

2000 HSC Code

INTERNATIONAL CODE OF SAFETY FOR HIGH-SPEED CRAFT, 2000

2008 Edition



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INTERNATIONAL CODE OF SAFETY FOR HIGH-SPEED CRAFT, 2000
2008 Edition

Resolution MSC.97(73)
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as amended by resolutions MSC.175(79)
and MSC.222(82)



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Foreword

The Maritime Safety Committee, at its seventy-third session (27 November to 6 December 2000), adopted, by resolution MSC.97(73), the International Code of Safety for High-Speed Craft, 2000 (2000 HSC Code), which had been developed following a thorough revision of the International Code of Safety for High-Speed Craft, 1994 (1994 HSC Code) (resolution MSC.36 (63)), which in turn had been developed following a thorough revision of the Code of Safety for Dynamically Supported Craft (DSC Code) (resolution A.373(X)).

Since then, amendments to the 2000 HSC Code have been adopted by the Maritime Safety Committee by resolutions MSC.175(79) and MSC.222(82), following the provisions in the Code (section 1.15) for a regular review to consider a revision of the existing requirements to take account of new developments in design and technology. The present 2008 edition contains the consolidated current text of the 2000 HSC Code, incorporating the above amendments.

The 1994 HSC Code and the 2000 HSC Code are mandatory under chapter X (Safety measures for high-speed craft) of the 1974 SOLAS Convention and apply to high-speed craft engaged in international voyages the keels of which were laid or which were at a similar stage of construction on or after 1 January 1996 (1994 HSC Code) and 1 July 2002 (2000 HSC Code) respectively. For high-speed craft constructed before 1 January 1996, the DSC Code should be applied.

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International Code of Safety for High-Speed Craft, 2000*

Preamble

1 The international conventions ratified in respect of conventional ships and the regulations applied as a consequence of such conventions have largely been developed having in mind the manner in which conventional ships are constructed and operated. Traditionally, ships have been built of steel and with the minimum of operational controls. The requirements for ships engaged on long international voyages are therefore framed in such a way that, providing the ship is presented for survey and a Ship Safety Certificate is issued, the ship may go anywhere in the world without any operational restrictions being imposed. Providing the ship is not involved in a casualty, all that is needed is that it is made available to the Administration for the purpose of a satisfactory resurvey before the Ship Safety Certificate expires and the Certificate will be reissued.

2 The traditional method of regulating ships should not be accepted as being the only possible way of providing an appropriate level of safety. Nor should it be assumed that another approach, using different criteria, could not be applied. Over a long period of time, numerous new designs of marine vehicles have been developed and have been in service. While these do not fully comply with the provisions of the international conventions relating to conventional ships built of steel, they have demonstrated an ability to operate at an equivalent level of safety when engaged on restricted voyages under restricted operational weather conditions and with approved maintenance and supervision schedules.

3 The High-Speed Craft Code, 1994 (1994 HSC Code) was derived from the previous Code of Safety for Dynamically Supported Craft (DSC Code) adopted by IMO in 1977, recognizing that safety levels can be significantly enhanced by the infrastructure associated with regular service on a particular route, whereas the conventional ship safety philosophy relies on the ship being self-sustaining with all necessary emergency equipment being carried on board.

* The International Code of Safety for High-Speed Craft, 2000 (2000 HSC Code) is the annex to resolution MSC.97(73), the text of which is at the end of this publication.

4 The safety philosophy of this Code is based on the management and reduction of risk as well as the traditional philosophy of passive protection in the event of an accident. Management of risk through accommodation arrangement, active safety systems, restricted operation, quality management and human factors engineering should be considered in evaluating safety equivalent to current conventions. Application of mathematical analysis should be encouraged to assess risk and determine the validity of safety measures.

5 This Code takes into account that a high-speed craft is of a light displacement compared with a conventional ship. This displacement aspect is the essential parameter to obtain fast and competitive sea transportation and consequently this Code allows for use of non-conventional shipbuilding materials, provided that a safety standard at least equivalent to conventional ships is achieved.

6 To clearly distinguish such craft, criteria based on speed and volumetric Froude number have been used to delineate those craft to which this Code applies from other, more conventional, craft.

7 The Code requirements also reflect the additional hazards which may be caused by the high speed compared with conventional ship transportation. Thus, in addition to the normal requirements (including life-saving appliances, evacuation facilities, etc.) provided in case of an accident occurring, further emphasis is placed on reducing the risk of hazardous situations arising. Some advantages result from the high-speed craft concept, i.e. the light displacement provides a large reserve buoyancy in relation to displacement, reducing the hazards addressed by the International Convention on Load Lines, 1966. The consequences of other hazards, such as of collision at high speed, are balanced by more stringent navigational and operational requirements and specially developed accommodation provisions.

8 The above-mentioned safety concepts were originally reflected in the DSC Code and in the 1994 HSC Code. The development of novel types and sizes of craft has led to the development of pressures within the maritime industry for craft which are not dynamically supported cargo craft or passenger craft carrying larger numbers of passengers or operating further afield than permitted by that Code to be certified according to those concepts. Additionally, improvements of maritime safety standards since 1994 were required to be reflected in the revisions of the 1994 HSC Code to maintain safety equivalence with conventional ships.

9 Accordingly, two differing principles of protection and rescue were embodied in the 1994 HSC Code.

10 The first of these recognizes the craft which were originally foreseen at the time of development of the DSC Code. Where rescue assistance is readily available and the total number of passengers is limited, a reduction in passive and active protection may be permitted. Such craft are called “assisted craft” and form the basis for “category A passenger craft” of this Code.

11 The second concept recognizes the further development of high-speed craft into larger craft. Where rescue assistance is not readily available or the number of passengers is unlimited, additional passive and active safety precautions are required. These additional requirements provide for an area of safe refuge on board, redundancy of vital systems, increased watertight and structural integrity and full fire-extinguishing capability. Such craft are called “unassisted craft” and form the basis for “cargo craft” and “category B passenger craft” of this Code.

12 These two concepts have been developed as a unified document on the basis that an equivalent level of safety to that normally expected on ships complying with the International Convention for the Safety of Life at Sea, 1974 is achieved. Where the application of new technology or design indicates an equivalent safety level to the strict application of this Code, the Administration is permitted to formally recognize such equivalence.

13 It is important that an Administration, in considering the suitability of a high-speed craft under this Code, should apply all sections of the Code because non-compliance with any part of the Code could result in an imbalance which would adversely affect the safety of the craft, passengers and crew. For a similar reason, modifications to existing craft, which may have an effect on safety, should be approved by the Administration.

14 In developing this Code, it has been considered desirable to ensure that high-speed craft do not impose unreasonable demands on existing users of the environment or conversely suffer unnecessarily through lack of reasonable accommodation by existing users. Whatever burden of compatibility there is, it should not necessarily be laid wholly on the high-speed craft.

15 Paragraph 1.15.1 of the 1994 HSC Code states that it should be reviewed by the Organization at intervals preferably not exceeding four years to consider revision of existing requirements to take account of new developments in design and technology. Experience gained with the application of the 1994 HSC Code since it entered into force in 1996 has

led to the recognition that it needed to be revised and updated. Subsequent work in the Organization has resulted in the development of the present Code to ensure that safety is not compromised as a result of continuous introduction of state-of-the-art technology and innovative developments into the new and generally much larger and faster high-speed craft.

Chapter 1

General comments and requirements

1.1 General comments

This Code shall be applied as a complete set of comprehensive requirements. It contains requirements for the design and construction of high-speed craft engaged on international voyages, the equipment which shall be provided and the conditions for their operation and maintenance. The basic aim of the Code is to set levels of safety which are equivalent to those of conventional ships required by the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS Convention) and the International Convention on Load Lines, 1966 (Load Line Convention) by the application of constructional and equipment standards in conjunction with strict operational controls.*

1.2 General requirements

1.2.1 The application of the provisions of this Code is subject to the following general requirements:

- .1** the Code will be applied in its entirety;
- .2** the management of the company operating the craft exercises strict control over its operation and maintenance by a quality-management system;†
- .3** the management ensures that only persons qualified to operate the specific type of craft used on the intended route are employed;
- .4** the distances covered and the worst intended conditions in which high-speed craft operations are permitted will be restricted by the imposition of operational limits;

* Refer to MSC/Circ.652 on Application of the 1966 LL Convention to high-speed craft.

† Refer to the International Safety Management (ISM) Code, adopted by the Organization by resolution A.741(18), as amended.

- .5 the craft will at all times be in reasonable proximity to a place of refuge, having due regard to the provisions of 1.3.4;
- .6 adequate communications facilities, weather forecasts and maintenance facilities are available within the area of craft operation;
- .7 in the intended area of operation, suitable rescue facilities will be readily available;
- .8 areas of high fire risk, such as machinery spaces and special category spaces, are protected with fire-resistant materials and fire-extinguishing systems to ensure, as far as is practicable, containment and rapid extinguishing of fire;
- .9 efficient facilities are provided for the rapid and safe evacuation of all persons into survival craft;
- .10 all passengers and crew are provided with seats; and
- .11 no enclosed sleeping berths for passengers are provided.

1.2.2 On all craft, new installation of materials containing asbestos used for the structure, machinery, electrical installations and equipment of a craft to which this Code applies shall be prohibited except for:

- .1 vanes used in rotary vane compressors and rotary vane vacuum pumps;
- .2 watertight joints and linings used for the circulation of fluids when, at high temperature (in excess of 350°C) or pressure (in excess of 7×10^6 Pa), there is a risk of fire, corrosion or toxicity; and
- .3 supple and flexible thermal insulation assemblies used for temperatures above 1000°C.

1.3 Application

1.3.1 This Code applies to high-speed craft as specified in 1.3.4 engaged in international voyages the keels of which are laid or which are at a similar stage of construction on or after 1 July 2002.

1.3.2 For the purpose of this Code, the term a *similar stage of construction* means the stage at which:

- .1 construction identifiable with a specific craft begins; and

- .2 assembly of that craft has commenced comprising at least 50 tonnes or three per cent of the estimated mass of all material used in the structure, including superstructure and deckhouse, whichever is less.

1.3.3 For the purpose of this Code :

- .1 the expression *craft constructed* means craft the keels of which are laid or which are at a similar stage of construction; and
- .2 a cargo craft, whenever built, which is converted to a passenger craft shall be treated as a passenger craft constructed on the date on which such a conversion commences.

1.3.4 This Code applies to:

- .1 passenger craft which do not proceed in the course of their voyage more than four hours at 90% of maximum speed from a place of refuge; and
- .2 cargo craft of 500 gross tonnage and upwards which do not proceed in the course of their voyage more than eight hours at 90% of maximum speed from a place of refuge when fully laden.

1.3.5 This Code, unless expressly provided otherwise, does not apply to:

- .1 craft of war and troopcraft;
- .2 craft not propelled by mechanical means;
- .3 wooden craft of primitive build;
- .4 pleasure craft not engaged in trade; and
- .5 fishing craft.

1.3.6 This Code does not apply to craft solely navigating the Great Lakes of North America and the River St. Lawrence as far east as a straight line drawn from Cap des Rosiers to West Point, Anticosti Island and, on the north side of Anticosti Island, the 63rd meridian.

1.3.7 The application of this Code shall be verified by the Administration and be acceptable to the Governments of the States to which the craft will be operating.

1.4 Definitions

For the purpose of this Code, unless expressly provided otherwise, the terms used therein have the meanings defined in the following paragraphs. Additional definitions are given in the general parts of the various chapters.

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**1.4.1** *Administration* means the Government of the State whose flag the craft is entitled to fly.

**1.4.2** *Air-cushion vehicle (ACV)* is a craft such that the whole or a significant part of its weight can be supported, whether at rest or in motion, by a continuously generated cushion of air dependent for its effectiveness on the proximity of the surface over which the craft operates.

**1.4.3** *Anniversary date* means the day and the month of each year which will correspond to the date of expiry of the relevant certificate.

**1.4.4** *Assembly station* is an area where passengers can be gathered in the event of an emergency, given instructions and prepared to abandon the craft, if necessary. The passenger spaces may serve as assembly stations if all passengers can be instructed there and prepared to abandon the craft.

**1.4.5** *Auxiliary machinery spaces* are spaces containing internal-combustion engines of a power output up to and including 110 kW, driving generators, sprinkler, drencher or fire pumps, bilge pumps, etc., oil filling stations, switchboards of aggregate capacity exceeding 800 kW, similar spaces and trunks to such spaces.

**1.4.6** *Auxiliary machinery spaces having little or no fire risk* are spaces such as refrigerating, stabilizing, ventilation and air-conditioning machinery, switchboards of aggregate capacity 800 kW or less, similar spaces and trunks to such spaces.

**1.4.7** *Base port* is a specific port identified in the route operational manual and provided with:

- .1 appropriate facilities providing continuous radio communications with the craft at all times while in ports and at sea;
- .2 means for obtaining a reliable weather forecast for the corresponding region and its due transmission to all craft in operation;
- .3 for a category A craft, access to facilities provided with appropriate rescue and survival equipment; and
- .4 access to craft maintenance services with appropriate equipment.

**1.4.8** *Base port State* means the State in which the base port is located.

**1.4.9** *Breadth (B)* means breadth of the broadest part of the moulded watertight envelope of the rigid hull, excluding appendages, at or below the design waterline in the displacement mode with no lift or propulsion machinery active.

**1.4.10** *Cargo craft* is any high-speed craft other than a passenger craft, and which is capable of maintaining the main functions and safety systems of unaffected spaces after damage in any one compartment on board.

**1.4.11** *Cargo spaces* are all spaces other than special category spaces and ro-ro spaces used for cargo and trunks to such spaces. For the purposes of chapter 7, part D, *cargo spaces* include ro-ro spaces, special category spaces and open deck spaces.

**1.4.12** *Category A craft* is any high-speed passenger craft:

- .1 operating on a route where it has been demonstrated to the satisfaction of the flag and port States that there is a high probability that, in the event of an evacuation at any point of the route, all passengers and crew can be rescued safely within the least of:
  - the time to prevent persons in survival craft from exposure causing hypothermia in the worst intended conditions,
  - the time appropriate with respect to environmental conditions and geographical features of the route, or
  - 4 hours; and
- .2 carrying not more than 450 passengers.

**1.4.13** *Category B craft* is any high-speed passenger craft other than a category A craft, with machinery and safety systems arranged such that, in the event of any essential machinery and safety systems in any one compartment being disabled, the craft retains the capability to navigate safely. The damage scenarios considered in chapter 2 should not be inferred in this respect.

**1.4.14** *Company* means the company as defined in chapter IX of the Convention.

**1.4.15** *Continuously manned control station* is a control station which is continuously manned by a responsible member of the crew while the craft is in normal service.

**1.4.16** *Control stations* are those spaces in which the craft's radio or navigating equipment (main displays and controls for equipment specified in 13.2 to 13.7) or the emergency source of power\* and emergency switchboard are located, or where the fire recording or fire control equipment is centralized,<sup>†</sup> or where other functions essential to the safe operation of the craft, such as propulsion control, public address, stabilization systems, etc., are located.

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

**1.4.18** *Crew accommodation* are those spaces allocated for the use of the crew, and include cabins, sick bays, offices, lavatories, lounges and similar spaces.

**1.4.19** *Critical design conditions* means the limiting specified conditions, chosen for design purposes, which the craft shall keep in displacement mode. Such conditions shall be more severe than the "worst intended conditions" by a suitable margin to provide for adequate safety in the survival condition.

**1.4.20** *Datum* means a watertight deck or equivalent structure of a non-watertight deck covered by a weathertight structure of adequate strength to maintain the weathertight integrity and fitted with weathertight closing appliances.

**1.4.21** *Design waterline* means the waterline corresponding to the maximum operational weight of the craft with no lift or propulsion machinery active and is limited by the requirements of chapters 2 and 3.

**1.4.22** *Displacement mode* means the regime, whether at rest or in motion, where the weight of the craft is fully or predominantly supported by hydrostatic forces.

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\* Spaces containing, for instance, the following battery sources should be regarded as control stations regardless of battery capacity:

- .1 emergency batteries in separate battery room for power supply from black-out until start of emergency generator;
- .2 emergency batteries in separate battery room as reserve source of energy to radio-communications installations;
- .3 batteries for start of emergency generator; and
- .4 in general, all emergency batteries required by 12.3.

<sup>†</sup> Where, in the sections of this Code relevant to fixed fire-extinguishing systems, there are no specific requirements for the centralization within a control station of major components of a system, such major components may be placed in spaces which are not considered to be control stations.

**1.4.23** *Failure Mode and Effect Analysis (FMEA)* is an examination, in accordance with annex 4, of the craft's systems and equipment to determine whether any reasonably probable failure or improper operation can result in a hazardous or catastrophic effect.

**1.4.24** *Fire Test Procedures Code (FTP Code)* means the International Code for Application of Fire Test Procedures, as defined in chapter II-2 of the Convention.

**1.4.25** *Flap* means an element formed as integrated part of, or an extension of, a foil, used to adjust the hydrodynamic or aerodynamic lift of the foil.

**1.4.26** *Flashpoint* means a flashpoint determined by a test using the closed-cup apparatus referenced in the International Maritime Dangerous Goods (IMDG) Code.

**1.4.27** *Foil* means a profiled plate or three-dimensional construction at which hydrodynamic lift is generated when the craft is under way.

**1.4.28** *Fully submerged foil* means a foil having no lift components piercing the surface of the water in the foil-borne mode.

**1.4.29** *Galleys* are those enclosed spaces containing cooking facilities with exposed heating surfaces, or which have any cooking or food heating appliances each having a power of more than 5 kW.

**1.4.30** *High-speed craft* is a craft capable of maximum speed, in metres per second (m/s), equal to or exceeding:

$$3.7\nabla^{0.1667}$$

where:

$\nabla$  = volume of displacement corresponding to the design waterline (m<sup>3</sup>)

excluding craft the hull of which is supported completely clear above the water surface in non-displacement mode by aerodynamic forces generated by ground effect.

**1.4.31** *Hydrofoil craft* is a craft the hull of which is supported completely clear above the water surface in non-displacement mode by hydrodynamic forces generated on foils.

**1.4.32** *IMDG Code* means the International Maritime Dangerous Goods (IMDG) Code as defined in chapter VII of the Convention.

**1.4.33** *Length (L)* means the overall length of the underwater watertight envelope of the rigid hull, excluding appendages, at or below the design waterline in the displacement mode with no lift or propulsion machinery active.

**1.4.34** *Lightweight* is the displacement of the craft in tonnes without cargo, fuel, lubricating oil, ballast water, fresh water and feedwater in tanks, consumable stores, passengers and crew and their effects.

**1.4.35** *Life-Saving Appliances Code (LSA Code)* means the International Life-Saving Appliance Code as defined in chapter III of the Convention.

**1.4.36** *Machinery spaces* are spaces containing internal-combustion engines either used for main propulsion or having an aggregate total power output of more than 110 kW, generators, oil fuel units, major electrical machinery and similar spaces and trunks to such spaces.

**1.4.37** *Maximum operational weight* means the overall weight up to which operation in the intended mode is permitted by the Administration.

**1.4.38** *Maximum speed* is the speed achieved at the maximum continuous propulsion power for which the craft is certified at maximum operational weight and in smooth water.

**1.4.39** *Non-displacement mode* means the normal operational regime of a craft when non-hydrostatic forces substantially or predominantly support the weight of the craft.

**1.4.40** *Oil fuel unit* includes any equipment for the preparation of oil fuel and delivery of oil fuel, heated or not, to boilers and engines (including gas turbines) at a pressure of more than 0.18 N/mm<sup>2</sup>.

**1.4.41** *Open ro-ro spaces* are those ro-ro spaces:

- .1 to which any passengers carried have access; and
- .2 which either:
  - .2.1 are open at both ends; or
  - .2.2 have an opening at one end and are provided with permanent openings distributed in the side plating or deckhead or from above, having a total area of at least 10% of the total area of the space sides.

**1.4.42** *Operating limitations* means the craft limitations in respect of handling, controllability and performance and the craft operational procedures within which the craft is to operate.

**1.4.43** *Operating compartment* means the enclosed area from which the navigation and control of the craft is exercised.

**1.4.44** *Operating station* means a confined area of the operating compartment equipped with necessary means for navigation, manoeuvring and communication, and from where the functions of navigating, manoeuvring, communication, commanding, conning and look-out are carried out.

**1.4.45** *Organization* means the International Maritime Organization.

**1.4.46** *Passenger* is every person other than:

- .1 the master and members of the crew or other persons employed or engaged in any capacity on board a craft on the business of that craft; and
- .2 a child under one year of age.

**1.4.47** *Passenger craft* is a craft which carries more than twelve passengers.

**1.4.48** *Place of refuge* is any naturally or artificially sheltered area which may be used as a shelter by a craft under conditions likely to endanger its safety.

**1.4.49** *Public spaces* are those spaces allocated for the passengers and include bars, refreshment kiosks, smoke rooms, main seating areas, lounges, dining rooms, recreation rooms, lobbies, lavatories and similar spaces, and may include sales shops.

**1.4.50** *Refreshment kiosks* are those spaces which are not enclosed, serving refreshments and containing food warming equipment having a total power of 5 kW or less and with an exposed heating surface temperature not above 150°C.

**1.4.51** *Ro-ro craft* is a craft fitted with one or more ro-ro spaces.

**1.4.52** *Ro-ro spaces* are spaces not normally subdivided in any way and normally extending to either a substantial length or the entire length of the craft in which motor vehicles with fuel in their tanks for their own propulsion and/or goods (packaged or in bulk, in or on rail or road cars, vehicles (including road or rail tankers), trailers, containers, pallets, demountable tanks or in or on similar stowage units or other receptacles) can be loaded and unloaded, normally in a horizontal direction.

**1.4.53** *Service spaces* are those enclosed spaces used for pantries containing food warming equipment but no cooking facilities with exposed heating surfaces, lockers, sales shops, store-rooms and enclosed baggage rooms. Such spaces containing no cooking appliances may contain:

- .1** coffee automats, toasters, dish washers, microwave ovens, water boilers and similar appliances, each of them with a maximum power of 5 kW; and
- .2** electrically heated cooking plates and hot plates for keeping food warm, each of them with a maximum power of 2 kW and a surface temperature not above 150°C.

**1.4.54** *Significant wave height* is the average crest-to-trough height of the highest one third of the zero-upcrossing waves in a specified period.

**1.4.55** *Special category spaces* are those enclosed ro-ro spaces to which passengers have access. Special category spaces may be accommodated on more than one deck provided that the total overall clear height for vehicles does not exceed 10 m.

**1.4.56** *Surface-effect ship (SES)* is an air-cushion vehicle whose cushion is totally or partially retained by permanently immersed hard structures.

**1.4.57** *Transitional mode* means the regime between displacement and non-displacement modes.

**1.4.58** *Watertight* in relation to a structure means capable of preventing the passage of water through the structure in any direction under the head of water likely to occur in the intact or damaged condition.

**1.4.59** *Weather deck* is a deck which is completely exposed to the weather from above and from at least two sides.

**1.4.60** *Weathertight* means that water will not penetrate into the craft in any wind and wave conditions up to those specified as critical design conditions.

**1.4.61** *Worst intended conditions* means the specified environmental conditions within which the intentional operation of the craft is provided for in the certification of the craft. This shall take into account parameters such as the worst conditions of wind force allowable, significant wave height (including unfavourable combinations of length and direction of waves), minimum air temperature, visibility and depth of water for safe operation and such other parameters as the Administration may require in considering the type of craft in the area of operation.

## 1.5 Surveys

**1.5.1** Each craft shall be subject to the surveys specified below:

- .1** an initial survey before the craft is put in service or before the Certificate is issued for the first time;
- .2** a renewal survey at intervals specified by the Administration but not exceeding 5 years except where 1.8.5 or 1.8.10 is applicable;
- .3** a periodical survey within three months before or after each anniversary date of the Certificate; and
- .4** an additional survey as the occasion arises.

**1.5.2** The surveys referred to in 1.5.1 shall be carried out as follows:

- .1** the initial survey shall include:
  - .1.1** an appraisal of the assumptions made and limitations proposed in relation to loadings, environment, speed and manoeuvrability;
  - .1.2** an appraisal of the data supporting the safety of the design, obtained, as appropriate, from calculations, tests and trials;
  - .1.3** a failure mode and effect analysis as required by this Code;
  - .1.4** an investigation into the adequacy of the various manuals to be supplied with the craft; and
  - .1.5** a complete inspection of the structure, safety equipment, radio installations and other equipment, fittings, arrangements and materials to ensure that they comply with the requirements of the Code, are in satisfactory condition and are fit for the service for which the craft is intended;
- .2** the renewal and periodical surveys shall include a complete inspection of the structure, including the outside of the craft's bottom and related items, safety equipment, radio installations and other equipment as referred to in 1.5.2.1 to ensure that they comply with the requirements of the Code, are in satisfactory condition and are fit for the service for which the craft is intended. The inspection of the craft's bottom shall be conducted with the craft out of the water under suitable conditions for close-up examination of any damaged or problem areas; and

- .3** an additional survey, either general or partial according to the circumstances, shall be made after a repair resulting from investigations prescribed in 1.7.3, or whenever any important repairs or renewals are made. The survey shall be such as to ensure that the necessary repairs or renewals have been effectively made, that the material and workmanship of such repairs or renewals are in all respects satisfactory, and that the craft complies in all respects with the requirements of the Code.

**1.5.3** The periodical surveys referred to in 1.5.1.3 shall be endorsed on the High-Speed Craft Safety Certificate.

**1.5.4** The inspection and survey of the craft, so far as regards the enforcement of the provisions of the Code, shall be carried out by officers of the Administration. The Administration may, however, entrust the inspections and surveys either to surveyors nominated for the purpose or to organizations recognized by it.

**1.5.5** An Administration nominating surveyors or recognizing organizations to conduct inspections and surveys as set forth in 1.5.4 shall, as a minimum, empower any nominated surveyor or recognized organization to:

- .1** require repairs to a craft; and
- .2** carry out inspections and surveys if requested by the appropriate authorities of a port State.

The Administration shall notify the Organization of the specific responsibilities and conditions of the authority delegated to nominated surveyors or recognized organizations.

**1.5.6** When a nominated surveyor or recognized organization determines that the condition of the craft or its equipment does not correspond substantially with the particulars of the Certificate or is such that the craft is not fit to operate without danger to the craft or persons on board, the surveyor or organization shall immediately ensure that corrective action is taken and shall, in due course, notify the Administration. If such corrective action is not taken, the Certificate shall be withdrawn and the Administration shall be notified immediately; and, if the craft is in an area under the jurisdiction of another Government, the appropriate authorities of the port State shall be notified immediately. When an officer of the Administration, a nominated surveyor or a recognized organization has notified the appropriate authorities of the port State, the Government of the port State concerned shall give such officer, surveyor or organization any necessary assistance to carry out their obligations under this section. When applicable,

the Government of the port State concerned shall ensure that the craft shall not continue to operate until it can do so without danger to the craft or the persons on board.

**1.5.7** In every case, the Administration shall fully guarantee the completeness and efficiency of the inspection and survey, and shall undertake to ensure the necessary arrangements to satisfy this obligation.

## **1.6 Approvals**

The owner of a craft shall accept the obligation to supply sufficient information to enable the Administration to fully assess the features of the design. It is strongly recommended that the company and the Administration and, where appropriate, the port State or States shall commence discussions at the earliest possible stage so that the Administration may fully evaluate the design in determining what additional or alternative requirements shall be applied to the craft, to achieve the required level of safety.

## **1.7 Maintenance of conditions after survey**

**1.7.1** The condition of the craft and its equipment shall be maintained to conform with the provisions of this Code to ensure that the craft in all respects will remain fit to operate without danger to the craft or the persons on board.

**1.7.2** After any survey of the craft under section 1.5 has been completed, no change shall be made to structure, equipment, fittings, arrangements and materials covered by the survey, without the sanction of the Administration.

**1.7.3** Whenever an accident occurs to a craft or a defect is discovered, either of which affects the safety of the craft or the efficiency or completeness of structure, equipment, fittings, arrangements and materials, the person in charge or owner of the craft shall report at the earliest opportunity to the Administration, the nominated surveyor or recognized organization responsible, who shall cause investigations to be initiated to determine whether a survey, as required by section 1.5, is necessary. If the craft is in an area under the jurisdiction of another Government, the person in charge or the owner shall also report immediately to the appropriate authorities of the port State and the nominated surveyor or recognized organization shall ascertain that such a report has been made.

## 1.8 High-Speed Craft Safety Certificate

**1.8.1** A certificate called a High-Speed Craft Safety Certificate is issued after completion of an initial or renewal survey to a craft which complies with the requirements of the Code. The Certificate shall be issued or endorsed either by the Administration or by any person or organization recognized by it. In every case, that Administration assumes full responsibility for the Certificate. On all craft, all certificates issued under this chapter, or certified copies thereof, shall be carried on the craft. Except where the flag State is a Party to the 1988 SOLAS Protocol, a copy of each of these certificates shall be posted up in a prominent and accessible place in the craft.

**1.8.2** A Contracting Government to the Convention may, at the request of the Administration, cause a craft to be surveyed and, if satisfied that the requirements of the Code are complied with, shall issue or authorize the issue of a Certificate to the craft and, where appropriate, endorse or authorize the endorsement of a Certificate on the craft in accordance with the Code. Any Certificate so issued shall contain a statement to the effect that it has been issued at the request of the Government of the State the flag of which the craft is entitled to fly, and it shall have the same force and receive the same recognition as a Certificate issued under 1.8.1.

**1.8.3** The Certificate shall be that of the model given in annex 1 to the Code. If the language used is not English, French or Spanish, the text shall include a translation into one of these languages.

**1.8.4** The High-Speed Craft Safety Certificate shall be issued for a period specified by the Administration which shall not exceed 5 years.

**1.8.5** Notwithstanding the requirements of 1.8.4, when the renewal survey is completed within three months before the expiry date of the existing Certificate, the new Certificate shall be valid from the date of completion of the renewal survey to a date not exceeding 5 years from the date of expiry of the existing Certificate.

**1.8.6** When the renewal survey is completed after the expiry date of the existing Certificate, the new Certificate shall be valid from the date of completion of the renewal survey to a date not exceeding 5 years from the date of expiry of the existing Certificate.

**1.8.7** When the renewal survey is completed more than 3 months before the expiry date of the existing Certificate, the new Certificate shall be valid from the date of completion of the renewal survey to a date not exceeding 5 years from the date of completion of the renewal survey.

**1.8.8** If a Certificate is issued for a period of less than 5 years, the Administration may extend the validity of the Certificate beyond the expiry date to the maximum period specified in 1.8.4, provided that the surveys required when a Certificate is issued for a period of 5 years are carried out.

**1.8.9** If a renewal survey has been completed and a new Certificate cannot be issued or placed on board the craft before the expiry date of the existing Certificate, the person or organization authorized by the Administration may endorse the existing Certificate and such a Certificate shall be accepted as valid for a further period which shall not exceed 5 months from the expiry date.

**1.8.10** If a craft, at the time when a Certificate expires, is not in the place in which it is to be surveyed, the Administration may extend the period of validity of the Certificate but this extension shall be granted only for the purpose of allowing the craft to proceed to the place in which it is to be surveyed, and then only in cases where it appears proper and reasonable to do so. No Certificate shall be extended for a period longer than one month, and a craft to which an extension is granted shall not, on its arrival in the place in which it is to be surveyed, be entitled by virtue of such extension to leave that place without having a new Certificate. When the renewal survey is completed, the new Certificate shall be valid to a date not exceeding 5 years from the date of expiry of the existing Certificate before the extension was granted.

**1.8.11** In special circumstances, as determined by the Administration, a new Certificate need not be dated from the date of expiry of the existing Certificate as required by 1.8.6 or 1.8.10. In these circumstances, the new Certificate shall be valid to a date not exceeding 5 years from the date of completion of the renewal survey.

**1.8.12** If a periodical survey is completed before the period specified in section 1.5, then:

- .1 the anniversary date shown on the relevant Certificate shall be amended by endorsement to a date which shall not be more than 3 months later than the date on which the survey was completed;
- .2 the subsequent periodical survey required by section 1.5 shall be completed at the intervals prescribed by 1.5 using the new anniversary date; and
- .3 the expiry date may remain unchanged provided one or more periodical surveys are carried out so that the maximum intervals between the surveys prescribed by 1.5.1.3 are not exceeded.

**1.8.13** A Certificate issued under 1.8.1 or 1.8.2 shall cease to be valid in any of the following cases:

- .1 if the relevant surveys are not completed within the periods specified in 1.5.1;
- .2 if the Certificate is not endorsed in accordance with 1.5.3;
- .3 upon transfer of the craft to the flag of another State. A new Certificate shall only be issued when the Government issuing the new Certificate is fully satisfied that the craft is in compliance with the requirements of 1.7.1 and 1.7.2. In the case of a transfer between Governments that are Contracting Governments to the Convention, if requested within 3 months after the transfer has taken place, the Government of the State whose flag the craft was formerly entitled to fly shall, as soon as possible, transmit to the Administration a copy of the Certificate carried by the craft before the transfer and, if available, copies of the relevant survey reports.

**1.8.14** The privileges of the Code may not be claimed in favour of any craft unless it holds a valid Certificate.

## **1.9 Permit to Operate High-Speed Craft**

**1.9.1** The craft shall not operate commercially unless a Permit to Operate High-Speed Craft is issued and valid in addition to the High-Speed Craft Safety Certificate.

**1.9.1.1** On all craft, transit voyages may be undertaken without a valid Permit to Operate High-Speed Craft provided the craft is not operating commercially with passengers or cargo on board. For the purpose of this provision, these transit voyages include delivery voyages, i.e., builder's port to base port, and voyages for repositioning purposes, i.e., change of base port and/or route. Such transit voyages in excess of the limits set out in this Code may be undertaken provided that:

- .1 the craft has a valid High-Speed Craft Safety Certificate or similar before the start of such a voyage;
- .2 the operator has developed a safety plan for the voyage, including any temporary accommodation and all relevant matters listed in 18.1.3, to ensure that the craft is capable of safely completing the transit voyage;

- .3 the master of the craft is provided with the materials and information necessary to operate the craft safely during the transit voyage; and
- .4 the Administration is satisfied that arrangements have been made for the safe conduct of the voyage.

**1.9.2** The Permit to Operate High-Speed Craft shall be issued by the Administration to certify compliance with 1.2.2 to 1.2.7 and stipulate conditions of the operation of the craft and be drawn up on the basis of the information contained in the route operational manual specified in chapter 18 of this Code.

**1.9.3** Before issuing the Permit to Operate, the Administration shall consult with each port State to obtain details of any operational conditions associated with operation of the craft in that State. Any such conditions imposed shall be shown by the Administration on the Permit to Operate and included in the route operational manual.

**1.9.4** A port State may inspect the craft and audit its documentation for the sole purpose of verifying its compliance with the matters certified by and conditions associated with the Permit to Operate. Where deficiencies are shown by such an audit, the Permit to Operate ceases to be valid until such deficiencies are corrected or otherwise resolved.

**1.9.5** The provisions of 1.8 shall apply to the issue and the period of validity of the Permit to Operate High-Speed Craft.

**1.9.6** The Permit to Operate High-Speed Craft shall be that of the model given in annex 2 to this Code. If the language used is not English, French or Spanish, the text shall include a translation into one of these languages.

**1.9.7** In determining the worst intended conditions and the operational limitations on all craft for insertion in the Permit to Operate, the Administration shall give consideration to all the parameters listed in annex 12. The limitations assigned shall be those that enable compliance with all of these factors.

## **1.10 Control**

The provisions of regulation I/19 of the Convention shall be applied to include the Permit to Operate High-Speed Craft in addition to the Certificate issued under 1.8.

## **1.11 Equivalents**

**1.11.1** Where this Code requires that a particular fitting, material, appliance or apparatus, or type thereof, shall be fitted or carried in a craft, or that any particular provision shall be made, the Administration may allow any other fitting, material, appliance or apparatus, or type thereof, to be fitted or carried, or any other provision to be made in the craft, if it is satisfied by trial thereof or otherwise that such fitting, material, appliance or apparatus, or type thereof, or provision, is at least as effective as that required by this Code.

**1.11.2** Where compliance with any of the requirements of this Code would be impractical for the particular design of the craft, the Administration may substitute those with alternative requirements, provided that equivalent safety is achieved. The Administration which allows any such substitution shall communicate to the Organization particulars of these substitutions and the reasons therefor, which the Organization shall circulate to its Member Governments for their information.

## **1.12 Information to be made available**

**1.12.1** The Administration shall ensure that the management of the Company operating the craft has provided the craft with adequate information and guidance in the form of manuals to enable the craft to be operated and maintained safely. These manuals shall include a route operational manual, craft operating manual, maintenance manual and servicing schedule. Such information shall be updated as necessary.

**1.12.2** The manuals shall contain at least the information specified in chapter 18, and shall be in a language understood by the crew. Where this language is not English, a translation into English shall be provided of at least the route operational manual and the craft operating manual.

## **1.13 Further developments**

**1.13.1** It is recognized that there is much ongoing research and development in the design of high-speed craft and that new types may emerge which have a different geometry to that envisaged during the formulation of this Code. It is important that this Code does not restrict this progress and the development of new designs.

**1.13.2** A design may be produced which cannot comply with the provisions of this Code. In such a case the Administration shall determine the extent to

which the provisions of the Code are applicable to the design and, if necessary, develop additional or alternative requirements to provide an equivalent level of safety for the craft.

**1.13.3** The foregoing shall be considered by the Administration when assessing the granting of equivalents under the Code.

## **1.14 Circulation of safety information**

**1.14.1** In the event that an Administration has cause to investigate an accident involving a craft to which this Code applies, that Administration shall provide a copy of the official report to the Organization, which will invite Member States to note the existence of the report and to obtain a copy.

**1.14.2** In the event that operational experience reveals structural or equipment failures affecting the safety of a design, craft owners shall inform the Administration.

## **1.15 Review of the Code**

**1.15.1** The Code shall be reviewed by the Organization at intervals preferably not exceeding six years to consider revision of existing requirements to take account of new developments in design and technology.

**1.15.2** Where a new development in design and technology has been found acceptable to an Administration, that Administration may submit particulars of such development to the Organization for consideration for incorporation into the Code during the periodical review.

# Chapter 2

## *Buoyancy, stability and subdivision*

### PART A – GENERAL

#### 2.1 General

2.1.1 A craft shall be provided with:

- 1 stability characteristics and stabilization systems adequate for safety when the craft is operated in the non-displacement mode and during the transitional mode;
- 2 buoyancy and stability characteristics adequate for safety where the craft is operated in the displacement mode, both in the intact condition and the damaged condition; and
- 3 stability characteristics in the non-displacement and transitional modes adequate to transfer the craft safely to displacement mode in case of any system malfunction.

2.1.2 Account shall be taken of the effect of icing in the stability calculations. An example of established practice for ice accretion allowances is given in annex 5 for the guidance of the Administration.

2.1.3 For the purpose of this and other chapters, unless expressly defined otherwise, the following definitions apply:

- 1 *Downflooding point* means any opening, irrespective of size, that would permit passage of water through a water/weather-tight structure (e.g., opening windows), but excludes any opening kept closed to an appropriate standard of water/weathertightness at all times other than when required for access or for operation of portable submersible bilge pumps in an emergency (e.g., non-opening windows of similar strength and weathertight integrity to the structure in which they are installed).
- 2 *Elsewhere*, when applied to sill and coaming heights in 2.2.7 and 2.2.8, is taken as applying to all weathertight and watertight closures located on or below the datum.
- 3 *Fully submerged foil* means a foil having no lift components piercing the surface of the water in the foil-borne mode.

- .4 *Monohull craft* means any craft which is not a multihull craft.
- .5 *Multihull craft* means a craft which in any normally achievable operating trim or heel angle has a rigid hull structure which penetrates the surface of the sea over more than one discrete area.
- .6 *Permeability* of a space means the percentage of the volume of that space which can be occupied by water.
- .7 *Skirt* means a downwardly extending, flexible structure used to contain or divide an air cushion.

**2.1.4** Other means of demonstrating compliance with the requirements of any part of this chapter may be accepted, provided that the method chosen can be shown to provide an equivalent level of safety. Such methods may include:

- .1 mathematical simulation of dynamic behaviour;
- .2 scale model testing; and
- .3 full-scale trials.

**2.1.5** The adequacy of mathematical simulations must first be demonstrated by correlation with full-scale or model tests for the appropriate type of craft. It may be appropriate to use mathematical simulations to help to identify the more critical scenarios for subsequent physical testing.\*

**2.1.6** Model or full-scale tests and/or calculations (as appropriate) shall also include consideration of the following known stability hazards to which high-speed craft are known to be liable, according to craft type:

- .1 directional instability, which is often coupled with roll and pitch instabilities;
- .2 broaching and bow diving in following seas at speeds near to wave speed, applicable to most types;
- .3 bow diving of planing monohulls and catamarans due to dynamic loss of longitudinal stability in relatively calm seas;
- .4 reduction in transverse stability with increasing speed of monohulls;
- .5 porpoising of planing monohulls, being coupled pitch and heave oscillations, which can become violent;

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\* Some mathematical simulation methods are not well suited to accurate modelling of extreme events. For safety level 3 or 4, it may be appropriate to use model testing as a precursor to, or instead of, full-scale testing.

- .6 chine tripping, being a phenomenon of planing monohulls occurring when the immersion of a chine generates a strong capsizing moment;
- .7 plough-in of air-cushion vehicles, either longitudinal or transverse, as a result of bow or side skirt tuck-under or sudden collapse of skirt geometry, which, in extreme cases, can result in capsize;
- .8 pitch instability of SWATH (small waterplane area twin hull) craft due to the hydrodynamic moment developed as a result of the water flow over the submerged lower hulls;
- .9 reduction in effective metacentric height (roll stiffness) of surface-effect ships (SES) in high-speed turns compared to that on a straight course, which can result in sudden increases in heel angle and/or coupled roll and pitch oscillations; and
- .10 resonant rolling of SES in beam seas, which, in extreme cases, can result in capsize.

**2.1.7** Suitable calculations shall be carried out and/or tests conducted to demonstrate that, when operating within approved operational limitations, the craft will, after a disturbance causing roll, pitch, heave or heel due to turning or any combination thereof, return to the original attitude. Where calculations are employed, it shall first be shown that they correctly represent dynamic behaviour within the operational limitations of the craft.

## **2.2 Intact buoyancy and watertight and weathertight integrity**

### **2.2.1 Buoyant spaces\***

**2.2.1.1** All craft shall have a sufficient reserve of buoyancy at the design waterline to meet the intact and damage stability requirements of this chapter. The Administration may require a larger reserve of buoyancy to permit the craft to operate in any of its intended modes. This reserve of buoyancy shall be calculated by including only those compartments that are:

- .1 watertight and situated below the datum, or
- .2 watertight or weathertight and situated above the datum.

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\* These requirements encompass the need for all hull openings and their closures to be provided with satisfactory integrity.

In considering the stability after damage, flooding shall be assumed to occur until limited by watertight boundaries in the equilibrium condition, and weathertight boundaries in intermediate stages of flooding and within the range of positive righting lever required to satisfy the residual stability requirements. Where a buoyant space may be subjected to increased fluid pressure in the equilibrium position after damage, the boundaries and associated openings and penetrations of that space shall be designed and constructed to prevent the passage of fluid under that pressure.

Craft built in conformity with the requirements of organizations recognized by the Administration, in accordance with regulation XI/1 of the Convention, may be considered to possess adequate strength and integrity.

**2.2.1.2** Arrangements shall be provided for checking the watertight or weathertight integrity of those compartments taken into account in 2.2.1.1, and the details incorporated in the craft operating manual required by 18.2.1.

## **2.2.2** *Openings in watertight divisions*

**2.2.2.1** The number of openings in watertight bulkheads shall be reduced to the minimum compatible with the design and proper working of the craft, and all such doors shall be closed prior to departure of the craft from the berth.

**2.2.2.2** Doors in watertight bulkheads may be hinged or sliding. They shall be shown by suitable testing to be capable of maintaining the watertight integrity of the bulkhead. Such testing shall be carried out for both sides of the door and shall apply a pressure head 10% greater than that determined from the minimum permissible height of a downflooding opening. Testing may be carried out either before or after the door is fitted into the craft but, where shore testing is adopted, satisfactory installation in the craft shall be verified by inspection and hose testing.

**2.2.2.3** Type approval may be accepted in lieu of testing individual doors, provided the approval process includes pressure testing to a head equal to, or greater than, the required head (refer to 2.2.2.2).

**2.2.2.4** All watertight doors shall be capable of being operated when the craft is inclined up to 15°, and shall be fitted with means of indication in the operating compartment showing whether they are open or closed. All such doors shall be capable of being opened and closed locally from each side of the bulkhead.

**2.2.2.5** Watertight doors shall remain closed when the craft is at sea, except that they may be opened for access. A notice shall be attached to each door to the effect that it is not to be left open.

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**2.2.2.6** Watertight doors shall be capable of being closed by remote control from the operating compartment in not less than 20 s and not more than 40 s, and shall be provided with an audible alarm, distinct from other alarms in the area, which will sound for at least 5 s but no more than 10 s before the doors begin to move whenever the door is closed remotely by power, and continue sounding until the door is completely closed. The power, control and indicators shall be operable in the event of main power failure, as required by regulation II-1/15.7.3 of the Convention. In passenger areas and areas where the ambient noise exceeds 85 dB(A) the audible alarm shall be supplemented by an intermittent visual signal at the door. If the Administration is satisfied that such doors are essential for the safe work of the craft, hinged watertight doors having only local control may be permitted for areas to which crew only have access, provided they are fitted with remote indicators as required by 2.2.2.4.

**2.2.2.7** Where pipes, scuppers, electric cables, etc. are carried through watertight divisions, the arrangements for creating a watertight penetration shall be of a type which has been prototype tested under hydrostatic pressure equal to or greater than that required to be withstood for the actual location in the craft in which they are to be installed. The test pressure shall be maintained for at least 30 min and there must be no leakage through the penetration arrangement during this period. The test pressure head shall be 10% greater than that determined from the minimum permissible height of a downflooding opening. Watertight bulkhead penetrations which are effected by continuous welding do not require prototype testing. Valves on scuppers from weathertight compartments included in the stability calculations shall have arrangements for remote closing from the operating station.

**2.2.2.8** Where a ventilation trunk forms part of a watertight boundary, the trunk shall be capable of withstanding the water pressure that may be present, taking into account the maximum inclination angle allowable during all stages of flooding.

### **2.2.3** *Inner bow doors*

**2.2.3.1** Where ro-ro craft are fitted with bow loading openings, an inner bow door shall be fitted abaft such openings to restrict the extent of flooding in the event of failure of the outer closure. This inner bow door, where fitted, shall be:

- .1 weathertight to the deck above, which deck shall itself be weathertight forward to the bow loading opening;

- .2 so arranged as to preclude the possibility of a bow loading door causing damage to it in the case of damage to, or detachment of, the bow loading door;
- .3 forward of all positions on the vehicle deck in which vehicles are intended to be carried; and
- .4 part of a boundary designed to prevent flooding into the remainder of the craft.

**2.2.3.2** A craft may be exempted from the requirement for such an inner bow door where one of the following applies:

- .1 the vehicle loading deck at the inner bow door position is above the design waterline by a height more than the significant wave height corresponding to the worst intended conditions;
- .2 it can be demonstrated, using model tests\* or mathematical simulations, that, when the craft is proceeding at a range of speeds up to the maximum attainable speed in the loaded condition at all headings in long crested seas of the greatest significant wave height corresponding to the worst intended conditions, either:
  - .2.1 the bow loading door is not reached by waves; or
  - .2.2 having been tested with the bow loading door open to determine the maximum steady-state volume of water which accumulates, it can be shown by static analysis that, with the same volume of water on the vehicle deck(s), the residual stability requirements of 2.6.12 and 2.13 or 2.15 are satisfied. If the model tests or mathematical simulations are unable to show that the volume of water accumulated reaches a steady state, the craft shall be considered not to have satisfied the conditions of this exemption.

Where mathematical simulations are employed, they shall already have been verified against full-scale or model testing;

- .3 bow loading openings lead to open ro-ro spaces provided with guardrails or having freeing ports complying with 2.2.3.2.4;
- .4 the deck of the lowest ro-ro space above the design waterline is fitted on each side of the deck with freeing ports evenly distributed along the sides of the compartment. These shall

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\* Reference should be made to MSC.1/Circ.1195, which provides guidelines for the conduct of high-speed craft model testing.

either be proven to be acceptable using tests according to 2.2.3.2.2 above or comply with the following:

**.4.1**  $A \geq 0.3l$

where:

$A$  = the total area of freeing ports on each side of the deck in  $m^2$ ; and

$l$  = the length of the compartment in metres;

**.4.2** the craft shall maintain a residual freeboard to the deck of the ro-ro space of at least 1 m in the worst condition;

**.4.3** such freeing ports shall be located within the height of 0.6 m above the deck of the ro-ro space, and the lower edge of the ports shall be within 0.02 m above the deck of the ro-ro space; and

**.4.4** such freeing ports shall be fitted with closing devices or flaps to prevent water entering the deck of the ro-ro space whilst allowing water which may accumulate on the deck of the ro-ro space to drain.

## **2.2.4** *Other provisions for ro-ro craft*

**2.2.4.1** All accesses in the ro-ro space that lead to spaces below the deck shall have a lowest point which is not less than the height required from the tests conducted according to 2.2.3.2.2 or 3 m above the design waterline.

**2.2.4.2** Where vehicle ramps are installed to give access to spaces below the deck of the ro-ro space, their openings shall be capable of being closed weathertight to prevent ingress of water below.

**2.2.4.3** Accesses in the ro-ro space that lead to spaces below the ro-ro deck and having a lowest point which is less than the height required from the tests conducted according to 2.2.3.2.2 or 3 m above the design waterline may be permitted provided they are watertight and are closed before the craft leaves the berth on any voyage and remain closed until the craft is at its next berth.

**2.2.4.4** The accesses referred to in 2.2.4.2 and 2.2.4.3 above shall be fitted with alarm indicators in the operating compartment.

**2.2.4.5** Special category spaces and ro-ro spaces shall be patrolled or monitored by effective means, such as television surveillance, so that any

movement of vehicles in adverse weather conditions and unauthorized access by passengers thereto can be detected whilst the craft is under way (refer to 7.8.3.1).

## **2.2.5** *Indicators and surveillance*

### **2.2.5.1** Indicators

Indicators shall be provided in the operating compartment for all shell doors, loading doors and other closing appliances which, if left open or not properly secured, could lead to major flooding in the intact and damage conditions. The indicator system shall be designed on the fail-safe principle and shall show by visual alarms if the door is not fully closed or if any of the securing arrangements are not in place and fully locked, and by audible alarms if such door or closing appliance becomes open or the securing arrangements become unsecured. The indicator panel in the operating compartment shall be equipped with a mode-selection function 'harbour/ sea voyage' so arranged that an audible alarm is given in the operating compartment if the craft leaves harbour with the bow doors, inner doors, stern ramp or any other side shell doors not closed or any closing device not in the correct position. The power supply for the indicator systems shall be independent of the power supply for operating and securing the doors.

### **2.2.5.2** Television surveillance

Television surveillance and a water leakage detection system shall be arranged to provide an indication to the operating compartment and to the engine control station of any leakage through inner and outer bow doors, stern doors or any other shell doors which could lead to major flooding.

## **2.2.6** *Integrity of superstructure*

**2.2.6.1** Where entry of water into structures above the datum would significantly influence the stability and buoyancy of the craft, such structures shall be:

- .1** of adequate strength to maintain the weathertight integrity and fitted with weathertight closing appliances; or
- .2** provided with adequate drainage arrangements; or
- .3** an equivalent combination of both measures.

**2.2.6.2** Weathertight superstructures and deckhouses located above the datum shall, in the outside boundaries, have means of closing openings with sufficient strength such as to maintain weathertight integrity in all damage

conditions where the space in question is not damaged. Furthermore, the means of closing shall be such as to maintain weathertight integrity in all operational conditions.

## **2.2.7** *Doors, windows, etc., in boundaries of weathertight spaces*

**2.2.7.1** Doors, windows, etc., and any associated frames and mullions in weathertight superstructures and deckhouses, shall be weathertight and shall not leak or fail at a uniformly applied pressure less than that at which the adjacent structure would experience permanent set or fail. Conformity with the requirements of organizations recognized by the Administration in accordance with regulation XI/1 of the Convention may be considered to possess adequate strength.

**2.2.7.2** For doors in weathertight superstructures, hose tests shall be carried out with water pressure from the outside in accordance with specifications at least equivalent to those acceptable to the Organization.\*

**2.2.7.3** The height above the deck of sills to doorways leading to exposed decks shall be as high above the deck as is reasonable and practicable, particularly those located in exposed positions. Such sill heights shall in general not be less than 100 mm for doors to weathertight spaces on decks above the datum, and 250 mm elsewhere.† For craft of 30 m in length and under, sill heights may be reduced to the maximum which is consistent with the safe working of the craft.

**2.2.7.4** Windows shall not be permitted in the boundaries of special category spaces or ro-ro spaces or below the datum. If required by restrictions in the Permit to Operate, forward-facing windows, or windows which may be submerged at any stage of flooding, shall be fitted with hinged or sliding storm shutters ready for immediate use.

**2.2.7.5** Sidescuttles to spaces below the datum shall be fitted with efficient hinged deadlights arranged inside so that they can be effectively closed and secured watertight.

**2.2.7.6** No sidescuttle shall be fitted in a position so that its sill is below a line drawn parallel to and one metre above the design waterline.

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\* Refer to ISO 6042 – *Ships and marine technology – Weathertight single-leaf steel doors*, or a similar standard.

† Refer to 2.1.3.2.

## **2.2.8** Hatchways and other openings

### **2.2.8.1** Hatchways closed by weathertight covers

The construction and the means for securing the weathertightness of cargo and other hatchways shall comply with the following:

- .1** coaming heights shall in general not be less than 100 mm for hatches to weathertight spaces on decks above the datum, and 250 mm elsewhere.\* For craft of 30 m in length and under, coaming heights may be reduced to the maximum which is consistent with the safe working of the craft;
- .2** the height of these coamings may be reduced, or the coamings omitted entirely, on condition that the Administration is satisfied that the safety of the ship is not thereby impaired in any sea conditions up to the worst intended conditions. Where coamings are provided, they shall be of substantial construction; and
- .3** the arrangements for securing and maintaining weathertightness shall ensure that the tightness can be maintained in any sea conditions up to the worst intended conditions.

### **2.2.8.2** Machinery space openings

**2.2.8.2.1** Machinery space openings shall be properly framed and efficiently enclosed by casings of ample strength and, where the casings are not protected by other structures, their strength shall be specially considered. Access openings in such casings shall be fitted with weathertight doors.†

**2.2.8.2.2** Heights of sills and coaming shall, in general, not be less than 100 mm for openings to weathertight spaces on decks above the datum, and 380 mm elsewhere.\* For craft of 30 m in length and under, these heights may be reduced to the maximum which is consistent with the safe working of the craft.

**2.2.8.2.3** Machinery space ventilator openings shall comply with the requirements of 2.2.8.4.2.

\* Refer to 2.1.3.2.

† Conformity with the requirements of organizations recognized by the Administration in accordance with regulation XI-1/1 of the Convention may be considered to possess adequate strength.

### **2.2.8.3** Miscellaneous openings in exposed decks

**2.2.8.3.1** Manholes and flush scuttles on the datum or within superstructures other than enclosed superstructures shall be closed by substantial covers capable of being made watertight. Unless secured by closely spaced bolts, the covers shall be permanently attached.

**2.2.8.3.2** Service hatches to machinery, etc., may be arranged as flush hatches provided that the covers are secured by closely spaced bolts, are kept closed at sea, and are equipped with arrangements for portable guardrails.

**2.2.8.3.3** Openings in exposed decks leading to spaces below the datum or enclosed superstructures other than hatchways, machinery space openings, manholes and flush scuttles shall be protected by an enclosed superstructure, or by a deckhouse or companionway of equivalent strength and weathertightness.

**2.2.8.3.4** The height above the deck of sills to the doorways in companionways shall, in general, not be less than 100 mm for doors to weathertight spaces on decks above the datum, and 250 mm elsewhere.\* For craft of 30 m in length and under, sill heights may be reduced to the maximum which is consistent with the safe working of the craft.

### **2.2.8.4** Ventilators

**2.2.8.4.1** Ventilators to spaces below the datum or decks of enclosed superstructures shall have substantially constructed coamings efficiently connected to the deck. Coaming heights shall in general not be less than 100 mm for ventilators to weathertight spaces on decks above the datum, and 380 mm elsewhere.\* For craft of 30 m in length and under, coaming heights may be reduced to the maximum which is consistent with the safe working of the craft.

**2.2.8.4.2** Ventilators the coamings of which extend to more than one metre above the deck or which are fitted to decks above the datum need not be fitted with closing arrangements unless they face forward or are specifically required by the Administration.

**2.2.8.4.3** Except as provided in 2.2.8.4.2, ventilator openings shall be provided with efficient weathertight closing appliances.

**2.2.8.4.4** Ventilator openings shall face aft or athwartships wherever practicable.

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\* Refer to 2.1.3.2.

## **2.2.9** *Scuppers, inlets and discharges*

**2.2.9.1** Discharges led through the shell either from spaces below the datum or from within superstructures and deckhouses fitted above the datum shall be fitted with efficient and accessible means for preventing water from passing inboard. Normally each separate discharge shall have one automatic non-return valve with a positive means of closing it from a position above the datum. Where, however, the vertical distance from the design waterline to the inboard end of the discharge pipe exceeds  $0.01L$ , the discharge may have two automatic non-return valves without positive means of closing, provided that the inboard valve is always accessible for examination under service conditions. Where that vertical distance exceeds  $0.02L$ , a single automatic non-return valve without positive means of closing may be accepted. The means for operating the positive-action valve shall be readily accessible and provided with an indicator showing whether the valve is open or closed.

**2.2.9.2** Valves on scuppers from weathertight compartments included in the stability calculations shall be operable from the operating compartment.

**2.2.9.3** In manned machinery spaces, main and auxiliary sea inlets and discharges in connection with the operation of machinery may be controlled locally. Such controls shall be readily accessible and shall be provided with indicators showing whether the valves are open or closed. In unmanned machinery spaces, main and auxiliary sea inlet and discharge controls in connection with the operation of machinery shall either:

- .1 be located at least 50% of the significant wave height corresponding to the worst intended conditions above the deepest flooded waterline following damage specified in 2.6.6 to 2.6.10; or
- .2 be operable from the operating compartment.

**2.2.9.4** Scuppers leading from superstructures or deckhouses not fitted with weathertight doors shall be led overboard.

**2.2.9.5** All shell fittings and the valves required by this Code shall be of a suitable ductile material. Valves of ordinary cast iron or similar material shall not be acceptable.

## **2.2.10** *Air pipes*

**2.2.10.1** Main storage tanks containing flammable liquids or tanks which can be pumped or filled from the sea shall have air pipes which do not terminate in enclosed spaces.