

2.2.2 The Manual shall include information on the ship-specific capabilities and limitations in relation to the assessment required under paragraph 1.5.

2.2.3 The Manual shall include or refer to specific procedures to be followed in normal operations and in order to avoid encountering conditions that exceed the ship's capabilities.

2.2.4 The Manual shall include or refer to specific procedures to be followed in the event of incidents in polar waters.

2.2.5 The Manual shall include or refer to specific procedures to be followed in the event that conditions are encountered which exceed the ship's specific capabilities and limitations in paragraph 2.2.2.

2.2.6 The Manual shall include or refer to procedures to be followed when using icebreaker assistance, as applicable.

2.3 Regulations

2.3.1 In order to comply with the functional requirements in section 2.2, the Manual shall be carried on board.

2.3.2 In order to comply with the functional requirements of paragraph 2.2.2, the Manual shall contain, where applicable, the methodology used to determine capabilities and limitations in ice.

2.3.3 In order to comply with the functional requirements of paragraph 2.2.3, the Manual shall include risk-based procedures for the following:

- .1** voyage planning to avoid ice and/or temperatures that exceed the ship's design capabilities or limitations;
- .2** arrangements for receiving forecasts of the environmental conditions;
- .3** means of addressing any limitations of the hydrographic, meteorological and navigational information available;
- .4** operation of equipment required under other chapters of this Code; and
- .5** implementation of special measures to maintain equipment and system functionality under low temperatures, topside icing and the presence of sea ice, as applicable.

2.3.4 In order to comply with the functional requirements of paragraph 2.2.4, the Manual shall include risk-based procedures to be followed for:

- .1** contacting emergency response providers for salvage, search and rescue (SAR), spill response, etc., as applicable; and
- .2** in the case of ships ice strengthened in accordance with chapter 3, procedures for maintaining life support and ship integrity in the event of prolonged entrapment by ice.

2.3.5 In order to comply with the functional requirements of paragraph 2.2.5, the Manual shall include risk-based procedures to be followed for measures to be taken in the event of encountering ice and/or temperatures which exceed the ship's design capabilities or limitations.

2.3.6 In order to comply with the functional requirements of paragraph 2.2.6, the Manual shall include risk-based procedures for monitoring and maintaining safety during operations in ice, as applicable, including any requirements for escort operations or icebreaker assistance. Different operational limitations may apply depending on whether the ship is operating independently or with icebreaker escort. Where appropriate, the PWOM should specify both options.

Chapter 3

Ship structure

3.1 Goal

The goal of this chapter is to provide that the material and scantlings of the structure retain their structural integrity based on global and local response due to environmental loads and conditions.

3.2 Functional requirements

In order to achieve the goal set out in paragraph 3.1 above, the following functional requirements are embodied in the regulations of this chapter:

- .1** for ships intended to operate in low air temperature, materials used shall be suitable for operation at the ships' PST; and
- .2** in ice strengthened ships, the structure of the ship shall be designed to resist both global and local structural loads anticipated under the foreseen ice conditions.

3.3 Regulations

3.3.1 In order to comply with the functional requirements of paragraph 3.2.1 above, materials of exposed structures in ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account standards acceptable to the Organization* or other standards offering an equivalent level of safety based on the polar service temperature.

3.3.2 In order to comply with the functional requirements of paragraph 3.2.2 above, the following applies:

- .1 scantlings of category A ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account standards acceptable to the Organization[†] or other standards offering an equivalent level of safety;
- .2 scantlings of category B ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account standards acceptable to the Organization[‡] or other standards offering an equivalent level of safety;
- .3 scantlings of ice strengthened category C ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account acceptable standards adequate for the ice types and concentrations encountered in the area of operation; and
- .4 a category C ship need not be ice strengthened if, in the opinion of the Administration, the ship's structure is adequate for its intended operation.

Chapter 4

Subdivision and stability

4.1 Goal

The goal of this chapter is to ensure adequate subdivision and stability in both intact and damaged conditions.

* Refer to IACS UR S6 Use of Steel Grades for Various Hull Members – Ships of 90 m in Length and Above (latest version) or IACS URI Requirements concerning Polar Class (latest version), as applicable.

[†] Refer to Polar Class 1-5 of IACS URI Requirements concerning Polar Class (latest version).

[‡] Refer to Polar Class 6-7 of IACS URI Requirements concerning Polar Class (latest version).

4.2 Functional requirements

In order to achieve the goal set out in paragraph 4.1 above, the following functional requirements are embodied in the regulations of this chapter:

- .1 ships shall have sufficient stability in intact conditions when subject to ice accretion; and
- .2 ships of category A and B, constructed on or after 1 January 2017, shall have sufficient residual stability to sustain ice-related damages.

4.3 Regulations

4.3.1 Stability in intact conditions

4.3.1.1 In order to comply with the functional requirement of paragraph 4.2.1, for ships operating in areas and during periods where ice accretion is likely to occur, the following icing allowance shall be made in the stability calculations:

- .1 30 kg/m² on exposed weather decks and gangways;
- .2 7.5 kg/m² for the projected lateral area of each side of the ship above the water plane; and
- .3 the projected lateral area of discontinuous surfaces of rail, sundry booms, spars (except masts) and rigging of ships having no sails and the projected lateral area of other small objects shall be computed by increasing the total projected area of continuous surfaces by 5% and the static moments of this area by 10%.

4.3.1.2 Ships operating in areas and during periods where ice accretion is likely to occur shall be:

- .1 designed to minimize the accretion of ice; and
- .2 equipped with such means for removing ice as the Administration may require; for example, electrical and pneumatic devices, and/or special tools such as axes or wooden clubs for removing ice from bulwarks, rails and erections.

4.3.1.3 Information on the icing allowance included in the stability calculations shall be given in the PWOM.

4.3.1.4 Ice accretion shall be monitored and appropriate measures taken to ensure that the ice accretion does not exceed the values given in the PWOM.

4.3.2 Stability in damaged conditions

4.3.2.1 In order to comply with the functional requirements of paragraph 4.2.2, ships of categories A and B, constructed on or after 1 January 2017, shall be able to withstand flooding resulting from hull penetration due to ice impact. The residual stability following ice damage shall be such that the factor s_i , as defined in SOLAS regulations II-1/7-2.2 and II-1/7-2.3, is equal to one for all loading conditions used to calculate the attained subdivision index in SOLAS regulation II-1/7. However, for cargo ships that comply with subdivision and damage stability regulations in another instrument developed by the Organization, as provided by SOLAS regulation II-1/4.1, the residual stability criteria of that instrument shall be met for each loading condition.

4.3.2.2 The ice damage extents to be assumed when demonstrating compliance with paragraph 4.3.2.1 shall be such that:

- .1** the longitudinal extent is 4.5% of the upper ice waterline length if centred forward of the maximum breadth on the upper ice waterline, and 1.5% of upper ice waterline length otherwise, and shall be assumed at any longitudinal position along the ship's length;
- .2** the transverse penetration extent is 760 mm, measured normal to the shell over the full extent of the damage; and
- .3** the vertical extent is the lesser of 20% of the upper ice waterline draught or the longitudinal extent, and shall be assumed at any vertical position between the keel and 120% of the upper ice waterline draught.

Chapter 5

Watertight and weathertight integrity

5.1 Goal

The goal of this chapter is to provide measures to maintain watertight and weathertight integrity.

5.2 Functional requirements

In order to achieve the goal set out in paragraph 5.1 above, all closing appliances and doors relevant to watertight and weathertight integrity of the ship shall be operable.

5.3 Regulations

In order to comply with the functional requirements of paragraph 5.2 above, the following applies:

- .1 for ships operating in areas and during periods where ice accretion is likely to occur, means shall be provided to remove or prevent ice and snow accretion around hatches and doors; and
- .2 in addition, for ships intended to operate in low air temperature the following apply:
 - .1 if the hatches or doors are hydraulically operated, means shall be provided to prevent freezing or excessive viscosity of liquids; and
 - .2 watertight and weathertight doors, hatches and closing devices which are not within a habitable environment and require access while at sea shall be designed to be operated by personnel wearing heavy winter clothing including thick mittens.

Chapter 6

Machinery installations

6.1 Goal

The goal of this chapter is to ensure that machinery installations are capable of delivering the required functionality necessary for safe operation of ships.

6.2 Functional requirements

6.2.1 In order to achieve the goal set out in paragraph 6.1 above, the following functional requirements are embodied in the regulations of this chapter.