ประกาศกรมเจ้าท่า

ที่ ๑๒๒/๒๕๖๖

เรื่อง การดำเนินการเกี่ยวกับอุปกรณ์บนเรือตาม
อนุสัญญาระหว่างประเทศว่าด้วยความปลอดภัยแห่งชีวิตในทะเล ค.ศ. ๑๙๗๔ และที่แก้ไขเพิ่มเติม

เพื่อให้การปฏิบัติงานเกี่ยวกับการตรวจเรือ การออกและการสลักหลังใบสำคัญรับรองตามกฎข้อบังคับสำหรับการตรวจเรือ กำหนดหลักเกณฑ์ วิธีการ และเงื่อนไขในการออกใบสำคัญรับรองเกี่ยวกับความปลอดภัยแห่งชีวิตในทะเล พ.ศ. ๒๕๕๙ เป็นไปอย่างมีประสิทธิภาพ สอดคล้องกับข้อกำหนดของอนุสัญญาระหว่างประเทศว่าด้วยความปลอดภัยแห่งชีวิตในทะเล ค.ศ. ๑๙๗๔ และที่แก้ไขเพิ่มเติม (International Convention for the Safety of Life at Sea, 1974 (SOLAS), as amended) อธิบดีกรมเจ้าท่า จึงประกาศกำหนดไว้ ดังต่อไปนี้

๑. ให้นำประมวลข้อบังคับระหว่างประเทศว่าด้วยอุปกรณ์ช่วยชีวิต (Resolution MSC.48(66) International Life-Saving Appliance (LSA) Code) และที่แก้ไขเพิ่มเติม ตามที่ปรากฏในภาคผนวก ๑ ที่แนบท้ายประกาศนี้ มาใช้บังคับกับการตรวจอุปกรณ์ช่วยชีวิตที่กำหนดให้มีไว้บนเรือตามอนุสัญญา SOLAS 1974

๒. ให้นำประมวลข้อบังคับระหว่างประเทศว่าด้วยระบบความปลอดภัยจากเพลิงไหม้ (Resolution MSC.98 (73) International Code for Fire Safety Systems) และที่แก้ไขเพิ่มเติม ตามที่ปรากฏในภาคผนวก ๒ ที่แนบท้ายประกาศนี้ มาใช้บังคับกับการตรวจอุปกรณ์หรือระบบดับเพลิงที่กำหนดให้มีไว้บนเรือตามอนุสัญญา SOLAS 1974

ทั้งนี้ การทดสอบและการรับรองอุปกรณ์ข้างต้นต้องดำเนินการให้สอดคล้องกับประมวลข้อบังคับระหว่างประเทศว่าด้วยขั้นตอนการทดสอบการป้องกันเพลิงของวัสดุและอุปกรณ์ (Resolution MSC.61(67) International Code for Application of Fire Test Procedures) และที่แก้ไขเพิ่มเติม ตามที่ปรากฏในภาคผนวก ๓ ที่แนบท้ายประกาศนี้

๓. ให้พิจารณานำแนวปฏิบัติ (Guideline) ข้อแนะนำ (Recommendation) หนังสือเวียน (Circular) และข้อกำหนดอื่น ๆ ขององค์การทางทะเลระหว่างประเทศ มาใช้บังคับกับการดำเนินการเกี่ยวกับอุปกรณ์บนเรือเท่าที่สามารถจะปฏิบัติได้

๔. ในกรณีที่เรือปฏิบัติตามข้อกำหนดในข้อ ๑ และข้อ ๒ แล้ว แต่อุปกรณ์ดังกล่าวชำรุดเสียหายหรือสูญหาย ให้แทนที่อุปกรณ์ที่ชำรุด เสียหาย หรือสูญหายด้วยอุปกรณ์ที่มีมาตรฐานไม่ต่ำกว่าข้อกำหนดเดิม

ประกาศ ณ วันที่ ๒๘ เมษายน พ.ศ. ๒๕๖๖
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ภาคผนวก ๑

ประมวลข้อบังคับระหว่างประเทศว่าด้วยอุปกรณ์ช่วยชีวิต

(Resolution MSC.48(66) International Life-Saving Appliance (LSA) Code)

RESOLUTION MSC.48(66)
(adopted on 4 June 1996)

ADOPTION OF THE INTERNATIONAL LIFE-SAVING APPLIANCE (LSA) CODE

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECOGNIZING the need to provide international standards for life-saving appliances required by chapter III of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended,

NOTING resolution MSC 47(66) by which it adopted, *inter alia*, amendments to chapter III of the SOLAS Convention to make the provisions of the International Life-Saving Appliance (LSA) Code mandatory under that Convention on or after 1 July 1998,

HAVING CONSIDERED, at its sixty-sixth session, the text of the proposed LSA Code,

1 ADOPTS the International Life-Saving Appliance (LSA) Code the text of which is set out in the Annex to the present resolution,

2. NOTES that under the amendments to chapter III of the 1974 SOLAS Convention, amendments to the LSA Code shall be adopted, brought into force and shall take effect in accordance with the provisions of article VIII of that Convention concerning the amendments procedure applicable to the Annex to the Convention other than chapter I,

3 REQUESTS the Secretary-General to transmit certified copies of the present resolution and the text of the LSA Code contained in the Annex to all Contracting Governments to the Convention;

4 FURTHER REQUESTS the Secretary-General to transmit copies of this resolution and its Annex to Members of the Organization, which are not Contracting Governments to the Convention

ANNEX

INTERNATIONAL LIFE-SAVING APPLIANCE (LSA) CODE

Contents

THE INTERNATIONAL LIFE-SAVING APPLIANCE CODE

PREAMBLE

1 The purpose of this Code is to provide international standards for life-saving appliances required by chapter III of the International Convention for the Safety of Life at Sea (SOLAS), 1974.

2 On and after 1 July 1998, the requirements of this Code will be mandatory under the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended. Any future amendment to the Code will be adopted and brought into force in accordance with the procedure laid down in article VIII of that Convention.

CHAPTER I - GENERAL

1.1 Definitions

1.1.1 *Convention* means the International Convention for the Safety of Life at Sea, 1974, as amended.

1.1.2 *Effective clearing of the ship* is the ability of the free-fall lifeboat to move away from the ship after free-fall launching without using its engine.

1.1.3 *Free-fall acceleration* is the rate of change of velocity experienced by the occupants during launching of a free-fall lifeboat.

1.1.4 *Free-fall certification height* is the greatest launching height for which the lifeboat is to be approved, measured from the still water surface to the lowest point on the lifeboat when the lifeboat is in the launch configuration.

1.1.5 *Launching ramp angle* is the angle between the horizontal and the launch rail of the lifeboat in its launching position with the ship on even keel.

1.1.6 *Launching ramp length* is the distance between the stern of the lifeboat and the lower end of the launching ramp.

1.1.7 *Regulation* means a regulation contained in the Annex to the Convention.

1.1.8 *Required free-fall height* is the greatest distance measured from the still water surface to the lowest point on the lifeboat when the lifeboat is in the launch configuration and the ship is in its lightest seagoing condition.

1.1.9 *Retro-reflective material* is a material which reflects in the opposite direction a beam of light directed on it.

1.1.10 *Water-entry angle* is the angle between the horizontal and the launch rail of the lifeboat when it first enters the water.

1.1.11 The terms used in this Code have the same meaning as those defined in regulation III/3.

1.2 General requirements for life-saving appliances

1.2.1 Paragraph 1.2.2.7 applies to life-saving appliances on all ships.

1.2.2 Unless expressly provided otherwise or unless, in the opinion of the Administration having regard to the particular voyages on which the ship is constantly engaged, other requirements are appropriate, all life-saving appliances prescribed in this part shall:

.1 be constructed with proper workmanship and materials;

.2 not be damaged in stowage throughout the air temperature range -30°C to +65°C;

.3 if they are likely to be immersed in seawater during their use, operate throughout the seawater temperature range -1°C to +30°C;

.4 where applicable, be rot-proof, corrosion-resistant, and not be unduly affected by seawater, oil or fungal attack;

.5 where exposed to sunlight, be resistant to deterioration,

.6 be of a highly visible colour on all parts where this will assist detection,

.7 be fitted with retro-reflective material where it will assist in detection and in accordance with the recommendations of the Organization;

.8 if they are to be used in a seaway, be capable of satisfactory operation in that environment;

.9 be clearly marked with approval information including the Administration which approved it, and any operational restrictions, and

.10 where applicable, be provided with electrical short circuit protection to prevent damage or injury.

1.2.3 The Administration shall determine the period of acceptability of life-saving appliances which are subject to deterioration with age. Such life-saving appliances shall be marked with a means for determining their age or the date by which they must be replaced. Permanent marking with a date of expiry is the preferred method of establishing the period of acceptability. Batteries not marked with an expiration date may be used if they are replaced annually, or in the case of a secondary battery (accumulator), if the condition of the electrolyte can be readily checked.

CHAPTER II - PERSONAL LIFE-SAVING APPLIANCES

2.1 Lifebuoys

2.1.1 Lifebuoy specification

Every lifebuoy shall:

.1 have an outer diameter of not more than 800 mm and an inner diameter of not less than 400 mm;

.2 be constructed of inherently buoyant material; it shall not depend upon rushes, cork shavings or granulated cork, any other loose granulated material or any air compartment which depends on inflation for buoyancy;

.3 be capable of supporting not less than 14.5 kg of iron in fresh water for a period of 24 h,

4 have a mass of not less than 2.5 kg;

.5 not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 s;

6 be constructed to withstand a drop into the water from the height at which it is stowed above the waterline in the lightest seagoing condition or 30 m, whichever is the greater, without impairing either its operating capability or that of its attached components;

.7 if it is intended to operate the quick release arrangement provided for the self-activated smoke signals and self-igniting lights, have a mass sufficient to operate the quick release arrangement, and

.8 be fitted with a grabline not less than 9.5 mm in diameter and not less than 4 times the outside diameter of the body of the buoy in length. The grabline shall be secured at four equidistant points around the circumference of the buoy to form four equal loops.

2.1.2 **Lifebuoy self-igniting lights**

Self-igniting lights required by regulation III/7.1.3 shall:

.1 be such that they cannot be extinguished by water;

.2 be of white colour and capable of either burning continuously with a luminous intensity of not less than 2 cd in all directions of the upper hemisphere or flashing (discharge flashing) at a rate of not less than 50 flashes and not more than 70 flashes per minute with at least the corresponding effective luminous intensity;

.3 be provided with a source of energy capable of meeting the requirement of paragraph 2.1.2.2 for a period of at least 2 h; and

.4 be capable of withstanding the drop test required by paragraph 2.1.1.6.

2.1.3 **Lifebuoy self-activating smoke signals**

Self-activating smoke signals required by regulation III/7.1.3 shall:

.1 emit smoke of a highly visible colour at a uniform rate for a period of at least 15 min when floating in calm water;

.2 not ignite explosively or emit any flame during the entire smoke emission time of the signal;

.3 not be swamped in a seaway;

.4 continue to emit smoke when fully submerged in water for a period of at least 10 s; and

.5 be capable of withstanding the drop test required by paragraph 2.1.1.6.

2.1.4 **Buoyant lifelines**

Buoyant lifelines required by regulation III/7.1.2 shall:

.1 be non-kinking;

.2 have a diameter of not less than 8 mm; and

.3 have a breaking strength of not less than 5 kN.

2.2 Lifejackets

2.2.1 General requirements for lifejackets

2.2.1.1 A lifejacket shall not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 s.

2.2.1.2 An adult lifejacket shall be so constructed that:

.1 at least 75% of persons, who are completely unfamiliar with the lifejacket, can correctly don it within a period of 1 min without assistance, guidance or prior demonstration;

.2 after demonstration, all persons can correctly don it within a period of 1 min without assistance;

.3 it is clearly capable of being worn in only one way or, as far as is practicable, cannot be donned incorrectly;

.4 it is comfortable to wear; and

.5 it allows the wearer to jump from a height of at least 4.5 m into the water without injury and without dislodging or damaging the lifejacket.

2.2.1.3 An adult lifejacket shall have sufficient buoyancy and stability in calm fresh water to:

.1 lift the mouth of an exhausted or unconscious person not less than 120 mm clear of the water with the body inclined backwards at an angle of not less than 20° from the vertical position; and

.2 turn the body of an unconscious person in the water from any position to one where the mouth is clear of the water in not more than 5 s.

2.2.1.4 An adult lifejacket shall allow the person wearing it to swim a short distance and to board a survival craft.

2.2.1.5 A child lifejacket shall be constructed and perform the same as an adult lifejacket except as follows:

.1 donning assistance is permitted for small children;

.2 it shall only be required to lift the mouth of an exhausted or unconscious wearer clear of the water a distance appropriate to the size of the intended wearer; and

.3 assistance may be given to board a survival craft, but wearer mobility shall not be significantly reduced.

2.2.1.6 In addition to the markings required by paragraph 1.2.2.9 , a child lifejacket shall be marked with:

.1 the height or weight range for which the lifejacket will meet the testing and evaluation criteria recommended by the Organization; and

.2 a "child" symbol as shown in the "child's lifejacket" symbol adopted by the Organization.

2.2.1.7 A lifejacket shall have buoyancy which is not reduced by more than 5% after 24 h submersion in fresh water.

2.2.1.8 Each lifejacket shall be fitted with a whistle firmly secured by a cord.

2.2.2 Inflatable lifejackets

A lifejacket which depends on inflation for buoyancy shall have not less than two separate compartments and comply with the requirements of paragraph 2.2.1 and shall:

.1 inflate automatically on immersion, be provided with a device to permit inflation by a single manual motion and be capable of being inflated by mouth;

.2 in the event of loss of buoyancy in any one compartment be capable of complying with the requirements of paragraphs 2.2.1.2, 2.2.1.3 and 2.2.1.4; and

.3 comply with the requirements of paragraph 2.2.1.7 after inflation by means of the automatic mechanism.

2.2.3 Lifejacket lights

2.2.3.1 Each lifejacket light shall:

.1 have a luminous intensity of not less than 0.75 cd in all directions of the upper hemisphere;

.2 have a source of energy capable of providing a luminous intensity of 0.75 cd for a period of at least 8 h;

.3 be visible over as great a segment of the upper hemisphere as is practicable when attached to a lifejacket; and

.4 be of white colour.

2.2.3.2 If the light referred to in paragraph 2.2.3.1 is a flashing light, it shall, in addition:

.1 be provided with a manually operated switch; and

.2 flash at a rate of not less than 50 flashes and not more than 70 flashes per minute with an effective luminous intensity of at least 0.75 cd.

2.3 Immersion suits

2.3.1 General requirements for immersion suits

2.3.1.1 The immersion suit shall be constructed with waterproof materials such that:

.1 it can be unpacked and donned without assistance within 2 min, taking into account any associated clothing, and a lifejacket if the immersion suit is to be worn in conjunction with a lifejacket;

.2 it will not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 s,

.3 it will cover the whole body with the exception of the face. Hands shall also be covered unless permanently attached gloves are provided;

.4 it is provided with arrangements to minimize or reduce free air in the legs of the suit, and

.5 following a jump from a height of not less than 4.5 m into the water there is no undue ingress of water into the suit.

2.3.1.2 An immersion suit which also complies with the requirements of section 2.2 may be classified as a lifejacket.

2.3.1.3 An immersion suit shall permit the person wearing it, and also wearing a lifejacket if the immersion suit is to be worn in conjunction with a lifejacket, to:

.1 climb up and down a vertical ladder at least 5 m in length;

.2 perform normal duties associated with abandonment;

.3 jump from a height of not less than 4 5 m into the water without damaging or dislodging the immersion suit, or being injured, and

.4 swim a short distance through the water and board a survival craft.

2.3.1.4 An immersion suit which has buoyancy and is designed to be worn without a lifejacket shall be fitted with a light complying with the requirements of paragraph 2.2.3 and the whistle prescribed by paragraph 2.2.1.8.

2.3.1.5 If the immersion suit is to be worn in conjunction with a lifejacket, the lifejacket shall be worn over the immersion suit. A person wearing such an immersion suit shall be able to don a lifejacket without assistance.

2.3.2 **Thermal performance requirements for immersion suits**

2.3.2.1 An immersion suit made of material which has no inherent insulation shall be:

.1 marked with instructions that it must be worn in conjunction with warm clothing; and

.2 so constructed that, when worn in conjunction with warm clothing, and with a lifejacket if the immersion suit is to be worn with a lifejacket, the immersion suit continues to provide sufficient thermal protection, following one jump by the wearer into the water from a height of 4.5 m, to ensure that when it is worn for a period of 1h in calm circulating water at a temperature of 5°C, the wearer's body core temperature does not fall more than 2°C.

2.3.2.2 An immersion suit made of material with inherent insulation, when worn either on its own or with a lifejacket, if the immersion suit is to be worn in conjunction with a lifejacket, shall provide the wearer with sufficient thermal insulation, following one jump into the water from a height of 4.5 m, to ensure that the wearer's body core temperature does not fall more than 2°C after a period of 6 h immersion in calm circulating water at a temperature of between 0°C and 2°C.

2.3.3 **Buoyancy requirements**

A person in fresh water wearing either an immersion suit or an immersion suit with a lifejacket, shall be able to turn from a face-down to a face-up position in not more than 5 s.

2.4 Anti-exposure suits

2.4.1 **General requirements for anti-exposure suits**

2.4.1.1 The anti-exposure suit shall be constructed with waterproof materials such that it:

.1 provides inherent buoyancy of at least 70 N;

.2 is made of material which reduces the risk of heat stress during rescue and evacuation operations;

.3 covers the whole body with the exception of the head and hands and, where the Administration so permits, feet; gloves and a hood shall be provided in such a manner as to remain available for use with the anti-exposure suits;

.4 can be unpacked and donned without assistance within 2 min;

.5 does not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 s;

.6 is equipped with a pocket for a portable VHF telephone; and

.7 has a lateral field of vision of at least 120°.

2.4.1.2 An anti-exposure suit which also complies with the requirements of section 2.2 may be classified as a lifejacket.

2.4.1.3 An anti-exposure suit shall permit the person wearing it, to:

.1 climb up and down a vertical ladder of at least 5 m in length;

.2 jump from a height of not less than 4.5 m into the water with feet first, without damaging or dislodging the suit, or being injured;

.3 swim through the water at least 25 m and board a survival craft;

.4 don a lifejacket without assistance; and

.5 perform all duties associated with abandonment, assist others and operate a rescue boat.

2.4.1.4 An anti-exposure suit shall be fitted with a light complying with the requirements of paragraph 2.2.3 and the whistle prescribed by paragraph 2.2.1.8.

2.4.2 **Thermal performance requirements for anti-exposure suits**

2.4.2.1 An anti-exposure suit shall:

.1 if made of material which has no inherent insulation, be marked with instructions that it must be worn in conjunction with warm clothing, and

.2 be so constructed, that when worn as marked, the suit continues to provide sufficient thermal protection following one jump into the water which totally submerges the wearer and shall ensure that when it is worn in calm circulating water at a temperature of 5°C, the wearer's body core temperature does not fall at a rate of more than 1.5°C per hour, after the first 0.5 h.

2.4.3 **Stability requirements**

A person in fresh water wearing an anti-exposure suit complying with the requirements of this section shall be able to turn from a face-down to a face-up position in not more than 5 s and shall be stable face-up. The suit shall have no tendency to turn the wearer face-down in moderate sea condition.

2.5 Thermal protective aids

2.5.1 A thermal protective aid shall be made of waterproof material having a thermal conductance of not more than 7,800 W/(m^2K) and shall be so constructed that, when used to enclose a person, it shall reduce both the convective and evaporative heat loss from the wearer's body.

2.5.2 The thermal protective aid shall:

.1 cover the whole body of persons of all sizes wearing a lifejacket with the exception of the face. Hands shall also be covered unless permanently attached gloves are provided;

.2 be capable of being unpacked and easily donned without assistance in a survival craft or rescue boat, and

.3 permit the wearer to remove it in the water in not more than 2 min, if it impairs ability to swim.

2.5.3 The thermal protective aid shall function properly throughout an air temperature range -30°C to +20°C.

CHAPTER III - VISUAL SIGNALS

3.1 Rocket parachute flares

3.1.1 The rocket parachute flare shall:

.1 be contained in a water-resistant casing;

.2 have brief instructions or diagrams clearly illustrating the use of the rocket parachute flare printed on its casing;

.3 have integral means of ignition; and

.4 be so designed as not to cause discomfort to the person holding the casing when used in accordance with the manufacturer's operating instructions.

3.1.2 The rocket shall, when fired vertically, reach an altitude of not less than 300 m. At or near the top of its trajectory, the rocket shall eject a parachute flare, which shall:

.1 burn with a bright red colour;

.2 burn uniformly with an average luminous intensity of not less than 30,000 cd;

.3 have a burning period of not less than 40 s;

.4 have a rate of descent of not more than 5 m/s; and

.5 not damage its parachute or attachments while burning.

3.2 Hand flares

3.2.1 The hand flare shall:

.1 be contained in a water-resistant casing;

.2 have brief instructions or diagrams clearly illustrating the use of the hand flare printed on its casing;

.3 have a self-contained means of ignition, and

.4 be so designed as not to cause discomfort to the person holding the casing and not endanger the survival craft by burning or glowing residues when used in accordance with the manufacturer's operating instructions.

3.2.2 The hand flare shall:

.1 burn with a bright red colour;

.2 burn uniformly with an average luminous intensity of not less than 15,000 cd;

.3 have a burning period of not less than 1 min; and

.4 continue to burn after having been immersed for a period of 10 s under 100 mm of water.

3.3 Buoyant smoke signals

3.3.1 The buoyant smoke signal shall:

.1 be contained in a water-resistant casing;

.2 not ignite explosively when used in accordance with the manufacturer's operating instructions; and

.3 have brief instructions or diagrams clearly illustrating the use of the buoyant smoke signal printed on its casing.

3.3.2 The buoyant smoke signal shall:

.1 emit smoke of a highly visible colour at a uniform rate for a period of not less than 3 min when floating in calm water;

.2 not emit any flame during the entire smoke emission time;

.3 not be swamped in a seaway; and

.4 continue to emit smoke when submerged in water for a period of 10 s under 100 mm of water.

CHAPTER IV - SURVIVAL CRAFT

4.1 General requirements for liferafts

4.1.1 Construction of liferafts

4.1.1.1 Every liferaft shall be so constructed as to be capable of withstanding exposure for 30 days afloat in all sea conditions.

4.1.1.2 The liferaft shall be so constructed that when it is dropped into the water from a height of 18 m, the liferaft and its equipment will operate satisfactorily. If the liferaft is to be stowed at a height of more than 18 m above the waterline in the lightest seagoing condition, it shall be of a type which has been satisfactorily drop-tested from at least that height.

4.1.1.3 The floating liferaft shall be capable of withstanding repeated jumps on to it from a height of at least 4.5 m above its floor both with and without the canopy erected.

4.1.1.4 The liferaft and its fittings shall be so constructed as to enable it to be towed at a speed of 3 knots in calm water when loaded with its full complement of persons and equipment and with one of its sea-anchors streamed.

4.1.1.5 The liferaft shall have a canopy to protect the occupants from exposure which is automatically set in place when the liferaft is launched and waterborne. The canopy shall comply with the following:

.1 it shall provide insulation against heat and cold by means of either two layers of material separated by an air gap or other equally efficient means. Means shall be provided to prevent accumulation of water in the air gap;

.2 its interior shall be of a colour that does not cause discomfort to the occupants;

.3 each entrance shall be clearly indicated and be provided with efficient adjustable closing arrangements which can be easily and quickly opened by persons clothed in immersion suits from inside and outside, and closed from inside, the liferaft so as to permit ventilation but exclude seawater, wind and cold. Liferafts accommodating more than eight persons shall have at least two diametrically opposite entrances;

.4 it shall admit sufficient air for the occupants at all times, even with the entrances closed;

.5 it shall be provided with at least one viewing port;

.6 it shall be provided with means for collecting rain water;

.7 it shall be provided with means to mount a survival craft radar transponder at a height of at least 1 m above the sea; and

.8 it shall have sufficient headroom for sitting occupants under all parts of the canopy.

4.1.2 **Minimum carrying capacity and mass of liferafts**

4.1.2.1 No liferaft shall be approved which has a carrying capacity of less than six persons calculated in accordance with the requirements of paragraph 4.2.3 or 4.3.3, as appropriate.

4.1.2.2 Unless the liferaft is to be launched by an approved launching appliance complying with the requirements of section 6.1 or is not required to be stowed in a position providing for easy side-to-side transfer, the total mass of the liferaft, its container and its equipment shall not be more than 185 kg.

4.1.3 **Liferaft fittings**

4.1.3.1 Lifelines shall be securely becketed around the inside and outside of the liferaft.

4.1.3.2 The liferaft shall be fitted with an efficient painter of length equal to not less than 10 m plus the distance from the stowed position to the waterline in the lightest seagoing condition or 15 m whichever is the greater. The breaking strength of the painter system, including its means of attachment to the liferaft, except the weak link required by paragraph 4.1.6, shall be not less than 15 kN for liferafts permitted to accommodate more than 25 persons, not less than 10 kN for liferafts permitted to accommodate 9 to 25 persons and not less than 7.5 kN for any other liferaft.

4.1.3.3 A manually controlled lamp shall be fitted to the top of the liferaft canopy. The light shall be white and be capable of operating continuously for at least 12 h with a luminous intensity of not less than 4.3 cd in all directions of the upper hemisphere. However, if the light is a flashing light it shall flash at a rate of not less than 50 flashes and not more than 70 flashes per minute for the 12 h operating period with an equivalent effective luminous intensity. The lamp shall light automatically when the canopy is erected. Batteries shall be of a type that does not deteriorate due to dampness or humidity in the stowed liferaft.

4.1.3.4 A manually controlled lamp shall be fitted inside the liferaft capable of continuous operation for a period of at least 12 h. It shall light automatically when the canopy is erected and be of sufficient intensity to permit reading of survival and equipment instructions. Batteries shall be of a type that does not deteriorate due to damp or humidity in the stowed liferaft.

4.1.4 **Davit-launched liferafts**

4.1.4.1 In addition to the above requirements, a liferaft for use with an approved launching appliance shall:

.1 when the liferaft is loaded with its full complement of persons and equipment, be capable of withstanding a lateral impact against the ship's side at an impact velocity of not less than 3.5 m/s and also a drop into the water from a height of not less than 3 m without damage that will affect its function; and

.2 be provided with means for bringing the liferaft alongside the embarkation deck and holding it securely during embarkation.

4.1.4.2 Every passenger ship davit-launched liferaft shall be so arranged that it can be rapidly boarded by its full complement of persons.

4.1.4.3 Every cargo ship davit-launched liferaft shall be so arranged that it can be boarded by its full complement of persons in not more than 3 min from the time the instruction to board is given.

4.1.5 **Equipment**

4.1.5.1 The normal equipment of every liferaft shall consist of:

.1 one buoyant rescue quoit, attached to not less than 30 m of buoyant line;

.2 one knife of the nonfolding type having a buoyant handle and lanyard attached and stowed in a pocket on the exterior of the canopy near the point at which the painter is attached to the liferaft. In addition, a liferaft which is permitted to accommodate 13 persons or more shall be provided with a second knife which need not be of the nonfolding type;

.3 for a liferaft which is permitted to accommodate not more than 12 persons, one buoyant bailer. For a liferaft which is permitted to accommodate 13 persons or more, two buoyant bailers;

.4 two sponges;

.5 two sea-anchors each with a shock resistant hawser and tripping line if fitted, one being spare and the other permanently attached to the liferaft in such a way that when the liferaft inflates or is waterborne it will cause the liferaft to lie oriented to the wind in the most stable manner. The strength of each sea-anchor and its hawser and tripping line if fitted shall be adequate in all sea conditions. The sea-anchors shall have means to prevent twisting of the line and shall be of a type which is unlikely to turn inside out between its shroud lines. The sea-anchor permanently attached to davit-launched liferafts and liferafts fitted on passenger ships shall be arranged for manual deployment only. All other liferafts are to have the sea-anchor deployed automatically when the liferaft inflates;

.6 two buoyant paddles;

.7 three tin-openers and a pair of scissors. Safety knives containing special tin-opener blades are satisfactory for this requirement;

.8 one first-aid outfit in a waterproof case capable of being closed tightly after use;

.9 one whistle or equivalent sound signal;

.10 four rocket parachute flares complying with the requirements of section 3.1;

.11 six hand flares complying with the requirements of section 3.2;

.12 two buoyant smoke signals complying with the requirements of section 3.3;

.13 one waterproof electric torch suitable for Morse signalling together with one spare set of batteries and one spare bulb in a waterproof container;

.14 an efficient radar reflector, unless a survival craft radar transponder is stowed in the liferaft;

.15 one daylight signalling mirror with instructions on its use for signalling to ships and aircraft;

.16 one copy of the life-saving signals referred to in regulation V/16 on a waterproof card or in a waterproof container;

.17 one set of fishing tackle;

.18 a food ration totalling not less than 10,000 kJ for each person the liferaft is permitted to accommodate. These rations should be palatable, edible throughout the recommended shelf life, and packed in a manner which can be readily divided and easily opened. The rations shall be kept in airtight packaging and be stowed in a watertight container;

.19 watertight receptacles containing a total of 1.5 *l* of fresh water for each person the liferaft is permitted to accommodate, of which either 0.5 *l* per person may be replaced by a de-salting apparatus capable of producing an equal amount of fresh water in 2 days or 1 *l* per person may be replaced by a manually powered reverse osmosis desalinator, as described in paragraph 4.4.7.5, capable of producing an equal amount of fresh water in 2 days;

.20 one rustproof graduated drinking vessel;

.21 anti-seasickness medicine sufficient for at least 48 h and one seasickness bag for each person the liferaft is permitted to accommodate;

.22 instructions on how to survive;

.23 instructions for immediate action; and

.24 thermal protective aids complying with the requirements of section 2.5 sufficient for 10% of the number of persons the liferaft is permitted to accommodate or two, whichever is the greater.

4.1.5.2 The marking required by paragraphs 4.2.6.3.5 and 4.3.6.7 on liferafts equipped in accordance with paragraph 4.1.5.1 shall be "SOLAS A PACK" in block capitals of the Roman alphabet.

4.1.5.3 In the case of passenger ships engaged on short international voyages of such a nature and duration that, in the opinion of the Administration, not all the items specified in paragraph 4.1.5.1 are necessary, the Administration may allow the liferafts carried on any such ships to be provided with the equipment specified in paragraphs 4.1.5.1.1 to 4.1.5.1.6 inclusive, 4.1.5.1.8, 4.1.5.1.9, 4.1.5.1.13 to 4.1.5.1.16 inclusive and 4.1.5.1.21 to 4.1.5.1.24 inclusive and one half of the equipment specified in paragraphs 4.1.5.1.10 to 4.1.5.1.12 inclusive. The marking required by paragraphs 4.2.6.3.5 and 4.3.6.7 on such liferafts shall be "SOLAS B PACK" in block capitals of the Roman alphabet.

4.1.5.4 Where appropriate the equipment shall be stowed in a container which, if it is not an integral part of, or permanently attached to, the liferaft, shall be stowed and secured inside the liferaft and be capable of floating in water for at least 30 min without damage to its contents.

4.1.6 **Float-free arrangements for liferafts**

4.1.6.1 **Painter system**

The liferaft painter system shall provide a connection between the ship and the liferaft and shall be so arranged as to ensure that the liferaft when released and, in the case of an inflatable liferaft, inflated is not dragged under by the sinking ship.

4.1.6.2 **Weak link**

If a weak link is used in the float-free arrangement, it shall:

.1 not be broken by the force required to pull the painter from the liferaft container;

.2 if applicable, be of sufficient strength to permit the inflation of the liferaft; and

.3 break under a strain of 2.2 ± 0.4 kN.

4.1.6.3 **Hydrostatic release units**

If a hydrostatic release unit is used in the float-free arrangements, it shall:

.1 be constructed of compatible materials so as to prevent malfunction of the unit. Galvanizing or other forms of metallic coating on parts of the hydrostatic release unit shall not be accepted;

.2 automatically release the liferaft at a depth of not more than 4 m;

.3 have drains to prevent the accumulation of water in the hydrostatic chamber when the unit is in its normal position;

.4 be so constructed as to prevent release when seas wash over the unit;

.5 be permanently marked on its exterior with its type and serial number;

.6 be permanently marked on the unit or identification plate securely attached to the unit, with the date of manufacture, type and serial number and whether the unit is suitable for use with a liferaft with a capacity of more than 25 persons;

.7 be such that each part connected to the painter system has a strength of not less than that required for the painter; and

.8 if disposable, in lieu of the requirement in paragraph 4.1.6.3.6 be marked with a means of determining its date of expiry.

4.2 Inflatable liferafts

4.2.1 Inflatable liferafts shall comply with the requirements of section 4.1 and, in addition, shall comply with the requirements of this section.

4.2.2 **Construction of inflatable liferafts**

4.2.2.1 The main buoyancy chamber shall be divided into not less than two separate compartments, each inflated through a nonreturn inflation valve on each compartment. The buoyancy chambers shall be so arranged that, in the event of any one of the compartments being damaged or failing to inflate, the intact compartments shall be able to support, with positive freeboard over the liferaft's entire periphery, the number of persons which the liferaft is permitted to accommodate, each having a mass of 75 kg and seated in their normal positions.

4.2.2.2 The floor of the liferaft shall be waterproof and shall be capable of being sufficiently insulated against cold either:

.1 by means of one or more compartments that the occupants can inflate, or which inflate automatically and can be deflated and reinflated by the occupants; or

.2 by other equally efficient means not dependent on inflation.

4.2.2.3 The liferaft shall be capable of being inflated by one person. The liferaft shall be inflated with a non-toxic gas. Inflation shall be completed within a period of 1 min at an ambient temperature of between 18°C and 20°C and within a period of 3 min at an ambient temperature of -30°C. After inflation the liferaft shall maintain its form when loaded with its full complement of persons and equipment.

4.2.2.4 Each inflatable compartment shall be capable of withstanding a pressure equal to at least 3 times the working pressure and shall be prevented from reaching a pressure exceeding twice the working pressure either by means of relief valves or by a limited gas supply. Means shall be provided for fitting the topping-up pump or bellows required by paragraph 4.2.9.1.2 so that the working pressure can be maintained.

4.2.3 **Carrying capacity of inflatable liferafts**

The number of persons which a liferaft shall be permitted to accommodate shall be equal to the lesser of:

.1 the greatest whole number obtained by dividing by 0.096 the volume, measured in cubic metres of the main buoyancy tubes (which for this purpose shall include neither the arches nor the thwarts, if fitted) when inflated; or

.2 the greatest whole number obtained by dividing by 0.372 the inner horizontal cross-sectional area of the liferaft measured in square metres (which for this purpose may include the thwart or thwarts, if fitted) measured to the innermost edge of the buoyancy tubes; or

.3 the number of persons having an average mass of 75 kg, all wearing either immersion suits and lifejackets or, in the case of davit-launched liferafts, lifejackets, that can be seated with sufficient comfort and headroom without interfering with the operation of any of the liferaft's equipment.

4.2.4 **Access into inflatable liferafts**

4.2.4.1 At least one entrance shall be fitted with a semi-rigid boarding ramp, capable of supporting a person weighing 100 kg, to enable persons to board the liferaft from the sea. The boarding ramp shall be so arranged as to prevent significant deflation of the liferaft if the ramp is damaged. In the case of a davit-launched liferaft having more than one entrance, the boarding ramp shall be fitted at the entrance opposite the bowsing lines and embarkation facilities.

4.2.4.2 Entrances not provided with a boarding ramp shall have a boarding ladder, the lowest step of which shall be situated not less than 0.4 m below the liferaft's light waterline.

4.2.4.3 There shall be means inside the liferaft to assist persons to pull themselves into the liferaft from the ladder.

4.2.5 **Stability of inflatable liferafts**

4.2.5.1 Every inflatable liferaft shall be so constructed that, when fully inflated and floating with the canopy uppermost, it is stable in a seaway.

4.2.5.2 The stability of the liferaft when in the inverted position shall be such that it can be righted in a seaway and in calm water by one person.

4.2.5.3 The stability of the liferaft when loaded with its full complement of persons and equipment shall be such that it can be towed at speeds of up to 3 knots in calm water.

4.2.5.4 The liferaft shall be fitted with water pockets complying with the following requirements:

.1 the water pockets shall be of a highly visible colour;

.2 the design shall be such that the pockets fill to at least 60% of their capacity within 25 s of deployment;

.3 the pockets shall have an aggregate capacity of at least 220 *l* for liferafts up to 10 persons;

.4 the pockets for liferafts certified to carry more than 10 persons shall have an aggregate capacity of not less than 20 N *l*, where N = number of persons carried; and

.5 the pockets shall be positioned symmetrically round the circumference of the liferaft. Means shall be provided to enable air to readily escape from underneath the liferaft.

4.2.6 **Containers for inflatable liferafts**

4.2.6.1 The liferaft shall be packed in a container that is:

.1 so constructed as to withstand hard wear under conditions encountered at sea;

.2 of sufficient inherent buoyancy, when packed with the liferaft and its equipment, to pull the painter from within and to operate the inflation mechanism should the ship sink; and

.3 as far as practicable watertight, except for drain holes in the container bottom.

4.2.6.2 The liferaft shall be packed in its container in such a way as to ensure, as far as possible, that the waterborne liferaft inflates in an upright position on breaking free from its container.

4.2.6.3 The container shall be marked with:

.1 maker's name or trade mark;

.2 serial number;

.3 name of approving authority and the number of persons it is permitted to carry;

.4 SOLAS;

.5 type of emergency pack enclosed;

.6 date when last serviced;

.7 length of painter;

.8 maximum permitted height of stowage above waterline (depending on drop-test height and length of painter); and

.9 launching instructions.

4.2.7 **Markings on inflatable liferafts**

4.2.7.1 The liferaft shall be marked with:

.1 maker's name or trade mark;

.2 serial number;

.3 date of manufacture (month and year);

.4 name of approving authority;

.5 name and place of servicing station where it was last serviced; and

.6 number of persons it is permitted to accommodate over each entrance in characters not less than 100 mm in height of a colour contrasting with that of the liferaft.

4.2.7.2 Provision shall be made for marking each liferaft with the name and port of registry of the ship to which it is to be fitted, in such a form that the ship identification can be changed at any time without opening the container.

4.2.8 **Davit-launched inflatable liferafts**

4.2.8.1 In addition to complying with the above requirements, a liferaft for use with an approved launching appliance shall, when suspended from its lifting hook or bridle, withstand a load of:

.1 4 times the mass of its full complement of persons and equipment, at an ambient temperature and a stabilized liferaft temperature of 20 ± 3°C with all relief valves inoperative; and

.2 1.1 times the mass of its full complement of persons and equipment at an ambient temperature and a stabilized liferaft temperature of -30°C with all relief valves operative.

4.2.8.2 Rigid containers for liferafts to be launched by a launching appliance shall be so secured that the container or parts of it are prevented from falling into the sea during and after inflation and launching of the contained liferaft.

4.2.9 **Additional equipment for inflatable liferafts**

4.2.9.1 In addition to the equipment required by paragraph 4.1.5, every inflatable liferaft shall be provided with:

.1 one repair outfit for repairing punctures in buoyancy compartments, and

.2 one topping-up pump or bellows.

4.2.9.2 The knives required by paragraph 4.1.5.1.2 shall be safety knives, and the tin-openers and scissors required by paragraph 4.1.5.1.7 shall be of the safety type.

4.3 Rigid liferafts

4.3.1 Rigid liferafts shall comply with the requirements of section 4.1 and, in addition, shall comply with the requirements of this section.

4.3.2 **Construction of rigid liferafts**

4.3.2.1 The buoyancy of the liferaft shall be provided by approved inherently buoyant material placed as near as possible to the periphery of the liferaft. The buoyant material shall be fire-retardant or be protected by a fire-retardant covering.

4.3.2.2 The floor of the liferaft shall prevent the ingress of water and shall effectively support the occupants out of the water and insulate them from cold.

4.3.3 **Carrying capacity of rigid liferafts**

The number of persons which a liferaft shall be permitted to accommodate shall be equal to the lesser of:

.1 the greatest whole number obtained by dividing by 0.096 the volume, measured in cubic metres, of the buoyancy material multiplied by a factor of 1 minus the specific gravity of that material; or

.2 the greatest whole number obtained by dividing by 0.372 the horizontal cross-sectional area of the floor of the liferaft measured in square metres; or

.3 the number of persons having an average mass of 75 kg, all wearing immersion suits and lifejackets, that can be seated with sufficient comfort and headroom without interfering with the operation of any of the liferaft's equipment.

4.3.4 **Access into rigid liferafts**

4.3.4.1 At least one entrance shall be fitted with a rigid boarding ramp to enable persons to board the liferaft from the sea. In the case of a davit-launched liferaft having more than one entrance, the boarding ramp shall be fitted at the entrance opposite to the bowsing and embarkation facilities.

4.3.4.2 Entrances not provided with a boarding ramp shall have a boarding ladder, the lowest step of which shall be situated not less than 0.4 m below the liferaft's light waterline.

4.3.4.3 There shall be means inside the liferaft to assist persons to pull themselves into the liferaft from the ladder.

4.3.5 **Stability of rigid liferafts**

4.3.5.1 Unless the liferaft is capable of operating safely whichever way up it is floating, its strength and stability shall be such that it is either self-righting or can be readily righted in a seaway and in calm water by one person.

4.3.5.2 The stability of a liferaft when loaded with its full complement of persons and equipment shall be such that it can be towed at speeds of up to 3 knots in calm water.

4.3.6 **Markings on rigid liferafts**

The liferaft shall be marked with:

1 name and port of registry of the ship to which it belongs;

2 maker's name or trade mark;

3 serial number;

4 name of approving authority;

5 number of persons it is permitted to accommodate over each entrance in characters not less than 100 mm in height of a colour contrasting with that of the liferaft;

6 SOLAS;

7 type of emergency pack enclosed;

8 length of painter;

9 maximum permitted height of stowage above waterline (drop-test height); and

10 launching instructions.

4.3.7 **Davit-launched rigid liferafts**

In addition to the above requirements, a rigid liferaft for use with an approved launching appliance shall, when suspended from its lifting hook or bridle, withstand a load of 4 times the mass of its full complement of persons and equipment.

4.4 General requirements for lifeboats

4.4.1 **Construction of lifeboats**

4.4.1.1 All lifeboats shall be properly constructed and shall be of such form and proportions that they have ample stability in a seaway and sufficient freeboard when loaded with their full complement of persons and equipment. All lifeboats shall have rigid hulls and shall be capable of maintaining positive stability when in an upright position in calm water and loaded with their full complement of persons and equipment and holed in any one location below the waterline, assuming no loss of buoyancy material and no other damage.

4.4.1.2 Each lifeboat shall be fitted with a certificate of approval, endorsed by the Administration, containing at least the following items:

- manufacturer's name and address;
- lifeboat model and serial number;
- month and year of manufacture;
- number of persons the lifeboat is approved to carry; and
- the approval information required under paragraph 1.2.2.9.

The certifying organization shall provide the lifeboat with a certificate of approval which, in addition to the above items, specifies:

- number of the certificate of approval;
- material of hull construction, in such detail as to ensure that compatibility problems in repair should not occur;
- total mass fully equipped and fully manned; and
- statement of approval as to sections 4.5, 4.6, 4.7, 4.8 or 4.9.

4.4.1.3 All lifeboats shall be of sufficient strength to:

.1 enable them to be safely launched into the water when loaded with their full complement of persons and equipment; and

.2 be capable of being launched and towed when the ship is making headway at a speed of 5 knots in calm water.

4.4.1.4 Hulls and rigid covers shall be fire-retardant or non-combustible.

4.4.1.5 Seating shall be provided on thwarts, benches or fixed chairs which are constructed so as to be capable of supporting:

.1 a static load equivalent to the number of persons each weighing 100 kg for which spaces are provided in compliance with the requirements of paragraph 4.4.2.2.2;

.2 a load of 100 kg in any single seat location when a lifeboat to be launched by falls is dropped into the water from a height of at least 3 m; and

.3 a load of 100 kg in any single seat location when a free-fall lifeboat is launched from a height of at least 1.3 times its free-fall certification height.

4.4.1.6 Except for free-fall lifeboats, each lifeboat to be launched by falls shall be of sufficient strength to withstand a load, without residual deflection on removal of that load:

.1 in the case of boats with metal hulls, 1.25 times the total mass of the lifeboat when loaded with its full complement of persons and equipment; or

.2 in the case of other boats, twice the total mass of the lifeboat when loaded with its full complement of persons and equipment.

4.4.1.7 Except for free-fall lifeboats, each lifeboat to be launched by falls shall be of sufficient strength to withstand, when loaded with its full complement of persons and equipment and with, where applicable, skates or fenders in position, a lateral impact against the ship's side at an impact velocity of at least 3.5 m/s and also a drop into the water from a height of at least 3 m.

4.4.1.8 The vertical distance between the floor surface and the interior of the enclosure or canopy over 50% of the floor area shall be:

.1 not less than 1.3 m for a lifeboat permitted to accommodate nine persons or less;

.2 not less than 1.7 m for a lifeboat permitted to accommodate 24 persons or more; and

.3 not less than the distance as determined by linear interpolation between 1.3 m and 1.7 m for a lifeboat permitted to accommodate between nine and 24 persons.

4.4.2 **Carrying capacity of lifeboats**

4.4.2.1 No lifeboat shall be approved to accommodate more than 150 persons.

4.4.2.2 The number of persons which a lifeboat to be launched by falls shall be permitted to accommodate shall be equal to the lesser of:

.1 the number of persons having an average mass of 75 kg, all wearing lifejackets, that can be seated in a normal position without interfering with the means of propulsion or the operation of any of the lifeboat's equipment; or

.2 the number of spaces that can be provided on the seating arrangements in accordance with figure 1. The shapes may be overlapped as shown, provided footrests are fitted and there is sufficient room for legs and the vertical separation between the upper and lower seat is not less than 350 mm.

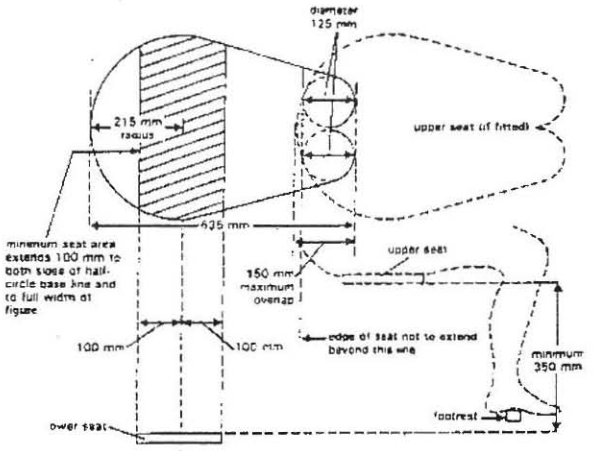


Figure 1

4.4.2.3 Each seating position shall be clearly indicated in the lifeboat.

4.4.3 **Access into lifeboats**

4.4.3.1 Every passenger ship lifeboat shall be so arranged that it can be rapidly boarded by its full complement of persons. Rapid disembarkation shall also be possible.

4.4.3.2 Every cargo ship lifeboat shall be so arranged that it can be boarded by its full complement of persons in not more than 3 min from the time the instruction to board is given. Rapid disembarkation shall also be possible.

4.4.3.3 Lifeboats shall have a boarding ladder that can be used at any boarding entrance of the lifeboat to enable persons in the water to board the lifeboat. The lowest step of the ladder shall be not less than 0.4 m below the lifeboat's light waterline.

4.4.3.4 The lifeboat shall be so arranged that helpless people can be brought on board either from the sea or on stretchers.

4.4.3.5 All surfaces on which persons might walk shall have a non-skid finish.

4.4.4 **Lifeboat buoyancy**

All lifeboats shall have inherent buoyancy or shall be fitted with inherently buoyant material which shall not be adversely affected by seawater, oil or oil products, sufficient to float the lifeboat with all its equipment on board when flooded and open to the sea. Additional inherently buoyant material, equal to 280 N of buoyant force per person shall be provided for the number of persons the lifeboat is permitted to accommodate. Buoyant material, unless in addition to that required above, shall not be installed external to the hull of the lifeboat.

4.4.5 **Lifeboat freeboard and stability**

4.4.5.1 All lifeboats shall be stable and have a positive GM value when loaded with 50% of the number of persons the lifeboat is permitted to accommodate in their normal positions to one side of the centreline.

4.4.5.2 Under the condition of loading in paragraph 4.4.5.1:

.1 each lifeboat with side openings near the gunwale shall have a freeboard, measured from the waterline to the lowest opening through which the lifeboat may become flooded, of at least 1.5% of the lifeboat's length or 100 mm, whichever is the greater; and

.2 each lifeboat without side openings near the gunwale shall not exceed an angle of heel of 20° and shall have a freeboard, measured from the waterline to the lowest opening through which the lifeboat may become flooded, of at least 1.5% of the lifeboat's length or 100 mm whichever is the greater.

4.4.6 **Lifeboat propulsion**

4.4.6.1 Every lifeboat shall be powered by a compression ignition engine. No engine shall be used for any lifeboat if its fuel has a flashpoint of 43°C or less (closed cup test).

4.4.6.2 The engine shall be provided with either a manual starting system, or a power starting system with two independent rechargeable energy sources. Any necessary starting aids shall also be provided.

The engine starting systems and starting aids shall start the engine at an ambient temperature of -15°C within 2 min of commencing the start procedure unless, in the opinion of the Administration having regard to the particular voyages in which the ship carrying the lifeboat is constantly engaged, a different temperature is appropriate. The starting systems shall not be impeded by the engine casing, seating or other obstructions.

4.4.6.3 The engine shall be capable of operating for not less than 5 min after starting from cold with the lifeboat out of the water.

4.4.6.4 The engine shall be capable of operating when the lifeboat is flooded up to the centreline of the crankshaft.

4.4.6.5 The propeller shafting shall be so arranged that the propeller can be disengaged from the engine. Provision shall be made for ahead and astern propulsion of the lifeboat.

4.4.6.6 The exhaust pipe shall be so arranged as to prevent water from entering the engine in normal operation.

4.4.6.7 All lifeboats shall be designed with due regard to the safety of persons in the water and to the possibility of damage to the propulsion system by floating debris.

4.4.6.8 The speed of a lifeboat when proceeding ahead in calm water, when loaded with its full complement of persons and equipment and with all engine-powered auxiliary equipment in operation, shall be at least 6 knots and at least 2 knots when towing a 25-person liferaft loaded with its full complement of persons and equipment or its equivalent. Sufficient fuel, suitable for use throughout the temperature range expected in the area in which the ship operates, shall be provided to run the fully loaded lifeboat at 6 knots for a period of not less than 24 h.

4.4.6.9 The lifeboat engine, transmission and engine accessories shall be enclosed in a fire-retardant casing or other suitable arrangements providing similar protection. Such arrangements shall also protect persons from coming into accidental contact with hot or moving parts and protect the engine from exposure to weather and sea. Adequate means shall be provided to reduce the engine noise so that a shouted order can be heard. Starter batteries shall be provided with casings which form a watertight enclosure around the bottom and sides of the batteries. The battery casings shall have a tight fitting top which provides for necessary gas venting.

4.4.6.10 The lifeboat engine and accessories shall be designed to limit electromagnetic emissions so that engine operation does not interfere with the operation of radio life-saving appliances used in the lifeboat.

4.4.6.11 Means shall be provided for recharging all engine starting, radio and searchlight batteries. Radio batteries shall not be used to provide power for engine starting. Means shall be provided for recharging lifeboat batteries from the ship's power supply at a supply voltage not exceeding 50 V which can be disconnected at the lifeboat embarkation station, or by means of a solar battery charger.

4.4.6.12 Water-resistant instructions for starting and operating the engine shall be provided and mounted in a conspicuous place near the engine starting controls.

4.4.7 **Lifeboat fittings**

4.4.7.1 All lifeboats except free-fall lifeboats shall be provided with at least one drain valve fitted near the lowest point in the hull, which shall automatically open to drain water from the hull when the lifeboat

is not waterborne and shall automatically close to prevent entry of water when the lifeboat is waterborne. Each drain valve shall be provided with a cap or plug to close the valve, which shall be attached to the lifeboat by a lanyard, a chain, or other suitable means. Drain valves shall be readily accessible from inside the lifeboat and their position shall be clearly indicated.

4.4.7.2 All lifeboats shall be provided with a rudder and tiller. When a wheel or other remote steering mechanism is also provided the tiller shall be capable of controlling the rudder in case of failure of the steering mechanism. The rudder shall be permanently attached to the lifeboat. The tiller shall be permanently installed on, or linked to, the rudder stock; however, if the lifeboat has a remote steering mechanism, the tiller may be removable and securely stowed near the rudder stock. The rudder and tiller shall be so arranged as not to be damaged by operation of the release mechanism or the propeller.

4.4.7.3 Except in the vicinity of the rudder and propeller, suitable handholds shall be provided or a buoyant lifeline shall be becketed around the outside of the lifeboat above the waterline and within reach of a person in the water.

4.4.7.4 Lifeboats which are not self-righting when capsized shall have suitable handholds on the underside of the hull to enable persons to cling to the lifeboat. The handholds shall be fastened to the lifeboat in such a way that, when subjected to an impact sufficient to cause them to break away from the lifeboat, they break away without damaging the lifeboat.

4.4.7.5 All lifeboats shall be fitted with sufficient watertight lockers or compartments to provide for the storage of the small items of equipment, water and provisions required by paragraph 4.4.8. The lifeboat shall be equipped with a means for collecting rain water, and in addition if required by the Administration a means for producing drinking water from seawater with a manually powered desalinator. The desalinator must not be dependent upon solar heat, nor on chemicals other than seawater. Means shall be provided for the storage of collected water.

4.4.7.6 Every lifeboat to be launched by a fall or falls, except a free-fall lifeboat, shall be fitted with a release mechanism complying with the following requirements subject to paragraph .5 below:

.1 the mechanism shall be so arranged that all hooks are released simultaneously;

.2 the mechanism shall have two release capabilities as follows:

.2.1 a normal release capability which will release the lifeboat when it is waterborne or when there is no load on the hooks, and

.2.2 an on-load release capability which will release the lifeboat with a load on the hooks. This release shall be so arranged as to release the lifeboat under any conditions of loading from no-load with the lifeboat waterborne to a load of 1.1 times the total mass of the lifeboat when loaded with its full complement of persons and equipment. This release capability shall be adequately protected against accidental or premature use. Adequate protection shall include special mechanical protection not normally required for offload release, in addition to a danger sign. To prevent an accidental release during recovery of the boat, the mechanical protection (interlock) should only engage when the release mechanism is properly and completely reset. To prevent a premature on-load release, on-load operation of the release mechanism should require a deliberate and sustained action by the operator. The release mechanism shall be so designed that crew members in the lifeboat can clearly observe when the release

mechanism is properly and completely reset and ready for lifting. Clear operating instructions should be provided with a suitably worded warning notice;

.3 the release control shall be clearly marked in a colour that contrasts with its surroundings;

.4 the fixed structural connections of the release mechanism in the lifeboat shall be designed with a calculated factor of safety of 6 based on the ultimate strength of the materials used, assuming the mass of the lifeboat is equally distributed between the falls; and

.5 where a single fall and hook system is used for launching a lifeboat or rescue boat in combination with a suitable painter, the requirements of paragraph 4.4.7.6.2 need not be applicable, in such an arrangement a single capability to release the lifeboat or rescue boat, only when it is fully waterborne, will be adequate.

4.4.7.7 Every lifeboat shall be fitted with a device to secure a painter near its bow. The device shall be such that the lifeboat does not exhibit unsafe or unstable characteristics when being towed by the ship making headway at speeds up to 5 knots in calm water. Except for free-fall lifeboats, the painter securing device shall include a release device to enable the painter to be released from inside the lifeboat, with the ship making headway at speeds up to 5 knots in calm water.

4.4.7.8 Every lifeboat which is fitted with a fixed two-way VHF radiotelephone apparatus with an antenna which is separately mounted shall be provided with arrangements for siting and securing the antenna effectively in its operating position.

4.4.7.9 Lifeboats intended for launching down the side of a ship shall have skates and fenders as necessary to facilitate launching and prevent damage to the lifeboat.

4.4.7.10 A manually controlled lamp shall be fitted. The light shall be white and be capable of operating continuously for at least 12 h with a luminous intensity of not less than 4.3cd in all directions of the upper hemisphere. However if the light is a flashing light it shall flash at a rate of not less than 50 flashes and not more than 70 flashes per minute for the 12 h operating period with an equivalent effective luminous intensity.

4.4.7.11 A manually controlled lamp or source of light shall be fitted inside the lifeboat to provide illumination for not less than 12 h to permit reading of survival and equipment instructions, however, oil lamps shall not be permitted for this purpose.

4.4.7.12 Every lifeboat shall be so arranged that an adequate view forward, aft and to both sides is provided from the control and steering position for safe launching and manoeuvring.

4.4.8 Lifeboat equipment

All items of lifeboat equipment, whether required by this paragraph or elsewhere in section 4.4, shall be secured within the lifeboat by lashings, storage in lockers or compartments, storage in brackets or similar mounting arrangements or other suitable means. However, in the case of a lifeboat to be launched by falls, the boat-hooks shall be kept free for fending off purposes. The equipment shall be secured in such a manner as not to interfere with any abandonment procedures. All items of lifeboat equipment shall be as small and of as little mass as possible and shall be packed in a suitable and compact form. Except where otherwise stated, the normal equipment of every lifeboat shall consist of:

.1 except for free-fall lifeboats, sufficient buoyant oars to make headway in calm seas. Thole pins, crutches or equivalent arrangements shall be provided for each oar provided. Thole pins or crutches shall be attached to the boat by lanyards or chains;

.2 two boat-hooks;

.3 a buoyant bailer and two buckets;

.4 a survival manual;

.5 an operational compass which is luminous or provided with suitable means of illumination. In a totally enclosed lifeboat, the compass shall be permanently fitted at the steering position; in any other lifeboat, it shall be provided with a binnacle if necessary to protect it from the weather, and suitable mounting arrangements;

.6 a sea-anchor of adequate size fitted with a shock-resistant hawser which provides a firm hand grip when wet. The strength of the sea-anchor, hawser and tripping line if fitted shall be adequate for all sea conditions;

.7 two efficient painters of a length equal to not less than twice the distance from the stowage position of the lifeboat to the waterline in the lightest seagoing condition or 15 m, whichever is the greater. On lifeboats to be launched by free-fall launching, both painters shall be stowed near the bow ready for use. On other lifeboats, one painter attached to the release device required by paragraph 4.4.7.7 shall be placed at the forward end of the lifeboat and the other shall be firmly secured at or near the bow of the lifeboat ready for use;

.8 two hatchets, one at each end of the lifeboat;

.9 watertight receptacles containing a total of 3 *l* of fresh water for each person the lifeboat is permitted to accommodate, of which either 1 *l* per person may be replaced by a de-salting apparatus capable of producing an equal amount of fresh water in 2 days, or 2 *l* per person may be replaced by a manually powered reverse osmosis desalinator as described in paragraph 4.4.7.5 capable of producing an equal amount of fresh water in 2 days;

.10 a rustproof dipper with lanyard;

.11 a rustproof graduated drinking vessel;

.12 a food ration as described in paragraph 4.1.5.1.18 totalling not less than 10,000 kJ for each person the lifeboat is permitted to accommodate; these rations shall be kept in airtight packaging and be stowed in a watertight container;

.13 four rocket parachute flares complying with the requirements of section 3.1;

.14 six hand flares complying with the requirements of section 3.2;

.15 two buoyant smoke signals complying with the requirements of section 3.3;

.16 one waterproof electric torch suitable for Morse signalling together with one spare set of batteries and one spare bulb in a waterproof container,

.17 one daylight signalling mirror with instructions for its use for signalling to ships and aircraft,

.18 one copy of the life-saving signals prescribed by regulation V/16 on a waterproof card or in a waterproof container,

.19 one whistle or equivalent sound signal,

.20 a first-aid outfit in a waterproof case capable of being closed tightly after use;

.21 anti-seasickness medicine sufficient for at least 48 h and one seasickness bag for each person;

.22 a jack-knife to be kept attached to the boat by a lanyard;

.23 three tin-openers,

.24 two buoyant rescue quoits, attached to not less than 30 m of buoyant line,

.25 if the lifeboat is not automatically self-bailing, a manual pump suitable for effective bailing,

.26 one set of fishing tackle,

.27 sufficient tools for minor adjustments to the engine and its accessories;

.28 portable fire-extinguishing equipment of an approved type suitable for extinguishing oil fires,

.29 a searchlight with a horizontal and vertical sector of at least 6° and a measured luminous intensity of 2,500 cd which can work continuously for not less than 3 h,

.30 an efficient radar reflector, unless a survival craft radar transponder is stowed in the lifeboat,

.31 thermal protective aids complying with the requirements of section 2.5 sufficient for 10% of the number of persons the lifeboat is permitted to accommodate or two, whichever is the greater; and

.32 in the case of ships engaged on voyages of such a nature and duration that, in the opinion of the Administration, the items specified in paragraphs 4.4.8.12 and 4.4.8.26 are unnecessary, the Administration may allow these items to be dispensed with.

4.4.9 **Lifeboat markings**

4.4.9.1 The number of persons for which the lifeboat is approved shall be clearly marked on it in clear permanent characters

4.4.9.2 The name and port of registry of the ship to which the lifeboat belongs shall be marked on each side of the lifeboat's bow in block capitals of the Roman alphabet.

4.4.9.3 Means of identifying the ship to which the lifeboat belongs and the number of the lifeboat shall be marked in such a way that they are visible from above.

4.5 Partially enclosed lifeboats

4.5.1 Partially enclosed lifeboats shall comply with the requirements of section 4.4 and in addition shall comply with the requirements of this section.

4.5.2 Partially enclosed lifeboats shall be provided with permanently attached rigid covers extending over not less than 20% of the length of the lifeboat from the stem and not less than 20% of the length of the lifeboat from the aftermost part of the lifeboat. The lifeboat shall be fitted with a permanently attached foldable canopy which together with the rigid covers completely encloses the occupants of the lifeboat in a weatherproof shelter and protects them from exposure. The lifeboat shall have entrances at both ends and on each side. Entrances in the rigid covers shall be weathertight when closed. The canopy shall be so arranged that:

.1 it is provided with adequate rigid sections or battens to permit erection of the canopy;

.2 it can be easily erected by not more than two persons;

.3 it is insulated to protect the occupants against heat and cold by means of not less than two layers of material separated by an air gap or other equally efficient means; means shall be provided to prevent accumulation of water in the air gap;

.4 its exterior is of a highly visible colour and its interior is of a colour which does not cause discomfort to the occupants;

.5 entrances in the canopy are provided with efficient adjustable closing arrangements which can be easily and quickly opened and closed from inside or outside so as to permit ventilation but exclude seawater, wind and cold; means shall be provided for holding the entrances securely in the open and closed position;

.6 with the entrances closed, it admits sufficient air for the occupants at all times;

.7 it has means for collecting rainwater; and

.8 the occupants can escape in the event of the lifeboat capsizing.

4.5.3 The interior of the lifeboat shall be of a highly visible colour.

4.5.4 If a fixed two-way VHF radiotelephone apparatus is fitted in the lifeboat, it shall be installed in a cabin large enough to accommodate both the equipment and the person using it. No separate cabin is required if the construction of the lifeboat provides a sheltered space to the satisfaction of the Administration.

4.6 Totally enclosed lifeboats

4.6.1 Totally enclosed lifeboats shall comply with the requirements of section 4.4 and in addition shall comply with the requirements of this section.

4.6.2 Enclosure

Every totally enclosed lifeboat shall be provided with a rigid watertight enclosure which completely encloses the lifeboat. The enclosure shall be so arranged that:

.1 it provides shelter for the occupants;

.2 access to the lifeboat is provided by hatches which can be closed to make the lifeboat watertight;

.3 except for free-fall lifeboats, hatches are positioned so as to allow launching and recovery operations to be performed without any occupant having to leave the enclosure;

.4 access hatches are capable of being opened and closed from both inside and outside and are equipped with means to hold them securely in open positions;

.5 except for a free-fall lifeboat, it is possible to row the lifeboat;

.6 it is capable, when the lifeboat is in the capsized position with the hatches closed and without significant leakage, of supporting the entire mass of the lifeboat, including all equipment, machinery and its full complement of persons;

.7 it includes windows or translucent panels which admit sufficient daylight to the inside of the lifeboat with the hatches closed to make artificial light unnecessary;

.8 its exterior is of a highly visible colour and its interior of a colour which does not cause discomfort to the occupants;

.9 handrails provide a secure handhold for persons moving about the exterior of the lifeboat, and aid embarkation and disembarkation;

.10 persons have access to their seats from an entrance without having to climb over thwarts or other obstructions; and

.11 during operation of the engine with the enclosure closed, the atmospheric pressure inside the lifeboat shall never be above or below the outside atmospheric pressure by more than 20 hPa.

4.6.3 Capsizing and re-righting

4.6.3.1 Except in free-fall lifeboats, a safety belt shall be fitted at each indicated seating position. The safety belt shall be designed to hold a person with a mass of 100 kg securely in place when the lifeboat is in a capsized position. Each set of safety belts for a seat shall be of a colour which contrasts with the belts for seats immediately adjacent. Free-fall lifeboats shall be fitted with a safety harness at each seat in contrasting colour designed to hold a person with a mass of 100 kg securely in place during a free-fall launch as well as with the lifeboat in capsized position.

4.6.3.2 The stability of the lifeboat shall be such that it is inherently or automatically self-righting when loaded with its full or a partial complement of persons and equipment and all entrances and openings are closed watertight and the persons are secured with safety belts.

4.6.3.3 The lifeboat shall be capable of supporting its full complement of persons and equipment when the lifeboat is in the damaged condition prescribed in paragraph .4.4.1.1 and its stability shall be such that in the event of capsizing, it will automatically attain a position that will provide an above-water escape for its occupants. When the lifeboat is in the stable flooded condition, the water level inside the lifeboat, measured along the seatback, shall not be more than 500 mm above the seat pan at any occupant seating position.

4.6.3.4 The design of all engine exhaust pipes, air ducts and other openings shall be such that water is excluded from the engine when the lifeboat capsizes and re-rights.

4.6.4 Propulsion

4.6.4.1 The engine and transmission shall be controlled from the helmsman's position.

4.6.4.2 The engine and engine installation shall be capable of running in any position during capsize and continue to run after the lifeboat returns to the upright or shall automatically stop on capsizing and be easily restarted after the lifeboat returns to the upright. The design of the fuel and lubricating systems shall prevent the loss of fuel and the loss of more than 250 ml of lubricating oil from the engine during capsize.

4.6.4.3 Air-cooled engines shall have a duct system to take in cooling air from, and exhaust it to, the outside of the lifeboat. Manually operated dampers shall be provided to enable cooling air to be taken in from, and exhausted to, the interior of the lifeboat.

4.6.5 Protection against acceleration

Notwithstanding paragraph 4.4.1.7, a totally enclosed lifeboat, except a free-fall lifeboat, shall be so constructed and fendered such that the lifeboat renders protection against harmful accelerations resulting from an impact of the lifeboat, when loaded with its full complement of persons and equipment, against the ship's side at an impact velocity of not less than 3.5 m/s.

4.7 Free-fall lifeboats

4.7.1 General requirements

Free-fall lifeboats shall comply with the requirements of section 4.6 and in addition shall comply with the requirements of this section.

4.7.2 Carrying capacity of a free-fall lifeboat

The carrying capacity of a free-fall lifeboat is the number of persons that can be provided with a seat without interfering with the means of propulsion or the operation of any of the lifeboat's equipment. The width of the seat shall be at least 430 mm. Free clearance in front of the backrest shall be at least 635 mm. The backrest shall extend at least 1,000 mm above the seatpan.

4.7.3 **Performance requirements**

4.7.3.1 Each free-fall lifeboat shall make positive headway immediately after water entry and shall not come into contact with the ship after a free-fall launching against a trim of up to 10° and a list of up to 20° either way from the certification height when fully equipped and loaded with:

.1 its full complement of persons;

.2 occupants so as to cause the centre of gravity to be in the most forward position;

.3 occupants so as to cause the centre of gravity to be in the most aft position; and

.4 its operating crew only.

4.7.3.2 For oil tankers, chemical tankers and gas carriers with a final angle of heel greater than 20° calculated in accordance with the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and the recommendations of the Organization, as applicable, a lifeboat shall be capable of being free-fall launched at the final angle of heel and on the base of the final waterline of that calculation.

4.7.3.3 The required free-fall height shall never exceed the free-fall certification height.

4.7.4 **Construction**

Each free-fall lifeboat shall be of sufficient strength to withstand, when loaded with its full complement of persons and equipment, a free-fall launch from a height of at least 1.3 times the free-fall certification height.

4.7.5 **Protection against harmful acceleration**

Each free-fall lifeboat shall be so constructed as to ensure that the lifeboat is capable of rendering protection against harmful accelerations resulting from being launched from the height for which it is to be certified in calm water under unfavourable conditions of a trim of up to 10° and a list of up to 20° either way when it is fully equipped and loaded with:

.1 its full complement of persons;

.2 occupants so as to cause the centre of gravity to be in the most forward position;

.3 occupants so as to cause the centre of gravity to be in the most aft position; and

.4 the operating crew only.

4.7.6 **Lifeboat fittings**

Each free-fall lifeboat shall be fitted with a release system which shall:

.1 have two independent activation systems for the release mechanisms which may only be operated from inside the lifeboat and be marked in a colour that contrasts with its surroundings;

.2 be so arranged as to release the boat under any condition of loading from no-load up to at least 200% of the normal load caused by the fully equipped lifeboat when loaded with the number of persons for which it is to be approved,

.3 be adequately protected against accidental or premature use;

.4 be designed to test the release system without launching the lifeboat; and

.5 be designed with a factor of safety of 6 based on the ultimate strength of the materials used.

4.7.7 **Certificate of approval**

In addition to the requirements of paragraph 4.4.1.2, the certificate of approval for a free-fall lifeboat shall also state:

.1 free-fall certification height,

.2 required launching ramp length; and

.3 launching ramp angle for the free-fall certification height.

4.8 Lifeboats with a self-contained air support system

In addition to complying with the requirements of section 4.6 or 4.7, as applicable, a lifeboat with a self-contained air support system shall be so arranged that, when proceeding with all entrances and openings closed, the air in the lifeboat remains safe and breathable and the engine runs normally for a period of not less than 10 min. During this period the atmospheric pressure inside the lifeboat shall never fall below the outside atmospheric pressure nor shall it exceed it by more than 20 hPa. The system shall have visual indicators to indicate the pressure of the air supply at all times.

4.9 Fire-protected lifeboats

4.9.1 In addition to complying with the requirements of section 4.8, a fire-protected lifeboat when waterborne shall be capable of protecting the number of persons it is permitted to accommodate when subjected to a continuous oil fire that envelops the lifeboat for a period of not less than 8 min.

4.9.2 **Water spray system**

A lifeboat which has a water spray fire-protection system shall comply with the following:

.1 water for the system shall be drawn from the sea by a self-priming motor pump. It shall be possible to turn "on" and turn "off" the flow of water over the exterior of the lifeboat;

.2 the seawater intake shall be so arranged as to prevent the intake of flammable liquids from the sea surface; and

.3 the system shall be arranged for flushing with fresh water and allowing complete drainage.

CHAPTER V - RESCUE BOATS

5.1 Rescue boats

5.1.1 General requirements

5.1.1.1 Except as provided by this section, all rescue boats shall comply with the requirements of paragraphs 4.4.1 to 4.4.7.4 inclusive and 4.4.7.6, 4.4.7.7, 4.4.7.9, 4.4.7.10 and 4.4.9. A lifeboat may be approved and used as a rescue boat if it meets all of the requirements of this section, if it successfully completes the testing for a rescue boat required in regulation III/4.2, and if its stowage, launching and recovery arrangements on the ship meet all of the requirements for a rescue boat.

5.1.1.2 Notwithstanding the requirements of paragraph 4.4.4 required buoyant material for rescue boats may be installed external to the hull, provided it is adequately protected against damage and is capable of withstanding exposure as specified in paragraph 5.1.3.3.

5.1.1.3 Rescue boats may be either of rigid or inflated construction or a combination of both and shall

.1 be not less than 3.8 m and not more than 8.5 m in length; and

.2 be capable of carrying at least five seated persons and a person lying on a stretcher. Notwithstanding paragraph 4.4.1.5, seating, except for the helmsman, may be provided on the floor, provided that the seating space analysis in accordance with paragraph 4.4.2.2.2 uses shapes similar to figure 1, but altered to an overall length of 1,190 mm to provide for extended legs. No part of a seating space shall be on the gunwale, transom, or on inflated buoyancy at the sides of the boat.

5.1.1.4 Rescue boats which are a combination of rigid and inflated construction shall comply with the appropriate requirements of this section to the satisfaction of the Administration.

5.1.1.5 Unless the rescue boat has adequate sheer, it shall be provided with a bow cover extending for not less than 15% of its length.

5.1.1.6 Rescue boats shall be capable of manoeuvring at a speed of at least 6 knots and maintaining that speed for a period of at least 4 h.

5.1.1.7 Rescue boats shall have sufficient mobility and manoeuvrability in a seaway to enable persons to be retrieved from the water, marshal liferafts and tow the largest liferaft carried on the ship when loaded with its full complement of persons and equipment or its equivalent at a speed of at least 2 knots.

5.1.1.8 A rescue boat shall be fitted with an inboard engine or outboard motor. If it is fitted with an outboard motor, the rudder and tiller may form part of the engine. Notwithstanding the requirements of paragraph 4.4.6.1, petrol- driven outboard engines with an approved fuel system may be fitted in rescue boats provided the fuel tanks are specially protected against fire and explosion.

5.1.1.9 Arrangements for towing shall be permanently fitted in rescue boats and shall be sufficiently strong to marshal or tow liferafts as required by paragraph 5.1.1.7.

5.1.1.10 Unless expressly provided otherwise, every rescue boat shall be provided with effective means of bailing or be automatically self-bailing.

5.1.1.11 Rescue boats shall be fitted with weathertight stowage for small items of equipment.

5.1.2 **Rescue boat equipment**

5.1.2.1 All items of rescue boat equipment, with the exception of boat-hooks which shall be kept free for fending off purposes, shall be secured within the rescue boat by lashings, storage in lockers or compartments, storage in brackets or similar mounting arrangements, or other suitable means. The equipment shall be secured in such a manner as not to interfere with any launching or recovery procedures. All items of rescue boat equipment shall be as small and of as little mass as possible and shall be packed in suitable and compact form.

5.1.2.2 The normal equipment of every rescue boat shall consist of:

.1 sufficient buoyant oars or paddles to make headway in calm seas. Thole pins, crutches or equivalent arrangements shall be provided for each oar. Thole pins or crutches shall be attached to the boat by lanyards or chains;

.2 a buoyant bailer;

.3 a binnacle containing an efficient compass which is luminous or provided with suitable means of illumination;

.4 a sea-anchor and tripping line if fitted with a hawser of adequate strength not less than 10 m in length;

.5 a painter of sufficient length and strength, attached to the release device complying with the requirements of paragraph 4.4.7.7 and placed at the forward end of the rescue boat;

.6 one buoyant line, not less than 50 m in length, of sufficient strength to tow a liferaft as required by paragraph 5.1.1.7;

.7 one waterproof electric torch suitable for Morse signalling, together with one spare set of batteries and one spare bulb in a waterproof container;

.8 one whistle or equivalent sound signal;

.9 a first-aid outfit in a waterproof case capable of being closed tightly after use;

.10 two buoyant rescue quoits, attached to not less than 30 m of buoyant line;

.11 a searchlight with a horizontal and vertical sector of at least 6° and a measured luminous intensity of 2,500 cd which can work continuously for not less than 3 h;

.12 an efficient radar reflector;

.13 thermal protective aids complying with the requirements of section 2.5 sufficient for 10% of the number of persons the rescue boat is permitted to accommodate or two, whichever is the greater; and

.14 portable fire-extinguishing equipment of an approved type suitable for extinguishing oil fires.

5 1.2.3 In addition to the equipment required by paragraph 5.1 2 2, the normal equipment of every rigid rescue boat shall include

.1 a boat-hook;

.2 a bucket; and

.3 a knife or hatchet

5.1.2 4 In addition to the equipment required by paragraph 5.1.2.2, the normal equipment of every inflated rescue boat shall consist of:

.1 a buoyant safety knife;

.2 two sponges;

.3 an efficient manually operated bellows or pump;

.4 a repair kit in a suitable container for repairing punctures; and

.5 a safety boat-hook

5.1 3 **Additional requirements for inflated rescue boats**

5.1.3.1 The requirements of paragraphs 4 4 1.4 and 4 4.1 6 do not apply to inflated rescue boats.

5.1.3.2 An inflated rescue boat shall be constructed in such a way that, when suspended by its bridle or lifting hook:

.1 it is of sufficient strength and rigidity to enable it to be lowered and recovered with its full complement of persons and equipment;

.2 it is of sufficient strength to withstand a load of 4 times the mass of its full complement of persons and equipment at an ambient temperature of 20 ± 3 °C, with all relief valves inoperative; and

.3 it is of sufficient strength to withstand a load of 1.1 times the mass of its full complement of persons and equipment at an ambient temperature of -30 °C, with all relief valves operative.

5.1 3.3 Inflated rescue boats shall be so constructed as to be capable of withstanding exposure:

.1 when stowed on an open deck on a ship at sea, and

.2 for 30 days afloat in all sea conditions.

5.1.3.4 In addition to complying with the requirements of paragraph 4.4.9 , inflated rescue boats shall be marked with a serial number, the maker's name or trade mark and the date of manufacture.

5.1.3.5 The buoyancy of an inflated rescue boat shall be provided by either a single tube subdivided into at least five separate compartments of approximately equal volume or two separate tubes neither

exceeding 60% of the total volume. The buoyancy tubes shall be so arranged that the intact compartments shall be able to support the number of persons which the rescue boat is permitted to accommodate, each having a mass of 75 kg, when seated in their normal positions with positive freeboard over the rescue boat's entire periphery under the following conditions:

.1 with the forward buoyancy compartment deflated;

.2 with the entire buoyancy on one side of the rescue boat deflated; and

.3 with the entire buoyancy on one side and the bow compartment deflated.

5.1.3.6 The buoyancy tubes forming the boundary of the inflated rescue boat shall on inflation provide a volume of not less than 0.17 m^3 for each person the rescue boat is permitted to accommodate.

5.1.3.7 Each buoyancy compartment shall be fitted with a nonreturn valve for manual inflation and means for deflation. A safety relief valve shall also be fitted unless the Administration is satisfied that such an appliance is unnecessary.

5.1.3.8 Underneath the bottom and on vulnerable places on the outside of the inflated rescue boat, rubbing strips shall be provided to the satisfaction of the Administration.

5.1.3.9 Where a transom is fitted it shall not be inset by more than 20% of the overall length of the rescue boat.

5.1.3.10 Suitable patches shall be provided for securing the painters fore and aft and the becketed lifelines inside and outside the boat.

5.1.3.11 The inflated rescue boat shall be maintained at all times in a fully inflated condition.

CHAPTER VI - LAUNCHING AND EMBARKATION APPLIANCES

6.1 Launching and embarkation appliances

6.1.1 General requirements

6.1.1.1 With the exception of the secondary means of launching for free-fall lifeboats, each launching appliance shall be so arranged that the fully equipped survival craft or rescue boat it serves can be safely launched against unfavourable conditions of a trim of up 10° and a list of up to 20° either way:

.1 when boarded, as required by regulation III/23 or III/33, by its full complement of persons; and

.2 with not more than the required operating crew on board.

6.1.1.2 Notwithstanding the requirements of paragraph 6.1.1.1, lifeboat launching appliances for oil tankers, chemical tankers and gas carriers with a final angle of heel greater than 20° calculated in accordance with the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and the recommendations of the Organization, as applicable, shall be capable of operating at the final angle of heel on the lower side of the ship taking into consideration the final damaged waterline of the ship.

6.1.1.3 A launching appliance shall not depend on any means other than gravity or stored mechanical power which is independent of the ship's power supplies to launch the survival craft or rescue boat it serves in the fully loaded and equipped condition and also in the light condition.

6.1.1.4 Each launching appliance shall be so constructed that only a minimum amount of routine maintenance is necessary. All parts requiring regular maintenance by the ship's crew shall be readily accessible and easily maintained.

6.1.1.5 The launching appliance and its attachments other than winch brakes shall be of sufficient strength to withstand a static proof load on test of not less than 2.2 times the maximum working load.

6.1.1.6 Structural members and all blocks, falls, padeyes, links, fastenings and all other fittings used in connection with launching equipment shall be designed with a factor of safety on the basis of the maximum working load assigned and the ultimate strengths of the materials used for construction. A minimum factor of safety of 4.5 shall be applied to all structural members, and a minimum factor of safety of 6 shall be applied to falls, suspension chains, links and blocks.

6.1.1.7 Each launching appliance shall, as far as practicable, remain effective under conditions of icing.

6.1.1.8 A lifeboat launching appliance shall be capable of recovering the lifeboat with its crew.

6.1.1.9 Each rescue boat launching appliance shall be fitted with a powered winch motor capable of raising the rescue boat from the water with its full rescue boat complement of persons and equipment at a rate of not less than 0.3 m/s.

6.1.1.10 The arrangements of the launching appliance shall be such as to enable safe boarding of the survival craft in accordance with the requirements of paragraphs 4.1.4.2, 4.1.4.3, 4.4.3.1 and 4.4.3.2.

6.1.2 **Launching appliances using falls and a winch**

6.1.2.1 Every launching appliance using falls and a winch, except for secondary launching appliances for free-fall lifeboats, shall comply with the requirements of paragraph 6.1.1 and, in addition, shall comply with the requirements of this paragraph.

6.1.2.2 The launching mechanism shall be so arranged that it may be actuated by one person from a position on the ship's deck and, except for secondary launching appliances for free-fall lifeboats, from a position within the survival craft or rescue boat. When launched by a person on the deck, the survival craft or rescue boat shall be visible to that person.

6.1.2.3 Falls shall be of rotation-resistant and corrosion-resistant steel wire rope.

6.1.2.4 In the case of a multiple drum winch, unless an efficient compensatory device is fitted, the falls shall be so arranged as to wind off the drums at the same rate when lowering, and to wind on to the drums evenly at the same rate when hoisting.

6.1.2.5 The winch brakes of a launching appliance shall be of sufficient strength to withstand:

.1 a static test with a proof load of not less than 1.5 times the maximum working load; and

.2 a dynamic test with a proof load of not less than 1.1 times the maximum working load at maximum lowering speed.

6.1.2.6 An efficient hand gear shall be provided for recovery of each survival craft and rescue boat. Hand gear handles or wheels shall not be rotated by moving parts of the winch when the survival craft or rescue boat is being lowered or when it is being hoisted by power.

6.1.2.7 Where davit arms are recovered by power, safety devices shall be fitted which will automatically cut off the power before the davit arms reach the stops in order to prevent overstressing the falls or davits, unless the motor is designed to prevent such overstressing.

6.1.2.8 The speed at which the fully loaded survival craft or rescue boat is lowered to the water shall not be less than that obtained from the formula:

$$S = 0.4 + 0.02H$$

where: S is the lowering speed in metres per second; and

H is the height in metres from the davit head to the waterline with the ship at the lightest seagoing condition.

6.1.2.9 The lowering speed of a fully equipped liferaft without persons on board shall be to the satisfaction of the Administration. The lowering speed of other survival craft, fully equipped but without persons on board, shall be at least 70% of that required by paragraph 6.1.2.8.

6.1.2.10 The maximum lowering speed shall be established by the Administration having regard to the design of the survival craft or rescue boat, the protection of its occupants from excessive forces, and the strength of the launching arrangements taking into account inertia forces during an emergency stop. Means shall be incorporated in the appliance to ensure that this speed is not exceeded.

6.1.2.11 Every launching appliance shall be fitted with brakes capable of stopping the descent of the survival craft or rescue boat and holding it securely when loaded with its full complement of persons and equipment; brake pads shall, where necessary, be protected from water and oil.

6.1.2.12 Manual brakes shall be so arranged that the brake is always applied unless the operator, or a mechanism activated by the operator, holds the brake control in the "off" position.

6.1.3 Float-free launching

Where a survival craft requires a launching appliance and is also designed to float free, the float-free release of the survival craft from its stowed position shall be automatic.

6.1.4 Launching appliances for free-fall lifeboats

6.1.4.1 Every free-fall launching appliance shall comply with the applicable requirements of paragraph 6.1.1 and, in addition, shall comply with the requirements of this paragraph.

6.1.4.2 The launching appliance shall be designed and installed so that it and the lifeboat it serves operate as a system to protect the occupants from harmful acceleration forces as required by paragraph 4.7.5, and to ensure effective clearing of the ship as required by paragraphs 4.7.3.1 and 4.7.3.2.

6.1.4.3 The launching appliance shall be constructed so as to prevent sparking and incendiary friction during the launching of the lifeboat.

6.1.4.4 The launching appliance shall be designed and arranged so that in its ready to launch position, the distance from the lowest point on the lifeboat it serves to the water surface with the ship in its lightest seagoing condition does not exceed the lifeboat's free-fall certification height, taking into consideration the requirements of paragraph 4.7.3.

6.1.4.5 The launching appliance shall be arranged so as to preclude accidental release of the lifeboat in its unattended stowed position. If the means provided to secure the lifeboat cannot be released from inside the lifeboat, it shall be so arranged as to preclude boarding the lifeboat without first releasing it.

6.1.4.6 The release mechanism shall be arranged so that at least two independent actions from inside the lifeboat are required in order to launch the lifeboat.

6.1.4.7 Each launching appliance shall be provided with a secondary means to launch the lifeboat by falls. Such means shall comply with the requirements of paragraph 6.1.1 (except 6.1.1.3) and paragraph 6.1.2 (except 6.1.2.6). It must be capable of launching the lifeboat against unfavourable conditions of a trim of up to only 2° and a list of up to only 5° either way and it need not comply with the speed requirements of paragraphs 6.1.2.8 and 6.1.2.9. If the secondary launching appliance is not dependent on gravity, stored mechanical power or other manual means, the launching appliance shall be connected both to the ship's main and emergency power supplies.

6.1.4.8 The secondary means of launching shall be equipped with at least a single off-load capability to release the lifeboat.

6.1.5 Liferaft launching appliances

Every liferaft launching appliance shall comply with the requirements of paragraphs 6.1.1 and 6.1.2, except with regard to embarkation in the stowed position, recovery of the loaded liferaft and that manual operation is permitted for turning out the appliance. The launching appliance shall include an automatic release hook arranged so as to prevent premature release during lowering and shall release the liferaft when waterborne. The release hook shall include a capability to release the hook under load. The on-load release control shall:

.1 be clearly differentiated from the control which activates the automatic release function;

.2 require at least two separate actions to operate;

.3 with a load of 150 kg on the hook, require a force of at least 600 N and not more than 700 N to release the load, or provide equivalent adequate protection against inadvertent release of the hook; and

.4 be designed such that the crew members on deck can clearly observe when the release mechanism is properly and completely set.

6.1.6 Embarkation ladders

6.1.6.1 Handholds shall be provided to ensure a safe passage from the deck to the head of the ladder and vice versa.

6.1.6.2 The steps of the ladder shall be:

.1 made of hardwood, free from knots or other irregularities, smoothly machined and free from sharp edges and splinters, or of suitable material of equivalent properties;

.2 provided with an efficient non-slip surface either by longitudinal grooving or by the application of an approved non-slip coating;

.3 not less than 480 mm long, 115 mm wide and 25 mm in depth, excluding any non-slip surface or coating; and

.4 equally spaced not less than 300 mm or more than 380 mm apart and secured in such a manner that they will remain horizontal.

6.1.6.3 The side ropes of the ladder shall consist of two uncovered manila ropes not less than 65 mm in circumference on each side. Each rope shall be continuous with no joints below the top step. Other materials may be used provided the dimensions, breaking strain, weathering, stretching and gripping properties are at least equivalent to those of manila rope. All rope ends shall be secured to prevent unravelling.

6.2 Marine evacuation systems

6.2.1 Construction of the marine evacuation systems

6.2.1.1 The passage of the marine evacuation system shall provide for safe descent of persons of various ages, sizes and physical capabilities wearing approved lifejackets from the embarkation station to the floating platform or survival craft.

6.2.1.2 Strength and construction of the passage and platform shall be to the satisfaction of the Administration.

6.2.1.3 The platform, if fitted, shall be:

.1 such that sufficient buoyancy will be provided for the working load. In the case of an inflatable platform, the main buoyancy chambers, which for this purpose shall include any thwarts or floor inflatable structural members are to meet the requirements of section 4.2 based upon the platform capacity except that the capacity shall be obtained by dividing by 0.25 the usable area given in paragraph 6.2.1.3.3;

.2 stable in a seaway and provide a safe working area for the system operators,

.3 of sufficient area that will provide for the securing of at least two liferafts for boarding and to accommodate at least the number of persons that at any time are expected to be on the platform. This usable platform area shall be at least equal to:

$$\frac{20\% \text{ of total number of persons that the Marine Evacuation System is certificated for}}{4} \ m^2$$

or 10 m^2, whichever is the greater. However, Administrations may approve alternate arrangements which are demonstrated to comply with all the prescribed performance requirements.

.4 self-draining;

.5 subdivided in such a way that the loss of gas from any one compartment will not restrict its operational use as a means of evacuation. The buoyancy tubes shall be subdivided or protected against damage occuring from contact with the ship's side;

.6 fitted with a stabilizing system to the satisfaction of the Administration;

.7 restrained by a bowsing line or other positioning systems which are designed to deploy automatically and if necessary, to be capable of being adjusted to the position required for evacuation, and

.8 provided with mooring and bowsing line patches of sufficient strength to securely attach the largest inflatable liferaft associated with the system.

6.2.1.4 If the passage gives direct access to the survival craft, it should be provided with a quick release arrangement.

6.2.2 **Performance of the marine evacuation system**

6.2.2.1 A marine evacuation system shall be:

.1 capable of deployment by one person;

.2 such as to enable the total number of persons for which it is designed, to be transferred from the ship into the inflated liferafts within a period of 30 min in the case of a passenger ship and of 10 min in the case of a cargo ship from the time abandon ship signal is given;

.3 arranged such that liferafts may be securely attached to the platform and released from the platform by a person either in the liferaft or on the platform;

.4 capable of being deployed from the ship under unfavourable conditions of a trim of up to 10° and a list of up to 20° either way;

.5 in the case of being fitted with an inclined slide, such that the angle of the slide to the horizontal is:

.1 within a range of 30° to 35° when the ship is upright and in the lightest seagoing condition; and

.2 in the case of a passenger ship, a maximum of 55° in the final stage of flooding set by the requirements in regulation II-1/8;

.6 evaluated for capacity by means of timed evacuation deployments conducted in harbour;

.7 capable of providing a satisfactory means of evacuation in a sea state associated with a wind of force 6 on the Beaufort scale;

.8 designed to, as far as practicable, remain effective under conditions of icing; and

.9 so constructed that only a minimum amount of routine maintenance is necessary. Any part requiring maintenance by the ship's crews shall be readily accessible and easily maintained.

6.2.2.2 Where one or more marine evacuation systems are provided on a ship, at least 50% of such systems shall be subjected to a trial deployment after installation. Subject to these deployments being satisfactory, the untried systems are to be deployed within 12 months of installation.

6.2.3 **Inflatable liferafts associated with marine evacuation systems**

Any inflatable liferaft used in conjunction with the marine evacuation system shall:

.1 conform with the requirements of section 4.2 ;

.2 be sited close to the system container but be capable of dropping clear of the deployed system and boarding platform;

.3 be capable of release one at a time from its stowage rack with arrangements which will enable it to be moored alongside the platform;

.4 be stowed in accordance with regulation III/13.4; and

.5 be provided with pre-connected or easily connected retrieving lines to the platform.

6.2.4 **Containers for marine evacuation systems**

6.2.4.1 The evacuation passage and platform shall be packed in a container that is:

.1 so constructed as to withstand hard wear under conditions encountered at sea; and

.2 as far as practicable watertight, except for drain holes in the container bottom.

6.2.4.2 The container shall be marked with:

.1 maker's name or trade mark;

.2 serial number;

.3 name of approval authority and the capacity of the system;

.4 SOLAS;

.5 date of manufacture (month and year);

.6 date and place of last service;

.7 maximum permitted height of stowage above waterline; and

.8 stowage position on board.

6.2.4.3 Launching and operating instructions shall be marked on or in the vicinity of the container.

6.2.5 **Marking on marine evacuation systems**

The marine evacuation system shall be marked with:

.1 maker's name or trade mark;

.2 serial number;

.3 date of manufacture (month and year);

.4 name of approving authority;

.5 name and place of servicing station where it was last serviced, along with the date of servicing, and

.6 the capacity of the system.

CHAPTER VII - OTHER LIFE-SAVING APPLIANCES

7.1 Line-throwing appliances

7.1.1 Every line-throwing appliance shall:

.1 be capable of throwing a line with reasonable accuracy;

.2 include not less than four projectiles each capable of carrying the line at least 230 m in calm weather;

.3 include not less than four lines each having a breaking strength of not less than 2 kN; and

.4 have brief instructions or diagrams clearly illustrating the use of the line-throwing appliance.

7.1.2 The rocket, in the case of a pistol-fired rocket, or the assembly, in the case of an integral rocket and line, shall be contained in a water-resistant casing. In addition, in the case of a pistol-fired rocket, the line and rockets together with the means of ignition shall be stowed in a container which provides protection from the weather.

7.2 General alarm and public address system

7.2.1 General emergency alarm system

7.2.1.1 The general emergency alarm system shall be capable of sounding the general emergency alarm signal consisting of seven or more short blasts followed by one long blast on the ship's whistle or siren and additionally on an electrically operated bell or klaxon or other equivalent warning system, which shall be powered from the ship's main supply and the emergency source of electrical power required by regulation II-1/42 or II-1/43, as appropriate. The system shall be capable of operation from the navigation bridge and, except for the ship's whistle, also from other strategic points. The system shall be audible throughout all the accommodation and normal crew working spaces. The alarm shall continue

to function after it has been triggered until it is manually turned off or is temporarily interrupted by a message on the public address system.

7.2.1 2 The minimum sound pressure levels for the emergency alarm tone in interior and exterior spaces shall be 80 dB (A) and at least 10 dB (A) above ambient noise levels existing during normal equipment operation with the ship underway in moderate weather. In cabins without a loudspeaker installation, an electronic alarm transducer shall be installed, e.g. a buzzer or similar.

7.2.1.3 The sound pressure levels at the sleeping position in cabins and in cabin bathrooms shall be at least 75 dB (A) and at least 10 dB (A) above ambient noise levels.

7.2.2 **Public address system**

7.2.2.1 The public address system shall be a loudspeaker installation enabling the broadcast of messages into all spaces where crew members or passengers, or both, are normally present, and to muster stations. It shall allow for the broadcast of messages from the navigation bridge and such other places on board the ship as the Administration deems necessary. It shall be installed with regard to acoustically marginal conditions and not require any action from the addressee. It shall be protected against unauthorized use.

7.2.2 2 With the ship underway in normal conditions, the minimum sound pressure levels for broadcasting emergency announcements shall be

.1 in interior spaces 75 dB (A) and at least 20 dB (A) above the speech interference level; and

.2 in exterior spaces 80 dB (A) and at least 15 dB (A) above the speech interference level.

ภาคผนวก ๒

ประมวลข้อบังคับระหว่างประเทศว่าด้วยระบบความปลอดภัยจากเพลิงไหม้
(Resolution MSC.98(73) International Code for Fire Safety Systems)

RESOLUTION MSC.98(73)
(adopted on 5 December 2000)

ADOPTION OF THE INTERNATIONAL CODE FOR FIRE SAFETY SYSTEMS

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

NOTING the revision of chapter II-2 of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as "the Convention"),

RECOGNIZING the need to continue the mandatory application of the fire safety systems required by the revised chapter II-2 of the Convention,

NOTING resolution MSC.99(73) by which it adopted, *inter alia*, the revised chapter II-2 of the Convention to make the provisions of the International Code for Fire Safety Systems (FSS Code) mandatory under the Convention,

HAVING CONSIDERED, at its seventy-third session, the text of the proposed FSS Code,

1. ADOPTS the International Code for Fire Safety Systems (FSS Code), the text of which is set out in the Annex to the present resolution;

2. INVITES Contracting Governments to the Convention to note that the FSS Code will take effect on 1 July 2002 upon the entry into force of the revised chapter II-2 of the Convention;

3. REQUESTS the Secretary-General to transmit certified copies of this resolution and the text of the FSS Code contained in the Annex to all Contracting Governments to the Convention;

4. FURTHER REQUESTS the Secretary-General to transmit copies of this resolution and the Annex to all Members of the Organization which are not Contracting Governments to the Convention.

ANNEX

INTERNATIONAL CODE FOR FIRE SAFETY SYSTEMS

Table of contents

THE INTERNATIONAL CODE FOR FIRE SAFETY SYSTEMS
(Fire Safety Systems Code)

PREAMBLE

1 The purpose of this Code is to provide international standards of specific engineering specifications for fire safety systems required by chapter II-2 of the International Convention for the Safety of Life at Sea, 1974, as amended.

2 On or after 1 July 2002, this Code will be mandatory for fire safety systems required by the International Convention for the Safety of Life at Sea, 1974, as amended. Any future amendment to the Code must be adopted and brought into force in accordance with the procedure laid down in article VIII of the Convention.

CHAPTER 1 - GENERAL

1 Application

1.1 This Code is applicable to fire safety systems as referred to in chapter II-2 of the International Convention for the Safety of Life at Sea, 1974, as amended.

1.2 Unless expressly provided otherwise, this Code is applicable for the fire safety systems of ships the keels of which are laid or which are at a similar stage of construction on or after 1 July 2002.

2 Definitions

2.1 *Administration* means the Government of the State whose flag the ship is entitled to fly.

2.2 *Convention* means the International Convention for the Safety of Life at Sea, 1974, as amended.

2.3 *Fire Safety Systems Code* means the International Code for Fire Safety Systems as defined in chapter II-2 of the International Convention for the Safety of Life at Sea, 1974, as amended.

2.4 For the purpose of this Code, definitions provided in chapter II-2 of the Convention also apply.

3 Use of equivalents and modern technology

In order to allow modern technology and development of fire safety systems, the Administrations may approve fire safety systems which are not specified in this Code if the requirements of part F of chapter II-2 of the Convention are fulfilled.

4 Use of toxic extinguishing media

The use of a fire-extinguishing medium which, in the opinion of the Administration, either by itself or under expected conditions of use gives off toxic gases, liquids and other substances in such quantities as to endanger persons shall not be permitted.

CHAPTER 2 - INTERNATIONAL SHORE CONNECTIONS

1 Application

This chapter details the specifications for international shore connections as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 Standard dimensions

Standard dimensions of flanges for the international shore connection shall be in accordance with the following table:

Table 2.1 - Standard dimensions for international shore connections

Description	Dimension
Outside diameter	178 mm
Inside diameter	64 mm
Bolt circle diameter	132 mm
Slots in flange	4 holes 19 mm in diameter spaced equidistantly on a bolt circle of the above diameter, slotted to the flange periphery
Flange thickness	14.5 mm minimum
Bolts and nuts	4, each of 16 mm diameter, 50 mm in length

2.2 Materials and accessories

International shore connections shall be of steel or other equivalent material and shall be designed for 1 N/mm^2 services. The flange shall have a flat face on one side and, on the other side, it shall be permanently attached to a coupling that will fit the ship's hydrant and hose. The connection shall be kept aboard the ship together with a gasket of any material suitable for 1 N/mm^2 services, together with four bolts of 16 mm diameter and 50 mm in length, four 16 mm nuts, and eight washers.

CHAPTER 3 - PERSONNEL PROTECTION

1 Application

This chapter details the specifications for personnel protection as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 Fire-fighter's outfit

A fire-fighter's outfit shall consist of a set of personal equipment and a breathing apparatus.

2.1.1 Personal equipment

Personal equipment shall consist of the following:

.1 protective clothing of material to protect the skin from the heat radiating from the fire and from burns and scalding by steam. The outer surface shall be water-resistant;

.2 boots of rubber or other electrically non-conducting material;

.3 rigid helmet providing effective protection against impact;

.4 electric safety lamp (hand lantern) of an approved type with a minimum burning period of 3 h. Electric safety lamps on tankers and those intended to be used in hazardous areas shall be of an explosion-proof type; and

.5 axe with a handle provided with high-voltage insulation.

2.1.2 Breathing apparatus

Breathing apparatus shall be a self-contained compressed air-operated breathing apparatus for which the volume of air contained in the cylinders shall be at least 1,200 *l*, or other self-contained breathing apparatus which shall be capable of functioning for at least 30 min. All air cylinders for breathing apparatus shall be interchangeable.

2.1.3 Lifeline

For each breathing apparatus a fireproof lifeline of at least 30 m in length shall be provided. The lifeline shall successfully pass an approval test by statical load of 3.5 kN for 5 min without failure. The lifeline shall be capable of being attached by means of a snap-hook to the harness of the apparatus or to a separate belt in order to prevent the breathing apparatus becoming detached when the lifeline is operated.

2.2 Emergency escape breathing devices (EEBD)

2.2.1 General

2.2.1.1 An EEBD is a supplied air or oxygen device only used for escape from a compartment that has a hazardous atmosphere and shall be of an approved type.

2.2.1.2 EEBDs shall not be used for fighting fires, entering oxygen deficient voids or tanks, or worn by fire-fighters. In these events, a self-contained breathing apparatus, which is specifically suited for such applications, shall be used.

2.2.2 Definitions

2.2.2.1 Face piece means a face covering that is designed to form a complete seal around the eyes, nose and mouth which is secured in position by a suitable means.

2.2.2.2 Hood means a head covering which completely covers the head, neck, and may cover portions of the shoulders.

2.2.2.3 Hazardous atmosphere means any atmosphere that is immediately dangerous to life or health.

2.2.3 Particulars

2.2.3.1 The EEBD shall have a service duration of at least 10 min.

2.2.3.2 The EEBD shall include a hood or full face piece, as appropriate, to protect the eyes, nose and mouth during escape. Hoods and face pieces shall be constructed of flame resistant materials and include a clear window for viewing.

2.2.3.3 An inactivated EEBD shall be capable of being carried hands-free.

2.2.3.4 An EEBD, when stored, shall be suitably protected from the environment.

2.2.3.5 Brief instructions or diagrams clearly illustrating their use shall be clearly printed on the EEBD. The donning procedures shall be quick and easy to allow for situations where there is little time to seek safety from a hazardous atmosphere.

2.2.4 Markings

Maintenance requirements, manufacturer's trademark and serial number, shelf life with accompanying manufacture date and name of the approving authority shall be printed on each EEBD. All EEBD training units shall be clearly marked.

CHAPTER 4 - FIRE EXTINGUISHERS

1 Application

This chapter details the specifications for fire extinguishers as required by chapter II-2 of the Convention.

2 Type approval

All fire extinguishers shall be of approved types and designs based on the guidelines developed by the Organization.

3 Engineering specifications

3.1 Fire extinguisher

3.1.1 Quantity of medium

3.1.1.1 Each powder or carbon dioxide extinguisher shall have a capacity of at least 5 kg and each foam extinguisher shall have a capacity of at least 9 *l*. The mass of all portable fire extinguishers shall not exceed 23 kg and they shall have a fire-extinguishing capability at least equivalent to that of a 9 *l* fluid extinguisher.

3.1.1.2 The Administration shall determine the equivalents of fire extinguishers.

3.1.2 Recharging

Only refills approved for the fire extinguisher in question shall be used for recharging.

3.2 Portable foam applicators

A portable foam applicator unit shall consist of a foam nozzle of an inductor type capable of being connected to the fire main by a fire hose, together with a portable tank containing at least 20 *l* of foam-forming liquid and one spare tank of foam-making liquid. The nozzle shall be capable of producing effective foam suitable for extinguishing an oil fire, at the rate of at least 1.5 m^3/min.

CHAPTER 5 - FIXED GAS FIRE-EXTINGUISHING SYSTEMS

1 Application

This chapter details the specifications for fixed gas fire-extinguishing systems as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 General

2.1.1 Fire-extinguishing medium

2.1.1.1 Where the quantity of the fire-extinguishing medium is required to protect more than one space, the quantity of medium available need not be more than the largest quantity required for any one space so protected.

2.1.1.2 The volume of starting air receivers, converted to free air volume, shall be added to the gross volume of the machinery space when calculating the necessary quantity of the fire-extinguishing medium. Alternatively, a discharge pipe from the safety valves may be fitted and led directly to the open air.

2.1.1.3 Means shall be provided for the crew to safely check the quantity of the fire-extinguishing medium in the containers.

2.1.1.4 Containers for the storage of fire-extinguishing medium and associated pressure components shall be designed to pressure codes of practice to the satisfaction of the Administration having regard to their locations and maximum ambient temperatures expected in service.

2.1.2 Installation requirements

2.1.2.1 The piping for the distribution of fire-extinguishing medium shall be arranged and discharge nozzles so positioned that a uniform distribution of the medium is obtained.

2.1.2.2 Except as otherwise permitted by the Administration, pressure containers required for the storage of fire-extinguishing medium, other than steam, shall be located outside the protected spaces in accordance with regulation II-2/10.4.3 of the Convention.

2.1.2.3 Spare parts for the system shall be stored on board and be to the satisfaction of the Administration.

2.1.3 System control requirements

2.1.3.1 The necessary pipes for conveying fire-extinguishing medium into the protected spaces shall be provided with control valves so marked as to indicate clearly the spaces to which the pipes are led. Suitable provision shall be made to prevent inadvertent release of the medium into the space. Where a cargo space fitted with a gas fire-extinguishing system is used as a passenger space, the gas connection shall be blanked during such use. The pipes may pass through accommodations providing that they are of substantial thickness and that their tightness is verified with a pressure test, after their installation, at a pressure head not less than 5 N/mm^2. In addition, pipes passing through accommodation areas shall be joined only by welding and shall

not be fitted with drains or other openings within such spaces. The pipes shall not pass through refrigerated spaces.

2.1.3.2 Means shall be provided for automatically giving audible warning of the release of fire-extinguishing medium into any ro-ro spaces and other spaces in which personnel normally work or to which they have access. The pre-discharge alarm shall be automatically activated (e.g., by opening of the release cabinet door). The alarm shall operate for the length of time needed to evacuate the space, but in no case less than 20 s before the medium is released. Conventional cargo spaces and small spaces (such as compressor rooms, paint lockers, etc.) with only a local release need not be provided with such an alarm.

2.1.3.3 The means of control of any fixed gas fire-extinguishing system shall be readily accessible, simple to operate and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in a protected space. At each location there shall be clear instructions relating to the operation of the system having regard to the safety of personnel.

2.1.3.4 Automatic release of fire-extinguishing medium shall not be permitted, except as permitted by the Administration.

2.2 Carbon dioxide systems

2.2.1 Quantity of fire-extinguishing medium

2.2.1.1 For cargo spaces the quantity of carbon dioxide available shall, unless otherwise provided, be sufficient to give a minimum volume of free gas equal to 30% of the gross volume of the largest cargo space to be protected in the ship.

2.2.1.2 For machinery spaces the quantity of carbon dioxide carried shall be sufficient to give a minimum volume of free gas equal to the larger of the following volumes, either:

.1 40% of the gross volume of the largest machinery space so protected, the volume to exclude that part of the casing above the level at which the horizontal area of the casing is 40% or less of the horizontal area of the space concerned taken midway between the tank top and the lowest part of the casing; or

.2 35% of the gross volume of the largest machinery space protected, including the casing.

2.2.1.3 The percentages specified in paragraph 2.2.1.2 above may be reduced to 35% and 30%, respectively, for cargo ships of less than 2,000 gross tonnage provided that where two or more machinery spaces are not entirely separate, they shall be considered as forming one space.

2.2.1.4 For the purpose of this paragraph the volume of free carbon dioxide shall be calculated at 0.56 m^3/kg.

2.2.1.5 For machinery spaces, the fixed piping system shall be such that 85% of the gas can be discharged into the space within 2 min.

2.2.2 Controls

Carbon dioxide systems shall comply with the following requirements:

.1 two separate controls shall be provided for releasing carbon dioxide into a protected space and to ensure the activation of the alarm. One control shall be used for opening the valve of the piping which conveys the gas into the protected space and a second control shall be used to discharge the gas from its storage containers; and

.2 the two controls shall be located inside a release box clearly identified for the particular space. If the box containing the controls is to be locked, a key to the box shall be in a break-glass-type enclosure conspicuously located adjacent to the box.

2.3 Requirements of steam systems

The boiler or boilers available for supplying steam shall have an evaporation of at least 1 kg of steam per hour for each 0.75 m^3 of the gross volume of the largest space so protected. In addition to complying with the foregoing requirements, the systems in all respects shall be as determined by, and to the satisfaction of, the Administration.

2.4 Systems using gaseous products of fuel combustion

2.4.1 General

Where gas other than carbon dioxide or steam, as permitted by paragraph 2.3, is produced on the ship and is used as a fire-extinguishing medium, the system shall comply with the requirements in paragraph 2.4.2.

2.4.2 Requirements of the systems

2.4.2.1 Gaseous products

Gas shall be a gaseous product of fuel combustion in which the oxygen content, the carbon monoxide content, the corrosive elements and any solid combustible elements in a gaseous product shall have been reduced to a permissible minimum.

2.4.2.2 Capacity of fire-extinguishing systems

2.4.2.2.1 Where such gas is used as the fire-extinguishing medium in a fixed fire-extinguishing system for the protection of machinery spaces, it shall afford protection equivalent to that provided by a fixed system using carbon dioxide as the medium.

2.4.2.2.2 Where such gas is used as the fire-extinguishing medium in a fixed fire-extinguishing system for the protection of cargo spaces, a sufficient quantity of such gas shall be available to supply hourly a volume of free gas at least equal to 25 % of the gross volume of the largest space protected in this way for a period of 72 h.

2.5 Equivalent fixed gas fire-extinguishing systems for machinery spaces and cargo pump rooms

Fixed gas fire-extinguishing systems equivalent to those specified in paragraphs 2.2 to 2.4 shall be approved by the Administration based on the guidelines developed by the Organization.

CHAPTER 6 - FIXED FOAM FIRE-EXTINGUISHING SYSTEMS

1 Application

This chapter details the specifications for fixed foam fire-extinguishing systems as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 General

Fixed foam fire-extinguishing systems shall be capable of generating foam suitable for extinguishing oil fires.

2.2 Fixed high-expansion foam fire-extinguishing systems

2.2.1 Quantity and performance of foam concentrates

2.2.1.1 The foam concentrates of high-expansion foam fire-extinguishing systems shall be approved by the Administration based on the guidelines developed by the Organization.

2.2.1.2 Any required fixed high-expansion foam system in machinery spaces shall be capable of rapidly discharging through fixed discharge outlets a quantity of foam sufficient to fill the greatest space to be protected at a rate of at least 1 m in depth per minute. The quantity of foam-forming liquid available shall be sufficient to produce a volume of foam equal to five times the volume of the largest space to be protected. The expansion ratio of the foam shall not exceed 1,000 to 1.

2.2.1.3 The Administration may permit alternative arrangements and discharge rates provided that it is satisfied that equivalent protection is achieved.

2.2.2 Installation requirements

2.2.2.1 Supply ducts for delivering foam, air intakes to the foam generator and the number of foam-producing units shall in the opinion of the Administration be such as will provide effective foam production and distribution.

2.2.2.2 The arrangement of the foam generator delivery ducting shall be such that a fire in the protected space will not affect the foam generating equipment. If the foam generators are located adjacent to the protected space, foam delivery ducts shall be installed to allow at least 450 mm of separation between the generators and the protected space. The foam delivery ducts shall be constructed of steel having a thickness of not less than 5 mm. In addition, stainless steel dampers (single or multi-bladed) with a thickness of not less than 3 mm shall be installed at the openings in the boundary bulkheads or decks between the foam generators and the protected space. The dampers shall be automatically operated (electrically, pneumatically or hydraulically) by means of remote control of the foam generator related to them.

2.2.2.3 The foam generator, its sources of power supply, foam-forming liquid and means of controlling the system shall be readily accessible and simple to operate and shall be grouped in as few locations as possible at positions not likely to be cut off by a fire in the protected space.

2.3 Fixed low-expansion foam fire-extinguishing systems

2.3.1 Quantity and foam concentrates

2.3.1.1 The foam concentrates of low-expansion foam fire-extinguishing systems shall be approved by the Administration based on the guidelines developed by the Organization.

2.3.1.2 The system shall be capable of discharging through fixed discharge outlets in not more than 5 min a quantity of foam sufficient to cover to a depth of 150 mm the largest single area over which oil fuel is liable to spread. The expansion ratio of the foam shall not exceed 12 to 1.

2.3.2 Installation requirements

2.3.2.1 Means shall be provided for the effective distribution of the foam through a permanent system of piping and control valves or cocks to suitable discharge outlets, and for the foam to be effectively directed by fixed sprayers on other main fire hazards in the protected space. The means for effective distribution of the foam shall be proven acceptable to the Administration through calculation or by testing.

2.3.2.2 The means of control of any such systems shall be readily accessible and simple to operate and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in the protected space.

CHAPTER 7 - FIXED PRESSURE WATER-SPRAYING AND WATER-MIST FIRE-EXTINGUISHING SYSTEMS

1 Application

This chapter details the specifications for fixed pressure water-spraying and water-mist fire-extinguishing systems as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 Fixed pressure water-spraying fire-extinguishing systems

2.1.1 Nozzles and pumps

2.1.1.1 Any required fixed pressure water-spraying fire-extinguishing system in machinery spaces shall be provided with spraying nozzles of an approved type.

2.1.1.2 The number and arrangement of the nozzles shall be to the satisfaction of the Administration and shall be such as to ensure an effective average distribution of water of at least 5 $l/m^2/min$ in the spaces to be protected. Where increased application rates are considered necessary, these shall be to the satisfaction of the Administration.

2.1.1.3 Precautions shall be taken to prevent the nozzles from becoming clogged by impurities in the water or corrosion of piping, nozzles, valves and pump.

2.1.1.4 The pump shall be capable of simultaneously supplying at the necessary pressure all sections of the system in any one compartment to be protected.

2.1.1.5 The pump may be driven by an independent internal combustion machinery, but, if it is dependent upon power being supplied from the emergency generator fitted in compliance with the provisions of regulation II-1/42 or regulation II-1/43 of the Convention, as appropriate, that generator shall be so arranged as to start automatically in case of main power failure so that power for the pump required by paragraph 2.1.1.4 is immediately available. The independent internal combustion machinery for driving the pump shall be so situated that a fire in the protected space or spaces will not affect the air supply to the machinery.

2.1.2 Installation requirements

2.1.2.1 Nozzles shall be fitted above bilges, tank tops and other areas over which oil fuel is liable to spread and also above other specific fire hazards in the machinery spaces.

2.1.2.2 The system may be divided into sections, the distribution valves of which shall be operated from easily accessible positions outside the spaces to be protected so as not to be readily cut off by a fire in the protected space.

2.1.2.3 The pump and its controls shall be installed outside the space or spaces to be protected. It shall not be possible for a fire in the space or spaces protected by the water-spraying system to put the system out of action.

2.1.3 System control requirements

The system shall be kept charged at the necessary pressure and the pump supplying the water for the system shall be put automatically into action by a pressure drop in the system.

2.2 Equivalent water-mist fire-extinguishing systems

Water-mist fire-extinguishing systems for machinery spaces and cargo pump-rooms shall be approved by the Administration based on the guidelines developed by the Organization.

CHAPTER 8 - AUTOMATIC SPRINKLER, FIRE DETECTION AND FIRE ALARM SYSTEMS

1 Application

This chapter details the specifications for automatic sprinkler, fire detection and fire alarm systems as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 General

2.1.1 Type of sprinkler systems

The automatic sprinkler systems shall be of the wet pipe type, but small exposed sections may be of the dry pipe type where, in the opinion of the Administration, this is a necessary precaution. Saunas shall be fitted with a dry pipe system, with sprinkler heads having an operating temperature up to 140^{o}C.

2.1.2 Sprinkler systems equivalent to those specified in paragraphs 2.2 to 2.4

Automatic sprinkler systems equivalent to those specified in paragraphs 2.2 to 2.4 shall be approved by the Administration based on the guidelines developed by the Organization.

2.2 Sources of power supply

2.2.1 Passenger ships

There shall be not less than two sources of power supply for the sea water pump and automatic alarm and detection system. Where the sources of power for the pump are electrical, these shall be a main generator and an emergency source of power. One supply for the pump shall be taken from the main switchboard, and one from the emergency switchboard by separate feeders reserved solely for that purpose. The feeders shall be so arranged as to avoid galleys, machinery spaces and other enclosed spaces of high fire risk except in so far as it is necessary to reach the appropriate switchboards, and shall be run to an automatic changeover switch situated near the sprinkler pump. This switch shall permit the supply of power from the main switchboard so long as a supply is available therefrom, and be so designed that upon failure of that supply it will automatically change over to the supply from the emergency switchboard. The switches on the main switchboard and the emergency switchboard shall be clearly labelled and normally kept closed. No other switch shall be permitted in the feeders concerned. One of the sources of power supply for the alarm and detection system shall be an emergency source. Where one of the sources of power for the pump is an internal combustion engine it shall, in addition to complying with the provisions of paragraph 2.4.3, be so situated that a fire in any protected space will not affect the air supply to the machinery.

2.2.2 Cargo ships

There shall not be less than two sources of power supply for the sea water pump and automatic alarm and detection system. If the pump is electrically driven, it shall be connected to the main source of electrical power, which shall be capable of being supplied by at least two generators. The feeders shall be so arranged as to avoid galleys, machinery spaces and other enclosed spaces of high fire risk except in so far as it is necessary to reach the appropriate switchboards. One of the sources of power supply for the alarm and detection system shall be an emergency source. Where one of the sources of power for the pump is an internal combustion engine, it shall, in addition to complying with the provisions of paragraph 2.4.3, be so situated that a fire in any protected space will not affect the air supply to the machinery.

2.3 Component requirements

2.3.1 Sprinklers

2.3.1.1 The sprinklers shall be resistant to corrosion by the marine atmosphere. In accommodation and service spaces the sprinklers shall come into operation within the temperature range from 68°C to 79°C, except that in locations such as drying rooms, where high ambient temperatures might be expected, the operating temperature may be increased by not more than 30°C above the maximum deckhead temperature.

2.3.1.2 A quantity of spare sprinkler heads shall be provided for all types and ratings installed on the ship as follows:

Total number of heads	Required number of spares
<300	6
300 to 1000	12
>1000	24

The number of spare sprinkler heads of any type need not exceed the total number of heads installed of that type.

2.3.2 Pressure tanks

2.3.2.1 A pressure tank having a volume equal to at least twice that of the charge of water specified in this paragraph shall be provided. The tank shall contain a standing charge of fresh water, equivalent to the amount of water which would be discharged in 1 min by the pump referred to in paragraph 2.3.3.2, and the arrangements shall provide for maintaining an air pressure in the tank such as to ensure that where the standing charge of fresh water in the tank has been used the pressure will be not less than the working pressure of the sprinkler, plus the pressure exerted by a head of water measured from the bottom of the tank to the highest sprinkler in the system. Suitable means of replenishing the air under pressure and of replenishing the fresh water charge in the tank shall be provided. A glass gauge shall be provided to indicate the correct level of the water in the tank.

2.3.2.2 Means shall be provided to prevent the passage of sea water into the tank.

2.3.3 Sprinkler pumps

2.3.3.1 An independent power pump shall be provided solely for the purpose of continuing automatically the discharge of water from the sprinklers. The pump shall be brought into action automatically by the pressure drop in the system before the standing fresh water charge in the pressure tank is completely exhausted.

2.3.3.2 The pump and the piping system shall be capable of maintaining the necessary pressure at the level of the highest sprinkler to ensure a continuous output of water sufficient for the simultaneous coverage of a minimum area of 280 m^2 at the application rate specified in paragraph 2.5.2.3. The hydraulic capability of the system shall be confirmed by the review of hydraulic calculations, followed by a test of the system, if deemed necessary by the Administration.

2.3.3.3 The pump shall have fitted on the delivery side a test valve with a short open-ended discharge pipe. The effective area through the valve and pipe shall be adequate to permit the release of the required pump output while maintaining the pressure in the system specified in paragraph 2.3.2.1.

2.4 Installation requirements

2.4.1 General

Any parts of the system which may be subjected to freezing temperatures in service shall be suitably protected against freezing.

2.4.2 Piping arrangements

2.4.2.1 Sprinklers shall be grouped into separate sections, each of which shall contain not more than 200 sprinklers. In passenger ships any section of sprinklers shall not serve more than two decks and shall not be situated in more than one main vertical zone. However, the Administration may permit such a section of sprinklers to serve more than two decks or be situated in more than one main vertical zone, if it is satisfied that the protection of the ship against fire will not thereby be reduced.

2.4.2.2 Each section of sprinklers shall be capable of being isolated by one stop valve only. The stop valve in each section shall be readily accessible in a location outside of the associated section or in cabinets within stairway enclosures. The valve's location shall be clearly and permanently indicated. Means shall be provided to prevent the operation of the stop valves by any unauthorized person.

2.4.2.3 A test valve shall be provided for testing the automatic alarm for each section of sprinklers by a discharge of water equivalent to the operation of one sprinkler. The test valve for each section shall be situated near the stop valve for that section.

2.4.2.4 The sprinkler system shall have a connection from the ship's fire main by way of a lockable screw-down non-return valve at the connection which will prevent a backflow from the sprinkler system to the fire main.

2.4.2.5 A gauge indicating the pressure in the system shall be provided at each section stop valve and at a central station.

2.4.2.6 The sea inlet to the pump shall wherever possible be in the space containing the pump and shall be so arranged that when the ship is afloat it will not be necessary to shut off the supply of sea water to the pump for any purpose other than the inspection or repair of the pump.

2.4.3 Location of systems

The sprinkler pump and tank shall be situated in a position reasonably remote from any machinery space of category A and shall not be situated in any space required to be protected by the sprinkler system.

2.5 System control requirements

2.5.1 Ready availability

2.5.1.1 Any required automatic sprinkler, fire detection and fire alarm system shall be capable of immediate operation at all times and no action by the crew shall be necessary to set it in operation.

2.5.1.2 The automatic sprinkler system shall be kept charged at the necessary pressure and shall have provision for a continuous supply of water as required in this chapter.

2.5.2 Alarm and indication

2.5.2.1 Each section of sprinklers shall include means for giving a visual and audible alarm signal automatically at one or more indicating units whenever any sprinkler comes into operation. Such alarm systems shall be such as to indicate if any fault occurs in the system. Such units shall

indicate in which section served by the system a fire has occurred and shall be centralised on the navigation bridge or in the continuously manned central control station and, in addition, visible and audible alarms from the unit shall also be placed in a position other than on the aforementioned spaces to ensure that the indication of fire is immediately received by the crew.

2.5.2.2 Switches shall be provided at one of the indicating positions referred to in paragraph 2.5.2.1 which will enable the alarm and the indicators for each section of sprinklers to be tested.

2.5.2.3 Sprinklers shall be placed in an overhead position and spaced in a suitable pattern to maintain an average application rate of not less than 5 $l/m^2/min$ over the nominal area covered by the sprinklers. However, the Administration may permit the use of sprinklers providing such an alternative amount of water suitably distributed as has been shown to the satisfaction of the Administration to be not less effective.

2.5.2.4 A list or plan shall be displayed at each indicating unit showing the spaces covered and the location of the zone in respect of each section. Suitable instructions for testing and maintenance shall be available.

2.5.3 Testing

Means shall be provided for testing the automatic operation of the pump on reduction of pressure in the system.

CHAPTER 9 - FIXED FIRE DETECTION AND FIRE ALARM SYSTEMS

1 Application

This chapter details the specifications for fixed fire detection and fire alarm systems as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 General requirements

2.1.1 Any required fixed fire detection and fire alarm system with manually operated call points shall be capable of immediate operation at all times.

2.1.2 The fixed fire detection and fire alarm system shall not be used for any other purpose, except that closing of fire doors and similar functions may be permitted at the control panel.

2.1.3 The system and equipment shall be suitably designed to withstand supply voltage variation and transients, ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered in ships.

2.1.4 Zone address identification capability

Fixed fire detection and fire alarm systems with a zone address identification capability shall be so arranged that:

.1 means are provided to ensure that any fault (e.g. power break, short circuit, earth, etc.) occurring in the loop will not render the whole loop ineffective;

.2 all arrangements are made to enable the initial configuration of the system to be restored in the event of failure (e.g. electrical, electronic, informatics, etc.);

.3 the first initiated fire alarm will not prevent any other detector from initiating further fire alarms; and

.4 no loop will pass through a space twice. When this is not practical (e.g. for large public spaces), the part of the loop which by necessity passes through the space for a second time shall be installed at the maximum possible distance from the other parts of the loop.

2.2 Sources of power supply

There shall be not less than two sources of power supply for the electrical equipment used in the operation of the fixed fire detection and fire alarm system, one of which shall be an emergency source. The supply shall be provided by separate feeders reserved solely for that purpose. Such feeders shall run to an automatic change-over switch situated in, or adjacent to, the control panel for the fire detection system.

2.3 Component requirements

2.3.1 Detectors

2.3.1.1 Detectors shall be operated by heat, smoke or other products of combustion, flame, or any combination of these factors. Detectors operated by other factors indicative of incipient fires may be considered by the Administration provided that they are no less sensitive than such detectors. Flame detectors shall only be used in addition to smoke or heat detectors.

2.3.1.2 Smoke detectors required in all stairways, corridors and escape routes within accommodation spaces shall be certified to operate before the smoke density exceeds 12.5% obscuration per metre, but not until the smoke density exceeds 2% obscuration per metre. Smoke detectors to be installed in other spaces shall operate within sensitivity limits to the satisfaction of the Administration having regard to the avoidance of detector insensitivity or oversensitivity.

2.3.1.3 Heat detectors shall be certified to operate before the temperature exceeds 78°C, but not until the temperature exceeds 54°C, when the temperature is raised to those limits at a rate less than 1°C per minute. At higher rates of temperature rise, the heat detector shall operate within temperature limits to the satisfaction of the Administration having regard to the avoidance of detector insensitivity or oversensitivity.

2.3.1.4 The operation temperature of heat detectors in drying rooms and similar spaces of a normal high ambient temperature may be up to 130°C, and up to 140°C in saunas.

2.3.1.5 All detectors shall be of a type such that they can be tested for correct operation and restored to normal surveillance without the renewal of any component.

2.4 Installation requirements

2.4.1 Sections

2.4.1.1 Detectors and manually operated call points shall be grouped into sections.

2.4.1.2 A section of fire detectors which covers a control station, a service space or an accommodation space shall not include a machinery space of category A. For fixed fire detection and fire alarm systems with remotely and individually identifiable fire detectors, a loop covering sections of fire detectors in accommodation, service spaces and control station shall not include sections of fire detectors in machinery spaces of category A.

2.4.1.3 Where the fixed fire detection and fire alarm system does not include means of remotely identifying each detector individually, no section covering more than one deck within accommodation spaces, service spaces and control stations shall normally be permitted except a section which covers an enclosed stairway. In order to avoid delay in identifying the source of fire, the number of enclosed spaces included in each section shall be limited as determined by the Administration. In no case shall more than 50 enclosed spaces be permitted in any section. If the system is fitted with remotely and individually identifiable fire detectors, the sections may cover several decks and serve any number of enclosed spaces.

2.4.1.4 In passenger ships, if there is no fixed fire detection and fire alarm system capable of remotely and individually identifying each detector, a section of detectors shall not serve spaces on both sides of the ship nor on more than one deck and neither shall it be situated in more than one main vertical zone except that the same section of detectors may serve spaces on more than one deck if those spaces are located in the fore or aft end of the ship or if they protect common spaces on different decks (e.g. fan rooms, galleys, public spaces, etc.). In ships of less than 20 m in breadth, the same section of detectors may serve spaces on both sides of the ship. In passenger ships fitted with individually identifiable fire detectors, a section may serve spaces on both sides of the ship and on several decks, but shall not be situated in more than one main vertical zone.

2.4.2 Positioning of detectors

2.4.2.1 Detectors shall be located for optimum performance. Positions near beams and ventilation ducts or other positions where patterns of air flow could adversely affect performance and positions where impact or physical damage is likely shall be avoided. Detectors which are located on the overhead shall be a minimum distance of 0.5 m away from bulkheads, except in corridors, lockers and stairways.

2.4.2.2 The maximum spacing of detectors shall be in accordance with the table below:

Table 9.1 - Spacing of detectors

Type of detector	Maximum floor area per detector	Maximum distance apart between centres	Maximum distance away from bulkheads
Heat	37 m^2	9 m	4.5 m
Smoke	74 m^2	11 m	5.5 m

The Administration may require or permit different spacing to that specified in the above table if based upon test data which demonstrate the characteristics of the detectors.

2.4.3 Arrangement of electric wiring

2.4.3.1 Electrical wiring which forms part of the system shall be so arranged as to avoid galleys, machinery spaces of category A, and other enclosed spaces of high fire risk except where it is necessary to provide for fire detection or fire alarm in such spaces or to connect to the appropriate power supply.

2.4.3.2 A loop of fire detection systems with a zone address identification capability shall not be damaged at more than one point by a fire.

2.5 System control requirements

2.5.1 Visual and audible fire signals

2.5.1.1 The activation of any detector or manually operated call point shall initiate a visual and audible fire signal at the control panel and indicating units. If the signals have not received attention within 2 min, an audible alarm shall be automatically sounded throughout the crew accommodation and service spaces, control stations and machinery spaces of category A. This alarm sounder system need not be an integral part of the detection system.

2.5.1.2 The control panel shall be located on the navigation bridge or in the continuously manned central control station.

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

2.5.1.4 Clear information shall be displayed on or adjacent to each indicating unit about the spaces covered and the location of the sections.

2.5.1.5 Power supplies and electric circuits necessary for the operation of the system shall be monitored for loss of power or fault conditions as appropriate. Occurrence of a fault condition shall initiate a visual and audible fault signal at the control panel which shall be distinct from a fire signal.

2.5.2 Testing

Suitable instructions and component spares for testing and maintenance shall be provided.

CHAPTER 10 - SAMPLE EXTRACTION SMOKE DETECTION SYSTEMS

1 Application

This chapter details the specifications for sample extraction smoke detection systems as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 General requirements

2.1.1 Wherever in the text of this chapter the word "system" appears, it shall mean "sample extraction smoke detection system".

2.1.2 Any required system shall be capable of continuous operation at all times except that systems operating on a sequential scanning principle may be accepted, provided that the interval between scanning the same position twice gives an overall response time to the satisfaction of the Administration.

2.1.3 The system shall be designed, constructed and installed so as to prevent the leakage of any toxic or flammable substances or fire-extinguishing media into any accommodation and service space, control station or machinery space.

2.1.4 The system and equipment shall be suitably designed to withstand supply voltage variations and transients, ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered in ships and to avoid the possibility of ignition of a flammable gas air mixture.

2.1.5 The system shall be of a type that can be tested for correct operation and restored to normal surveillance without the renewal of any component.

2.1.6 An alternative power supply for the electrical equipment used in the operation of the system shall be provided.

2.2 Component requirements

2.2.1 The sensing unit shall be certified to operate before the smoke density within the sensing chamber exceeds 6.65% obscuration per metre.

2.2.2 Duplicate sample extraction fans shall be provided. The fans shall be of sufficient capacity to operate under normal ventilation conditions in the protected area and shall give an overall response time to the satisfaction of the Administration.

2.2.3 The control panel shall permit observation of smoke in the individual sampling pipe.

2.2.4 Means shall be provided to monitor the airflow through the sampling pipes so designed as to ensure that as far as practicable equal quantities are extracted from each interconnected accumulator.

2.2.5 Sampling pipes shall be a minimum of 12 mm internal diameter except when used in conjunction with fixed gas fire-extinguishing systems when the minimum size of pipe shall be sufficient to permit the fire-extinguishing gas to be discharged within the appropriate time.

2.2.6 Sampling pipes shall be provided with an arrangement for periodically purging with compressed air.

2.3 Installation requirements

2.3.1 Smoke accumulators

2.3.1.1 At least one smoke accumulator shall be located in every enclosed space for which smoke detection is required. However, where a space is designed to carry oil or refrigerated cargo alternatively with cargoes for which a smoke sampling system is required, means may be provided to isolate the smoke accumulators in such compartments for the system. Such means shall be to the satisfaction of the Administration.

2.3.1.2 Smoke accumulators shall be located for optimum performance and shall be spaced so that no part of the overhead deck area is more than 12 m measured horizontally from an accumulator. Where systems are used in spaces which may be mechanically ventilated, the position of the smoke accumulators shall be considered having regard to the effects of ventilation.

2.3.1.3 Smoke accumulators shall be positioned where impact or physical damage is unlikely to occur.

2.3.1.4 Not more than four accumulators shall be connected to each sampling point.

2.3.1.5 Smoke accumulators from more than one enclosed space shall not be connected to the same sampling point.

2.3.2 Sampling pipes

2.3.2.1 The sampling pipe arrangements shall be such that the location of the fire can be readily identified.

2.3.2.2 Sampling pipes shall be self-draining and suitably protected from impact or damage from cargo working.

2.4 System control requirements

2.4.1 Visual and audible fire signals

2.4.1.1 The control panel shall be located on the navigation bridge or in the continuously manned central control station.

2.4.1.2 Clear information shall be displayed on, or adjacent to, the control panel designating the spaces covered.

2.4.1.3 The detection of smoke or other products of combustion shall initiate a visual and audible signal at the control panel and the navigation bridge or continuously manned central control station.

2.4.1.4 Power supplies necessary for the operation of the system shall be monitored for loss of power. Any loss of power shall initiate a visual and audible signal at the control panel and the navigation bridge which shall be distinct from a signal indicating smoke detection.

2.4.2 Testing

Suitable instructions and component spares shall be provided for the testing and maintenance of the system.

CHAPTER 11 - LOW-LOCATION LIGHTING SYSTEMS

1 Application

This chapter details the specifications for low-location lighting systems as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 General requirements

Any required low-location lighting systems shall be approved by the Administration based on the guidelines developed by the Organization, or to an international standard acceptable to the Organization.

CHAPTER 12 - FIXED EMERGENCY FIRE PUMPS

1 Application

This chapter details the specifications for emergency fire pumps as required by chapter II-2 of the Convention. This chapter is not applicable to passenger ships of l,000 gross tonnage and upwards. See regulation II-2/10.2.2.3.1.1 of the Convention for requirements for such ships.

2 Engineering specifications

2.1 General

The emergency fire pump shall be of a fixed independently driven power-operated pump.

2.2 Component requirements

2.2.1 Emergency fire pumps

2.2.1.1 Capacity of the pump

The capacity of the pump shall not be less than 40% of the total capacity of the fire pumps required by regulation II-2/10.2.2.4.1 of the Convention and in any case not less than the following:

.1	for passenger ships less than 1,000 gross tonnage and for cargo ships of 2,000 gross tonnage and upwards; and	25 m^3/h
.2	for cargo ships less than 2,000 gross tonnage	15 m^3/h.

2.2.1.2 Pressure at hydrants

When the pump is delivering the quantity of water required by paragraph 2.2.1.1, the pressure at any hydrants shall be not less than the minimum pressure required by chapter II-2 of the Convention.

2.2.1.3 Suction heads

The total suction head and the net positive suction head of the pump shall be determined having due regard to the requirements of the Convention and this chapter on the pump capacity and on the hydrant pressure under all conditions of list, trim, roll and pitch likely to be encountered in service. The ballast condition of a ship on entering or leaving a dry dock need not be considered a service condition.

2.2.2 Diesel engines and fuel tank

2.2.2.1 Starting of diesel engine

Any diesel-driven power source for the pump shall be capable of being readily started in its cold condition down to the temperature of 0°C by hand (manual) cranking. If this is impracticable, or if lower temperature are likely to be encountered, consideration shall be given to the provision and maintenance of the heating arrangement, acceptable to the Administration so that ready

starting will be assured. If hand (manual) starting is impracticable, the Administration may permit other means of starting. These means shall be such as to enable the diesel-driven power source to be started at least six times within a period of 30 min and at least twice within the first 10 min.

2.2.2.2 Fuel tank capacity

Any service fuel tank shall contain sufficient fuel to enable the pump to run on full load for at least 3 h and sufficient reserves of fuel shall be available outside the machinery space of category A to enable the pump to be run on full load for an additional 15 h.

CHAPTER 13 - ARRANGEMENT OF MEANS OF ESCAPE

1 Application

This chapter details the specifications for means of escape as required by chapter II-2 of the Convention.

2 Passenger ships

2.1 Width of stairways

2.1.1 Basic requirements for stairway width

Stairways shall not be less than 900 mm in clear width. The minimum clear width of stairways shall be increased by 10 mm for every one person provided for in excess of 90 persons. The total number of persons to be evacuated by such stairways shall be assumed to be two thirds of the crew and the total number of passengers in the areas served by such stairways. The width of the stairways shall not be inferior to those determined by paragraph 2.1.2.

2.1.2 Calculation method of stairway width

2.1.2.1 Basic principles of the calculation

2.1.2.1.1 This calculation method determines the minimum stairway width at each deck level, taking into account the consecutive stairways leading into the stairway under consideration.

2.1.2.1.2 It is the intention that the calculation method shall consider evacuation from enclosed spaces within each main vertical zone individually and take into account all of the persons using the stairway enclosures in each zone, even if they enter that stairway from another vertical zone.

2.1.2.1.3 For each main vertical zone the calculation shall be completed for the night time (case 1) and day time (case 2) and the largest dimension from either case used for determining the stairway width for each deck under consideration.

2.1.2.1.4 The calculation of stairway widths shall be based upon the crew and passenger load on each deck. Occupant loads shall be rated by the designer for passenger and crew accommodation spaces, service spaces, control spaces and machinery spaces. For the purpose of the calculation the maximum capacity of a public space shall be defined by either of the following two values: the number of seats or similar arrangements, or the number obtained by assigning 2 m^2 of gross deck surface area to each person.

2.1.2.2 Calculation method for minimum value

2.1.2.2.1 Basic formulae

In considering the design of stairway widths for each individual case which allow for the timely flow of persons evacuating to the assembly stations from adjacent decks above and below, the following calculation methods shall be used (see figures 1 and 2):

when joining two decks: $W=(N_1+N_2)$ 10mm;
when joining three decks: $W=(N_1+N_2+0.5N_3)$ 10mm;
when joining four decks: $W=(N_1+N_2+0.5N_3+0.25N_4)$ 10mm; and
when joining five decks or more decks, the width of the stairways shall be determined by applying the above formula for four decks to the deck under consideration and to the consecutive deck,

where:

W = the required tread width between handrails of the stairway.

The calculated value of W may be reduced where available landing area S is provided in stairways at the deck level defined by subtracting P from Z, such that:

$P = S \times 3.0$ persons/m^2 ; and $P_{max} = 0.25Z$

where:

Z = the total number of persons expected to be evacuated on the deck being considered
P = the number of persons taking temporary refuge on the stairway landing, which may be subtracted from Z to a maximum value of P = 0.25Z (to be rounded down to the nearest whole number)
S = the surface area (m^2) of the landing, minus the surface area necessary for the opening of doors and minus the surface area necessary for accessing the flow on stairs (see figure 1)
N = the total number of persons expected to use the stairway from each consecutive deck under consideration; N_1 is for the deck with the largest number of persons using that stairway; N_2 is taken for the deck with the next highest number of persons directly entering the stairway flow such that, when sizing the stairway width as each deck level, $N_1 > N_2 > N_3 > N_4$ (see figure 2). These decks are assumed to be on or upstream (i.e., away from the embarkation deck) of the deck being considered.

Figure 1

LANDING CALCULATION FOR STAIRWAY WIDTH REDUCTION

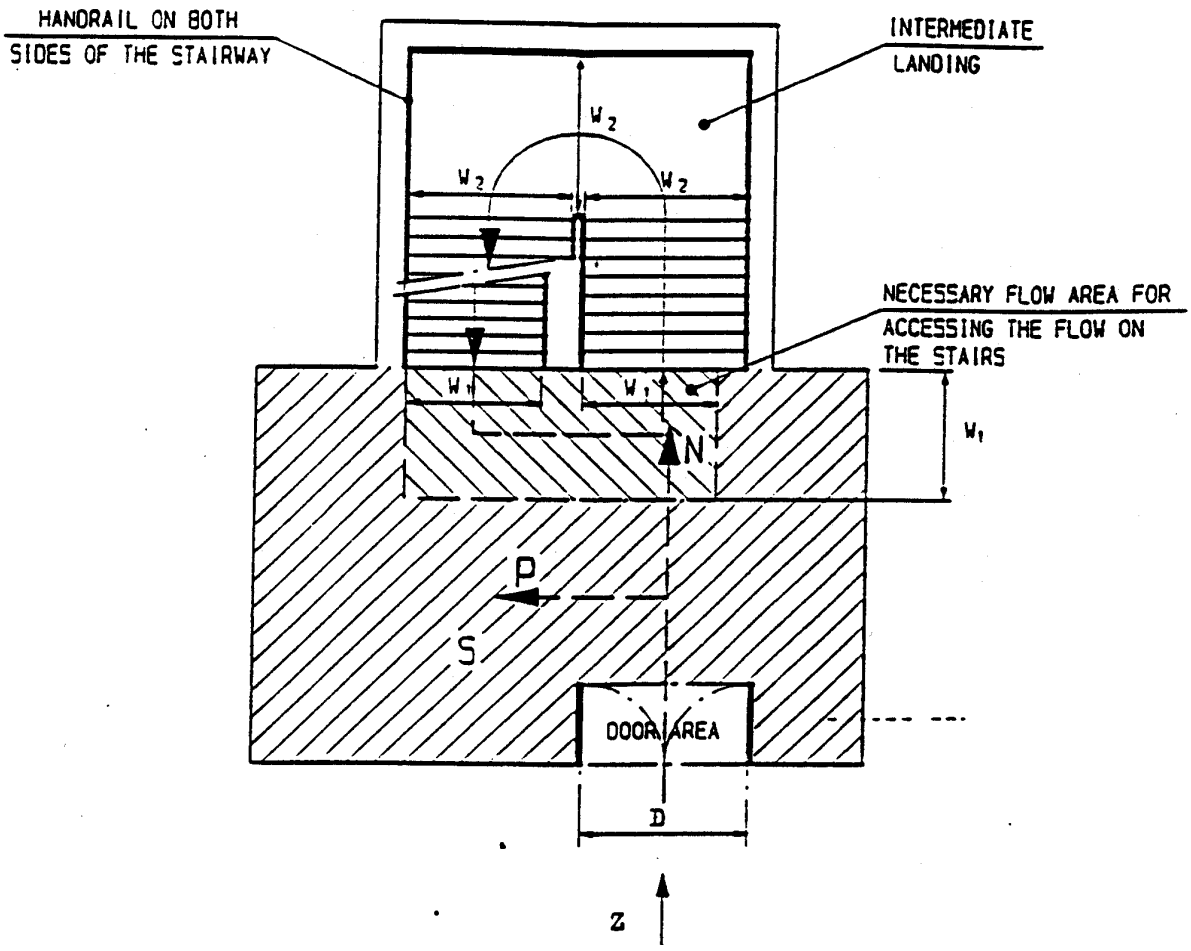
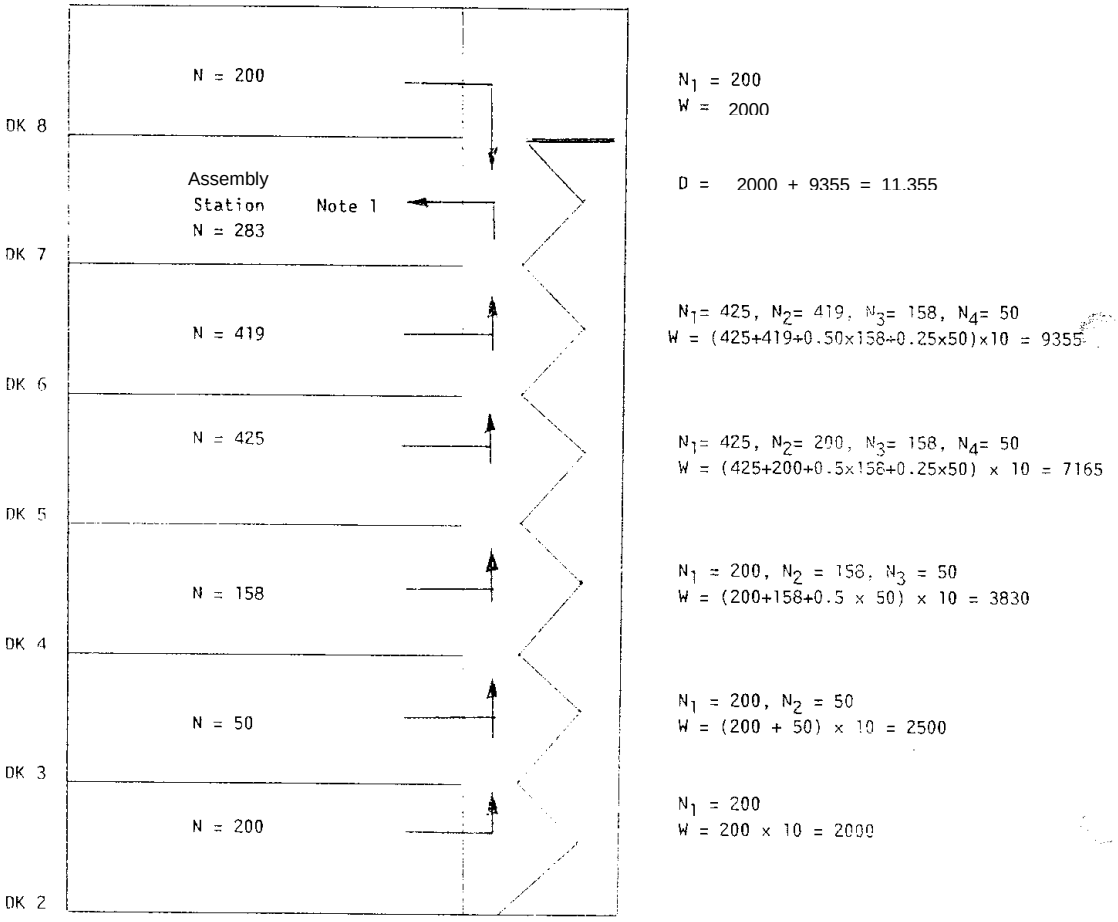


Figure 2

MINIMUM STAIRWAY WIDTH (W) CALCULATION EXAMPLE



Z	=	number of persons expected to evacuate through the stairway
N	=	number of persons directly entering the stairway flow from a given deck
W (mm)	=	$(N_1 + N_2 + 0.5 \times N_3 + 0.25 \times N_4) \times 10$ = calculated width of stairway
D (mm)	=	width of exit doors

$N_1 > N_2 > N_3 > N_4$ where:

N_1	=	the deck with the largest number of persons N entering directly the stairway
N_2	=	the deck with the next largest number of persons N entering directly the stairway, etc.

Note: The doors to the assembly station shall have aggregate width of 10,255 mm.

2.1.2.2.2 Distribution of persons

2.1.2.2.2.1 The dimension of the means of escape shall be calculated on the basis of the total number of persons expected to escape by the stairway and through doorways, corridors and landings (see figure 3). Calculations shall be made separately for the two cases of occupancy of the spaces specified below. For each component part of the escape route, the dimension taken shall not be less than the largest dimension determined for each case:

Case 1: Passengers in cabins with maximum berthing capacity fully occupied; members of the crew in cabins occupied to 2/3 of maximum berthing capacity; and service spaces occupied by 1/3 of the crew.

Case 2: Passengers in public spaces occupied to 3/4 of maximum capacity; members of the crew in public spaces occupied to 1/3 of the maximum capacity; service spaces occupied by 1/3 of the crew; and crew accommodation occupied by 1/3 of the crew.

2.1.2.2.2.2 The maximum number of persons contained in a main vertical zone, including persons entering stairways from another main vertical zone, shall not be assumed to be higher than the maximum number of persons authorized to be carried on board for the calculation of stairway width only.

2.1.3 Prohibition of decrease in width in the direction to the assembly station

The stairway shall not decrease in width in the direction of evacuation to the assembly station. Where several assembly stations are in one main vertical zone, the stairway width shall not decrease in the direction of the evacuation to the most distant assembly station.

2.2 Details of stairways

2.2.1 Handrails

Stairways shall be fitted with handrails on each side. The maximum clear width between handrails shall be 1,800 mm.

2.2.2 Alignment of stairways

All stairways sized for more than 90 persons shall be aligned fore and aft.

2.2.3 Vertical rise and inclination

Stairways shall not exceed 3.5 m in vertical rise without the provision of a landing and shall not have an angle of inclination greater than 45°.

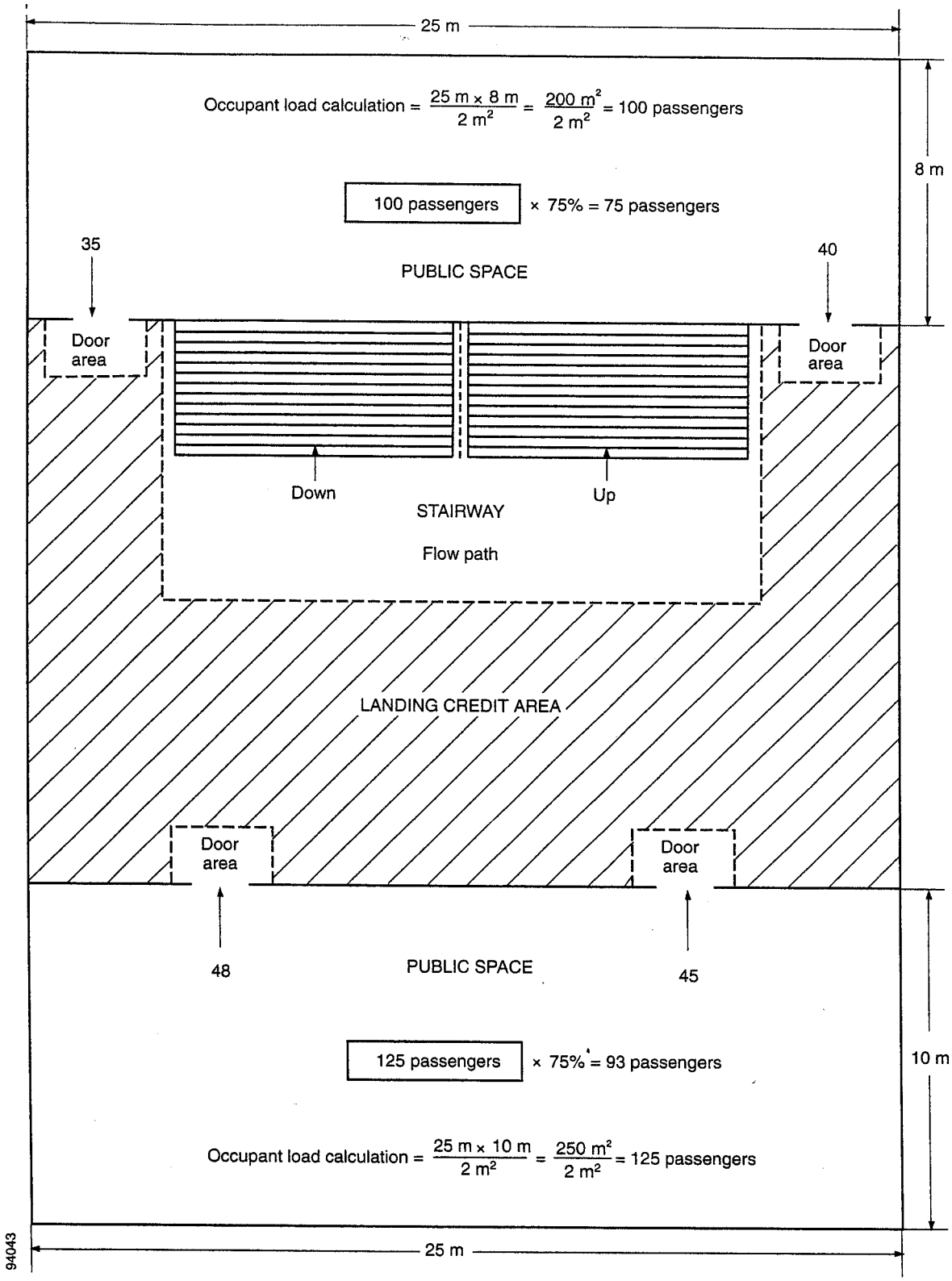


Figure 3 – *Occupant loading calculation example*

2.2.4 Landings

Landings at each deck level shall be not less than 2 m^2 in area and shall increase by 1 m^2 for every 10 persons provided for in excess of 20 persons, but need not exceed 16 m^2, except for those landings servicing public spaces having direct access onto the stairway enclosure.

2.3 Doorways and corridors

2.3.1 Doorways and corridors and intermediate landings included in means of escape shall be sized in the same manner as stairways.

2.3.2 The aggregate width of stairway exit doors to the assembly station shall not be less than the aggregate width of stairways serving this deck.

2.4 Evacuation routes to the embarkation deck

2.4.1 Assembly station

It shall be recognized that the evacuation routes to the embarkation deck may include an assembly station. In this case consideration shall be given to the fire protection requirements and sizing of corridors and doors from the stairway enclosure to the assembly station and from the assembly station to the embarkation deck, noting that evacuation of persons from assembly stations to embarkation positions will be carried out in small controlled groups.

2.4.2 Routes from the assembly station to the survival craft embarkation position

Where the passengers and crew are held at an assembly station which is not at the survival craft embarkation position, the dimension of stairway width and doors from the assembly station to this position shall be based on the number of persons in the controlled group. The width of these stairways and doors need not exceed 1,500 mm unless larger dimensions are required for evacuation of these spaces under normal conditions.

2.5 Means of escape plans

2.5.1 Means of escape plans shall be provided indicating the following:

.1 the number of the crew and passengers in all normally occupied spaces;

.2 the number of crew and passengers expected to escape by stairway and through doorways, corridors and landings;

.3 assembly stations and survival craft embarkation positions;

.4 primary and secondary means of escape; and

.5 width of stairways, doors, corridors and landing areas.

2.5.2 Means of escape plans shall be accompanied by detailed calculation for determining the width of escape stairways, doors, corridors and landing areas.

3 Cargo ships

Stairways and corridors used as means of escape shall be not less than 700 mm in clear width and shall have a handrail on one side. Stairways and corridors with a clear width of 1,800 mm and over shall have handrails on both sides. "Clear width" is considered the distance between the handrail and the bulkhead on the other side or between the handrails. The angle of inclination of stairways should be, in general, 45º, but not greater than 50º, and in machinery spaces and small spaces not more than 60º. Doorways which give access to a stairway shall be of the same size as the stairway.

CHAPTER 14 - FIXED DECK FOAM SYSTEMS

1 Application

This chapter details the specifications for fixed deck foam systems which are required to be provided by chapter II-2 of the Convention.

2 Engineering specifications

2.1 General

2.1.1 The arrangements for providing foam shall be capable of delivering foam to the entire cargo tanks deck area as well as into any cargo tank the deck of which has been ruptured.

2.1.2 The deck foam system shall be capable of simple and rapid operation.

2.1.3 Operation of a deck foam system at its required output shall permit the simultaneous use of the minimum required number of jets of water at the required pressure from the fire main.

2.2 Component requirements

2.2.1 Foam solution and foam concentrate

2.2.1.1 The rate of supply of foam solution shall be not less than the greatest of the following:

.1 0.6 *l*/min per square metre of cargo tanks deck area, where cargo tanks deck area means the maximum breadth of the ship multiplied by the total longitudinal extent of the cargo tank spaces;

.2 6 *l*/min per square metre of the horizontal sectional area of the single tank having the largest such area; or

.3 3 *l*/min per square metre of the area protected by the largest monitor, such area being entirely forward of the monitor, but not less than 1,250 *l*/min.

2.2.1.2 Sufficient foam concentrate shall be supplied to ensure at least 20 min of foam generation in tankers fitted with an inert gas installation or 30 min of foam generation in tankers not fitted with an inert gas installation when using solution rates stipulated in paragraph 2.2.1.1, as appropriate, whichever is the greatest. The foam expansion ratio (i.e., the ratio of the volume of foam produced to the volume of the mixture of water and foam-making concentrate supplied) shall not generally exceed 12 to 1. Where systems essentially produce low expansion foam, but an expansion ratio slightly in excess of 12 to 1, the quantity of foam solution available shall be

calculated as for 12 to 1 expansion ratio systems. When medium expansion ratio foam (between 50 to 1 and 150 to 1 expansion ratio) is employed, the application rate of the foam and the capacity of a monitor installation shall be to the satisfaction of the Administration.

2.2.2 Monitors and foam applicators

2.2.2.1 Foam from the fixed foam system shall be supplied by means of monitors and foam applicators. At least 50% of the foam solution supply rate required in paragraphs 2.2.1.1.1 and 2.2.1.1.2 shall be delivered from each monitor. On tankers of less than 4,000 tonnes deadweight the Administration may not require installation of monitors but only applicators. However, in such a case the capacity of each applicator shall be at least 25% of the foam solution supply rate required in paragraphs 2.2.1.1.1 or 2.2.1.1.2.

2.2.2.2 The capacity of any monitor shall be at least 3 *l*/min of foam solution per square metre of deck area protected by that monitor, such area being entirely forward of the monitor. Such capacity shall be not less than 1,250 *l*/min.

2.2.2.3 The capacity of any applicator shall be not less than 400 *l*/min and the applicator throw in still air conditions shall be not less than 15 m.

2.3 Installation requirements

2.3.1 Main control station

The main control station for the system shall be suitably located outside the cargo area, adjacent to the accommodation spaces and readily accessible and operable in the event of fire in the areas protected.

2.3.2 Monitors

2.3.2.1 The number and position of monitors shall be such as to comply with paragraph 2.1.1.

2.3.2.2 The distance from the monitor to the farthest extremity of the protected area forward of that monitor shall not be more than 75% of the monitor throw in still air conditions.

2.3.2.3 A monitor and hose connection for a foam applicator shall be situated both port and starboard at the front of the poop or accommodation spaces facing the cargo tanks deck. On tankers of less than 4,000 tonnes deadweight, a hose connection for a foam applicator shall be situated both port and starboard at the front of the poop or accommodation spaces facing the cargo tanks deck.

2.3.3 Applicators

2.3.3.1 The number of foam applicators provided shall be not less than four. The number and disposition of foam main outlets shall be such that foam from at least two applicators can be directed on to any part of the cargo tanks deck area.

2.3.3.2 Applicators shall be provided to ensure flexibility of action during fire-fighting operations and to cover areas screened from the monitors.

2.3.4 Isolation valves

Valves shall be provided in the foam main, and in the fire main when this is an integral part of the deck foam system, immediately forward of any monitor position to isolate damaged sections of those mains.

CHAPTER 15 - INERT GAS SYSTEMS

1 Application

This chapter details the specifications for inert gas systems as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 General

2.1.1 Throughout this chapter the term cargo tank includes also slop tanks.

2.1.2 The inert gas system referred to in chapter II-2 of the Convention shall be designed, constructed and tested to the satisfaction of the Administration. It shall be so designed and operated as to render and maintain the atmosphere of the cargo tanks non-flammable at all times, except when such tanks are required to be gas-free. In the event that the inert gas system is unable to meet the operational requirement set out above and it has been assessed that it is impracticable to effect a repair, then cargo discharge, deballasting and necessary tank cleaning shall only be resumed when the "emergency conditions" specified in the Guidelines on inert gas systems are complied with.

2.1.3 Required functions

The system shall be capable of:

.1 inerting empty cargo tanks by reducing the oxygen content of the atmosphere in each tank to a level at which combustion cannot be supported;

.2 maintaining the atmosphere in any part of any cargo tank with an oxygen content not exceeding 8% by volume and at a positive pressure at all times in port and at sea except when it is necessary for such a tank to be gas-free;

.3 eliminating the need for air to enter a tank during normal operations except when it is necessary for such a tank to be gas-free; and

.4 purging empty cargo tanks of a hydrocarbon gas, so that subsequent gas-freeing operations will at no time create a flammable atmosphere within the tank.

2.2 Component requirements

2.2.1 Supply of inert gas

2.2.1.1 The inert gas supply may be treated flue gas from main or auxiliary boilers. The Administration may accept systems using flue gases from one or more separate gas generators or other sources or any combination thereof, provided that an equivalent standard of safety is achieved. Such systems shall, as far as practicable, comply with the requirements of this chapter. Systems using stored carbon dioxide shall not be permitted unless the Administration is satisfied that the risk of ignition from generation of static electricity by the system itself is minimized.

2.2.1.2 The system shall be capable of delivering inert gas to the cargo tanks at a rate of at least 125% of the maximum rate of discharge capacity of the ship expressed as a volume.

2.2.1.3 The system shall be capable of delivering inert gas with an oxygen content of not more than 5 % by volume in the inert gas supply main to the cargo tanks at any required rate of flow.

2.2.1.4 Two fuel oil pumps shall be fitted to the inert gas generator. The Administration may permit only one fuel oil pump on condition that sufficient spares for the fuel oil pump and its prime mover are carried on board to enable any failure of the fuel oil pump and its prime mover to be rectified by the ship's crew.

2.2.2 Scrubbers

2.2.2.1 A flue gas scrubber shall be fitted which will effectively cool the volume of gas specified in paragraphs 2.2.1.2 and 2.2.1.3 and remove solids and sulphur combustion products. The cooling water arrangements shall be such that an adequate supply of water will always be available without interfering with any essential services on the ship. Provision shall also be made for an alternative supply of cooling water.

2.2.2.2 Filters or equivalent devices shall be fitted to minimize the amount of water carried over to the inert gas blowers.

2.2.2.3 The scrubber shall be located aft of all cargo tanks, cargo pump-rooms and cofferdams separating these spaces from machinery spaces of category A.

2.2.3 Blowers

2.2.3.1 At least two blowers shall be fitted and be capable of delivering to the cargo tanks at least the volume of gas required by paragraphs 2.2.1.2 and 2.2.1.3. For systems with gas generators the Administration may permit only one blower if that system is capable of delivering the total volume of gas required by paragraphs 2.2.1.2 and 2.2.1.3 to the protected cargo tanks, provided that sufficient spares for the blower and its prime mover are carried on board to enable any failure of the blower and its prime mover to be rectified by the ship's crew.

2.2.3.2 The inert gas system shall be so designed that the maximum pressure which it can exert on any cargo tank will not exceed the test pressure of any cargo tank. Suitable shutoff arrangements shall be provided on the suction and discharge connections of each blower. Arrangements shall be provided to enable the functioning of the inert gas plant to be stabilized before commencing cargo discharge. If the blowers are to be used for gas-freeing, their air inlets shall be provided with blanking arrangements.

2.2.3.3 The blowers shall be located aft of all cargo tanks, cargo pump-rooms and cofferdams separating these spaces from machinery spaces of category A.

2.2.4 Water seals

2.2.4.1 The water seal referred to in paragraph 2.3.1.4.1 shall be capable of being supplied by two separate pumps, each of which shall be capable of maintaining an adequate supply at all times.

2.2.4.2 The arrangement of the seal and its associated fittings shall be such that it will prevent backflow of hydrocarbon vapours and will ensure the proper functioning of the seal under operating conditions.

2.2.4.3 Provision shall be made to ensure that the water seal is protected against freezing, in such a way that the integrity of seal is not impaired by overheating.

2.2.4.4 A water loop or other approved arrangement shall also be fitted to each associated water supply and drain pipe and each venting or pressure-sensing pipe leading to gas-safe spaces. Means shall be provided to prevent such loops from being emptied by vacuum.

2.2.4.5 The deck water seal and loop arrangements shall be capable of preventing return of hydrocarbon vapours at a pressure equal to the test pressure of the cargo tanks.

2.2.4.6 In respect of paragraph 2.4.3.1.7, the Administration shall be satisfied as to the maintenance of an adequate reserve of water at all times and the integrity of the arrangements to permit the automatic formation of the water seal when the gas flow ceases. The audible and visual alarm on the low level of water in the water seal shall operate when the inert gas is not being supplied.

2.3 Installation requirements

2.3.1 Safety measures in the system

2.3.1.1 Flue gas isolating valves

Flue gas isolating valves shall be fitted in the inert gas supply mains between the boiler uptakes and the flue gas scrubber. These valves shall be provided with indicators to show whether they are open or shut, and precautions shall be taken to maintain them gas-tight and keep the seatings clear of soot. Arrangements shall be made to ensure that boiler soot blowers cannot be operated when the corresponding flue gas valve is open.

2.3.1.2 Prevention of flue gas leakage

2.3.1.2.1 Special consideration shall be given to the design and location of scrubber and blowers with relevant piping and fittings in order to prevent flue gas leakages into enclosed spaces.

2.3.1.2.2 To permit safe maintenance, an additional water seal or other effective means of preventing flue gas leakage shall be fitted between the flue gas isolating valves and scrubber or incorporated in the gas entry to the scrubber.

2.3.1.3 Gas regulating valves

2.3.1.3.1 A gas regulating valve shall be fitted in the inert gas supply main. This valve shall be automatically controlled to close as required in paragraph 2.3.1.5**.** It shall also be capable of automatically regulating the flow of inert gas to the cargo tanks unless means are provided to automatically control the speed of the inert gas blowers required in paragraph 2.2.3.

2.3.1.3.2 The valve referred to in paragraph 2.3.1.3.1 shall be located at the forward bulkhead of the forward most gas-safe space through which the inert gas supply main passes.

2.3.1.4 Non-return devices of flue gas

2.3.1.4.1 At least two non-return devices, one of which shall be a water seal, shall be fitted in the inert gas supply main, in order to prevent the return of hydrocarbon vapour to the machinery space uptakes or to any gas-safe spaces under all normal conditions of trim, list and motion of the ship. They shall be located between the automatic valve required by paragraph 2.3.1.3.1 and the aftermost connection to any cargo tank or cargo pipeline.

2.3.1.4.2 The devices referred to in paragraph 2.3.1.4.1 shall be located in the cargo area on deck.

2.3.1.4.3 The second device shall be a non-return valve or equivalent capable of preventing the return of vapours or liquids and fitted forward of the deck water seal required in paragraph 2.3.1.4.1. It shall be provided with positive means of closure. As an alternative to positive means of closure, an additional valve having such means of closure may be provided forward of the non-return valve to isolate the deck water seal from the inert gas main to the cargo tanks.

2.3.1.4.4 As an additional safeguard against the possible leakage of hydrocarbon liquids or vapours back from the deck main, means shall be provided to permit this section of the line between the valve having positive means of closure referred to in paragraph 2.3.1.4.3 and the valve referred to in paragraph 2.3.1.3 to be vented in a safe manner when the first of these valves is closed.

2.3.1.5 Automatic shutdown

2.3.1.5.1 Automatic shutdown of the inert gas blowers and gas regulating valve shall be arranged on predetermined limits being reached in respect of paragraphs 2.4.3.1.1, 2.4.3.1.2 and 2.4.3.1.3**.**

2.3.1.5.2 Automatic shutdown of the gas regulating valve shall be arranged in respect of paragraph 2.4.3.1.4.

2.3.1.6 Oxygen rich gas

In respect of paragraph 2.4.3.1.5, when the oxygen content of the inert gas exceeds 8% by volume, immediate action shall be taken to improve the gas quality. Unless the quality of the gas improves, all cargo tank operations shall be suspended so as to avoid air being drawn into the tanks and the isolation valve referred to in paragraph 2.3.1.4.3 shall be closed.

2.3.2 Inert gas lines

2.3.2.1 The inert gas main may be divided into two or more branches forward of the non-return devices required by paragraphs 2.2.4 and 2.3.1.4.

2.3.2.2 The inert gas supply main shall be fitted with branch piping leading to each cargo tank. Branch piping for inert gas shall be fitted with either stop valves or equivalent means of control for isolating each tank. Where stop valves are fitted, they shall be provided with locking arrangements, which shall be under the control of a responsible ship's officer. The control system shall provide unambiguous information of the operational status of such valves.

2.3.2.3 In combination carriers, the arrangement to isolate the slop tanks containing oil or oil residues from other tanks shall consist of blank flanges which will remain in position at all times

when cargoes other than oil are being carried except as provided for in the relevant section of the Guidelines on inert gas systems.

2.3.2.4 Means shall be provided to protect cargo tanks against the effect of overpressure or vacuum caused by thermal variations when the cargo tanks are isolated from the inert gas mains.

2.3.2.5 Piping systems shall be so designed as to prevent the accumulation of cargo or water in the pipelines under all normal conditions.

2.3.2.6 Arrangements shall be provided to enable the inert gas main to be connected to an external supply of inert gas. The arrangements shall consist of a 250 mm nominal pipe size bolted flange, isolated from the inert gas main by a valve and located forward of the non-return valve referred to in paragraph 2.3.1.4.3. The design of the flange should conform to the appropriate class in the standards adopted for the design of other external connections in the ship's cargo piping system.

2.3.2.7 If a connection is fitted between the inert gas supply main and the cargo piping system, arrangements shall be made to ensure an effective isolation having regard to the large pressure difference which may exist between the systems. This shall consist of two shutoff valves with an arrangement to vent the space between the valves in a safe manner or an arrangement consisting of a spool-piece with associated blanks.

2.3.2.8 The valve separating the inert gas supply main from the cargo main and which is on the cargo main side shall be a non-return valve with a positive means of closure.

2.4 Operation and control requirements

2.4.1 Indication devices

Means shall be provided for continuously indicating the temperature and pressure of the inert gas at the discharge side of the gas blowers, whenever the gas blowers are operating.

2.4.2 Indicating and recording devices

2.4.2.1 Instrumentation shall be fitted for continuously indicating and permanently recording, when inert gas is being supplied:

.1 the pressure of the inert gas supply mains forward of the non-return devices required by paragraph 2.3.1.4.1; and

.2 the oxygen content of the inert gas in the inert gas supply mains on the discharge side of the gas blowers.

2.4.2.2 The devices referred to in paragraph 2.4.2.1 shall be placed in the cargo control room where provided. But where no cargo control room is provided, they shall be placed in a position easily accessible to the officer in charge of cargo operations.

2.4.2.3 In addition, meters shall be fitted:

.1 in the navigation bridge to indicate at all times the pressure referred to in paragraph 2.4.2.1.1 and the pressure in the slop tanks of combination carriers, whenever those tanks are isolated from the inert gas supply main; and

.2 in the machinery control room or in the machinery space to indicate the oxygen content referred to in paragraph 2.4.2.1.2.

2.4.2.4 Portable instruments for measuring oxygen and flammable vapour concentration shall be provided. In addition, suitable arrangement shall be made on each cargo tank such that the condition of the tank atmosphere can be determined using these portable instruments.

2.4.2.5 Suitable means shall be provided for the zero and span calibration of both fixed and portable gas concentration measurement instruments, referred to in paragraphs 2.4.2.1 to 2.4.2.4.

2.4.3 Audible and visual alarms

2.4.3.1 For inert gas systems of both the flue gas type and the inert gas generator type, audible and visual alarms shall be provided to indicate:

.1 low water pressure or low water flow rate to the flue gas scrubber as referred to in paragraph 2.2.2.1;

.2 high water level in the flue gas scrubber as referred to in paragraph 2.2.2.1;

.3 high gas temperature as referred to in paragraph 2.4.1;

.4 failure of the inert gas blowers referred to in paragraph 2.2.3;

.5 oxygen content in excess of 8% by volume as referred to in paragraph 2.4.2.1.2**;**

.6 failure of the power supply to the automatic control system for the gas regulating valve and to the indicating devices as referred to in paragraphs 2.3.1.3 and 2.4.2.1;

.7 low water level in the water seal as referred to in paragraph 2.3.1.4.1;

.8 gas pressure less than 100 mm water gauge as referred to in paragraph 2.4.2.1.1. The alarm arrangement shall be such as to ensure that the pressure in slop tanks in combination carriers can be monitored at all times; and

.9 high gas pressure as referred to in paragraph 2.4.2.1.1.

2.4.3.2 For inert gas systems of the inert gas generator type, additional audible and visual alarms shall be provided to indicate:

.1 insufficient fuel oil supply;

.2 failure of the power supply to the generator; and

.3 failure of the power supply to the automatic control system for the generator.

2.4.3.3 The alarms required in paragraphs 2.4.3.1.5, 2.4.3.1.6 and 2.4.3.1.8 shall be fitted in the machinery space and cargo control room, where provided, but in each case in such a position that they are immediately received by responsible members of the crew.

2.4.3.4 An audible alarm system independent of that required in paragraph 2.4.3.1.8 or automatic shutdown of cargo pumps shall be provided to operate on predetermined limits of low pressure in the inert gas main being reached.

2.4.4 Instruction manuals

Detailed instruction manuals shall be provided on board, covering the operations, safety and maintenance requirements and occupational health hazards relevant to the inert gas system and its application to the cargo tank system. The manuals shall include guidance on procedures to be followed in the event of a fault or failure of the inert gas system.

ภาคผนวก ๓

ประมวลข้อบังคับระหว่างประเทศว่าด้วยขั้นตอนการทดสอบการป้องกันเพลิงของวัสดุและอุปกรณ์
(Resolution MSC.61(67) International Code for Application of Fire Test Procedures)

RESOLUTION MSC.61(67)
(adopted on 5 December 1996)

ADOPTION OF THE INTERNATIONAL CODE FOR APPLICATION OF FIRE TEST PROCEDURES

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECOGNIZING the need to provide a mandatory application of fire test procedures required by chapter II-2 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended,

NOTING resolution MSC.57(67) by which it adopted, *inter alia,* amendments to chapter II-2 of the SOLAS Convention to make the provisions of the International Code for Application of Fire Test Procedures (FTP Code) mandatory under that Convention on or after 1 July 1998,

HAVING CONSIDERED, at its sixty-seventh session, the text of the proposed FTP Code,

1. ADOPTS the International Code for Application of Fire Test Procedures (FTP Code) the text of which is set out in the Annex to the present resolution;

2. NOTES that under the amendments to chapter II-2 of the SOLAS Convention, amendments to the FTP Code should be adopted, brought into force and shall take effect in accordance with the provisions of article VIII of that Convention concerning the amendments procedures applicable to the annex to the Convention other than chapter I;

3. REQUESTS the Secretary-General to transmit certified copies of the present resolution and the text of the FTP Code contained in the Annex to all Contracting Governments to the Convention;

4. FURTHER REQUESTS the Secretary-General to transmit copies of this resolution and the Annex to all Members of the Organization which are not Contracting Governments to the Convention.

ANNEX

INTERNATIONAL CODE FOR APPLICATION OF FIRE TEST PROCEDURES

Contents

INTERNATIONAL CODE FOR APPLICATION OF FIRE TEST PROCEDURES

1 SCOPE

1.1 This Code is intended for use by the Administration and the competent authority of the flag State when approving products for installation in ships flying the flag of the flag State in accordance with the fire safety requirements of the International Convention for the Safety of Life at Sea, 1974, as amended.

1.2 This Code shall be used by the testing laboratories when testing and evaluating products under this Code.

2 APPLICATION

2.1 This Code is applicable for the products which are required to be tested, evaluated and approved in accordance with the Fire Test Procedures Code as referenced in the Convention.

2.2 Where reference to the Code is indicated in the Convention by the terminology "... in accordance with the Fire Test Procedures Code" the subject product shall be tested in accordance with the applicable fire test procedure or procedures as referred to in paragraph 4.1.

2.3 Where reference is only made to a product's fire performance in the Convention using such terminology as "... and their exposed surfaces shall have low flame spread characteristics", the subject product shall be tested in accordance with the applicable fire test procedure or procedures as referred to in paragraph 4.1.

3 DEFINITIONS

3.1 "Fire Test Procedures Code" means the International Code for Application of Fire Test Procedures as defined in chapter II-2 of the Convention, as amended.

3.2 "Test expiry date" means the last date on which the given test procedure may be used to test and subsequently approve any product under the Convention.

3.3 "Approval expiry date" means the last date on which the subsequent approval is valid as proof of meeting the fire safety requirements of the Convention.

3.4 "Administration" means the Government of the State whose flag the ship is entitled to fly.

3.5 "Competent authority" means an organization authorized by the Administration to perform functions required by this Code.

3.6 "Laboratory recognized by the Administration" means a testing laboratory which is acceptable to the Administration concerned. Other testing laboratories may be recognized on a case-by-case basis for specific approvals as agreed upon by the Administration concerned.

3.7 "Convention" means the International Convention for the Safety of Life at Sea, 1974, as amended.

3.8 "Standard fire test" means a test in which specimens are exposed in a test furnace to temperatures corresponding approximately to the standard time-temperature curve.

3.9 "Standard time-temperature curve" means the time-temperature curve defined by the formula:

$$T = 345 \log_{10}(8t + 1) + 20$$

where:

T is the average furnace temperature (°C)
t is the time (minutes).

4 TESTING

4.1 Fire test procedures

4.1.1 Annex 1 of this Code presents the required test procedures which shall be used in testing products as a basis for approval (including renewal of approval), except as provided in section 8.

4.1.2 The test procedures identify the test methods and the acceptance and classification criteria.

4.2 Testing laboratories

4.2.1 The tests shall be carried out in testing laboratories recognized by the Administrations concerned.

4.2.2 When recognizing a laboratory, the Administration shall consider the following criteria:

.1 that the laboratory is engaged, as a regular part of its business, in performing inspections and tests that are the same as, or similar to, the tests as described in the applicable part;

.2 that the laboratory has access to the apparatus, facilities, personnel, and calibrated instruments necessary to perform these tests and inspections; and

.3 that the laboratory is not owned or controlled by a manufacturer, vendor or supplier of the product being tested.

4.2.3 The testing laboratory shall use a quality control system audited by the competent authority.

4.3 Test reports

4.3.1 The test procedures state the required contents of the test reports.

4.3.2 In general, a test report is the property of the sponsor of the test.

5 APPROVAL

5.1 General

5.1.1 The Administration shall approve products in accordance with their established approval procedures by using the type approval procedure (see paragraph 5.2) or the case-by-case approval (see paragraph 5.3).

5.1.2 The Administration may authorize competent authorities to issue approvals on their behalf.

5.1.3 An applicant who seeks approval shall have the legal right to use the test reports on which the application is based (see paragraph 4.3.2).

5.1.4 The Administration may require that the approved products are provided with special approval markings.

5.1.5 The approval shall be valid when the product is installed on board a ship. If a product is approved when manufactured, but the approval expires before the product is installed on the ship, the product may be installed as approved material, provided that the criteria have not changed since the expiry date of the approval certificate.

5.1.6 The application for approval shall be sought from the Administration or competent authority. The application shall contain at least the following:

.1 the name and address of the applicant and of the manufacturer;

.2 the name or trade name of the product;

.3 the specific qualities for which approval is sought;

.4 drawings or descriptions of the assembly and materials of the product as well as instructions, where applicable, for its installation and use; and

.5 a report on the fire test(s).

5.1.7 Any significant alteration to a product shall make the relevant approval to cease to be valid. To obtain a new approval, the product shall be retested.

5.2 Type approval

5.2.1 The type approval certificates shall be issued and renewed on basis of the test reports of the applicable fire tests (see section 4).

5.2.2 The Administration shall require that the manufacturers have a quality control system audited by a competent authority to ensure continuous compliance with the type approval conditions. Alternatively, the Administration may use final product verification procedures where the compliance with the type approval certificate is verified by a competent authority before the product is installed on board ships.

5.2.3 The type approval certificates shall be valid no more than 5 years from the date of issue.

5.2.4 Type approval certificates shall include at least the following:

.1 identification (name or trade name and description) of the product;

.2 classification and any restrictions in the use of the product;

.3 name and address of the manufacturer and applicant;

.4 test method(s) used in test(s);

.5 identification of the test report(s) and applicable statements (including date of issue, possible file number and the name and address of the testing laboratory);

.6 date of issue and possible number of the type approval certificate;

.7 expiration date of the certificate; and

.8 name of the issuing body (competent authority) and, if applicable, authorization.

5.2.5 In general, the type approved products may be installed for their intended use on board ships flying the flag of the approving Administration.

5.3 Case-by-case approval

5.3.1 The case-by-case approval means approval where a product is approved for installation on board a specific ship without using a type approval certificate.

5.3.2 The Administration may approve products using the applicable test procedures for specific ship applications without issuing a type approval certificate. The case-by-case approval is only valid for the specific ship.

6 PRODUCTS WHICH MAY BE INSTALLED WITHOUT TESTING AND/OR APPROVAL

Annex 2 of this Code specifies the groups of products, which (if any) are considered to comply with the specific fire safety regulations of the Convention and which may be installed without testing and/or approval.

7 USE OF EQUIVALENTS AND MODERN TECHNOLOGY

7.1 To allow modern technology and development of products, the Administration may approve products to be installed on board ships based on tests and verifications not specifically mentioned in this Code but considered by the Administration to be equivalent with the applicable fire safety requirements of the Convention.

7.2 The Administration shall inform the Organization of approvals referenced to in paragraph 7.1 in accordance with regulation I/5 of the Convention and follow the documentation procedures as outlined below:

.1 in the case of new and unconventional products, a written analysis as to why the existing test method(s) cannot be used to test this specific product;

.2 a written analysis showing how the proposed alternative test procedure will prove performance as required by the Convention; and

.3 a written analysis comparing the proposed alternative test procedure to the required procedure in the Code.

8 PERIOD OF GRACE FOR OTHER TEST PROCEDURES

8.1 The newest test procedures adopted by the Organization are considered being the most suitable for demonstrating that the products concerned comply with the applicable fire safety requirements of the Convention.

8.2 Notwithstanding what is said elsewhere in this Code, the Administration may use established test procedures and acceptance criteria, other than those in annex 1 to this Code, when approving products to comply with the fire safety requirements of the Convention to allow a practicable period of grace for the testing laboratories to obtain testing equipment, for the industry to re-test their products and for the Administrations to provide the necessary new certification. For such other test procedures and acceptance criteria the test expiry dates and the approval expiry dates are given in annex 3 to this Code.

9 LIST OF REFERENCES

The following IMO Assembly resolutions and ISO standards are referred to in parts 1 to 9 of annex 1 to the Code:

.1 resolution A.471(XII) - "Recommendation on test method for determining the resistance to flame of vertically supported textiles and films";

.2 resolution A.563(14) - "Amendments to the Recommendation on test method for determining the resistance to flame of vertically supported textiles and films (resolution A.471(XII))";

.3 resolution A.652(16) - "Recommendation on fire test procedures for upholstered furniture";

.4 resolution A.653(16) - "Recommendation on improved fire test procedures for surface flammability of bulkhead, ceiling and deck finish materials";

.5 resolution A.687(17) - "Fire test procedures for ignitability of primary deck coverings";

.6 resolution A.688(17) - "Fire test procedures for ignitability of bedding components";

.7 resolution A.753(18) - "Guidelines for the application of plastic pipes on ships";

.8 resolution A.754(18) - "Recommendation on fire resistance tests for "A", "B" and "F" class divisions";

.9 ISO 1182:1990 - "Fire test - Building materials - Non-combustibility test";

.10 ISO 1716:1973 - "Building materials - Determination of calorific potential"; and

.11 ISO 5659:1994 - "Plastics - Smoke generation, Part 2 Determination of optical density by a single chamber test".

ANNEX 1

FIRE TEST PROCEDURES

Preamble

1 This annex contains the fire test procedures which shall be used for verifying that the products comply with the applicable requirements. For other test procedures provisions in paragraph 8.2 of, and annex 3 to, the Code shall apply.

2 Reference to the test procedures of this annex shall be made (e.g., in the test report and in the type approval certificate) by referring to the applicable part number or numbers as follows:

Example: Where a primary deck covering has been tested in accordance with parts 2 and 6 of annex 1, the reference shall be "IMO FTPC Parts 2 and 6".

3 Some products or their components are required to be tested in accordance with more than one test procedure. For this purpose, references to other parts are given in some parts of this annex. Such references are here for information only, and the applicable guidance shall be sought in the relevant requirements of the Convention.

4 For products which may be installed without testing and/or approval, annex 2 to the Code is referred.

PART 1 - NON-COMBUSTIBILITY TEST

1 Application

1.1 Where a material is required to be non-combustible, it shall be determined in accordance with this part.

1.2 If a material passes the test as specified in section 2, it shall be considered as "non-combustible" even if it consists of a mixture of inorganic and organic substances.

2 Fire test procedure

2.1 The non-combustibility shall be verified in accordance with the test procedure in the standard ISO 1182:1990 except that instead of Annex A "Criteria for evaluation" of this standard all the following criteria shall be satisfied:

.1 the average furnace thermocouple temperature rise as calculated in 8.1.2 of ISO 1182 does not exceed 30°C;

.2 the average surface thermocouple temperature rise as calculated in 8.1.2 of ISO 1182 does not exceed 30°C;

.3 the mean duration of sustained flaming as calculated in 8.2.2 of ISO 1182 does not exceed 10 s; and

.4 the average mass loss as calculated in 8.3 of ISO 1182 does not exceed 50%.

2.2 The test report shall include the following information:

.1 name of testing body;

.2 name of manufacturer of the material;

.3 date of supply of the materials and of tests;

.4 name or identification of the material;

.5 description of the material;

.6 density of the material;

.7 description of the specimens;

.8 test method;

.9 test results including all observations;

.10 designation of the material according to the test criteria specified in paragraph 2.1 above.

PART 2 - SMOKE AND TOXICITY TEST

1 Application

Where a material is required not to be capable of producing excessive quantities of smoke and toxic products or not to give rise to toxic hazards at elevated temperatures, the material shall comply with this part.

2 Fire test procedure

2.1 General

Smoke generation tests shall be conducted in accordance with standard ISO 5659:1994, Part 2 and additional test procedures as described in this part of the Code. To carry out the tests in accordance with this standard, modifications of the arrangements and procedures to the ISO standard shall be made, if necessary.

2.2 Test specimen

Preparation of test specimen shall be in accordance with the practice outlined in resolutions A.653(16), A.687(17) and A.753(18). In the case of cables, only specimens of those with maximum insulation thickness need be tested.

2.3 Test conditions

Irradiance to the specimen during the test shall be kept constant. Three specimens shall be tested under each of the following conditions:

.1 irradiance of 25 kW/m^2 in the presence of pilot flame;

.2 irradiance of 25 kW/m^2 in the absence of pilot flame; and

.3 irradiance of 50 kW/m^2 in the absence of pilot flame.

2.4 Duration of tests

The test shall be carried out for at least 10 min. If the minimum light transmittance value has not been reached during the 10-minute exposure, the test shall be continued for a further 10-minute period.

2.5 **Test results**

2.5.1 Specific optical density of smoke (Ds) as defined below shall be recorded during the test period at least every 5 s:

$$Ds = (V/(A*L))*\log_{10}(I_o/I)$$

where:

V = total volume of the chamber (m^3)
A = exposed area of the specimen (m^2)
L = optical length (m) of smoke measurement
I_0 = light intensity before the test
I = light intensity during the test (after absorbtion by the smoke).

2.5.2 When making toxicity measurements, the sampling of fumes shall be made during the testing of the second or the third specimen at each test condition, from the geometrical centre of the chamber within 3 min of the time when the maximum specific optical density of smoke is reached. The concentration of each toxic gas shall be determined as ppm in the chamber volume.

2.6 **Classification criteria**

2.6.1 Smoke

An average (Dm) of the maximum of Ds of three tests at each test condition shall be calculated.

.1 for materials used as surface of bulkheads, linings or ceilings, the Dm shall not exceed 200 in any test condition;

.2 for materials used as primary deck covering, the Dm shall not exceed 400 in any test condition;

.3 for materials used as floor covering, the Dm shall not exceed 500 in any test condition; and

.4 for plastic pipes and electric cables, the Dm shall not exceed 400 in any test condition.

2.6.2 Toxicity

The gas concentration measured at each test condition shall not exceed the following limits:

CO	1450 ppm	HBr	600 ppm
HCl	600 ppm	HCN	140 ppm
HF	600 ppm	SO_2	120 ppm
NO_x	350 ppm		

2.7 **Test report**

A test report shall contain the following information:

.1 type of the material, i.e. surface finish, floor covering, primary deck covering, pipes, etc;

.2 trade name of the material;

.3 description of the material;

.4 construction of the specimen;

.5 name and address of the manufacturer of the material;

.6 Dm at each heating and ignition condition;

.7 concentrations of toxic gases in ppm, if applicable;

.8 judgement according to paragraph 2.6;

.9 name and address of the testing laboratory; and

.10 date of testing

3 Additional requirements

3.1 Part 5 of this annex is also applicable to paints, floor coverings, varnishes and other finishes used on exposed interior surfaces.

3.2 Part 6 of this annex is also applicable to the primary deck coverings.

PART 3 - TEST FOR "A", "B" AND "F" CLASS DIVISIONS

1 Application

Where products (such as decks, bulkheads, doors, ceilings, linings, windows, fire dampers, pipe penetrations and cable transits) are required to be "A" or "B" or "F" class divisions, they shall comply with this part.

2 Fire test procedure

2.1 The products shall be tested and evaluated in accordance with the fire test procedure specified in resolution A.754(18). This contains test procedures also for windows, fire dampers and pipe and duct penetrations in its appendices.

2.2 Specimen sizes

2.2.1 For the purpose of this Code, the first sentence of paragraphs 2.1.1, 2.4.1 and 2.7.1 of the annex to resolution A.754(18) is replaced by the following:

> "The minimum overall dimensions of test specimen, including the perimeter details at the top, bottom and vertical edges, are 2,440 mm width and 2,500 mm height, except that the minimum overall dimensions of 2,440 mm in height and 4.65 m^2 in the exposed surface of the test specimen may be used in testing up to 31 December 1998. The approval expiry date is 31 December 2003 for approvals based on tests with such smaller test specimen."

2.2.2 For the purpose of this Code, the first sentence of paragraphs 2.2.1, 2.5.1 and 2.8.1 of the annex to resolution A.754(18) is replaced by the following:

> "The minimum overall dimensions of test specimen, including the perimeter details at all the edges, are 2,440 mm width and 3,040 mm length, except that the minimum overall dimensions of 2,440 mm in length and 4.65 m^2 in the exposed surface of the test specimen may be used in testing up to 31 December 1998. The approval expiry date is 31 December 2003 for approvals based on tests with such smaller test specimen."

2.2.3 The specimen sizes shall be given in the test reports

2.3 Where thermal radiation through windows is required to be limited, the window assembly may be tested and evaluated in accordance with appendix 1 of this part.

2.4 Where ceilings or linings are required to be continuous "B" class ceilings or linings they may be tested and evaluated in accordance with appendix 2 of this part.

3 Additional requirements

3.1 The integrity of class "B" constructions shall be achieved with non-combustible materials. Adhesives used in the construction of the specimen are not required to be non-combustible; however, for the purpose of this Code, they shall have low flame-spread characteristics.

3.2 Materials placed at "B" class panel joints for avoiding vibration or noise transmission shall be of low flame spread characteristics and fire tested with "B" class divisions along which they are used. However, such materials shall be non-combustible if they are necessary to support the non-combustible "B" class structure or to achieve the required integrity.

3.3 Doors and shutters, which are fitted above the bulkhead deck and which are required to meet both fire protection and watertight requirements, shall comply with the fire protection requirements as required in the Convention, for the divisions where they are installed. The watertight doors fitted below the bulkhead deck are not required to be insulated.

4 Other references

4.1 The non-combustibility of materials used in "A" and "B" class divisions shall be verified in accordance with part 1.

4.2 Where combustible veneers are allowed to be provided in "A" and "B" class divisions, the low flame spread characteristics of such veneers, if required, shall be verified in accordance with part 5.

APPENDIX 1

THERMAL RADIATION TEST SUPPLEMENT TO FIRE RESISTANCE TESTS FOR WINDOWS IN "A", "B" AND "F" CLASS DIVISIONS

1 Scope

1.1 This appendix specifies a procedure for measuring heat flux through windows as a basis for characterizing their ability to limit the heat radiation in order to prevent the spread of fire and to enable escape routes to pass near the windows.

1.2 This procedure is an optional requirement and may be requested by some Administrations for windows in specific areas of a ship.

2 Test procedure

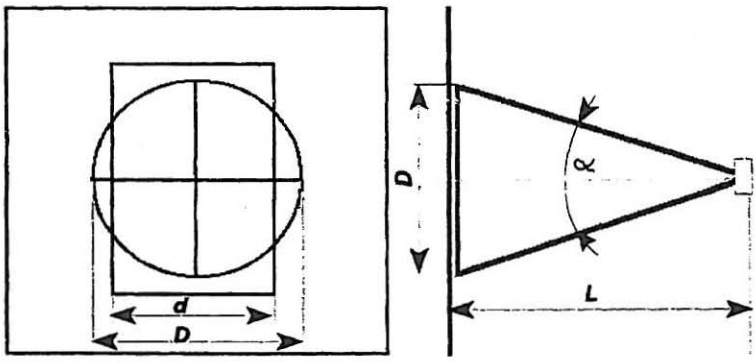
2.1 The window should be tested in accordance with resolution A.754(18) using the additional instrumentation as described below.

2.2 The term "window" includes windows, side scuttles and any other glazed opening provided for light transmission or vision purposes in a fire resistant division. The term "fire resistant division" includes bulkheads and doors.

3 Additional instrumentation

3.1 Additional instrumentation consists of a restricted-view total-heat fluxmeter calibrated with the restricted view to indicate incident heat flux. The fluxmeter should be water-cooled and capable of measuring heat flux 0 to 60 kW/m^2. The fluxmeter should be calibrated at least once a year against a standard device.

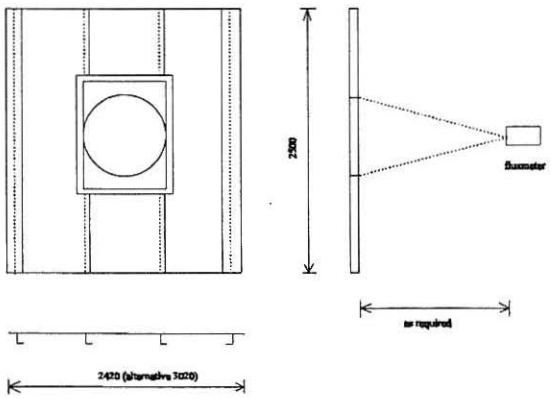
3.2 The fluxmeter should be placed perpendicular to the centre of the window being tested, and in a position such that the centre of the fluxmeter's view coincides with the centre of the window (see the figure). The fluxmeter should be located at a distance greater than 0.5 m from the window, such that the view of the fluxmeter just includes part of the frame. However, the fluxmeter should not be located more than 2.5 m from the window. The dimension of the boundary and window frame seen by the fluxmeter, which remains outside the window should not exceed 10% of the total width seen by the fluxmeter on the surface of the sample. It should be calculated on the basis of restricted view angle of the fluxmeter and its distance to the sample surface.



3.3 For windows whose greater dimension is less than 1.57 times the smaller dimension, only one fluxmeter is needed.

3.4 For oblong windows whose greater dimension is more than 1.57 times the smaller dimension, additional fluxmeters should be provided. The distance of the fluxmeters from the window should be adjusted such that the fluxmeters' view covers at least 50% of the window. However, the fluxmeters should not be located less than 0.5 m nor more than 2.5 m from the window.

Figure



4 Classification criteria

4.1 The peak heat flux (E_w) should be measured for the first 15 min of the test, for the first 30 min of the test, and for the entire duration of the test (i.e. 60 min for class "A" and 30 min for class "B" boundaries).

4.2 The peak heat fluxes (E_w) measured in accordance with paragraph 4.1 should be compared against the reference value (E_c) from the table.

4.3 If (E_w) is less than (E_c), the window is acceptable for installation in a boundary of the corresponding fire resistant classification.

Table 1 - Criteria for heat flux

Fire resistant division classification	Time period from beginning of test to	Heat flux E_c (kW/m^2)
A-0	60 minutes	56.5
A-15	15 minutes 60 minutes	2.34 8.0
A-30	30 minutes 60 minutes	2.34 6.4
A-60	60 minutes	2.34
B-0	30 minutes	36.9
B-15	15 minutes 30 minutes	2.34 4.3

APPENDIX 2

CONTINUOUS "B" CLASS DIVISIONS

1 Scope

1.1 This appendix specifies the procedure for testing linings and ceilings for verifying that they are "continuous 'B' class linings" and "continuous 'B' class ceilings" and for evaluating full constructions to be "continuous 'B' class constructions".

1.2 This procedure is an optional requirement and may be requested by some Administrations for continuous "B" class divisions.

2 Test procedure and evaluation

2.1 The linings, ceilings and constructions should be evaluated in accordance with resolution A.754(18) using the arrangements described below.

2.2 The ceilings should be tested in accordance with paragraph 2.8 of the annex to resolution A.754(18) except that the ceiling should be mounted on the horizontal furnace so that at least 150 mm high "B" class bulkheads are mounted on the furnace and the ceiling is fixed to these partial bulkheads by using the joining method as is intended to be used in practice. Such ceilings and the joining methods should be evaluated as required for ceilings in accordance with resolution A.754(18) and accordingly they should be classified as "continuous 'B' (B-0 or B-15, as applicable) class ceilings".

2.3 A lining which has been evaluated in accordance with resolution A.754(18) to be a "B" (B-0 or B-15, as applicable on basis of the lining test) class lining may be considered forming "continuous 'B' (B-0 or B-15, as applicable) class lining" in conjunction with a "continuous 'B' (B-0 or B-15, as applicable) class ceiling" and with the joining method used in the test (see paragraph 2.2 above) without further testing the lining.

2.4 An enclosed construction installed on an "A" class deck and formed by "continuous 'B' (B-0 or B-15, as applicable) class linings" and "continuous 'B' (B-0 or B-15, as applicable) class ceiling" should be considered forming "continuous 'B' class construction".

PART 4 - TEST FOR FIRE DOOR CONTROL SYSTEMS

1 Application

Where a control system of fire doors is required to be able to operate in case of fire, the system shall comply with this part.

2 Fire test procedure

The fire door control systems shall be tested and evaluated in accordance with the test procedure presented in the appendix to this part.

3 Additional requirements

Part 1 of this annex is also applicable to insulation materials used in connection with a fire door control system.

APPENDIX

FIRE TEST PROCEDURE FOR FIRE DOOR CONTROL SYSTEMS

1 General

1.1 Fire door control systems which are intended to be used for fire doors capable of operating in case of fire shall be tested in accordance with the fire test procedure described in this appendix independent of its power supply (pneumatical, hydraulic or electrical).

1.2 The fire tests shall be a prototype test and be carried out with the complete control system in a furnace dimensioned according to resolution A.754(18).

1.3 The construction to be tested shall be, as far as practicable, representative of that to be used on board ships, including the materials and method of assembly.

1.4 The functions of the control system including its closing mechanism shall be tested, i.e. normal functions of and, if required, emergency function, including switchover functions, if this is a basis of the manufacturer's design. The required kind of installation and functions shall be evident from a detailed function description.

2 Nature of prototype control systems

2.1 The installation of the prototype control system shall fully comply with the manufacturer's installation manual.

2.2 The prototype control system shall include a typical door arrangement connected to the closing mechanism. For the purpose of the test a door model shall be used. In case of sliding doors, the model door shall run in original door tracks with original supporting and guide rollers. The model door shall have the weight of the largest door to be actuated by this control system.

2.3 In case of pneumatic or hydraulic systems, the actuator (cylinder) shall have the maximum length allowed by the furnace.

3 Materials for prototype control systems

3.1 Specifications

Prior to the test, drawings and the list of materials of the test arrangement shall be submitted to the laboratory by the applicant.

3.2 Control measurements

3.2.1 The testing laboratory shall take reference specimens of all those materials whose characteristics are important to the performance of the prototype control system (excluding steel and equivalent material).

3.2.2 If necessary, non-combustibility tests of insulation material in accordance with part 1 shall be conducted. Adhesives used in the construction of the specimen are not required to be non-combustible, however, they shall have low flame-spread characteristics.

3.2.3 The density of each insulation material shall be determined. The density of mineral wool or any similar compressible material shall be related to the nominal thickness.

3.2.4 The thickness of each insulation material and combination of materials shall be measured by using a suitable gauge or calipers.

4 Conditioning of the prototype control systems

4.1 Conditioning of the prototype control system (except insulation) is not necessary.

4.2 If insulation material is used in the construction, the prototype control system shall not be tested until the insulation has reached an air dry condition. This condition is designed as an equilibrium (constant weight) with an ambient atmosphere of 50% relative humidity at 23°C.

Accelerated conditioning is permissible provided the method does not alter the properties of component materials. High temperature conditioning shall be below temperatures critical for the materials.

5 Mounting of the prototype control systems

5.1 The prototype fire door control system and the insulation, if used for protection of the system or parts of it, shall be mounted at the bulkhead plate as shown in figure 1.

5.2 The structural core shall be mounted at the furnace in accordance with the principles for 'A' class divisions in paragraph 5 of resolution A.754(18).

5.3 The door model shall be arranged within the furnace. The structural core to which the system and the door model are fitted shall have no door opening. However, small openings for the release mechanism of the control systems are allowed.

6 Examination of the prototype control systems

6.1 Conformity

The laboratory shall verify the conformity of the prototype control system with the drawings and method of assembly provided by the applicant (see section 2), and any area of discrepancy shall be resolved prior to commencement of the test.

6.2 Operation of the prototype control system

Immediately prior to the test, the laboratory shall check the operability of the system by opening the door model by a distance of at least 300 mm. The door model shall then be closed.

7 Instrumentation

The furnace and the instrumentation of the furnace shall be in accordance with section 7 of the annex to resolution A.754(18).

8 Method of test

8.1 Commencement of test

Not more than 5 min before the commencement of the test, the initial temperatures recorded by all thermocouples shall be checked to ensure consistency and the datum values shall be noted. Similar datum values shall be obtained for deformation, and initial condition of the prototype control system shall be noted.

At the time of the test, the initial average internal temperature shall be 20 ±10°C and shall be within 5°C of the initial ambient temperature.

8.2 Furnace control

The furnace control shall be in accordance with paragraph 8.3 of the annex to resolution A.754(18)

8.3 Temperatures, duration of testing and actions during test

8.3.1 The average furnace temperature shall be increased and stabilized at 200 ±50°C within 5 min and kept at the level of 200°±50°C up to the end of the first 60 min. Then the average furnace temperature shall be increased according to the standard time-temperature curve beginning with the level of 200°C up to 945°C.

8.3.2 The opening and closing function of the door control mechanism shall be activated every 5 min from the beginning of the test for the duration of 60 min.

8.3.3 The automatic switchover shall isolate the door control system from the power supply at the average furnace temperature of 300°C and shall be able to keep the door closed at least up to 945°C.

8.4 Measurements and observations on the prototype control system

In case of pneumatic or hydraulic systems, the input pressure which shall be identical with the approved system pressure shall be recorded. Due to a high input pressure, necessary safety precautions shall be taken when the test is carried out.

9 Classification criteria

9.1 During the first 60 min of the test, a prototype fire door control system shall not fail.

9.2 During the period from the end of the first 60 min until the end of the test, the door shall remain closed.

10 Test report

The test report shall include all important information relevant to the prototype control system and the fire test, including the following specific items:

.1 the name of the testing laboratory and the test date;

.2 the name of the applicant for the test;

.3 the name of the manufacturer of the prototype control system and of the products and components used in the construction, together with identification marks and trade names;

.4 the constructional details of the prototype control system, including description and drawings and principal details of components. All the details requested in section 2 shall be given. The description and the drawings which are included in the test report shall, as far as practicable, be based on information derived from a survey of the prototype control system. When full and detailed drawings are not included in the report, then the applicant's drawing(s) of the prototype control system shall be authenticated by the laboratory and at least one copy of the authenticated drawing(s) shall be retained by the laboratory; in this case reference to the applicant's drawing(s) shall be given in the report together with a statement indicating the method of endorsing the drawings;

.5 all the properties of materials used that have a bearing on the fire performance of the prototype control system together with measurements of thickness and density of the insulation material(s);

.6 a statement that the test has been conducted in accordance with the requirements of this Appendix and if any deviations have been made to the prescribed procedures (including any special requirements of the Administration), a clear statement of the deviations;

.7 the name of the representative of the Administration present at the test. When the test is not witnessed by a representative of the Administration, a note to this effect shall be made in the report in the following form:

> "The ..... (name of the Administration) ... was notified of the intention to conduct the test detailed in this report and did not consider it necessary to send a representative to witness it.";

.8 information concerning the location of the pressure gauges or other devices together with tabulated data obtained during the test;

.9 observations of significant behaviour of the prototype control system during test and photographs, if any; and

.10 a statement that the prototype fire door control system has passed the test and complies with the classification criteria.

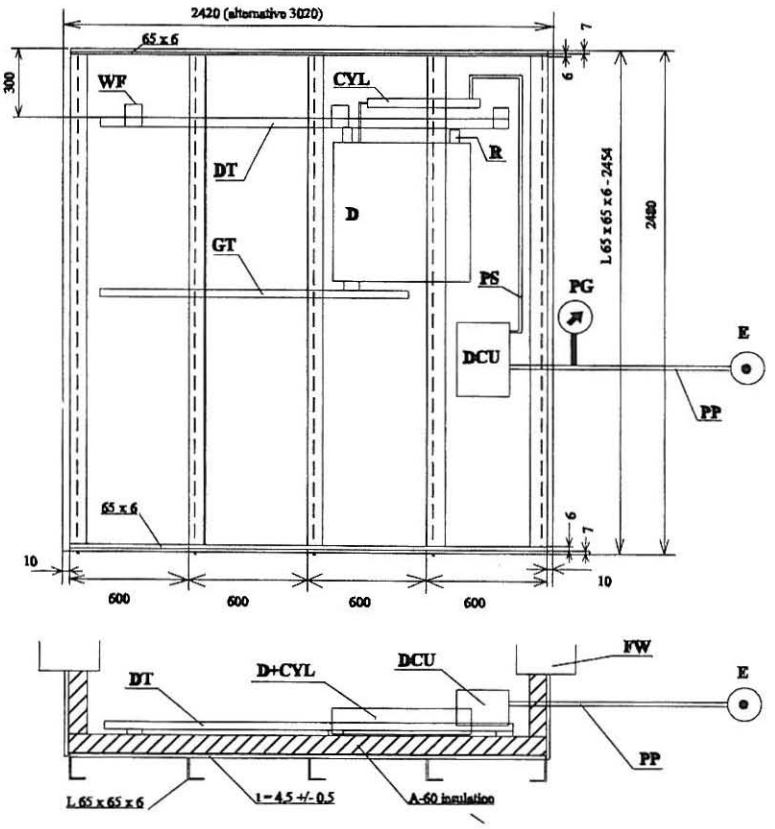


Figure 1 - Structural core for fitting the prototype fire door control system.

D	=	door model,	R	=	supporting roller,
DCU	=	door control unit,	PS	=	piping system,
DT	=	door track,	PG	=	pressure gauge,
WF	=	weld fastening,	PP	=	pressure pipe,
GT	=	guide track,	E	=	energy,
CYL	=	door cylinder,	FW	=	furnace wall.

PART 5 - TEST FOR SURFACE FLAMMABILITY

1 Application

Where a product is required to have a surface with low flame-spread characteristics, the product shall comply with this part.

2 Fire test procedure

2.1 The surface materials shall be tested and evaluated in accordance with the test procedure specified in resolution A.653(16). For the purpose of this part, the total heat release value (Q_t) for floor coverings given in section 10 of the Annex to resolution A.653(16) is replaced by $\leq$2.0 MJ. The test may be terminated after 40 min.

2.2 During fire tests for bulkhead, ceiling and deck finish materials and primary deck coverings (see part 6 of this annex for primary deck coverings), there are those specimens which exhibit various phenomena which cause difficulties in classification of the materials. Appendix to this part provides guidance on the uniform interpretation of such results.

3 Additional requirements

3.1 Surface materials for bulkheads and ceilings and similar exposed surfaces

In case there is a requirement of maximum gross calorific value (e.g. 45 MJ/m^2) for a product, the method specified in standard ISO 1716: 1973 is recommended for determining the gross calorific value.

3.2 Floor coverings and primary deck coverings

3.2.1 A primary deck covering is the first layer of a floor construction which is applied directly on top of the deck plating and is inclusive of any primary coat, anti-corrosive compound or adhesive which is necessary to provide protection or adhesion to the deck plating. Other layers in the floor construction above the deck plating are floor coverings.

3.2.2 Where a floor covering is required to be low flame-spread, all layers shall comply with part 5. If the floor covering has a multilayer construction, the Administration may require the tests to be conducted for each layer or for combinations of some layers of the floor coverings. Each layer separately, or a combination of layers (i.e. the test and approval are applicable only to this combination), of the floor covering shall comply with this part. When a primary deck covering is required to be not readily ignitable and is placed below a floor covering, the primary deck covering shall comply with part 6. When the primary deck covering is also the exposed surface, it shall comply with this part. Primer or similar thin film of paint on deck plating need not comply with the above requirements of part 6.

3.3 Combustible ventilation ducts

3.3.1 Where combustible ventilation ducts are required to be of material which has low flame-spread characteristics, the surface flammability test procedure and criteria for lining and ceiling finishes according to resolution A.653(16) shall be applied for such ducts. In case homogeneous materials are used for the ducts, the test shall apply to outside surface of the duct, whilst both sides of the ducts of composite materials shall be tested.

3.4 Insulation materials for cold service systems

Where the exposed surfaces of vapour barriers and adhesives used in conjunction with insulation, as well as insulation of pipe fittings, for cold service systems are required to have low flame-spread characteristics, the surface flammability test procedure and criteria for linings and ceilings according to resolution A.653(16) shall be applied for such exposed surfaces.

3.5 Other references

Part 2 of this annex is also applicable to surface materials.

APPENDIX

INTERPRETATION OF RESULTS
Evaluating unusual test specimen behaviour
(see paragraph 2.2 of this part)

	Unusual behaviour	Guidance on classification
1	Flashing, no steady flame	Report furthest progress of flame and time, and whether or not flash is on centerline. Classify on basis of the data.
2	Explosive spalling, no flashing or flame	Accept material as passing test.
3	Rapid flash over surface, later steady flame progress	Report result for both flame fronts but classify on basis of worst performance for each of the four test parameters in the two burning regimes.
4	Specimen or veneer melts and drips off, no flame	Report behaviour and extent of advance on specimen.
5	Explosive spalling, and flame on exposed part of specimen	Report explosions and classify on basis of flame progress irrespective of whether above or below centerline.
6	Specimen or veneer melts, burns, and drips off	Reject material regardless of criteria. For floor covering, no more than 10 burning drops are acceptable.
7	Pilot flame extinguished	Report occurrence, reject data and repeat test.
8	Heat release signal after test and re-insertion of dummy specimen remains at a higher or lower level than initial stabilizing level.	Reject data and stabilize the equipment, then repeat test.
9	Very short ignition delay on carpets or non-rigid specimens	Could be caused by pile extension above holder surface, reducing space to pilot flame. Repeat with shims as required by procedure in paragraph 8.1.1 of the Annex to resolution A.653(16).

10	Specimen breaks up, and falls out of holder	Report behaviour, but classify on basis of worst performance with and without specimen restraint in paragraph 8.3.2 of the Annex to resolution A.653(16).
11	Substantial jetting combustible pyrolysis gases from specimen, adhesive or bonding agents	Reject material.
12	Small flame remaining along the edge of specimen	Report behaviour and terminate the test 3 min after flaming on exposed surface of specimen ceased.

PART 6 - TEST FOR PRIMARY DECK COVERINGS

1 Application

1.1 Where the primary deck coverings are required to be not readily ignitable, they shall comply with this part.

1.2 For determining which layers on the deck shall be tested as floor coverings and which of them shall be tested as primary deck coverings, see paragraph 3.2 of part 5.

2 Fire test procedure

2.1 The primary deck coverings shall be tested and evaluated in accordance with the fire test procedure specified in resolution A.687(17):

2.2 The test shall be terminated after 40 min.

3 Additional requirements

Part 2 of this annex 1 is also applicable to primary deck coverings.

PART 7 - TEST FOR VERTICALLY SUPPORTED TEXTILES AND FILMS

1 Application

Where draperies, curtains and other supported textile materials are required to have qualities of resistance to the propagation of flame not inferior to those of wool of mass 0.8 kg/m^2,they shall comply with this part .

2 Fire test procedure

The vertically supported textiles and films shall be tested and evaluated in accordance with the fire test procedure specified in resolution A.471(XII) as amended by resolution A.563(14).

3 Additional requirements

The tests shall be made by using specimens of the final product (e.g. with colour treatment). In cases where only the colours change, a new test is not necessary. However, in cases where the basis product or the treatment procedure change, a new test is required.

PART 8 - TEST FOR UPHOLSTERED FURNITURE

1 Application

Where upholstered furniture are required to have qualities of resistance to the ignition and propagation of flame, the upholstered furniture shall comply with this part.

2 Fire test procedure

The upholstered furniture shall be tested and evaluated in accordance with the fire test procedure specified in resolution A.652(16).

3 Additional requirements

The tests shall be made by using specimens of the final product (e.g. with colour treatment). In cases where only the colours change, a new test is not necessary. However, in cases where the basis product or the treatment procedure change, a new test is required.

PART 9 - TEST FOR BEDDING COMPONENTS

1 Application

Where bedding components are required to have qualities of resistance to the ignition and propagation of flame, the bedding components shall comply with this part.

2 Fire test procedure

The bedding components shall be tested and evaluated in accordance with the fire test procedure specified in resolution A.688(17).

3 Additional requirements

The tests shall be made by using specimens of the final product (e.g. with colour treatment). In cases where only the colours change, a new test is not necessary. However, in cases where the basis product or the treatment procedure change, a new test is required.

ANNEX 2

PRODUCTS WHICH MAY BE INSTALLED WITHOUT TESTING AND/OR APPROVAL

General

In general, the products and product groups listed in this annex are considered to have the fire safety characteristics specified below and they may be installed without testing according to and without approval on basis of the specific fire test procedures in this Code for the specific safety characteristics of the product.

The paragraphs below are numbered with the same part number in which the corresponding testing requirements are specified in annex 1.

1 Non-combustible materials

In general, products made only of glass, concrete, ceramic products, natural stone, masonry units, common metals and metal alloys are considered being non-combustible and they may be installed without testing and approval.

2 Materials not generating excessive quantities of smoke nor toxic products in fire

2.1 In general, non-combustible materials are considered to comply with the requirements of part 2 of annex 1 without further testing.

2.2 In general, surface materials and primary deck coverings with both the total heat release (Q_t) of not more than 0.2 MJ and the peak heat release rate (q_p) of not more than 1.0 kW (both values determined in accordance with part 5 of annex 1 or in accordance with resolution A.653(16) are considered to comply with the requirements of part 2 of annex 1 without further testing.

3 "A", "B" and "F" class divisions

3.1 The following products may be installed without testing or approval:

Classification	Product description
Class A-0 bulkhead	A steel bulkhead with dimensions not less than the minimum dimensions given below: - thickness of plating: 4 mm - stiffeners 60 x 60 x 5 mm spaced at 600 mm or structural equivalent

Class A-0 deck	A steel deck with dimensions not less than the minimum dimensions given below: - thickness of plating: 4 mm - stiffeners 95 x 65 x 7 mm spaced at 600 mm or structural equivalent.

3.2 Notwithstanding the provisions in 3.1 above, the materials which are used in "A", "B" and "F" class divisions and which are required to have certain other specified characteristics (e.g. non-combustibility, low flame-spread characteristics, etc.) shall comply with the appropriate parts of annex 1 or section 8 and annex 3, of this Code.

4 Fire door control systems
(no entries)

5 Low flame-spread surfaces

5.1 Non-combustible materials are considered to comply with the requirements of part 5 of annex 1. However, due consideration shall be given to the method of application and fixing (e.g. glue).

5.2 Primary deck coverings classified as not readily ignitable in accordance with part 6 of annex 1 are considered to comply with the requirements of part 5 of annex 1 for floor coverings.

6 Primary deck coverings

Non-combustible materials are considered to comply with the requirements of part 6 of annex 1. However, due consideration shall be given to the method of application and fixing.

7 Vertically supported textiles and films
(no entries)

8 Upholstered furniture
(no entries)

9 Bedding components
(no entries)

ANNEX 3

USE OF OTHER FIRE TEST PROCEDURES

Administrations may use test procedures other than those referred to in annex 1 as follows:

.1 for fire test procedures previously adopted by the Assembly, the expiry dates are given in the table below; and

.2 for other established test procedures and acceptance criteria applied by an Administration, the test expiry date is 31.12.1998 and the approval expiry date is 31.12.2003.

Products (reference part in annex 1)	**Test procedure**	**Test expiry date**	**Approval expiry date**
Non-combustible materials (part 1)	Resolution A.472(XII)	31.12.1998	31.12.2003
	Resolution A.270(VIII)	1.7.1997	1.7.2002
Materials not generating excessive quantities of smoke nor toxic products (part 2)	-	-	-
A, B and F class divisions (part 3)	Resolution A.517(13)*	31.12.1998	31.12.2003
	Resolution A.163(ES.IV)* as corrected by Resolution A.215(VII)	1.7.1997	1.7.2002
	Resolution A.163(ES.IV)*	1.7.1997	1.7.2002
Fire door control systems (part 4)	-	-	-
Surface materials (part 5)	Resolution A.564(14)	31.12.1998	31.12.2003
	Resolution A.516(13)	31.12.1998	31.12.2003
Primary deck coverings (part 6)	Resolution A.214(VII)	31.12.1998	31.12.2003
Vertically supported textiles (part 7)	Resolution A.471(XII)	31.12.1998	31.12.2003
Upholstered furniture (part 8)	-	-	-
Bedding components (part 9)	-	-	-

*The maximum average temperature rise of 140°C may be used instead of 139°C in the acceptance criteria in resolutions A.163(ES.IV) and A.517(13).

RESOLUTION MSC.61(67)
(adopted on 5 December 1996)
ADOPTION OF THE INTERNATIONAL CODE FOR APPLICATION
OF FIRE TEST PROCEDURES