, Canberra

COMMONWEALTH OF AUSTRALIA
ORDER UNDER SECTION 427 OF NAVIGATION ACT 1912

I, PAUL BARCROFT ECCLES, delegate of the Minister for Transport and Communications, pursuant to section 427 of the Navigation Act 1912, hereby declare that the provisions annexed to this order are the provisions of Section 5, Sub-section F of the Uniform Shipping Laws Code as in existence on the date of this Order.

Dated this 4th day of September 1989.

A handwritten signature in black ink, appearing to read 'P. B. Eccles', written over a horizontal line.

P. B. ECCLES
FIRST ASSISTANT SECRETARY
MARITIME OPERATIONS DIVISION

SUB-SECTION F
CONTENTS

<i>Clause</i>	<i>Title</i>
F.1	Application
F.2	Definitions
F.3	General Requirements

Structural Fire Protection

1. Application

1.1 The following classes of vessel shall conform to the structural fire protection provisions of Marine Orders, part 15 (Ship Structural Fire Protection, Fire Detection and Fire Extinction).

- Class 1A vessels that are required to be surveyed under the (Commonwealth) Navigation Act 1912
- Class 1A vessels, other than those required to be surveyed under the (Commonwealth) Navigation Act 1912, having a length of 35 metres or greater.
- Class 2A and Class 2B vessels over 500 tons gross.

1.2 Class 1 and Class 2 vessels, other than those specified in 1.1 and Class 3A vessels engaged on overseas fishing voyages subject to the Commonwealth Navigation Act 1912, shall comply with the relevant provisions of this sub-section.

1.3 Class 3 vessels other than those specified in 1.2 shall comply with the requirements of Clauses 3.2, 3.7, 3.9, 3.11, 3.12 and 3.13."

1.4 In the case of vessels of composite construction, e.g. steel hull and timber topside structure, the requirements for structural protection or the alternative to structural fire protection shall be governed by the principal material in each portion.

2. Definitions

2.1 Definitions applicable to Steel Vessels

2.1.1 "'A' class divisions" means those divisions formed by bulkheads and decks that comply with the following:

- (a) they shall be constructed of steel or other equivalent material;
- (b) they shall be suitably stiffened;
- (c) they shall be so constructed as to be capable of preventing the passage of smoke and flame to the end of the one hour standard fire test;
- (d) they shall be insulated with approved non-combustible materials such that, when subjected to the standard fire test, the average temperature of the unexposed side will not rise more than 139°C above the original temperature, nor will the temperature, at any one point, including any joint, rise more than 180°C above the original temperature, within the time listed below;
 - for Class "A-30" : 30 minutes;
 - for Class "A-15" : 15 minutes; or
 - for Class "A-0" : 0 minutes; and
- (e) the Authority may require a test of a prototype bulkhead or deck to ensure that it will meet the requirements of (c) and (d) of this definition.

2.1.2 "'B' class divisions" means those divisions formed by bulkheads, decks, ceilings or linings that comply with the following:

- (a) they shall be so constructed as to be capable of preventing the passage of flame to the end of the first half hour of the standard fire test;

2 *Section 5 Sub-section F*

- (b) they shall have an insulation value such that, when subjected to the standard fire test, the average temperature of the unexposed side will not rise more than 139°C above the original temperature, nor will the temperature at any one point, including any joint, rise more than 225°C above the original temperature, within the time listed below:
 - for class "B-15" : 15 minutes; or
 - for class "B-0" : 0 minutes;
- (c) All materials entering into the construction and erection of "B" class divisions shall be non-combustible, with the exception that combustible veneers may be permitted provided they meet other requirements of this sub-section; and
- (d) the Authority may require a test of prototype division to ensure that it will meet the requirements of (a), (b) and (c) of this definition.

2.1.3 "C" class divisions" means divisions constructed of non-combustible materials acceptable to the Authority. They need meet neither requirements relative to the passage of smoke and flame nor limitations relative to the temperature rise. Combustible veneers are permitted provided they meet other requirements of this sub-section.

2.1.4 "continuous 'B' class ceilings or linings" means those "B" class ceilings or linings that terminate only at an "A" or "B" class division;

2.1.5 "standard fire test" means a fire test in which specimens of the relevant bulkheads or decks are exposed in a test furnace to temperatures corresponding approximately to the standard time-temperature curve. The specimen shall have an exposed surface of not less than 4.65 square metres and height, or length of not less than 2.44 metres, resembling as closely as possible the intended construction and including where appropriate at least one joint. The standard time-temperature curve is defined by a smooth curve drawn through the following temperature points measured above the initial cold furnace temperature:

- at the end of the first 5 minutes—556°C;
- at the end of the first 10 minutes—659°C;
- at the end of the first 15 minutes—718°C;
- at the end of the first 30 minutes—821°C;
- at the end of the first 60 minutes—925°C;

2.2 Definitions applicable to Timber, GRP or Aluminium Vessels.

2.2.1 "basic fire protection division" is a division formed by a bulkhead or a deck which complies with following requirements:

- (a) it shall be so constructed as to be capable of preventing the passage of smoke and flame when subjected to a "Basic Fire Test" up to the time required by this sub-section as the time rating for the particular division; and
- (b) if insulated, it shall be with approved non-combustible materials.
- (c) when subjected to the "Basic Fire Test" the average temperature of the unexposed side will not rise more than 139°C above the original temperature, nor will the temperature at any one point, including any joint, rise more than 180°C above the original temperature within the time required by this sub-section as the time rating for the particular division.
- (d) the Authority may require a test of a division to ensure that it will meet the requirements of (a) and (c) of this definition.

2.2.2 "Basic Fire Test" is one in which a specimen of the relevant bulkhead or deck is exposed in a test furnace to temperatures corresponding to the standard time-temperature curve. The specimen shall have an exposed surface of not less than 0.20 square metres and a height of bulkhead or length of not less than 0.45 metres resembling as closely as possible the intended construction and including where appropriate at least one joint. The standard time-temperature curve is defined by a smooth curve drawn through the following temperature points, measured above the initial cold furnace temperature.

- at the end of the first 5 minutes : 556°C
- at the end of the first 10 minutes : 659°C
- at the end of the first 15 minutes : 718°C
- at the end of the first 30 minutes : 821°C
- at the end of the first 60 minutes : 925°C

2.3 Definitions applying to all vessels

- 2.3.1 "equivalent material" means any non-combustible material that, 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:

Note: Aluminium alloy with appropriate insulation is an example of equivalent material referred to in this definition;

- 2.3.2 "Low Flame Spread Surface" is one which, when bonded to a substrate and subjected to the test laid down in Australian Standard 1530 Part 3 "Test for Early Fire Hazard Properties of Materials" meets the following criteria:

Spread of flame index, not to exceed 3

Ignitability index plus heat involved index not to exceed 7 (in total)

Smoke developed index, not to exceed 4

Note: An Authority may accept a smoke developed index of up to 5 where the spread of flame index does not exceed 1, and the ignitability index plus the heat evolved index does not exceed 3.

- 2.3.3 "Non-combustible material" means a material which, when heated to a temperature of 750°C, neither flames for longer than 10 seconds duration, nor raises either its surface temperature or the temperature of the test furnace more than 50°C above 750°C when tested in accordance with Australian Standard 1530 Part 1 "Combustibility Test for Materials".

2.4 Categories of Spaces

- 2.4.1 The following definitions of Categories of Spaces are applicable within this sub-section:

Category	Description
(1) Control Stations	Wheelhouse, radio room, fire control station.
(2) Corridors	Corridors, stairways, lobbies.
(3) Accommodation Spaces	Sleeping rooms, mess rooms, public spaces, storerooms (in which flammable products are not stored).
(4) Machinery Spaces	(a) Spaces containing internal combustion machinery for: <ul style="list-style-type: none"> (i) main propulsion, (ii) other purposes when such machinery in the aggregate has a total power output of not less than 375 kW, or (b) spaces which contain any oil fired boiler.
(5) High Risk Spaces	(a) Spaces containing internal combustion machinery other than as defined in (4) (b) Separate galleys (c) Storerooms containing flammable products.
(6) Cargo Spaces	All spaces used for the carriage of cargo.

3. General requirements, for all vessels

3.1 The machinery space shall be protected by an automatic fire detection system and a fixed fire extinguishing installation, as required in Section 11 of this Code. Where a water-spray type of fixed fire extinguishing system is fitted, then the structural fire integrity requirements of Tables 1, 2, 3 and 4 need not be adhered to for the boundaries of the machinery space.

3.2 Internal combustion engine exhausts, boiler and galley uptakes and similar sources of ignition shall be kept clear of any combustile material and where necessary shall be efficiently insulated with non-combustible materials.

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

4 Section 5 Sub-section F

3.4 The fire resistance of doors, hatches and their landings shall be equivalent to that of the division in which they are fitted.

3.5 In corridor bulkheads, required by this sub-section to have a fire rating, ventilation openings may be fitted in the lower half of a door. The total net area area of any such openings shall not exceed 0.05 square metres and shall be fitted with a grill of non-combustible material.

3.6 Ventilation systems, piping and cables penetrating rated divisions shall not reduce the fire integrity of the division and shall be to the satisfaction of the Authority.

3.7 Paints, varnishes or any similar preparations shall not be used if they contain a nitro-cellulose or other highly flammable base. Fabrics containing nitro-cellulose shall not be fitted.

3.8 Paint lockers and similar compartments, used for the stowage of flammable liquids, shall be separated from adjacent compartments by noncombustible divisions. In the case of materials other than steels, the insulated face of the division shall be inside the high-risk compartment.

3.9 Fuel tanks situated within a machinery space shall be constructed of metal. Fuel tanks constructed of other materials shall be situated outside of machinery spaces.

3.10 Where the total length of any blind corridor, including the length of stairway, if any, exceeds 5 metres, the corridor bulkheads, doors opening on to the corridor and stairway bulkheads shall be of non-combustible material.

3.11 In any space containing fixed oil, gas or electric cooking appliances, the bulkheads and linings within 1 metre of the perimeter of the appliance and deckheads up to 500 mm outwards from the vertically projected perimeter of the appliance shall be protected by non-combustible material.

3.12 Means of escape shall be clearly marked and provided as follows:

- (a) Subject to clause 3.12 (b) a vessel shall be provided with not less than two widely separated escape routes from all general areas accessible to passengers or where the crew may be quartered or normally employed.
- (b) Where the length of a compartment does not exceed 5 metres, one means of escape may be acceptable provided that:
 - (i) there is no potential fire risk in that space and the means of escape is remote from the machinery spaces or high risk spaces.
 - (ii) The arrangement is such that the installation of two means of escape does not materially improve the safety of the vessel or those on board.
 - (iii) The space is one which is not normally occupied by more than 8 persons at any one time.
- (c) Windows, windshields and side scuttles giving access to an open deck, capable of being manually opened, having a minimum dimension of clear opening of 460 mm, and having unhindered accessibility may be considered as one avenue of escape.
- (d) Where hatches are provided for emergency purposes, the clear opening shall not be less than 460 mm in any direction. Facilities are to be provided to enable easy access to the hatch opening. The hatch cover is to be operable from both sides.

3.13 Machinery and high risk spaces shall have closing devices acceptable to the Authority enabling the space to be closed down in the event of fire.

3.14 Where lifeboats, liferafts or buoyancy apparatus are stowed directly above a machinery space, accommodation space or galley, the deck in that area shall have a time rating of 15 minutes.

4. Structural fire protection for steel vessels

4.1 Steel vessels having a measured length not exceeding 12.5 metres

4.1.1 Structural fire protection is not required.

4.2 Steel vessels having a measured length exceeding 12.5 metres but not exceeding 25 metres.

4.2.1 Where the machinery space is contiguous with an accommodation space, any dividing bulkhead or deck shall be of A-15 standard.

4.3 Steel vessels having a measured length exceeding 25 metres.

4.3.1 Stairways that penetrate a single deck shall be closed at one level by at least B-0 divisions with self closing doors.

4.3.2 Stairways penetrating more than one deck shall be surrounded by at least A-0 divisions with self closing doors at all levels.

4.3.3 Bulkheads having a minimum fire integrity as required by Table 1 and decks having a minimum fire integrity as required by Table 2 shall be fitted in the vessel.

TABLE 1
FIRE INTEGRITY OF BULKHEADS SEPARATING ADJACENT SPACES

<i>Spaces</i>		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
Control Station	1	B-0	B-0	B-15	A-30	B-15	A-15
Corridors	2		C	C	A-30	B-15	B-0
Accommodation	3			N	A-30	B-0	A-0
Machinery	4				*	A-0	A-0
High Risk	5					C	A-0
Cargo	6						N

Notes:

* = Division is required to be steel or equivalent material but need not be "A" class standard.

C = Non-combustible materials.

N = No fire integrity required.

TABLE 2
FIRE INTEGRITY OF DECKS SEPARATING ADJACENT SPACES

<i>Space Below</i>		<i>Space Above</i>					
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
Control Station	1	A-0	A-0	A-0	A-15	A-0	A-0
Corridors	2	A-0	*	*	A-0	A-0	A-0
Accommodation	3	A-30	A-15	*	A-15	A-0	A-0
Machinery	4	A-30	A-30	A-30	*	A-30	A-0
High Risk	5	A-30	A-15	A-15	A-0	A-15	A-0
Cargo	6	A-30	A-15	A-15	A-0	A-15	*

Notes:

* = Division is required to be steel or equivalent material but need not be "A" class standard.

5. STRUCTURAL FIRE PROTECTION FOR ALUMINIUM, G.R.P. OR TIMBER VESSELS

5.1 Aluminium, G.R.P. or timber vessels having a measured length not exceeding 12.5 metres.

5.1.1 Structural fire protection is not required.

5.2 Aluminium, G.R.P. or timber vessels having a measured length exceeding 12.5 metres but not exceeding 25 metres.

5.2.1 Where the machinery space is contiguous with an accommodation space, any dividing bulkhead or deck shall be a basic fire protection division having a time rating of 15 minutes.

5.3 Aluminium, G.R.P. or timber vessels having a measured length exceeding 25 metres.

6 *Section 5 Sub-section F*

- 5.3.1 Stairways that penetrate a single deck shall be closed at one level by basic fire protection divisions, having a time rating of at least 15 minutes, with self closing doors.
- 5.3.2 Stairways penetrating more than one deck shall be surrounded by fire protection divisions, having a time rating of at least 30 minutes with self closing doors at all levels.
- 5.3.3 The vessel shall be fitted with bulkheads which shall be basic fire protection divisions, having minimum time ratings as required by Table 3.
- 5.3.4 Desks in the vessel shall be basic fire protection divisions, having a minimum time rating as required by Table 4.

TABLE 3
FIRE INTEGRITY OF BULKHEADS SEPARATING ADJACENT SPACES

<i>Spaces</i>		1	2	3	4	5	6
Control Station	1	15	15	30	30	30	30
Corridors	2		15 or C	15	30	30	15
Accommodation	3			N	30	15	15
Machinery	4				N	15	15
High Risk	5					C	15
Cargo	6						N

Notes:

C = Non-combustible materials.

N = No integrity required.

TABLE 4
FIRE INTEGRITY OF DECKS SEPARATING ADJACENT SPACES

		<i>Space Above</i>					
<i>Space Below</i>		1	2	3	4	5	6
Control Station	1	15	15	15	30	30	30
Corridors	2	15	N	15	30	15	15
Accommodation	3	30	15	N	30	15	15
Machinery	4	30	30	30	N	30	15
High Risk	5	30	15	30	15	C	15
Cargo	6	30	15	30	15	15	N

Notes:

C = Non-combustible materials.

N = No integrity required.

6. Alternatives to Structural Fire Protection

6.1 As an alternative to the requirements for structural fire protection, automatic fire detection systems or automatic sprinkler systems may be provided in accordance with clauses 6.4 and 6.5 as appropriate.

6.2 The general requirements specified in clause 3 shall apply with the exception of 3.3, 3.4, 3.5, 3.6, 3.8 and 3.10.

6.3 In accommodation spaces, the Authority may require certain surfaces to be low flame spread surfaces.

6.4 Steel vessels

6.4.1 Steel vessels of Class 1B, 1C, 2B, 2C or 3A having a measured length in excess of 12.5 metres but not exceeding 25 metres shall be fitted with a fixed automatic fire detection system in accordance with the requirements of Appendix A.

6.4.2 Steel vessels of Class 1B, 1C, 2B, 2C or 3A having a measured length in excess of 25 metres shall be fitted with a fixed automatic fire detection system in accordance with the requirements of Appendix B.

6.4.3 Steel vessels of Class 1D and 1E having a measured length in excess of 12.5 metres shall be fitted with a fixed automatic fire detection system in accordance with the requirements of Appendix A.

6.4.4 Detectors shall be fitted in all control stations, accommodation spaces and high risk spaces as defined in clause 2.4.

6.5 Aluminium G.R.P. and timber vessels

6.5.1 Aluminium G.R.P. and timber vessels of Class 1B, 1C, 2B, 2C or 3A having a measured length in excess of 12.5 metres but not exceeding 25 metres shall be fitted with a fixed automatic fire detection system in accordance with the requirements of Appendix A.

Detectors shall be fitted in all control stations, accommodation spaces and high risk spaces as defined in clause 2.4.

6.5.2 Aluminium G.R.P. and timber vessels in Class 1B, 1C, 2B, 2C or 3A having a measured length in excess of 25 metres shall be fitted with a fixed automatic sprinkler system in accordance with the requirements of Appendix C.

Sprinkler heads shall be fitted in all control stations, accommodation spaces and high risk spaces as defined in clause 2.4.

6.5.3 Aluminium G.R.P. and timber vessels of Class 1D and 1E having a measured length in excess of 12.5 metres shall be fitted with a fixed automatic fire detection system in accordance with the requirements of Appendix A.

Detectors shall be fitted in all control stations, accommodation spaces and high risk spaces as defined in clause 2.4.

Appendix A

FIXED FIRE DETECTION SYSTEMS

A.1 General Requirements

A.1.1 A fixed fire detection system shall be capable of immediate operation at all times.

A.1.2 Power supplies and electrical circuits necessary for the operation of the system shall be monitored for loss of power and fault conditions as appropriate.

A.1.3 A fault condition in the system shall initiate a visual and audible signal at the control panel.

A.1.4 The system shall have not less than 2 sources of power one of which shall be from an emergency source.

A.1.5 Activation of a detector shall initiate a visual and audible signal at the control panel.

A.1.6 The control panel shall be located in the wheelhouse or at a position that is normally manned.

A.1.7 Detectors shall be operated by heat, smoke, products of combustion, or any combination of these factors.

A.2 Installation Requirements

A.2.1 Detectors shall be located for optimum performance. Location near beams, ventilation ducts or positions where patterns of airflow could adversely affect performance or where physical damage could occur shall be avoided. Detectors in ceilings should normally be a minimum distance of 500 mm away from bulkheads.

A.2.2 Detectors shall be spaced at intervals suitable to their characteristics, and to the satisfaction of the Authority.

A.2.3 Electric cable that forms part of the system, unless it is suitably constructed, shall be so arranged as to avoid high risk areas and machinery spaces.

A.3 Design Requirements

- A.3.1 The system and detectors shall be designed to withstand the conditions normally encountered in vessels (i.e. vibration, humidity, shock and corrosion).
- A.3.2 Detectors shall comply with Appendix A or B of Australian Standard 1670 and shall be appropriate for the location.
- A.3.3 Operational limits and rate of heat rise of thermal detectors shall be to the satisfaction of the Authority using Australian Standard 1603 as a guide.

Appendix B

FIXED FIRE DETECTION SYSTEMS

B.1 General Requirements

- B.1.1 In addition to the requirements given in Appendix A the following requirements shall apply.
- B.1.2 Supply from main and emergency power shall be by separate feeders reserved solely for that purpose. The feeders shall run to an automatic changeover switch in or adjacent to the control panel.
- B.1.3 Detectors shall be grouped into sections: indicating units on or adjacent to the control panel shall denote the section in which a detector has operated.
- B.1.4 The location of sections and spaces covered shall be shown on or adjacent to the indicating unit.
- B.1.5 A section of indicators shall not serve more than one deck.
- B.1.6 Where the system also serves machinery spaces the associated circuits shall each be efficiently protected.

APPENDIX C

AUTOMATIC SPRINKLER SYSTEM

- C.1 The system shall be a wet pipe automatic system actuated by heat at the sprinkler head. Adequate protection against water freezing in the pipe shall be provided where necessary.
 - C.2 The system shall consist of a pressure vessel containing a standing charge of water pressurised by air, bus main piping and single branch pipes to a heat actuated sprinkler head. One of the ship's fire pumps shall be connected to the bus main.
 - C.3 Operation of the system shall give a visual and audible alarm in the wheel house or at a position that is normally manned.
 - C.4 A gauge indicating the pressure in the system together with a visual and audible alarm that operates at a predetermined fall of pressure in the system shall be fitted adjacent to the alarms in clause C.3.
 - C.5 Sprinklers shall be suitable for a marine atmosphere and shall come into operation within the temperature range 70-80°C except that in locations such as drying rooms, where high ambient temperatures may be expected, the operating temperature may be increased up to 30°C above the maximum deckhead temperature.
 - C.6 Sprinklers shall be a type that gives a flat or wide angle discharge pattern of at least 180° and produce a mist or fog like discharge. The area of coverage shall be not less than a circle of 3.5 metres in diameter.
 - C.7 The rate of flow from a sprinkler shall be not less than 5 litres per minute for each square metre of floor area.
 - C.8 Spacing and location of sprinklers shall be to the satisfaction of the Authority.
 - C.9 The storage vessel containing the standing charge of water shall be designed in accordance with the relevant section of Australian Standard 1210 "Unfired Pressure Vessels."
- Provision shall be made for:
- (a) a discharge connection in the bottom, for water discharge to the bus main piping, provided with a stop and non-return valve
 - (b) charging connections for water and air, provided with a stop valve

- (c) means of indicating the water level in the vessel: provision should be made for isolating the indicator
- (d) connections for alarms required by clauses C.3 and C.4 together with stop valves
- (e) a pressure gauge
- (f) a safety relief valve.

C.10 The standing charge, in litres, of water in the pressure vessel shall be not less than 5 times the largest area in square metres covered by a single sprinkler with a minimum charge of 50 litres.

C.11 The volume of the pressure vessel shall be not less than twice the volume of the standing charge as defined by C.10.

C.12 The working pressure in the tank shall be not less than twice the sum of;

- (a) the required design pressure at the nozzle;
- (b) the maximum static head in the system from the water discharge connection on the pressure vessel to the highest nozzle in the system; and
- (c) the maximum frictional losses due to flow in the piping during discharge of the standing charge through a sprinkler.

C.13 All piping in the system shall be galvanised or otherwise protected against corrosion.

C.14 Bus main piping shall be not less than 25 mm internal diameter and branch pipes to sprinklers not less than 20 mm internal diameter.

C.15 Provision shall be made for testing the alarms required by C.3 and C.4

C.16 A non-return valve shall be fitted in the discharge line from the fire pump to the bus main.